

**Payment, clearing and  
settlement systems in  
Canada**



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## List of abbreviations

ACSS	Automated Clearing Settlement System
ACV	Aggregate Collateral Value
AMF	Autorité des marchés financiers
ASO	additional settlement obligation
ATM	automated teller machine
BNDS	Bank Note Distribution System
BoC	Bank of Canada
CCP	central counterparty
CDCC	Canadian Derivatives Clearing Corporation
CDS	CDS Clearing and Depository Services Inc
CLS	Continuous Linked Settlement
CP Act	Canadian Payments Act
CPA	Canadian Payments Association
CPSS	Committee on Payment and Settlement Systems
CSA	Canadian Securities Administrators
CUCC	Credit Union Central of Canada
DTCC	Depository Trust and Clearing Corporation
DVP	delivery versus payment
EDI	electronic data interchange
EFTPOS	electronic funds transfer at the point of sale
FCAC	Financial Consumer Agency of Canada
ICE	Intercontinental Exchange
IDP	<i>Interac</i> Direct Payment
IIAC	Investment Industry Association Canada
IIROC	Investment Industry Regulatory Organization of Canada
IMN	Inter-Member Network
LVTS	Large Value Transfer System
MX	Montréal Exchange
MFDA	Mutual Fund Dealers Association of Canada
NGX	Natural Gas Exchange Inc.
OSC	Ontario Securities Commission
OSFI	Office of the Superintendent of Financial Institutions
PAC	Payment Advisory Committee
PCSA	Payment Clearing and Settlement Act
PIN	personal identification number
POS	point of sale
SAC	Stakeholder Advisory Council
SCD	Shared Cash Dispensing
USBE	US Bulk Exchange



## Introduction

Regulatory responsibilities for payment systems are shared between the Bank of Canada and the Federal Minister of Finance. The Bank of Canada has responsibility for the oversight of payment, clearing and settlement systems it has designated for the purpose of controlling systemic risk. The Minister of Finance has certain oversight powers for the Canadian Payments Association, as well as for payment, clearing and settlement systems. The two bodies coordinate oversight activities through a non-statutory body called the Payments Advisory Committee (PAC).

The Canadian Payments Association (CPA), established in 1980, is a not-for-profit organisation with membership open to deposit-taking and certain non-deposit-taking financial institutions. The CPA has a legal mandate to establish and operate systems for clearing and settling payments; to interact with other such systems; and to facilitate the development of new payment technologies. Under this mandate, the CPA owns and operates the two national payments systems: the Large Value Transfer System (LVTS) and the Automated Clearing Settlement System (ACSS). The CPA also owns and operates the US Bulk Exchange System (USBEX), which facilitates the clearing of US dollar-denominated payments between members of the CPA.

The LVTS, Canada's principal system for large-value and time-sensitive payments, began full operations in February 1999. It is an electronic credit transfer system that provides real-time processing and finality of payment. Its risk management arrangements ensure that payments are final and irrevocable once processed and that settlement will occur even in the event of a default by one or more participants with the largest net debit positions.

The ACSS was introduced in 1984 to automate the clearing and settlement of payments in Canada. It is a deferred net settlement system that clears and settles electronic payments and paper-based payments, such as cheques. With the introduction of the LVTS, the ACSS is now primarily oriented to retail payments.

For both the LVTS and ACSS, access to the systems is tiered, with CPA members able to access each system directly or indirectly through other members with direct access. Settlement occurs across accounts that direct participants hold at the Bank of Canada. The LVTS is by far the larger system by value – accounting for approximately 90% of the total value of payments cleared and settled in Canadian payment systems.

A wide variety of options for making cashless payments exists. The use of cheques has continued to decline over the past decade, while electronic payment methods, such as debit and credit card payments and online bill payments, have grown rapidly.

The prevalent credit card networks are operated by Visa, MasterCard and American Express (Amex). The main debit card network in Canada is operated by the Interac Association, which offers two services: a shared network for cash withdrawal from ATMs, and a shared network that allows debit card holders pay for purchases at the point of sale (EFTPOS). Both services are widely used and accepted in Canada.

CLS Bank, in operation since 2002, facilitates the settlement of foreign exchange transactions in 17 currencies, including the Canadian dollar. CLS Bank uses the LVTS as its approved payment system for the Canadian dollar, for the settlement of CLS pay-ins and pay-outs in the currency.

The two systems for clearing and settling securities and derivatives transactions are CDSX<sup>1</sup> and the Canadian Derivatives Clearing Corporation (CDCC). The former is owned and

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<sup>1</sup> CDSX is the full name of the system; it is not an acronym.

operated by the CDS Clearing and Depository Services Inc (CDS), a subsidiary of the Canadian Depository for Securities Limited, which is itself owned by the major Canadian chartered banks, members of the Investment Industry Regulatory Organization of Canada (IIROC)<sup>2</sup> and the TMX Group.<sup>3</sup> CDCC is a wholly owned subsidiary of the Montréal Exchange (MX), which has itself been owned by the TMX Group since May 2008. By transaction value, CDSX is the larger of the two systems.

In addition to depository services, CDSX facilitates the clearing<sup>4</sup> and settlement of Canadian dollar-denominated debt, money market and equity securities. It can be described as a model 2 delivery-versus-payment (DVP) mechanism:<sup>5</sup> transactions are settled with securities ownership moving on a gross basis in real time while net funds positions are settled at the end of the day via the LVTS.<sup>6</sup> The risk management arrangements ensure that CDSX could adequately settle all transactions even after the failure of the participant with the single largest net obligation to CDS.<sup>7</sup> CDSX also includes two integrated central counterparty facilities, for certain equities and debt.

The CDCC is the central counterparty (CCP) that clears almost all exchange-traded financial derivatives in Canada (except rights and warrants settled in CDSX). Currently, CDCC receives futures and options trades from two sources: the Montréal Exchange and Converge, which provides CCP services for over-the-counter equity options. CDCC is currently working on the implementation of a new CCP service for cash fixed income transactions and repurchase agreements (repos).

The Bank of Canada is involved in the payments and securities clearing and settlement systems in various ways. First, the Bank of Canada oversees the LVTS, CDSX and CLS Bank for the purpose of controlling systemic risk. Second, the Bank provides a settlement account to each of the CPA members that participate directly in the ACSS and the LVTS. Settlement is completed across these accounts. Third, the Bank provides collateralised advances to these same participants to fund end-of-day obligations in the LVTS if necessary. Fourth, the Bank accepts collateral and provides various collateral services in support of LVTS intraday operations and advances. Fifth, the Bank acts as the settlement agent for CDS with respect to the money settlement of CDSX, making and receiving payments on CDS's behalf through the LVTS. The Bank also provides the CLS Bank with a settlement account and makes and receives payments on its behalf through the LVTS. Finally, the Bank of Canada is a CPA member and participates directly in the LVTS and the ACSS. The Bank is also a participant in CDSX.

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<sup>2</sup> IIROC, which was created in 2008 through the amalgamation of the Investment Dealers Association of Canada and Market Regulation Services Inc, self-regulates aspects of the investment industry in Canada.

<sup>3</sup> TMX Group owns and operates two major stock exchanges in Canada: the Toronto Stock Exchange (for senior equity) and the TSX Venture Exchange (for public venture equity). TMX Group also has other subsidiaries such as the Montréal Exchange (for derivatives trading), the Canadian Derivatives Clearing Corporation (a central counterparty), the Natural Gas Exchange (for natural gas and electricity contracts) and Shorcan (a fixed income inter-dealer broker).

<sup>4</sup> For non-CCP-related services, clearing pertains to reconciliation, confirmation and netting of participants' positions. For CCP-related services, clearing also includes novation.

<sup>5</sup> See Committee on Payment and Settlement Systems, *Delivery versus payment in securities settlement systems*, Basel, 1992, page 4 (<http://www.bis.org/publ/cpss06.pdf>).

<sup>6</sup> CDS's model 2 DVP also has additional risk mitigation features such as: (i) simultaneous transfer of funds and securities at the time of settlement are final and irrevocable; and (ii) negative funds balances are fully collateralised.

<sup>7</sup> See Section 4.2.1: CDSX will settle even in the event of the failure of the largest extender of credit in the system.



## 1. Institutional aspects

### 1.1 The general institutional framework

The general legal and regulatory framework governing payments, clearing and settlement systems is discussed first, followed by a description of those institutions eligible to participate in the Canadian payments system.

#### 1.1.1 The legal and regulatory framework

The general legal framework for the Canadian payments system involves both public laws and private laws. Public laws are rules that have compulsory application by statute and are designed to promote the public interest. They include the *Canadian Payments Act*, the *Payment Clearing and Settlement Act*, the *Bank of Canada Act*, the *Bank Act*, the *Bills of Exchange Act*, the *Currency Act*, provincial securities laws, federal insolvency laws, and federal and provincial consumer protection laws.

Private laws are those rules that establish the legal framework of voluntary arrangements and are created to define and promote individual responsibilities and rights. These laws include property law, commercial law and contract law. They relate, among other things, to the autonomy of contracting parties, the liability for contractual commitments and good faith in mutual relations. For example, the deposit agreements and payments service contracts between individuals and their deposit-taking institutions, as well as the membership criteria, by-laws, procedural rules and operating standards of the Interac Association and credit card companies are legally validated through private law. However, the by-laws and procedural rules of the CPA, which is a statutory body, are defined under both public and private laws.

The most relevant legislation and voluntary standards are discussed below.

#### *The Canadian Payments Act (CP Act)*

The CP Act establishes the role of the Canadian Payments Association (CPA) and the Minister of Finance in the Canadian payments system. The Act gives certain oversight powers to the Minister of Finance respecting payments systems and the CPA.<sup>8</sup>

The CP Act gives the CPA Board of Directors the power to make by-laws (which require the approval of Governor in Council)<sup>9</sup> and rules that set out the procedures and standards governing the daily operations of participants in its national clearing and settlement systems. Among the items covered in the by-laws are the organisational structure of the clearing and settlement systems; the general procedures for the clearing of payments and their subsequent settlement on the books of the Bank of Canada; the description of which classes of items are eligible for clearing in the national system; and the definition of the rights and responsibilities of member institutions. These by-laws, together with the related rules, can be considered to form the operational framework of the LVTS and the ACSS.<sup>10</sup>

#### *The Payment Clearing and Settlement Act (PCSA)*

The PCSA gives the Bank of Canada responsibility for the oversight of payment, clearing and settlement systems in Canada for the purpose of controlling systemic risk. The Bank designates those systems with the potential to create systemic risk as being subject to the

<sup>8</sup> See Section 1.3.1 for more on the role of the Minister of Finance.

<sup>9</sup> The Governor in Council is the federal cabinet, a part of the federal government.

<sup>10</sup> See Section 1.3.2 for more information on the CPA.

PCSA and oversees designated systems for the appropriate control of systemic risk.<sup>11, 12, 13</sup> The PCSA contains provisions that, when combined with federal insolvency legislation, strengthen the legal enforceability of netting in designated systems. In addition, the PCSA contains provisions to ensure that the settlement rules of designated systems are immune to automatic stays, reversal or other legal challenges, even in cases where a participant in one of these systems fails. Thus, the PCSA increases the certainty surrounding the legal arrangements governing the operations of designated clearing and settlement systems. The PCSA also contains provisions with respect to the services the Bank may provide to an eligible system or its clearing house,<sup>14</sup> such as the provision of accounts and liquidity facilities.

#### *The Bank of Canada Act (BoC Act)*

The BoC Act, by governing the powers and activities of the central bank, has an important influence on the institutional framework of Canadian payment, clearing and settlement systems. The Bank may open accounts for commercial banks and other members of the CPA, and these accounts are used to effect the final settlement of payment obligations in the ACSS and the LVTs. The Bank of Canada, as the ultimate source of liquidity to the financial system, is authorised to make loans or advances on a secured basis to commercial banks and other members of the CPA.

#### *Acts governing bills of exchange*

The *Bills of Exchange Act* sets out the statutory framework governing cheques, promissory notes and other bills of exchange. The Act deals with matters such as what constitutes a valid bill of exchange and the rights and obligations of various parties to a bill, including provisions establishing liability in the event of fraud or forgery, and liabilities in the event of the loss of an instrument.

The *Depository Bills and Notes Act* allows clearing houses or depositories to transfer depository bills or notes, such as bankers' acceptances, from seller to buyer through book-entry transfers.

#### *Federal and provincial financial institutions statutes*

The federal financial institutions statutes (*Bank Act, Trust and Loans Companies Act, Cooperative Credit Associations Act and Insurance Companies Act*), coupled with legislation governing provincially incorporated financial institutions, provide the statutory underpinnings of the Canadian financial system. These statutes regulate such matters as corporate ownership and business powers, and define many aspects of the relationships between financial institutions and their customers, the government and some government agencies.

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<sup>11</sup> The Minister of Finance must be of the opinion that designation is in the public interest. See Section 1.2.2.

<sup>12</sup> The PCSA directs the Bank to be concerned with the oversight of clearing and settlement systems, rather than the regulation of a particular financial market or the supervision of the affairs of individual financial institutions that may be members of these systems. Any matter that is not directly related to an institution's participation in a designated clearing and settlement system is not subject to the Bank's oversight under the PCSA.

<sup>13</sup> The PCSA does not define specific criteria to be used to evaluate the potential for systemic risk. The Bank has, however, published criteria as part of its "Guideline Related to Bank of Canada Oversight Activities". This document is available at <http://www.bankofcanada.ca/en/financial/guide2002.html>.

<sup>14</sup> The PCSA defines a clearing house as a corporation, association, partnership, agency or other entity that provides clearing or settlement services for a clearing and settlement system, but does not include a stock exchange or the Bank of Canada.

Governed by the *Office of the Superintendent of Financial Institutions Act*, the Office of the Superintendent of Financial Institutions (OSFI) is responsible for regulating and supervising federally chartered financial institutions, which include many of the financial intermediaries that provide payment services. OSFI administers the various federal financial institutions statutes and, in carrying out its responsibilities, identifies institution-specific risks and intervenes in a timely manner to prevent or mitigate losses to depositors and policyholders.

The various provincial securities commissions currently regulate and oversee different aspects of the securities industry and capital markets in Canada. For example, the Ontario Securities Commission (OSC) administers and enforces the *Ontario Securities Act*, and the Autorité des marchés financiers (AMF) administers and enforces the *Quebec Securities Act* and the *Quebec Derivatives Act*. Some provincial securities commissions are involved in the regulation of certain clearing and settlement systems for securities and derivatives transactions, such as the systems operated by CDS and CDCC. A regulatory passport system permits some cross-provincial coordination, but this remains limited. In June 2009, the Government of Canada announced the creation of the Canadian Securities Transition Office to develop a national Canadian securities regulator, and in May 2010, it released the proposed *Canadian Securities Act*. The proposed Act would harmonise the existing provincial securities legislation in the form of a single statute. At this time, it is expected that provincial participation will be voluntary and the national regime will apply to provinces and territories that opt in.

#### *The Canadian Code of Practice for Consumer Debit Card Services*<sup>15</sup>

The Canadian Code of Practice for Consumer Debit Card Services is an industry-led initiative that establishes minimum levels of consumer protection in debit card arrangements. The Code was developed and revised through consultation among consumer groups, financial institutions, retailers and government, and is voluntary and not legally binding on organisations that endorse the Code.<sup>16</sup>

#### *Canadian Code of Practice for Consumer Protection in Electronic Commerce*<sup>17</sup>

The Canadian Code of Practice for Consumer Protection in Electronic Commerce provides merchants that choose to endorse the Code with a set of principles and benchmarks for good business practices for conducting commercial activities with consumers online. The code is voluntary and not legally binding. It was developed by various industry representatives and released in 2004. The set of principles addresses consumer information provision, contract formation and fulfilment, online privacy, security of payment and personal information, redress and unsolicited e-mail.

#### *The Code of Conduct for the Credit and Debit Card Industry in Canada*<sup>18</sup>

The Code of Conduct for the Credit and Debit Card Industry in Canada came into effect in August 2010. It was introduced by the Department of Finance to address issues related to

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<sup>15</sup> The Code of Practice for Consumer Debit Card Services is available at <http://www.fcac-acfc.gc.ca/eng/industry/RefDocs/DebitCardCode/DebitCardCode-eng.asp>.

<sup>16</sup> The following organisations endorse the Code: the Canadian Bankers Association, Canadian Federation of Independent Business, Credit Union Central of Canada, Consumers' Association of Canada, La Fédération des caisses Desjardins du Québec, Retail Council of Canada. In addition, the Canadian Payments Association supports the Code.

<sup>17</sup> The Code of Practice for Consumer Protection in Electronic Commerce is available at <http://cmcweb.ca>.

<sup>18</sup> The Code of Conduct for the Credit and Debit Card Industry is available at <http://www.fin.gc.ca/n10/10-029-eng.asp>.

the costs and conditions of accepting credit and debit cards. It also addresses the application of competing domestic networks on the same card and the issuance of premium credit cards. The purpose of the Code is to ensure that merchants who accept credit and debit cards are fully aware of their payment card costs, have more pricing flexibility and can freely choose which payment options they accept. The Code applies to credit and debit card networks, issuers and acquirers. Compliance with the Code is monitored by the Financial Consumer Agency of Canada (FCAC).

## **1.2 The role of the central bank**

The Bank of Canada has various operational roles as well as responsibility and authority for the oversight of designated clearing and settlement systems operating in Canada, for the purpose of controlling systemic risk.

### **1.2.1 Operational roles**

The Bank of Canada does not own or operate any payment, clearing or settlement systems, although it is a member of the CPA and a participant in the LVTS, ACSS and CDSX. The Bank does, however, provide the following services:

#### *Provision of a settlement asset*

The LVTS and ACSS use claims on the Bank of Canada to settle net payment obligations among those participants that participate directly in these systems.<sup>19</sup> This is supported through the provision of domestic currency settlement accounts by the Bank of Canada to participants.

#### *Standing liquidity facility*

The Bank of Canada provides collateralised, overnight advances to participants in the LVTS. These advances provide a source of immediate liquidity should they need to fund an end-of-day settlement obligation.

An LVTS advance is a secured loan provided by the Bank of Canada to a participant in the LVTS to cover a net amount owed by the institution in its end-of-day LVTS position. The interest rate on the overnight loan is set at the upper limit of the Bank of Canada's operating band for the overnight interest rate – the Bank Rate. Positive balances on the participants' accounts with the Bank of Canada are paid interest at the bottom of the operating band.

#### *Collateral services*

The Bank of Canada performs several functions respecting the collateral pledged to it by direct participants in support of overnight advances and use of the LVTS. The Bank establishes the types of assets acceptable for pledging, values the pledged securities (including an applicable haircut) and reports the valuations to the LVTS.<sup>20</sup>

#### *Settlement agent services*

The Bank of Canada provides accounts and acts as settlement agent, or “banker”, for CDSX, which is operated by CDS. CDSX settles trades of debt securities and equities in Canada and reports to participants the net payment obligations owed to (and from) other participants

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<sup>19</sup> See Section 3 for more on the LVTS and the ACSS.

<sup>20</sup> See *Assets eligible as collateral under the Bank of Canada's standing liquidity facility*, Bank of Canada, July 2010, available at <http://www.bankofcanada.ca/>.

resulting from these trades.<sup>21</sup> To effect settlement, CDS receives LVTS payments into its account at the Bank of Canada from participants that owe money and makes LVTS payments to participants entitled to receive money. In addition, the Bank provides CDS with a cash collateral account and an account for the collection of entitlement payments received via the LVTS during the day.

The Bank of Canada also provides the CLS Bank with a settlement account and makes and receives Canadian dollar payments on its behalf in the LVTS.<sup>22</sup>

As a participant in the LVTS, ACSS and CDSX, the Bank sends and receives payments and conducts securities transactions on its own behalf and on behalf of the federal government, other central banks and foreign official financial institution clients, such as the International Monetary Fund (IMF) and the Bank for International Settlements.

### 1.2.2 Oversight

Under the *Payment Clearing and Settlement Act* (PCSA), the Bank of Canada reviews all eligible payment and other clearing and settlement systems for their potential to pose systemic risk. A system is eligible for review by the Bank if:

- it has three or more participants, one of which is a bank;
- it clears or settles Canadian dollar payment obligations; and
- the payment obligations are ultimately settled through accounts at the Bank of Canada.

If the Governor of the Bank forms the opinion that a system has the potential to pose systemic risk, the system may be designated as subject to the PCSA, provided that the Minister of Finance is of the opinion that this is in the public interest. Once designated, a system has to satisfy the Bank that it has mechanisms in place to manage and control systemic risk associated with the system. The Governor may issue directives to the system operators or to participants in a designated system in extreme situations where the Governor judges that systemic risk is being inadequately controlled. The Bank has designated the LVTS, CDSX and CLS Bank under the PCSA.

The “Guideline related to Bank of Canada oversight activities under the Payment Clearing and Settlement Act”,<sup>23</sup> issued by the Bank of Canada in 2002, describes how the Bank operates under the PCSA, particularly in gathering information to identify systems eligible for review and in determining whether eligible systems will be designated. The guideline also indicates the minimum standards that the Bank applies to designated systems. These minimum standards incorporate the international standards issued by the Committee on Payment and Settlement Systems (CPSS) and the International Organization of Securities Commissions (IOSCO).<sup>24</sup> The LVTS, Canada’s principal system for large-value payments, has been assessed by the Bank as being in full compliance with the 2001 CPSS Core Principles for systemically important payment systems. In addition, in June 2000, the IMF and the World Bank published their Report on the Observance of Standards and Codes on

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<sup>21</sup> See Section 4.4.1.

<sup>22</sup> Other than CLS, no foreign, non-Canada-domiciled banks are granted direct access to accounts at the Bank of Canada. However, the Bank of Canada provides accounts to other central banks and foreign official institutions.

<sup>23</sup> The guideline is available at: <http://www.bankofcanada.ca/en/financial/guide2002.html>.

<sup>24</sup> For more information, see Clyde Goodlet, “Core principles for systemically important payments systems and their application in Canada”, *Bank of Canada Review*, Spring 2001.

Canada (prepared in the context of the Financial Sector Assessment Program) which concluded that the LVTS is in full compliance with the CPSS core principles.<sup>25</sup> In January 2008, an IMF Report on the Observance of Standards and Codes concluded that CDSX is in full compliance with the majority of the 2001 CPSS-IOSCO recommendations for securities settlement systems.

The PCSA also provides the Bank of Canada with a number of powers that it could exercise with respect to designated payment, clearing and settlement systems. Two noteworthy powers are the ability to provide a guarantee of settlement to particular systems and the ability to pay interest on special deposits accepted from the participants in particular systems. With regard to the former, the Bank of Canada has provided a guarantee that the LVTS will settle in all circumstances. The guarantee could only be called on in the following extremely unlikely circumstances: there is an unanticipated failure of more than one participant on the same day during LVTS operating hours; the failing participants have a net owing position vis-à-vis the system; and the amount owed by the failing participants exceeds the value of collateral that has been pledged to the Bank of Canada.<sup>26</sup>

To carry out its oversight responsibilities, the Bank engages in regular monitoring, meetings and correspondence with the payment system operators; conducts on-site inspections; and reviews proposed changes to a designated system's operations, arrangements, rules and procedures to analyse their implications for systemic risk. The Bank supports these activities through various research initiatives, which help to inform policy-related decisions. Audits and self-assessments of designated systems are conducted annually.

The Bank does not have oversight powers with respect to non-designated systems. It therefore does not oversee or apply any standards to eligible but non-designated systems. However, the Bank regularly monitors developments and conducts research and analysis to periodically assess payment clearing and settlement systems for their potential to pose systemic risk.

### **1.2.3 Cooperation with other institutions**

The Bank of Canada shares oversight authority of CDSX with the Ontario Securities Commission (OSC) and the equivalent securities commission for Quebec, the *Autorité des marchés financiers* (AMF). While there are some common responsibilities in relation to regulating CDSX (eg risk controls), the mandates of these regulators do not fully overlap with the Bank's. The emphasis lies in maintaining strong relationships between the different regulators and there is frequent communication regarding the various changes and amendments to the systems.

With regard to oversight of CLS Bank, responsibilities are shared across the central banks with eligible currencies in the system, including the Bank of Canada. In November 2008, the cooperative oversight arrangement was formalised in a protocol document that provides a mechanism for participating central banks to carry out their individual responsibilities while promoting a consistent oversight approach. The Federal Reserve Bank of New York is the lead overseer of CLS and coordinates the cooperation between participating central banks. The shared oversight arrangement enables CLS to be overseen in a comprehensive manner while keeping to a minimum the duplication of effort.

The Bank of Canada's cooperation with the Department of Finance and the Canadian Payments Association is described in the following section.

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<sup>25</sup> This report is available at <http://www.imf.org/external/np/rosc/can/index.htm>.

<sup>26</sup> See Section 3.2 for more on the LVTS.

### 1.3 The role of other private and public bodies

#### 1.3.1 Department of Finance

The Minister of Finance has oversight powers respecting the Canadian Payments Association (CPA) and payments systems under the *Canadian Payments Act* (CP Act). These include approval and directive powers regarding by-laws, rules and standards set out by the CPA, or any other payment system designated for such oversight under the CP Act. The main objective of the Minister's oversight is to protect public interests. The Minister oversees the Canadian Payments Association and its systems (ACSS and LVTS).<sup>27</sup>

As both the Bank of Canada and the Minister of Finance have the ability to designate payments systems, a non-statutory body called the Payments Advisory Committee (PAC) has been formed to coordinate oversight activities and to advise the Minister of Finance and Governor of the Bank of Canada on relevant issues. The group is co-chaired by senior officers of the Department of Finance and the Bank of Canada.

#### 1.3.2 The Canadian Payments Association

The Canadian Payments Association (CPA) is a not-for-profit organisation created by an Act of Parliament in 1980 under the *Canadian Payments Association Act*. The Act was modified in 2001 and renamed the *Canadian Payments Act* (the CP Act).

##### *Mandate and services*

The mandate of the CPA under the CP Act is threefold, and in fulfilling this mandate, the CPA has the public policy objective to "... promote the efficiency, safety and soundness of its clearing and settlement systems and take into account the interests of users". The mandate of the CPA is to:

- establish and operate national systems for the clearing and settlement of payments and other arrangements for the making or exchange of payments;
- facilitate the interaction of its clearing and settlement systems and related arrangements with other systems or arrangements involved in the exchange, clearing or settlement of payments; and
- facilitate the development of new payment methods and technologies.

In carrying out its mandate, the CPA owns and operates the two main national systems for the clearing and settlement of payments in Canada: the Automated Clearing Settlement System (ACSS) and the Large Value Transfer System (LVTS). Through a network of committees representing its members and stakeholders, the CPA interacts with financial institutions and users of the payments system operating in Canada and actively investigates emerging payments and payment-related issues and services.

##### *Membership and governance*

Membership in the CPA is open to the Bank of Canada; all domestic banks; foreign banks authorised to operate in Canada; other deposit-taking institutions such as credit union centrals and trust and loan companies; and certain types of non-deposit-taking financial institutions, namely, life insurance companies, securities dealers and money market mutual funds.

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<sup>27</sup> The Minister may designate other payment systems if it is substantially national in scope or plays a major role in supporting transactions in Canadian financial markets or the Canadian economy. To date, the Minister has not designated a payment system under the Act.

The CPA is governed by a 16-person Board of Directors (Board), where the Chair is a senior representative of the Bank of Canada. Three further positions on the Board are appointed by the Minister of Finance and the rest are elected by CPA members, with half of the seats assigned to “bank” class members and half assigned to “non-bank” members. Also contributing to the mandate of the CPA is the Stakeholder Advisory Council (SAC), which provides advice to the Board on payment, clearing and settlement issues. The SAC consists of no more than 20 persons including two Board members and is broadly representative of the users of the CPA’s services and the service providers.

The CPA operates under the authority of the CP Act. Through its Board, the CPA sets by-laws, rules and standards that govern members’ participation in these systems and outlines operational procedures. All CPA by-laws are approved by Cabinet.<sup>28</sup> CPA rules and standards, including amendments to such, are subject to a 30-day review period by the Minister of Finance who has the power to disallow any rule, in whole or in part, that is not deemed to be in the public’s interest. The Minister also has the authority to direct the CPA to make, amend or repeal a by-law, rule or standard.

### **1.3.3 Provincial regulators**

Every province and territory has one or more bodies to regulate financial institutions under provincial responsibility. The regulation of the securities industry is a provincial responsibility and each province has its securities commission or administrator that is generally accountable to the Provincial Ministry of Finance. These provincial regulators participate in an organisation called the Canadian Securities Administrators (CSA). The CSA’s objective is to coordinate and harmonise regulation of the Canadian capital markets.<sup>29</sup>

## **2. Payment media used by non-banks**

### **2.1 Cash**

The Bank of Canada is the sole issuer of Canadian bank notes under the *Bank of Canada Act*. It is responsible for designing, producing and distributing bank notes. The Bank of Canada meets the public’s demand for bank notes by providing bank notes to financial institutions through the Bank Note Distribution System.<sup>30</sup> Financial institutions distribute bank notes to their own branch network, other financial institutions, retailers and ultimately the public. Notes no longer fit for circulation are returned to the Bank of Canada for destruction. Denominations currently printed and issued are the 5, 10, 20, 50 and 100 dollar bank notes. In late 2011, the Bank of Canada will begin to introduce a new series of bank notes with the same denominational structure.

The Royal Canadian Mint is a crown corporation that operates under the *Royal Canadian Mint Act*. The Mint is responsible for issuing Canadian coin, which is a separate function from the Bank of Canada’s role in issuing bank notes.<sup>31</sup> The Act specifies that all Canadian coins produced by the Mint shall be delivered to the Minister of Finance or a designate. The

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<sup>28</sup> That is, approved by the executive branch of the federal government.

<sup>29</sup> The CSA website is at <http://www.securities-administrators.ca/>.

<sup>30</sup> See G Bilkes, “[The new bank note distribution system](#)”, *Bank of Canada Review*, Summer 1997.

<sup>31</sup> On occasion, the Department of Finance, the Bank of Canada and the Mint will consult each other and cooperate on certain initiatives, such as the past replacement of the CAD 1 and 2 bank notes by coins.



Department of Finance therefore buys coinage from the Mint and sells it to financial institutions.

The coin denominations currently issued are the 1, 5, 10 and 25 cent pieces and the 1 and 2 dollar pieces. Both bank notes issued by the Bank of Canada, including those notes that are no longer issued but still in circulation, and coins issued by the Royal Canadian Mint are legal tender.<sup>32</sup>

As of 2009, the value of bank notes and coin issued stood at CAD 60.5 billion.

## 2.2 Non-cash payments

Non-cash payments can be divided into paper or electronic payments. Paper-based payments of less than CAD 25 million are cleared through the ACSS.<sup>33</sup> Electronic payments are cleared in both the ACSS and LVTS.<sup>34</sup>

The volume of paper-based items cleared through ACSS has declined considerably with the rapid expansion of electronic payments. In 1990, paper-based items represented 87% of the total number of ACSS transactions and electronic payments represented only 13%. By 2009, paper-based items represented 16% and electronic payments represented 84% of ACSS transactions. The value of paper-based items cleared in ACSS has also declined over time. However, paper-based items represented 58% of the total value of ACSS transactions in 2009, still exceeding that of electronic payments (42%). This can partly be explained by the continued use of large paper-based items,<sup>35</sup> which are those greater than CAD 50,000 and less than CAD 25 million.

### 2.2.1 Paper-based payments

The vast majority of paper-based payments in Canada are cheques. Less frequently used paper items include traveller's cheques, money orders, bank drafts, paper-based remittances and paper preauthorised debits. The framework surrounding the exchange of paper items is set out in the CPA's by-laws, rules and standards.

#### *Cheques*

A cheque is a bill of exchange drawn on a member of the CPA and is payable on demand of the person/institution to whom the item is directed. The statutory framework for cheques is provided by the *Bills of Exchange Act*<sup>36</sup> and they are subject to the by-laws and rules of the CPA.

Cheques were once the predominant method for making cashless payments. However, with the commencement of the LVTS, the use of cheques for large-value payments has decreased substantially as payments have moved to this well risk-proofed, electronic credit transfer system. For small retail transactions at the point of sale too, the use of cheques has

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<sup>32</sup> The legal tender status of Canadian bank notes falls under the *Bank of Canada Act*: <http://laws.justice.gc.ca/en/B-2/FullText.html>. Coin is considered legal tender in Canada up to certain limits, as is described in the *Currency Act*: <http://laws.justice.gc.ca/en/C-52/FullText.html>.

<sup>33</sup> In 2003, a CAD 25 million limit was imposed on paper items cleared in ACSS. This forced the migration of such large-value payments to the LVTS.

<sup>34</sup> For a description of ACSS settlement, see Section 3.3.4.

<sup>35</sup> LVTS only processes electronic payments. High-value paper items typically relate to business-to-business transactions.

<sup>36</sup> See Section 1.1.1.

given way to debit and credit cards. In 2009, an estimated 1.1 billion cheques worth CAD 3.4 trillion were used in Canada. This represents a decline of almost 20% in volume and 4% in nominal value over the previous five years.

### **2.2.2 Electronic transfers**

Automated funds transfers and account-holder initiated one-time transfers are cleared and settled through the ACSS and subject to the applicable CPA by-laws, rules and standards.

#### *Electronic Funds Transfers*

Electronic funds transfer (EFT) payment media include direct debit (debit transfers) and direct credit. Direct debits are payments preauthorised by the payer. As preauthorised debits, they may be payable at regular intervals for obligations such as rent or mortgage payments, organised savings programmes, bill payments and tax payments. They may also be sporadic payments subject to certain authorisation and notification requirements. The debit and transfer process is initiated by payment instructions from the payee through its financial institution.

Direct credits (or standing orders) are payments transferred on a prearranged basis directly into the payee's account at regular repeating intervals. Each transfer is initiated by payment instructions from the payer to its bank to debit its account and forward the payment to the payee's account at its deposit-taking institution. These include such payment items as direct payroll deposit and regular government transfer payments.

Both direct debit and direct credit have been growing significantly in volume and value. Over the past five years, direct debit grew 28% in volume and 56% in value. Direct credit grew 33% in volume and 76% in value over the same period. In 2009, there were 756 million direct debits worth CAD 604 billion and 703 million direct credits worth CAD 1.4 trillion.

#### *Account-holder initiated transfers*

One-time credit transfers initiated by account holders are often in the form of electronic bill payments. It is increasingly common for consumers and businesses to conduct electronic bill payments over the internet, whether that is on the biller's website, through online banking or through third parties that authorise and accept online payments from customers to pay businesses on the customer's behalf.<sup>37, 38</sup> Account holders may also initiate credit transfers for bill payments using their financial institution's automated telephone banking service or ATMs. Electronic bill payments that clear and settle through the ACSS may fall under the CPA's framework and rules for bill payments, which include the use of electronic data interchange (EDI). (EDI provides remittance information in a standardised format.) However, many small and medium-size billers have end-to-end bill payment arrangements with their financial institutions and do not follow the CPA's bill payment framework or use EDI. The same applies to bill payment services provided by third parties and credit card schemes.

Nonetheless, in 2009, ACSS cleared and settled 2.2 million business-to-business EDI bill payments worth CAD 128 billion and 342 million consumer-to-business EDI bill payments worth CAD 106 billion. Over the previous five years, the combined EDI payments grew a remarkable 93% in volume and 63% in value.

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<sup>37</sup> For more information, see N Chande, "A survey and risk analysis of selected non-bank retail payments systems", *Bank of Canada Discussion Paper*, no 17, 2008 (<http://www.bankofcanada.ca/en/res/dp/2008/dp08-17.pdf>).

<sup>38</sup> The 2009 Canadian Internet Use Survey, conducted by Statistics Canada, suggested that 67% of Canadians use the internet for online banking or bill payments.

The use of *Interac* Online and *Interac* Email Money Transfer<sup>39</sup> are other examples of credit transfers initiated by account holders; however, the value and volume of these transactions are currently relatively small.

#### *Credit transfers through the LVTS*

The LVTS facilitates large-value and time-sensitive credit transfers between direct participants in the system who may act on their own and their clients' behalf. CPA by-laws, rules and standards govern the exchange of these payment instructions. Since the LVTS began operations in 1999, electronic transfers made through this system have grown to account for 90% of all payment value exchanged through CPA-operated systems.

### **2.2.3 Payment cards**

#### *Debit cards*

Debit cards in Canada are PIN-based and generally offer two main services to the cardholder. They allow cardholders to pay a vendor through an electronic funds transfer at the point of sale (EFTPOS) and provide access to the ATM networks with which the card issuer is affiliated. With respect to the latter, such networks include the card issuer's proprietary network, and shared networks such as *Interac*, The Exchange, MasterCard Cirrus and Visa Plus.<sup>40</sup> *Interac* offers the principal nationwide network for shared ATM transactions and EFTPOS.<sup>41</sup>

*Interac's* Shared Cash Dispensing (SCD) service allows cardholders to withdraw cash from the ATM of any other *Interac* Association member or associated institution using a debit or credit card with the *Interac* logo. The service uses a shared network, the *Interac* Inter-Member Network (IMN), to connect the proprietary systems of the members for the routing of transactions. In 2009, the SCD service processed 244 million transactions worth a total of about CAD 27 billion.

The *Interac* Direct Payment (IDP) service allows customers to pay for purchases at the point of sale (POS).<sup>42</sup> It also uses the *Interac* IMN to connect acquirers and issuers. Cardholders validate the payment instructions through the use of a PIN, which is verified by the issuer online and in real time for each transaction. Once a debit card transaction is authorised over the IMN, the cardholder's bank account is debited in real time. In 2009, 436,000 merchants accepted debit as a method of payment and 3.9 billion transactions were processed for a total value of CAD 171 billion.<sup>43</sup> With 22 million active debit card users in Canada, this represents an annual average of 174 transactions worth CAD 7,680 per user.

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<sup>39</sup> See Section 2.3, Recent developments.

<sup>40</sup> Transactions through proprietary networks are typically cleared and settled as "on-us" transactions.

<sup>41</sup> The role of *Interac* Association is to facilitate the development of shared services that support electronic banking and payment services offered by its member institutions. It is a non-profit unincorporated association that sets and enforces rules governing transactions routed over its network, manages network operations, and markets *Interac* services. Any company incorporated in Canada is eligible for *Interac* membership. As of 2010, there were 60 members representing various aspects of the payments industry (including beyond deposit-taking financial institutions). Members are classified as either direct or indirect connectors and consist of issuers, acquirers, connection service providers and settlement agents.

<sup>42</sup> Cross Border Debit, introduced in 2005, is a service that allows *Interac* cardholders to use their debit card at retailers in the United States that are connected to the NYCE network. Agreements have also been developed with PULSE and China Union Pay to allow their cardholders to withdraw cash in Canada at ATMs of participating acquirers.

<sup>43</sup> By comparison, in 2005 some 391,000 merchants accepted debit cards and 3.1 billion debit card transactions were made, worth CAD 137 billion.

Card issuers charge cardholders for access to the shared ATM network and the EFTPOS service. These are often bundled with other account service fees. Additional fees are often charged when the cardholder uses an ATM that is not affiliated with the financial institution that issued their card.

Under the 1996 Consent Order,<sup>44</sup> Interac Association must derive its revenues solely from switch fees and operate on a cost-recovery basis. Interac Association therefore calculates the costs of operating the system to determine the switch fee and collects switch fees from both the issuer and acquirer for every IDP and SCD transaction. These fees are determined at the beginning of the fiscal year based on annual budget requirements.

Debit card interchange fees are not regulated in Canada and the 1996 Consent Order does not restrict Interac's ability to set the level of interchange fees.<sup>45</sup> Interac Association therefore determines the level of interchange fees for IDP and SCD transactions. The interchange fee for IDP transactions is currently set at zero. As such, merchants are typically charged a flat fee by their acquirer for every IDP transaction, as opposed to an ad valorem fee. There is, however, an interchange fee for SCD transactions, which is paid by the card issuer to the acquirer.

All SCD and IDP transactions will be chip-enabled by the end of 2012 and 2015, respectively, as part of a migration towards EMV-compliant chip technology to mitigate debit card fraud.<sup>46</sup>

### *Credit cards*

Credit cards, including charge cards, provide consumers and businesses with uncollateralised borrowing (almost always subject to a prespecified credit limit) for either a cash advance (eg through an ATM) or for purchases at a participating merchant. Payments to merchants can be made at the point of sale, by mail, or over the telephone and internet. Cardholders are billed monthly and, depending on the terms of the card, may pay the whole balance or a partial amount. Interest is charged on the unpaid portion and there is typically a minimum monthly payment. For a cash advance, a consumer may be subject to a fee that is a fixed amount, a percentage of the transaction value, or a fixed amount plus a percentage. In addition to the cash advance fee, the credit card issuer charges interest starting on the date the cash is withdrawn and continues to charge interest daily until the entire cash advance is paid off.<sup>47</sup>

The main general purpose credit card brands in Canada are Visa, MasterCard and Amex. Visa is only issued by financial institutions and MasterCard is issued by financial institutions and offered by some major retailers. As of 2008, card issuers can issue both Visa and MasterCard, which is referred to as duality. Amex is unique because it issues credit and charge cards to consumers and businesses directly. Credit card issuers compete for cardholders by offering reward and loyalty programmes, additional services, such as travel insurance, and competitive interest rates and annual fees. In fact, many credit cards have no annual fees.

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<sup>44</sup> In 1996, the Competition Tribunal issued a consent order that broadened Interac's membership criteria, established Interac's governance and revenue structure as not-for-profit, and addressed fees, surcharges and other aspects. See <http://www.ct-tc.gc.ca/CMFiles/0093a38PPG-3102004-67.pdf>.

<sup>45</sup> See P Bergevin, "Change is in the cards: competition in the Canadian debit card market", *Backgrounders*, no 125, C D Howe Institute, February 2010.

<sup>46</sup> EMV refers to the global chip technology standards developed by EMVCo.

<sup>47</sup> Source: Financial Consumer Agency of Canada.

Credit card acceptance in Canada is fairly high with over 670,000 merchants accepting 2.7 billion credit card transactions worth CAD 289 billion in 2009.<sup>48</sup> Merchants receive credit card processing services and POS equipment from acquirers. For every credit card purchase accepted, acquirers charge merchants a percentage of the transaction value, which is referred to as the merchant discount rate (MDR).<sup>49</sup> The MDR includes the interchange fee that is paid by the acquirer to the issuer for every transaction.

Credit card interchange fees are not regulated in Canada. In 2009, the Standing Senate Committee on Banking, Trade and Commerce examined the credit and debit card systems in Canada and their relative rates and fees. The Committee's report suggested that the government appoint within an existing federal organisation an "oversight board" that would, among other things, monitor and publish annually information on trends in interchange and other payment system fees.<sup>50</sup> More recently, the Competition Bureau, pursuant to Section 76 of the *Competition Act*, included interchange fees in its December 2010 application to the Competition Tribunal to address the arrangements that Visa and MasterCard impose on merchants for their credit card network services.<sup>51</sup>

As with debit cards, the migration towards EMV-compliant chip technology for credit cards is currently under way. Cardholders with chip cards will have to enter a PIN at the POS instead of signing a receipt.

### *Prepaid cards*

Prepaid cards in Canada have mainly consisted of single-use or reloadable gift/store cards. These cards are either closed loop, ie redeemable at a specific retail store or chain, or semi-closed loop, ie redeemable at multiple merchants within a limited area, such as a shopping mall. A consumer may purchase such cards using traditional methods of payment (eg cash, debit card or credit card). When a card is purchased, the merchant will activate it by swiping its magnetic stripe through the POS terminal. The merchant's payment service provider will then authorise and process future transactions made on the card. Most of these cards are transferable; however, consumers may have the option of registering the card's account number online and uploading funds when desired or automatically.

Single-use gift cards and reloadable store cards are regulated in some provinces. Certain consumer protection laws specifically regulate unclaimed card balances, expiry dates, dormancy fees (ie fees charged for inactive use) and the disclosure of terms and conditions.

Open-loop stored value cards are available in Canada. All three major credit card brands offer prepaid cards that are accepted anywhere their credit cards are accepted. Thus, transactions are processed through their proprietary networks. This allows cardholders to make purchases in-store, online, abroad or over the phone, and to withdraw cash at certain ATMs. However, a variety of fees may be associated with the purchase and use of these cards, including monthly maintenance fees, overdraft fees and card replacement fees. These cards may be issued by participating financial institutions or sold by designated retailers.

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<sup>48</sup> By comparison, in 2005 there were 626,000 merchants accepting Visa and/or MasterCard credit cards and 1.9 billion transactions worth CAD 210 billion (Source: Canadian Bankers' Association).

<sup>49</sup> See C Arango and V Taylor, "Merchants' costs of accepting retail payments: is cash the least costly?", *Bank of Canada Review*, Winter 2008–09 ([http://www.bank-banque-canada.ca/en/review/winter08-09/arango\\_taylor.pdf](http://www.bank-banque-canada.ca/en/review/winter08-09/arango_taylor.pdf)).

<sup>50</sup> See *Transparency, balance, and choice: Canada's credit card and debit card systems*, Report of the Standing Senate Committee on Banking, Trade and Commerce, June 2009.

<sup>51</sup> The Competition Bureau's notice of application is available at <http://www.ct-tc.gc.ca/Home.asp>.

### **2.2.4 Automated teller machines (ATMs)**

The first cash dispenser was installed in Canada by a large chartered bank in 1969. The first automated banking machine followed in 1972. Today, ATMs are practically ubiquitous and offer a wide range of services. The two main types of ATMs in Canada are full-service ATMs located on the premises of a financial institution, and cash dispensers known as “white label machines”.<sup>52</sup> Full-service ATMs offer cash dispensing as well as banking services to their account holders, including deposits, account balance viewing, bill payments and transfers between accounts held by the same person with the same institution. When the account holder is a customer of the financial institution providing the ATM services, the transaction is routed through a proprietary system and not through Interac’s network for Shared Cash Dispensing (SCD). These so-called “on-us” transactions make up roughly 75% of total ATM transactions. For “on-us” transactions, account holders may be charged regular account fees, depending on their banking arrangements. Customers who withdraw cash from a full-service ATM that is not owned by their financial institution are usually subject to regular account fees, plus network access fees and convenience fees.<sup>53</sup> These transactions are later cleared and settled in ACSS.

White label machines offer basic cash withdrawal services and are independently owned and operated by private companies. They were introduced in Canada in the late 1990s, following the 1996 Consent Order that expanded Interac’s membership eligibility to non-financial institutions.<sup>54</sup> Since then, white label machines have proliferated and are now readily found in almost any retail setting. To access customer accounts, white label machines must connect to Interac’s network for SCD. Thus, customers who use white label machines are subject to network access fees and convenience fees, in addition to their regular account fees.

As of 2009, there were more than 40,000 white label machines in Canada, which far exceeded the 17,000 full-service ATMs. However, the volume and value of transactions made at full-service ATMs is significantly higher than at white label machines. Of the estimated 1 billion ATM cash withdrawals made in 2009, 622 million were at full-service ATMs.

## **2.3 Recent developments**

### **Contactless and mobile phone payments**

Canada is likely to continue to shift towards electronic payment methods as current technologies evolve and new technologies are introduced. The migration towards EMV-compliant chip technology for debit and credit cards, for example, is an opportunity to introduce contactless payments to Canada. Contactless devices, whether they are cards, mobile phones or other devices, use the chip technology with radio frequency identification (RFID) or near field communication (NFC) to transmit information wirelessly. The device is waved in front of a contactless reader to process the payment. However, transactions over a certain maximum value, eg CAD 50, must usually be verified by the consumer’s signature or PIN. Visa PayWave and MasterCard PayPass credit cards and prepaid cards are currently accepted at a limited number of retail locations, particularly grocery or fast-food chains. Interac has begun to introduce a contactless debit card over 2010 and 2011. It too will have

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<sup>52</sup> For background information and statistics on Canada’s ATM market, see the Canadian Bankers’ Association: <http://www.cba.ca/?lang=en>.

<sup>53</sup> For a list of ATM fees charged to customers, see the Financial Consumer Agency of Canada website: <http://www.fcac-acfc.gc.ca/>.

<sup>54</sup> See Section 2.2.3, Debit cards.

limits on transaction values without specific verification that will be determined by the card issuers.

Contactless tags have been attached to mobile phone handsets in recent pilots. The use of mobile phones for contactless payments will probably become more common as NFC technology is embedded in new phones. Furthermore, as smartphones are increasingly adopted by consumers, more applications will be available to augment mobile payment capabilities, such as account balance viewing and person-to-person (P2P) transfers. The most recent example of a mobile payment scheme is Zoompass, which is the result of a joint venture between three major telecommunication companies in Canada. Transactions are conducted online through a computer, mobile phone browser or mobile phone application. Users sign up for a Zoompass account that is linked to an existing bank account and/or credit card. Once registered, users can transfer funds into their Zoompass account by accessing their bank account through the Zoompass website or through an online bill payment. They can also transfer funds automatically from their bank account to their Zoompass account at set time intervals, or whenever the Zoompass account drops below a certain balance. Zoompass allows users to make P2P payments via their mobile phone. Zoompass account holders can also sign up for a prepaid MasterCard PayPass card that allows for contactless transactions in retail locations.

### ***Online debit card payments***

The *Interac* portfolio has broadened into online services to allow cardholders to access their bank accounts to pay for purchases over the internet and to transfer funds person-to-person. *Interac* Online, introduced in 2005, is currently offered by four financial institutions and accepted by a number of merchants, government agencies and charities. The service directs cardholders to their online banking websites, where the transaction is completed by entering their card number and password. *Interac* Email Money Transfer, introduced in 2004, is a domestic person-to-person funds transfer service that also uses online banking.

### ***Other recent developments***

Another recent development in Canadian retail payments is the announcement by Visa and MasterCard that they plan to introduce PIN-based debit cards (Maestro and Visa Debit). Unlike the existing *Interac* debit cards, these cards will be processed over the card companies' proprietary systems and cardholders will have more opportunity to use a debit card for purchases made online, over the phone or abroad. They will also offer cardholders the benefits of reward programmes and liability protection against unauthorised or fraudulent card use.

Newly introduced regulation directed towards the payment card industry will also shape the retail payments landscape. The 2010 Code of Conduct for the Credit and Debit Card Industry<sup>55</sup> requires payment card network operators and participants to adjust their business practices according to new rules. For example, the Code affects the manner in which Visa and MasterCard are able to introduce their debit cards because of the restriction against competing debit card applications on the same card.

In March 2010, the Government of Canada enacted the *Payment Card Networks Act*, which allows for the regulation of the market conduct of credit and debit card networks and their participants, if necessary. This legislation also expands the mandate of the Financial Consumer Agency of Canada to supervise payment card network operators to monitor their compliance with the Code of Conduct and with any regulations introduced under the new Act.

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<sup>55</sup> See Section 1.1.1.

In December 2010, the Competition Bureau filed an application with the Competition Tribunal to address the rules that Visa and MasterCard impose on merchants who accept their credit cards.

### 3. Payment systems

#### 3.1 General overview

The CPA owns and operates Canada's two national systems for the clearing and settlement of payments: the LVTS and the ACSS. The LVTS is the larger of the two by transaction value. These systems are described in the following two sections, which are followed by an outline of the options for clearing cross-border payments.

#### 3.2 The Large Value Transfer System

The Large Value Transfer System (LVTS) started its activities on 4 February 1999.<sup>56</sup> It is an electronic credit transfer system that provides real-time processing and real-time finality of payment, as well as guaranteeing settlement. The LVTS is Canada's primary system for clearing and settling large-value Canadian dollar transactions. It is designated under the PCSA for Bank of Canada oversight.<sup>57</sup> It is also closely linked with the implementation of monetary policy. The Bank of Canada sets the target for the overnight interest rate, which is the rate at which LVTS participants lend or borrow funds overnight from each other to settle their end-of-day payment obligations. Changes to the Bank's target for the overnight interest rate influence other interest rates in the market, which affects total spending in the economy, and, ultimately, inflation.<sup>58</sup>

During 2009, LVTS processed, on average, 22,250 transactions per day worth approximately CAD 153 billion, which represents 90% of the total value in the Canadian national payments systems.

##### 3.2.1 Institutional framework

The *Canadian Payments Act* gives the CPA the right to establish by-laws, rules and standards regarding the operation and governance of its systems. The LVTS by-law and associated rules and standards govern all aspects of the LVTS.<sup>59</sup> It is on the basis of these documents that the CPA administers both the daily operations of the LVTS and compliance with transaction rules. Both the Governor of the Bank of Canada and the Minister of Finance are given, by the PCSA and CP Act respectively, certain regulatory powers with respect to the LVTS rules and by-law.<sup>60</sup>

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<sup>56</sup> For more information on the LVTS, see N Arjani and D McVanel, *A primer on Canada's Large Value Transfer System*, Bank of Canada, March 2006 ([http://www.bankofcanada.ca/en/financial/lvts\\_neville.pdf](http://www.bankofcanada.ca/en/financial/lvts_neville.pdf)).

<sup>57</sup> See Sections 1.3.2 for information on the CPA and 1.1.1 for information on the PCSA and the CP Act.

<sup>58</sup> For more information, see *A primer on the implementation of monetary policy in the LVTS environment*, Bank of Canada, June 2010, available at: [http://www.bankofcanada.ca/en/lvts/lvts\\_primer\\_2010.pdf](http://www.bankofcanada.ca/en/lvts/lvts_primer_2010.pdf).

<sup>59</sup> These rules are publicly available on the CPA website at: [www.cdnpay.ca](http://www.cdnpay.ca).

<sup>60</sup> See Sections 1.1.1 and 1.2.2.



### 3.2.2 Participation

The CPA sets out the requirements for financial institutions to be direct participants in the LVTS. To become a participant, a financial institution must first be a member of the Canadian Payments Association. It must also:

- maintain a settlement account at the Bank of Canada;
- enter into agreements relating to taking loans from the central bank and to pledging the appropriate collateral;
- have access to SWIFT in Canada;
- have the technical capability for its LVTS operations; and
- have adequate backup capability for its LVTS operations.

Beyond these requirements, the LVTS is an open system that does not require financial institutions to maintain a minimum value or volume of transactions to become participants. Foreign bank branches that are members of the CPA are eligible to become direct participants. However, the Governor of the Bank of Canada has the right to prohibit such a participant if the Governor is of the opinion that such a participant poses or is likely to pose an unacceptable risk to the Bank of Canada or the LVTS. Financial institutions that are not participants must use the services of a direct participant in order to make transactions in the LVTS.<sup>61</sup>

As of October 2010, there were 16 direct participants in the LVTS consisting of 12 commercial banks, two federations of credit union centrals, one government savings institution and the Bank of Canada. Direct participation in the LVTS is a reflection of Canada's concentrated banking industry. The decision to be a direct or indirect participant is a business decision that takes into consideration the benefits of direct participation and the operational costs.

### 3.2.3 Types of transactions

The LVTS is an electronic credit transfer system for the final and irrevocable transfer of large-value or time-sensitive Canadian dollar payments. It is used to facilitate a range of transfers such as commercial transactions; correspondent banking transactions; payment (settlement) obligations arising from the Visa and MasterCard networks in Canada; payment obligations arising from the Canadian securities settlement system (CDSX);<sup>62</sup> the Canadian dollar leg of foreign exchange transactions; payment obligations arising from ACSS; and transfers relating to the auction of federal government funds. Although designed to process large-value transfers, no minimum value threshold is set in the LVTS.

Participants send their payments through one of two streams: Tranche 1 or Tranche 2. Tranche 1 is a fully collateralised defaulter-pays mechanism. Tranche 2 uses collateral in a survivors-pay arrangement. Tranche 2 payments account for the majority of LVTS volume since the cost of collateral supporting these payments is lower.<sup>63</sup> On average, for 2009, Tranche 2 accounted for 99% of daily payments volume and 80% of daily payments value.

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<sup>61</sup> There is no contractual relationship between an indirect participant and the CPA. The relationship is between the direct and indirect participant. However, LVTS rules require direct participants to provide the CPA with a list of other CPA members that have an account with the direct participant and for which the direct participant acts as an agent for LVTS purposes.

<sup>62</sup> See Section 4.4.1.

<sup>63</sup> Section 3.2.5 describes the risk control mechanisms in more detail.

### **3.2.4 Operation of the system and settlement procedures**

Each morning participants set their own net debit cap for Tranche 1 and the bilateral credit limits they grant to each of the other participants for Tranche 2. Based on the bilateral credit lines they grant, the maximum additional settlement obligation (Max ASO) is calculated for each participant. Collateral is pledged to the Bank of Canada in an amount sufficient to cover both the Tranche 1 net debit cap and the calculated Max ASO, ie collateral supporting Tranche 2 payments.<sup>64</sup> Participants often pledge more than the required amount of collateral to ease the process of making intra-cycle adjustments.<sup>65</sup> However, in the event of a default this excess collateral would not be used to effect settlement.

From 00:30 to 18:00, participants send payment messages on their own behalf and on behalf of their clients.<sup>66</sup> Payments during this period are also sent to settle payment obligations arising from the daily auction of federal government funds, the bank note exchange system and other clearing and settlement systems, such as the ACSS, CDSX and CLS. Each payment instruction, whether for Tranche 1 or Tranche 2, is subject to real-time risk control tests which verify that a participant's net debit position does not exceed the appropriate net debit cap.<sup>67</sup> If the tests are passed, funds are made available to the recipient on an unconditional and irrevocable basis.

The general payments exchange period is followed by a half-hour pre-settlement period to allow participants to transact with each other for the purpose of reducing their short or long position in LVTS – thus reducing the amount they may have to borrow from, or have on deposit with, the Bank of Canada overnight.

At the end of the daily cycle, the participant's final multilateral net positions are settled across settlement accounts at the Bank of Canada. These entries are final. After the settlement period, the Bank of Canada lifts its security interest on the amounts pledged as LVTS collateral.

The Bank of Canada facilitates intraday credit to participants in the sense that collateral is pledged to the Bank of Canada in support of final settlement. Participants that have a net debit position in the LVTS at the end of the day close out their position by taking a fully collateralised overnight advance from the Bank of Canada, for which they pay the Bank Rate. Deposits earn Bank Rate less 50 basis points.<sup>68</sup>

### **3.2.5 Risk management**

The LVTS has risk control mechanisms that enable payments to be final and irrevocable even in the unlikely event of a default by one or more participants. In aggregate, the amount pledged by participants to the Bank of Canada is sufficient to ensure settlement in the event of a failure of the participant with the largest possible multilateral net debit position.

The main risk control mechanisms are:

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<sup>64</sup> The Bank of Canada determines eligible collateral and the conditions that apply. See [http://www.bankofcanada.ca/en/financial/securities\\_160710.pdf](http://www.bankofcanada.ca/en/financial/securities_160710.pdf).

<sup>65</sup> At any time during the payments cycle, participants can adjust their Tranche 1 net debit cap and/or bilateral lines of credit, subject to additional collateral requirements and other conditions.

<sup>66</sup> The period from 00:30 to 06:00 is reserved for CLS activity and non-CLS payments (if bilaterally agreed by participants). General payment exchange occurs from 06:00 to 18:00.

<sup>67</sup> Each participant's position is calculated in real time on a payment-by-payment basis (netting by novation).

<sup>68</sup> See Section 1.2.1.

- Participants determine their own Tranche 1 multilateral net debit caps, which must be fully collateralised. Therefore, in the event of one or more participant defaults, sufficient liquidity will be available to settle all Tranche 1 payments.
- For Tranche 2 payments, each participant extends a bilateral credit line to each other participant, thereby controlling the amount of exposure it is willing to take on with respect to each participant. Further collateral is pledged by each participant to support Tranche 2 payments. The amount pledged is a set portion (called the “system-wide percentage”) of the largest limit it grants to any counterparty. This is called the maximum additional settlement obligation (Max ASO). Participants may adjust the bilateral credit limits they extend throughout the day. However, although such an adjustment may increase the required collateral, the required collateral will never decrease intraday, regardless of the adjustment made.
- In the event of a default, the defaulter’s Tranche 1 and Tranche 2 collateral is used first. Any remaining shortfall is made up by survivors on a pro-rated basis based on the bilateral credit limit extended to the defaulter in Tranche 2. The maximum any survivor will be allotted in the event of one or more defaults is their maximum additional settlement obligation, thereby capping their exposure.
- For Tranche 2, each participant has a multilateral net debit cap which is the sum of all the bilateral credit limits granted to it multiplied by the system-wide percentage.
- The combination of bilateral and multilateral caps and the pledged collateral ensures that the system can handle the failure of the participant with the largest net debit position.

Finally, the Bank of Canada guarantees settlement.<sup>69</sup> However, given the design of the risk controls, this guarantee would only be called upon in the extremely unlikely circumstance that more than one direct participant defaulted within the same LVTS day, the defaulters had an overall net debit position in Tranche 2, and there was not enough collateral to complete settlement. If the Bank needed to invoke its guarantee, it would realise available collateral and become an unsecured creditor of the defaulting institutions for the residual amount.

Regarding operational risk, the CPA has arrangements in place to ensure timely recovery of operations if problems, such as system problems or building unavailability, are encountered. In addition to technical redundancies and contingency procedures for processing payments, the CPA has two operating sites and two data centres. The LVTS rules also require participants to be available to process payments at least 98% of the time in any given 30-day period. The recovery time objective for LVTS is one hour.

### 3.2.6 Pricing

Under the *Canadian Payments Act*, the Canadian Payments Association charges its members dues for their participation in the system based on their volume of activity. The costs for any development projects, as well as the operating costs, are entirely covered by the LVTS participants. The pricing method used by the CPA can be characterised as “cost recovery”. The proportion of the total costs charged to each participant depends on its share of the total volume sent and received through the LVTS. New participants pay an admission fee that covers administrative costs, initial implementation and setup costs, and the costs of verifying the appropriate technical/systems capabilities to participate in the LVTS. Although the Bank of Canada has the right to recover costs for the settlement services it provides to

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<sup>69</sup> This is a residual guarantee, only invoked once the defaulter’s and survivors’ collateral have been used.

CPA members, it does not presently charge fees beyond the interest charges applied to overnight loans.<sup>70</sup>

### **3.2.7 Major ongoing and future projects**

During 2009, the CPA continued to develop a strategy to evolve its systems and rules framework over the long term. The five-pillar “Vision 2020”, released in February 2010, includes a strategy to enhance the robustness and resiliency of CPA technology, networks and applications for clearing and settlement. To inform the strategy and to ensure that its systems, including the LVTS, continue to perform reliably and cost-effectively, the CPA also initiated a Payment Systems Health Check.<sup>71</sup>

## **3.3 Retail payment systems – the Automated Clearing Settlement System**

The Automated Clearing Settlement System (ACSS), introduced in 1984, is owned and operated by the CPA. This uncollateralised deferred net settlement system clears and settles primarily retail electronic payments and paper-based payments in Canada. The ACSS is used to process a high volume of lower-value, less time-sensitive payments that do not require the intraday finality provided by the LVTS.

In 2009, the ACSS handled an average of 23 million payment items per day, with an average total value of CAD 20 billion.

### **3.3.1 Institutional framework**

Under the CP Act, the CPA administers the ACSS by-law and supporting rules which govern all aspects of the operation of the ACSS. All by-laws must be approved by the Minister of Finance. The Minister of Finance has the right to disallow any new rule or amendment within 30 days.<sup>72</sup>

### **3.3.2 Participation**

The ACSS and related arrangements are based on a tiered structure with direct and indirect participants (also known as direct clearers/group clearers and indirect clearers). Only direct clearers and group clearers and the Bank of Canada can make entries in the ACSS.<sup>73</sup> Direct clearers enter transactions directly into the system and settle for the net value of payment items drawn on or payable by it through their settlement accounts at the Bank of Canada. They can also act as clearing agents for indirect clearers. In order to be eligible to become a direct clearer, an institution must:

- be a member of the CPA;
- be a deposit-taking institution or a securities dealer;
- process payment items volume of at least 0.5% of the total national volume of payment items;
- establish and maintain a settlement account at the Bank of Canada;

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<sup>70</sup> The Bank of Canada pays interest on deposits at a rate below the target overnight rate.

<sup>71</sup> Further information about Vision 2020 and the Payment System Health Check is available from the CPA.

<sup>72</sup> Both the ACSS by-law and the associated rules are available on the CPA website at: [www.cdnpay.ca](http://www.cdnpay.ca).

<sup>73</sup> See Section 1.1.2 for a complete description of institutions eligible for CPA membership.

- establish a loan facility with the Bank of Canada; and
- satisfy the technical requirements of the ACSS.

Group clearers must fulfil the same requirements. In addition, they must provide a list of entities that belong to the group and show that there are contractual commitments to act as group clearer.

Indirect clearers are members of the CPA that enter into the ACSS through the services provided by a direct clearer. Items drawn on an indirect clearer or payable to one are settled through a settlement account at a direct clearer.

As of December 2010, there were 11 direct clearers in the ACSS consisting of eight commercial banks, two federations of credit union centrals and one government savings institution. In addition, there were 107 indirect clearers. The Bank of Canada also participates in ACSS.

### **3.3.3 Types of transactions**

The ACSS clears and settles a variety of primarily retail payment instruments. Paper-based items include, for example, cheques, money orders, gift certificates, remittances and traveller's cheques. Electronic payment items include direct debit and direct credit items (or standing orders); account holder-initiated payments; electronic funds transfers initiated at the point of sale (EFTPOS) and cash disbursements through shared ATM networks such as Interac.<sup>74</sup>

All items must meet specifications and standards set out in the ACSS rules according to the type of payment item. For this purpose, the items are grouped into "streams" that share the same rules and procedures. A CAD 25 million cap is imposed on the value of individual paper items that can be cleared through the system. Payments greater than CAD 25 million must be sent electronically via EFT or LVTS. There are no value restrictions on other types of payments in the system.

### **3.3.4 Operation: the transaction processing environment and settlement**

Payment items exchanged throughout the day are processed overnight and settled the next day. The specifics of the exchange and clearing of the items vary depending on the item, for example, whether exchanged on paper or via electronic data transmission. Nevertheless, all items follow a similar path.

Clearing of paper-based instruments is handled through six regional settlement points across the country and the specifics differ according to the type of payment item. Generally, paper-based items collected by CPA members previous to and throughout the value day (V) are forwarded to a local data centre operated, or contracted, by a direct clearer. At the data centre, high-speed computerised reader/sorter equipment sorts the items according to the institutions on which they are drawn. Once sorted, the items drawn on other institutions are delivered to the data centres of the appropriate direct clearer in the same regional clearing area. The delivering direct clearer enters into its ACSS terminal the information of the exchanged items, including the volume and value of items with a "stream" identifier. This information can be checked by the receiving direct clearers' data centre and disputed if necessary. The next day, the payment items are returned to the branches of the institutions on which they are drawn according to the type of payment item. For cheques, most are returned no later than two days after they are deposited.

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<sup>74</sup> See Section 2.2.2 for a more detailed description of the various payment types.

Electronic payments, such as point of sale, EFT and EDI payments are entered into ACSS through a virtual exchange region called the National Electronic Settlement Region. These entries are used to calculate each direct clearer's net position for settlement on the next business day.

This exchange of items, entering of information into the ACSS terminals and, potentially, contesting of entries continues on the value day until the final closing time. The ACSS calculates a multilateral net position across all "streams" for each of the direct clearers. By 08:00 the next morning (V+1), the financial institutions have typically finished making adjustments to their clients' accounts, debiting payers' accounts and crediting payees' accounts. At approximately 09:30, initial net balances are available to all the direct clearers. Bilateral reopenings of the clearing may occur to correct errors if both counterparties agree. By 11:00, the final multilateral positions of the direct clearers are calculated and made known to the Bank of Canada.

Direct clearers' net positions are settled by adjustments to their settlement accounts at the Bank of Canada. This is typically completed by 12:00 EST on V+1. Direct clearers in a net debit position make an LVTS payment to their ACSS account at the Bank of Canada. Direct clearers in a net credit position have the funds credited to their account and value is returned to them through an LVTS payment on V+1. ACSS members have agreed to an interest compensation mechanism to allow them to give provisional credit to their clients on day V even though ACSS settlement occurs on day V+1. The CPA calculates the interest compensation, so that direct clearers in a net credit position receive an interest payment to cover the cost of crediting depositors before receiving the funds through settlement and direct clearers in a net debit position make interest payments. Interest is calculated at the Target Overnight Rate.<sup>75</sup> The interest compensation adjustments are included in the clearing balances exchanged through the LVTS.

### **3.3.5 Risk management**

The ACSS is a survivors-pay, uncollateralised, deferred net settlement system. The settlement entries in the direct clearers' accounts at the Bank of Canada are considered to be final. However, the ACSS does not legally support settlement finality, intraday or at the end of the day.<sup>76</sup>

Participants take on credit risk throughout the day as value is credited to client accounts in anticipation of receiving funds through settlement the next day. However, there are circumstances under which this value may not be received. For instance, some types of payments may be reversed when an item presented is drawn on an account with insufficient funds or if the item is subject to a stop payment order. CPA rules govern the process for the reversal of these payment items. Also, value may not be received in the rare event that a direct or indirect clearer defaults on its settlement obligation. In this situation, the CPA rules outline the default procedure, which includes the immediate return of payment items drawn on the defaulting member and the reversal of the debit posting to the settlement account of that member.<sup>77</sup> They also stipulate the additional settlement obligations required from the surviving participants to cover the remaining shortfall. These rules will be modified in the near future, as outlined in Section 3.3.7 below.

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<sup>75</sup> The Target Overnight Rate set by the Bank of Canada is the average interest rate the Bank wants to see in the market for financial institutions lending to each other overnight. For more information, see "Target for the Overnight Rate fact sheet", available at <http://www.bankofcanada.ca/en/backgrounders/bg-p9.html>.

<sup>76</sup> The ACSS rules indicate that only certain payment items settled in ACSS are irrevocable and irreversible.

<sup>77</sup> For a description of risks and default procedures in the ACSS, see *A guide to risk in payment systems owned and operated by the CPA*, CPA, 2005 ([http://www.cdnpay.ca/imis15/pdf/pdfs\\_publications/Risk\\_Guide.pdf](http://www.cdnpay.ca/imis15/pdf/pdfs_publications/Risk_Guide.pdf)).

Some degree of liquidity risk is experienced daily through the uncertainty related to the final net settlement obligation due at 12:00 EST. For credit and liquidity risk, participants cannot use real-time risk management tools in the ACSS to control their exposure. For example, there are no bilateral or multilateral credit limits.

Regarding operational risk, the contingency arrangements for the ACSS are similar to those for the LVTS. However, the recovery time objective is four hours.

### **3.3.6 Pricing**

The CPA recovers its operating costs through dues charged to its members. Each year, the total assessment is determined based on the costs of operating the system. The amount each member pays is based on its proportional share by volume of the ACSS payment items it sent and received compared to the total volume of items sent and received through the ACSS. At a minimum, each member pays CAD 10,000 for its annual dues. The dues are payable in two instalments.

As with the LVTS, the Bank of Canada does not charge fees for its settlement services. There is no ACSS balance and no overdrafts are carried on the Bank of Canada's balance sheet overnight and therefore no interest rate charges are payable to the Bank of Canada. In the rare event that a direct clearer cannot pay its negative clearing balance through LVTS, the direct clearer can apply for a collateralised advance from the Bank of Canada to obtain the liquidity needed to settle. This advance is settled through the LVTS later in the day and is therefore unlikely to be used for overnight borrowing. The Bank of Canada does not impose an interest rate charge for this intraday borrowing.

### **3.3.7 Future developments**

#### *Default procedures*

Recently, the CPA reviewed the ACSS default procedures and decided to remove the unwinding provisions due to the legal and operational complexities involved with returning certain payment items. The CPA is pursuing amendments to existing by-laws and rules for this purpose.

#### *Review of risks in ACSS*

Following the review of ACSS default procedures, the CPA has decided to examine the risks that exist in the ACSS. This study will be part of a larger Retail Clearing Framework Program. The CPA is planning to identify the risks that exist in ACSS and the existing mitigating strategies, and to consider whether any further mitigating actions should be introduced.

## **3.4 Offshore payment systems – CLS Bank**

The Continuous Linked Settlement (CLS) Bank began commercial operations on 9 September 2002.<sup>78</sup> CLS Bank facilitates the settlement of foreign exchange transactions in 17 different currencies, including the Canadian dollar. CLS Bank uses the LVTS as its approved payment system for the Canadian dollar. In 2009, CLS Bank settled an average daily value of USD 3.4 trillion from an average daily volume of 598,000 instructions. This included Canadian-dollar transactions with an average daily value of CAD 77 billion and average daily volume of 18,500 instructions.

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<sup>78</sup> For more details on CLS, see the corresponding chapter in the forthcoming second volume of this publication.

Currently, four major Canadian banks participate directly in CLS Bank as settlement members and a fifth is expected to become a settlement member in the near future. Other Canadian banks participate indirectly as third-party users, accessing the system through the services of a settlement member. Several LVTS participants provide nostro services to CLS Bank members. There are currently two Canadian dollar liquidity providers.

The Bank of Canada has designated the Canadian dollar operations of CLS Bank under the PCSA. The Bank of Canada is part of a formal cooperative oversight arrangement that allows CLS Bank to be jointly overseen by the central banks whose currencies are included in the system. The Federal Reserve Bank of New York is the lead overseer of CLS and it coordinates the cooperation between participating central banks. The shared oversight arrangement enables CLS to be overseen in a comprehensive manner while keeping to a minimum the duplication of effort.

Another role played by the Bank is to provide CLS Bank with a Canadian-dollar settlement account. This enables the Bank to make and receive final and irrevocable payments on behalf of CLS through the LVTS.<sup>79</sup>

### 3.5 Other cross-border payment arrangements

Outside CLS Bank, cross-border payments are settled in a variety of ways. Correspondent banking arrangements are important for both electronic and paper-based payments such as cheques. Correspondent arrangements are typically organised as either an “in-house” arrangement, where the foreign correspondent for the Canadian clearing bank is its branch or banking subsidiary in the foreign country, or as “club” arrangements, where a group of individual institutions in different payments jurisdictions agree to offer one another indirect access to the domestic clearing system in which they participate.

In addition, the CPA owns and operates the US Bulk Exchange System (USBE) to facilitate the clearing of US dollar-denominated payments, both cheques and certain types of electronic payments, between members of the CPA. The USBE provides a mechanism for tracking the exchange of these USD payment items and the resulting balances due to and from the participants. These balances are calculated on a bilateral basis between each pair of participants, rather than on a multilateral basis. The net positions are settled through CHIPS via either the Canadian participants’ branch or subsidiary acting in CHIPS, or via correspondent arrangements.

There are also two cross-border electronic batch payments systems of interest currently operating in Canada: the US Federal Reserve’s International Automated Clearing House (IACH) Service and the European Transferts Interbancaires de Paiements Automatisés Network (TIPANET).

Finally, ATM networks offer access to cash for payments, both to foreigners visiting Canada and to Canadians travelling abroad. Customers can obtain local currency through ATMs via the Cirrus or Plus networks. The cross-border payment obligation of the card-issuing institution to the cash-dispensing institution is cleared and converted into a USD obligation through the MasterCard International (for Cirrus) or Visa system (for Plus). The Canadian leg of the obligation is settled through the LVTS. For example, if a Canadian resident uses a foreign ATM to obtain local currency, the card-issuing institution in Canada settles its obligation to the cross-border cash-dispensing institution through an LVTS payment to the MasterCard (or Visa) settlement bank in Canada. This settlement bank then settles through its nostro account with an international settlement bank serving MasterCard or Visa, which

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<sup>79</sup> For more details, see P Miller and C Northcott, “CLS Bank: managing foreign exchange settlement risk”, *Bank of Canada Review*, Autumn 2002.



then credits the account of the cash-dispensing institution. Essentially the same is the process for clearing and settling cross-border Visa and MasterCard credit card payments, as well as MasterCard offline debit card transactions.

## **4. Systems for post-trade processing, clearing and securities settlement**

### **4.1 General overview**

In Canada, the two major systems for post-trade processing, clearing and securities settlement are CDSX and CDCC. CDS Clearing and Depository Services Inc (CDS) operates CDSX, which is Canada's main system for clearing and settlement of eligible Canadian exchange-traded and over-the-counter equity, debt and money market transactions. The Canadian Derivatives Clearing Corporation (CDCC) issues, clears and guarantees as a central counterparty all equity, index and interest rate derivatives traded on the Montréal Exchange (MX).

### **4.2 Post-trade processing systems**

Canada does not currently have trade repositories, nor is there any specific institution that only performs post-trade services. Both CDCC and CDSX have integrated some post-trade services internally within their systems (described below). For example, CDS offers a Matched Institutional Trade Interface service that enables domestic institutional trades provided through a virtual matching utility (VMU) or other authorised third party to be reported and created in real time as confirmed non-exchange trades in CDSX. Currently trade data are collected by CDS and CDCC for all trades that settle through their systems. The situation with regard to trade repositories may change as part of the G20 commitment for over-the-counter (OTC) derivatives, which states that OTC derivatives contracts should be reported to trade repositories. Should international trade repositories not provide Canadian authorities with adequate data access and coverage of Canadian participants and products, there may be a desire to establish a Canadian trade repository for OTC derivatives.

### **4.3 Central counterparties and clearing systems**

#### **4.3.1 Canadian Derivatives Clearing Corporation**

The Canadian Derivatives Clearing Corporation (CDCC) issues, clears and guarantees as central counterparty all equity derivatives, index derivatives and interest rate derivatives traded on the Montréal Exchange (MX).<sup>80</sup>

CDCC is a wholly owned subsidiary of MX, which is itself owned by the TMX Group.<sup>81</sup>

At the end of 2009, CDCC had 34 members, and 40.2 million contracts (one-sided) were processed that year.

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<sup>80</sup> The source for this section is CDCC's website: [www.cdcc.ca](http://www.cdcc.ca).

<sup>81</sup> TMX Group owns and operates two major stock exchanges in Canada: the Toronto Stock Exchange (for senior equity) and the TSX Venture Exchange (for public venture equity). TMX Group also has other subsidiaries such as the Montréal Exchange (for derivatives trading), the Canadian Derivatives Clearing Corporation (a central counterparty), the Natural Gas Exchange (for natural gas and electricity contracts) and Shorcan (a fixed income inter-dealer broker).

#### 4.3.1.1 Institutional framework

CDCC is recognised as a self-regulated organisation and is regulated by Quebec's *Autorité des marchés financiers* (AMF). In addition, to support the clearing of derivatives contracts that are registered for sale to US residents, CDCC files documentation in accordance with Securities and Exchange Commission requirements.

#### 4.3.1.2 Participation

All clearing members of the CDCC must be participants of an exchange recognised in a Canadian province (such as the MX) or be a bank or an authorised foreign bank under the *Bank Act* of Canada. Clearing members must meet the requirements of their regulator: IIROC for broker-dealer members or OSFI for federal commercial deposit-taking institutions. CDCC regularly monitors the capital of its clearing members through quarterly and monthly financial reporting.

#### 4.3.1.3 Types of assets and products cleared

CDCC issues, clears and acts as central counterparty (CCP) for three broad categories of contracts traded on the MX:

- Option contracts: this category includes options on bonds, equities, exchange-traded funds and equity indexes.
- Futures contracts: this category includes two-year, five-year, 10-year and 30-year Government of Canada bond futures, three-month bankers' acceptance futures and S&P/TSX 60 index futures. In June 2010, CDCC also started to clear futures on the NGX WCS WTI Crude Oil Index, which is based on the differential price between the Western Canadian Select Heavy Crude Oil (WCS) and the West Texas Intermediate Light Crude Oil (WTI). This is the first contract to settle in USD in CDCC.
- Options on futures contracts: this category includes options on 10-year Government of Canada bond futures.

CDCC also acts as CCP for OTC equity options contracts traded on its Converge platform.

#### 4.3.1.4 Operation of the system

CDCC receives trades from the MX and Converge. CDCC's clearing application has a record of the net outstanding derivatives contracts, including futures and options. Based on the net outstanding derivatives contracts, CDCC's clearing application generates, during the overnight batch process, cash and security delivery obligations for each clearing member to be settled at its commercial settlement bank and at CDSX respectively.

#### 4.3.1.5 Risk management

CDCC has many risk control mechanisms in place. As a central counterparty, it ensures settlement will occur even if a clearing member were to default on its obligations. Numerous risk controls are in place to deal with default and limit risk. These include membership standards, margin deposits, a list of acceptable collateral with associated haircuts, two intraday margin calculations at 10:30 and 13:30, capital monitoring, a liquidity line and a clearing fund that can also be used for loss-sharing among survivors. In case of a participant's default, CDCC would use the following resources in this sequence:

- (i) the defaulter's margin deposits;
- (ii) the defaulter's clearing fund deposits;
- (iii) any remaining collateral pledged by the defaulter in excess of the margin requirement and clearing fund contribution;

- (iv) if the defaulter's proprietary assets and client assets are not sufficient to cover losses:
  - (a) the survivors' clearing fund deposits;
  - (b) a second clearing fund contribution, but not more than the preceding clearing fund contributions;
- (v) CDCC's capital.

#### 4.3.1.6 *Links to other systems*

Cash positions (mainly option premiums and cash-settled variation margins) are settled through electronic transfers at a commercial settlement bank the next business day by 07:45. Clearing members can also use LVTS to pledge cash to CDCC as collateral. Security positions have to be settled in CDSX on an ISIN basis with the associated risk controls. CDCC and its clearing members all have accounts at CDS. The trades are settled on a trade-for-trade basis in CDSX. Clearing members also use CDSX to pledge securities as collateral to CDCC.

#### 4.3.1.7 *Major ongoing and future projects*

In December 2009, CDCC was selected to develop CCP services for Canadian fixed income markets in response to a request for proposal from the Investment Industry Association of Canada (IIAC). CDCC is working with the industry to implement the new service in 2011. It is expected that the Bank will formally oversee the system operated by CDCC once it commences operations.<sup>82</sup>

### 4.3.2 **CDS Clearing and Depository Services Inc (CDS)**

CDS offers two CCP services: Continuous Net Settlement (CNS) and FINet. CNS nets eligible exchange-traded equity transactions and FINet nets eligible trades in Government of Canada bonds, treasury bills, Government of Canada-guaranteed corporate bonds and provincial bonds, notes and treasury bills. These CCP services are integrated with CDS's securities settlement CDSX.<sup>83</sup>

### 4.3.3 **Natural Gas Exchange Inc**<sup>84</sup>

Natural Gas Exchange Inc (NGX), wholly owned by TMX Group, provides electronic trading, central counterparty clearing and data services to the North American natural gas and electricity markets. In May 2009, through the acquisition of NetThruPut, NGX added crude oil to its suite of physically and financially cleared products.

In 2008, NGX formed a technology and physical clearing alliance with the Intercontinental Exchange Inc (ICE). Under the arrangement, the cleared and bilateral markets for North American physical natural gas and Canadian electricity operated by NGX and ICE are offered together on ICE's Trading Platform. NGX also uses the ICEBlock system to electronically accept, for clearing, off-exchange transactions in financial gas and other energy products. In 2011, NGX and ICE expanded the alliance to Canadian and US physical and Canadian financial crude oil products.

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<sup>82</sup> Under the PCSA, the Governor of the Bank of Canada can designate a system once the Minister of Finance agrees it is in the public interest to do so.

<sup>83</sup> This system is described in Section 4.4.1 below.

<sup>84</sup> For more details, see <http://www.ngx.com>.

The Alberta Securities Commission regulates NGX. NGX is not subject to Bank of Canada oversight.

In 2009, NGX cleared 625,000 contracts worth a total of CAD 97 billion.

#### **4.3.4 ICE Clear Canada<sup>85</sup>**

ICE Clear Canada is the designated central counterparty for ICE Futures Canada, an agricultural exchange offering futures and options contracts on canola and barley. ICE Clear Canada was originally established in 1998 as WCE Clearing Corporation. Winnipeg Commodity Exchange (WCE) and WCE Clearing Corporation were acquired by Intercontinental Exchange Inc (ICE) in 2007.

ICE Clear Canada is regulated by the Manitoba Securities Commission pursuant to the provisions of the *Commodity Futures Act* (Manitoba). All ICE Clear Canada's rules, operational manual and by-law amendments are submitted to its regulator, the Manitoba Securities Commission. ICE Clear Canada is not subject to Bank of Canada oversight.

In 2009, ICE Clear Canada cleared 3.6 million transactions at a value of CAD 29.5 billion.

### **4.4 Securities settlement systems**

#### **4.4.1 CDS Clearing and Depository Services Inc**

The Canadian Depository for Securities Limited was incorporated in 1970 as a non-profit corporation. It is owned by the major Canadian chartered banks, members of the Investment Industry Regulatory Organization of Canada (IIROC) and the TMX Group. CDS Clearing and Depository Services Inc (CDS) is a subsidiary of Canadian Depository for Securities Limited. CDS owns and operates CDSX, which is Canada's main system for clearing and settlement of eligible Canadian exchange-traded and OTC equity, debt and money market transactions. CDS's depository service provides facilities to deposit and withdraw depository-eligible securities, manage related ledger positions, and use these positions for various business functions.<sup>86</sup> In 2003, CDSX replaced both the Debt Clearing Service (DCS), which was used to clear and settle most Canadian-dollar debt transactions, and the Securities Settlement Service (SSS), which settled equities and some debt transactions.

On average in 2009, CDSX processed about 1 million daily trades worth about CAD 258 billion. This compares to about 250,000 daily trades worth about CAD 192 billion in 2005. The value of securities on deposit was about CAD 3.3 trillion as at 31 December 2009.

##### **4.4.1.1 Governance**

CDS does not have its own board; however, the Canadian Depository for Securities Limited Board of Directors consists of 14 directors: nine shareholder directors, one director from CDS's management, one director from the TMX Group and three independent directors from outside the securities industry.

##### **4.4.1.2 Institutional framework**

CDS, its clearing and settlement system, and its participants are subject to legislation and regulations of various jurisdictions. At the federal level, the Bank of Canada oversees CDSX,

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<sup>85</sup> For more information, see [https://www.theice.com/clear\\_canada.jhtml](https://www.theice.com/clear_canada.jhtml).

<sup>86</sup> Major depository accountabilities are the safe custody and movement of securities, accurate record-keeping and the collection and distribution of the entitlements associated with the securities.

which is a designated system under the *Payment Clearing and Settlement Act* (PCSA). At the provincial level, CDS is regulated by the Ontario Securities Commission (OSC) under the *Ontario Securities Act* and the Autorité des marchés financiers (AMF) under the Quebec Securities Act. CDS also works with the Alberta and British Columbia securities commissions as needed. In addition, CDS reports, as required, to the Canadian Securities Administrators (CSA). Finally, CDS cooperates with federal and provincial financial institution regulators that oversee CDS participants.

#### 4.4.1.3 Participation

In 2009, CDS participants included the Bank of Canada, 11 commercial banks, eight trust companies, 55 investment dealers and nine other participants (credit unions, depositories and treasury branches), when counting participants and their affiliates individually, along with 13 limited-purpose participants. Canadian financial institution members in CDSX must be incorporated, in compliance with regulations for their industry, and meet minimum prudential requirements. Foreign institutions are regulated by the laws of their own country, but there must be certainty, according to expert legal opinion, that the laws of the foreign country do not interfere with the enforceability of CDS rules and procedures.

All CDSX participants must be members in good standing with an industry self-regulatory organisation, if applicable. They must also demonstrate sufficient financial and operational capacity to meet obligations to CDS and other participants. CDS relies on its participants' regulators for monitoring compliance, although CDS conducts a credit assessment of new participant applicants.

#### 4.4.1.4 Types of assets and products cleared

CDSX settles transactions in equities and the following debt securities: Government of Canada; federally guaranteed; provincial; corporate; unrated public sector entities and government grants; unrated municipal; and US Treasury bills, bonds and notes.

#### 4.4.1.5 Operation of the system

Settlement in CDSX uses a model 2 delivery versus payment (DVP) mechanism,<sup>87</sup> ie transactions are settled with securities ownership moving on a gross real-time basis while the net funds positions are settled at the end of the day.<sup>88</sup> The DVP mechanism has additional risk mitigation features including: (i) the simultaneous transfers of funds and securities at the time of settlement of transactions are final and irrevocable; and (ii) negative funds balances are fully collateralised.

CDS manages the safekeeping of depository-eligible domestic and international securities in both electronic and physical certificate form for its participants. Eligible securities are held by CDS or transfer agents and registered in CDS's nominee name (CDS & Co). Once the electronic or physical securities are deposited with CDS, CDS enters them into a ledger and they trade electronically.

Trade transactions are entered by one party and confirmed by the other party. These transactions can be entered into CDSX either via file transmission from proprietary systems or exchanges, or by direct participant access. CDSX also provides trade matching, where netted payment obligations are settled at the end of the day via designated bankers, with payments made through the LVTS to CDS's settlement account held at the Bank of Canada.

<sup>87</sup> See Committee on Payment and Settlement Systems, *Delivery versus payment in securities settlement systems*, Basel, 1992.

<sup>88</sup> Securities may also be cleared via a daily batch settlement which occurs during the early hours. Although described as a batch process, it is legally a gross mechanism.

Securities held in CDSX can also be reserved as collateral for LVTS payments that are intended for settling final funds positions in CDSX. CDS retains a prior claim on these securities until the LVTS payment is made. LVTS payments are final and irrevocable, allowing final settlement of CDS to occur once all the payment obligations have been received. After settlement, securities that were held in accounts with restricted access become available for use without restriction.

The opening hours for CDSX are designed to support the operations of the LVTS during the CLS settlement period. CDSX is open from 00:30 to 19:30, where settlement of payments (payment exchange) begins at 16:00 and ends at 17:00. After settlement, CDSX remains open until 19:30 for free movement of securities only.<sup>89</sup>

#### 4.4.1.6 Risk management

The risk containment model developed in CDSX, which is a combination of survivor-pay and defaulter-pay loss-sharing arrangements, runs in real time and is designed to protect CDS from the intraday failure of the participant with at least the single largest net obligation to CDS. In addition, for CAD transactions, the Bank of Canada acts as CDS's settlement agent and provides settlement accounts so that CDS is protected from banker risk.

There are primarily two types of participants in CDSX: receivers of credit and extenders of credit. The receivers of credit are the majority of institutions participating in the system and they receive lines of credit from extenders that enable them to purchase securities during the day. Extenders of credit collateralise their own intraday payment obligations. Receivers of credit must also collateralise their own obligations enabled by the extended line of credit. At the end of the day, the extenders of credit are required to make payments to CDS to cover the net amount of securities bought on their own behalf and on behalf of their customers, as well as to cover securities bought by receivers of credit. Receivers of credit grant the extenders a security interest in the securities delivered to them on that day. If an extender is required to make payment for a receiver that is unable to fulfil its end-of-day payment obligation, the extender is entitled to take possession of those securities (the so-called delivered or "unpaid-for" securities). The amount that each extender can owe the system (either on behalf of those to which it has extended credit or on its own behalf) is capped.

The system also has a loss-allocation procedure in the event that an extender of credit is unable to meet its end-of-day payment obligation, either for its own net purchases during the day or on behalf of those receivers of credit that are unable to fulfil their payment obligations at the end of the day. Under the loss-allocation procedure, the remaining extenders are required to fulfil the obligation to the system of the failed extender. This loss-allocation procedure is backed up by a pool of collateral that all extenders of credit maintain in accordance with the requirements set out in the CDSX Rules. The extenders may also guarantee some of their own payment obligations individually by pledging collateral to CDS on a dollar-for-dollar basis to cover these obligations.

The sum of these two types of collateral is sufficient to cover the failure of the extender with the single largest possible net debit to the system. Thus, in the case of the failure of a single extender, CDSX would be expected to be able to settle without causing undue liquidity strains for participating financial institutions. To facilitate any liquidity issues in the event of a default, CDS has obtained a collateralised line of credit from a private sector bank. In the extreme case, where the liquidity line is insufficient, the Bank of Canada would provide a fully collateralised last-resort loan facility. As CDSX operates as a model 2 DVP system, transactions that have settled intraday cannot be unwound.

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<sup>89</sup> Free movement of securities allows participants to pledge securities to other participants' accounts.

Within this framework, CDSX incorporates a variety of risk-control mechanisms in its design and operations:

- CDSX is a real-time online facility with the position of each participant calculated on a transaction-by-transaction basis.
- CDSX has been designed to operate on a DVP (value-for-value) basis. There is gross, or item-by-item, settlement for securities transfers throughout the day and, at the same time, there is continuous netting and novation to CDS of corresponding payment obligations.
- All participants' net debit payment positions vis-à-vis CDSX are subject to "system operating caps", ie ceilings, with the cap for certain participants linked to the size of their regulatory capital.
- Each category credit ring member has a collateral pool where members of the pool combine collateral for common use and share risk by guaranteeing the obligations of the other members that arise from use of the pool.<sup>90</sup>
- The Aggregate Collateral Value (ACV) control ensures that any default will be fully collateralised (subject to the sufficiency of the applicable haircut rates as described below) at all times. The system rejects transactions that would cause a participant's payment obligation to exceed the collateral value of securities available and pledged as collateral to cover that payment obligation. The ACV control tracks the value of a participant's collateral in real time.
- The usable value of securities as collateral in the system is the market value of each security less a haircut, to account for day-to-day volatility in the market price. The securities eligible as collateral in CDSX are mostly in line with the securities allowed for the Bank of Canada's Standing Liquidity Facility – with the exception of equities.
- Any transactions that would put a participant outside the limits imposed by the collateralisation requirement or system operating caps are placed in a "pending" status until a change would allow the transaction to settle within these limits.
- All participants in CDSX can calculate their potential risk exposure at any given time.
- At the end of the day, the net amounts in Canadian dollars owed and owing between the CDSX (as a result of the novation of obligations to CDS) and the participants are settled using the LVTS. US dollar settlement occurs through a commercial settlement bank via Fedwire.
- The system does not permit the reversal or unwinding of transactions as a means of dealing with participant failure.
- For Canadian dollars, the Bank of Canada acts as settlement agent for CDS in the LVTS, with respect to payment obligations in CDSX. The Bank of Canada, in carrying out this daily function, receives payments from participants that owe money to CDS and makes payments to participants entitled to receive money from CDS. With the Bank acting as settlement agent, so-called "banker risk" is eliminated for CDSX and its participants transacting in Canadian dollars. There is no liquidity or credit risk to the Bank of Canada from carrying out this function because the LVTS is used to make end-of-day CDSX payments and the Bank will make an LVTS payment on behalf of CDS only if there is a sufficient balance in the CDS account to cover the amount of the payment.

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<sup>90</sup> Except for non-contributing receivers of credit (ie participants who do not create payment obligations for CDS).

For CDS's CCP services (FINet and CNS), the process has additional risk management features that require each FINet/CNS participant to contribute margin collateral to cover the participant's own risks to CDS for its specific FINet/CNS activities. If a participant fails to fulfil any of its obligations to CDS within FINet or CNS, CDS may suspend the participant and initiate both the CDSX default procedures and the related CCP closeout procedures. The closeout procedures use a defaulters-pay model and the value of the FINet/CNS collateral that CDS has received from the defaulting participant is expected to be sufficient to cover any CCP loss generated by the default of that participant. If it is not sufficient, the survivors share in the losses.<sup>91</sup>

#### *4.4.1.7 Links to other systems*

The LVTS and CDSX have links that allow participants to move liquidity from one system to the other. A participant in both LVTS and CDSX with a positive funds balance in CDSX can send these funds to the Bank of Canada in CDSX and the Bank will send the participant an LVTS payment for that amount. A similar arrangement allows a participant in both systems to transfer LVTS funds to its CDSX funds account.

CDS has also established custody links to depositories in the United States, Japan, France, Peru and Sweden. To help CDSX participants manage their US business, CDS has set up links with both the Depository Trust Company (DTC) and the National Securities Clearing Corporation (NSCC) to form an active inter-depository linkage. DTC is the central depository for US securities and provides custodial and settlement services (trade-for-trade only), and NSCC provides clearing services and settlement (on a trade-for-trade and CCP basis) through DTC. CDS facilitates this through two links: the New York Link (NYL) and DTC Direct Link (DDL). For NYL, CDS sponsors participants for direct membership in NSCC and DTC. These participants can access NSCC's/DTC's custodial, institutional clearing and settlement services, where NYL trading activity is predominantly settled on a continuous net settlement basis. For DDL, CDS also sponsors participants for direct membership in DTC.

#### *4.4.1.8 Major ongoing and future projects*

To improve the efficiency and cost effectiveness of the Canadian capital markets, CDS is working towards eliminating physical securities certificates both for existing issues within CDS's vaults and the issuance of new securities. This will reduce overall industry processing and holding costs for securities transactions, and lower the risk and eliminate the potential cost of replacing lost certificates. In addition, with a target date of November 2011, all entitlement payments paid to CDS will be in electronic form.

### **4.5 The use of securities infrastructure by the central bank**

The Bank of Canada is a direct participant in CDSX and completes several business activities through its participation.

#### **4.5.1 Collateral management**

The Bank of Canada uses CDSX to receive securities as collateral. This collateral is used to support the intraday operations of the LVTS; Standing Loan Facilities related to the settlement of the LVTS; and any advances associated with the withdrawal of currency by participants in the Note Exchange System.

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<sup>91</sup> For a detailed description of the risk controls and default management, see [http://www.cds.ca/cdsclearinghome.nsf/Downloads/-EN-CDSFinancialRiskModel-Version6.0/\\$File/CDS+Financial+Risk+Model\\_Version+6.0.pdf?OpenElement](http://www.cds.ca/cdsclearinghome.nsf/Downloads/-EN-CDSFinancialRiskModel-Version6.0/$File/CDS+Financial+Risk+Model_Version+6.0.pdf?OpenElement).



#### **4.5.2 Monetary policy**

The Bank of Canada, as part of its monetary policy, has a target for the overnight rate, and is prepared to enter into open market securities operations with purchase and resales or sales and repurchases to support the target rate. Term repos can also be used when liquidity premia in money markets are distorted and associated with widespread liquidity problems in an asset class or maturity. These would be most useful for providing liquidity to money markets since they can be offered to any financial market participants with marketable securities as the basis for the transaction. These transactions are all settled in CDSX.

#### **4.5.3 Government debt administration**

As part of the debt management services the Bank provides to the federal government, the Bank issues through auction, and settles through CDSX, all new issues of government treasury bills and marketable bond issues. Within CDSX, the Bank of Canada is the sub-custodian for Government of Canada securities. Also, all interest and redemption payments on government securities held in CDSX are settled through CDSX by the Bank of Canada acting on behalf of the government.

#### **4.5.4 Client services**

The Bank of Canada offers settlement services on behalf of its correspondent clients, primarily other central banks, for the Canadian dollar-denominated securities transactions that these clients have entered into. These transactions are settled through CDSX.