

# Management of Foreign Exchange Settlement Risk at Canadian Banks

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**I**n a standard foreign exchange transaction, parties to a trade agree to exchange value denominated in one currency for value denominated in another currency. The transfer of funds to settle each party's payment obligation typically takes place within the relevant payments systems of the currencies involved in the trade. Settlement of foreign exchange (FX) trades across national payments systems and legal jurisdictions can expose banks to different types of risk. The principal types of risk include credit, liquidity, operational, and legal risk.<sup>1</sup> Together, these risks comprise foreign exchange settlement risk.

The focus here is on the credit risk dimension of foreign exchange settlement risk, henceforth referred to as "FXSR." A bank that irrevocably pays out the sold currency to its counterparty unconditional upon final receipt of the currency it has purchased is exposed to financial loss up to the principal value of the trade if its counterparty fails to deliver the purchased currency. That is, a bank is exposed to FXSR if settlement does not take place on a payment-versus-payment (PvP) basis.

Given the global scope of the FX marketplace, trades often settle across international time zones. Differences in time zones could exacerbate a bank's exposure to FXSR, since it may be required to pay out the sold currency before the business day begins in the country of the currency it has purchased.<sup>2</sup> Thus, exposure to FXSR could last up to two business days, and possibly longer, when settlement is interrupted by weekends and holidays. At any given time, therefore, the value of a bank's exposure to a single counterparty

could equal two or more days' worth of trades, potentially exceeding the value of its capital (CPSS 1996). With almost US\$4 trillion settling daily in the FX marketplace, large counterparty FXSR exposures are likely to exist.

This report highlights the key aspects of FX settlement and banks' management of FXSR. Available methods for settling FX trades and the risk characteristics of each are discussed. The necessary components of an effective risk-management strategy for individual banks are outlined. The report goes on to discuss how Canada's major banks use these settlement methods and risk-management strategies.

## Methods of Foreign Exchange Settlement and Associated Risk

FX trades are usually settled using one of four methods, each of which is characterized by a different degree of risk.

### Gross non-PvP settlement

Under this settlement arrangement, payment obligations relating to each currency leg of an FX trade are transferred individually through national payments systems. Where a bank does not participate directly in the national payments system for currencies that it actively trades in, it must rely on a correspondent (or nostro) bank to settle its payment obligations in those currencies.

When settling trades using gross non-PvP settlement, a bank's delivery of the sold currency is generally not made conditional on final receipt of the purchased currency. This exposes the bank to financial loss up to the principal value of the trade until final settlement.

1. For a description of these and other risks, see Aaron, Armstrong, and Zelmer (2007).
2. Settlement of each currency leg must take place in the country or region where the currency is issued.

## On-us settlement

On-us settlement takes place where both currency legs of a trade are settled across the books of the same bank. This could be a scenario in which a bank is settling an FX trade across its books on behalf of two of its clients, or where the settlement bank is a counterparty to the trade. That is, one party to the trade is a client of the other party. This report deals with the latter arrangement only, where the settlement bank is a counterparty to the trade.<sup>3</sup>

When settling an FX trade on-us, a transfer of funds through national payments systems is not necessary. Nonetheless, on-us settlement can also expose a bank to FXSR, especially where the trade is booked by the settlement bank across time zones in separate subsidiaries or branches. If the bank credits the sold currency to its client's account prior to debiting the bought currency from the client's account, the bank is exposed to FXSR up to the principal value of the trade. This is because there is a possibility that the client would not have sufficient funds available to meet its obligation and that the bank would be unable to retrieve the sold currency.

## Bilateral netting agreement

This method involves the netting of individual payment obligations in the same currency stemming from two or more underlying FX trades that are due to settle on the same date. Bilateral netting of payment obligations between a particular pair of banks typically involves one bank sending a single net payment in the respective currency to the other, rather than settling each trade between them individually. Net payment obligations are settled on a non-PvP basis.

To better understand bilateral netting, consider the following example. Suppose that Bank A owes Bank B individual amounts of 50 and 100 in currency X, stemming from two trades between them. In addition, Bank B owes Bank A 125 in currency X to settle a third trade between them. All three trades mature on the same date and are eligible to settle under the bilateral netting agreement established between the banks. Bilaterally netting these trades results in Bank A owing a

single amount of 25 in currency X to Bank B, while Bank B's payment obligation to Bank A in currency X is eliminated altogether.

Banks typically maintain bilateral netting agreements with certain counterparties. Provided that an agreement is legally enforceable in all relevant jurisdictions, bilateral netting has the potential to reduce counterparty credit risk, but may not eliminate it completely, as demonstrated in the example above. That is, under a legally valid bilateral netting agreement, a bank is exposed to FXSR vis-à-vis its counterparty for an amount equal to the net value owing from all trades in the purchased currency.

## Continuous linked settlement (CLS Bank)

CLS Bank owns and operates an electronic infrastructure linking together fifteen national payments systems, including Canada's Large Value Transfer System, in real time.<sup>4</sup> This arrangement—Continuous Linked Settlement (CLS)—facilitates the simultaneous (PvP) settlement of each currency leg for accepted FX transactions on a trade-by-trade basis. By employing specific risk controls to limit participants' exposure in the system, CLS virtually eliminates credit risk associated with settling foreign exchange transactions. Further, since participants' settlement obligations to the system are calculated on a multilateral net basis, CLS also economizes on settlement funding.

## Management of FXSR

Banks exposed to FXSR are encouraged to have in place an appropriate risk-management framework to contend with this exposure. However, previous surveys conducted by the Bank for International Settlements (CPSS 1996 and 1998) found that some banks did not recognize their exposure to FXSR as being similar to other credit exposures, and thus were not taking appropriate action to manage it.

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3. The larger a bank is, and the more extensive its client base and FX operations are, the greater the scale of its on-us settlement activity will likely be.

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4. The CLS Bank began operations in September 2002. The Canadian-dollar leg of CLS is subject to Bank of Canada oversight under the Payment Clearing and Settlement Act. For more information on CLS Bank and the Bank of Canada's oversight of CLS, see Miller and Northcott (2002). For a more recent update on CLS oversight, see Goodlet (2007).

Citing the large scale of the FX trading and settlement activity by banks, and the resulting size and systemic implications of their exposures to FXSR, these studies set out a strategic framework for action on the part of individual private banks, central banks, and industry groups. Indeed, the introduction of the CLS Bank was one response at the industry-group level to this call for action.

For an individual bank, a framework for managing FXSR should incorporate the following elements: a corporate governance structure that acknowledges exposure to FXSR; accurate measurement of the exposure associated with each settlement method; and the use of appropriate tools to control this exposure where it exists.

### Acknowledgement of exposure

Exposure to FXSR should be recognized as a short-term credit exposure for a bank. To that end, clear lines of responsibility should be established for managing this exposure throughout the organization, including the involvement of senior management.

### Measurement of exposure

Banks should acknowledge the degree of exposure associated with each settlement method. That is, they should recognize exposure to FXSR when settling trades using gross non-PvP settlement (including settlement of bilaterally netted amounts owing) and on-us arrangements involving non-PvP settlement. At the same time, they should also recognize that certain settlement methods, such as CLS and on-us arrangements providing PvP settlement, can virtually eliminate FXSR.

For settlement methods that expose them to FXSR, banks should employ a measurement mechanism that accurately gauges the extent of this exposure, where exposure has both a value and duration element. For example, with gross non-PvP settlement, the value of a bank's exposure to FXSR should be measured as the principal amount of the trade.

With regard to the duration of exposure, a bank should be able to identify its minimum and maximum exposure associated with settling gross non-PvP. A bank's minimum exposure is defined as the period of time between when payment of the sold currency becomes unilaterally irrevocable to when the purchased currency

is expected to be received with finality.<sup>5</sup> Of course, it may not be possible for a bank to verify final receipt of the purchased currency immediately, especially where a correspondent bank is receiving these funds on its behalf. Until receipt has been confirmed, there is a possibility that a counterparty could default on its obligation. Thus, a bank's maximum exposure is defined as the length of time between when delivery of the sold currency becomes unilaterally irrevocable to when the bank is able to verify its final or failed receipt of the purchased currency. Only when non-receipt of payment within the allotted time frame has been verified can a bank take action to recover settlement losses.<sup>6</sup>

### Control of exposure

Once identified and measured, procedures should be put in place to limit exposure to FXSR within parameters that are acceptable to the bank. For example, this could include the use of daily settlement limits for FX counterparties. A daily settlement limit (DSL) granted to a counterparty represents the maximum receivable (i.e., purchased) currency settlement position vis-à-vis that counterparty that the granting bank is willing to incur on a given day. DSLs are more effective in limiting exposure when they are binding (e.g., pre-trade authorization by the credit-risk department is necessary for anticipated limit breaches before a trade can be confirmed). Further, counterparty exposures against these limits should be monitored and updated in real time on a global basis (i.e., limits should be enforceable across all of a bank's trading centres).

An institution should also employ a reporting and follow-up procedure to deal with a counterparty's failure to deliver the purchased currency as expected. For instance, a counterparty may experience an internal operational problem that temporarily prohibits it from transferring funds through the payments system. Alternatively, a counterparty may suffer from a more serious liquidity problem that prevents it from meeting some or

5. Finality refers to the unconditional and irrevocable receipt of funds.
6. As alluded to earlier, with gross non-PvP settlement across international time zones and/or where correspondent banks are involved, there is a possibility that the banks' exposure to FXSR could be greatly increased.

all of its payment obligations over a longer time frame. Regardless of the cause, a failed trade represents continued exposure to the counterparty for the principal value of the trade. Hence, banks should account for failed trades in their measurement and control of FXSR.

## The Canadian Environment: Stylized Facts

In 2006, the Bank of Canada, in conjunction with several other central banks, organized and conducted a survey of financial institutions regarding their use of various FX settlement methods and their FXSR management strategies.<sup>7</sup> Canada's major banks participated in the survey.<sup>8</sup> The survey is intended to identify changes in the use of available FX settlement methods and to assess progress in managing FXSR exposure since the CPSS-BIS survey published in 1998. The FX settlement landscape has changed considerably since then, particularly with the introduction of the CLS Bank.

The survey consists of two sections. The first asks respondents to report on average daily FX settlement values according to currency, counterparty type, and settlement method for April 2006. The second section consists of questions pertaining to the measurement and control of FXSR. The survey covers settlement of FX spot, forward, and swap transactions.

Some stylized facts from the survey of major Canadian banks are as follows.<sup>9</sup>

- The average daily FX settlement value (in terms of currency sold) reported by the Canadian banks in April 2006 was

US\$98.3 billion.<sup>10</sup> The settlement value of Canadian banks represents close to 3 per cent of the total daily FX settlement value for all institutions participating in the survey.

- Settlement value of the Canadian banks is heavily concentrated in the U.S. dollar (US\$), the Canadian dollar (Can\$), and the euro (EUR) (Table 1). Approximately 85 per cent of daily settlement value involves these currencies. Although the survey did not collect information on trade volumes for specific currency pairings, these results suggest that the majority of FX trades by Canadian banks are US\$/Can\$ and US\$/EUR. In 1998, trades involving the U.S. dollar and the Canadian dollar accounted for a slightly greater combined proportion of the banks' daily settlement value.
- Overall, gross non-PvP settlement continues to represent the largest source of exposure to FXSR for Canadian banks; however, its prominence as a settlement method has declined since the introduction of the CLS Bank. Gross non-PvP settlement currently accounts for 55 per cent of daily settlement value (Table 2), compared with over 80 per cent in 1998.
- Close to 23 per cent of the aggregate daily FX value settled by Canadian banks went through CLS. This accounted for about 50 per cent of the daily FX value for the three Canadian banks participating in this system in April 2006.
- Roughly 30 per cent of banks' daily FX settlement value was bilaterally netted. This percentage was greater for non-CLS participants (54 per cent) than for CLS participants (15 per cent). The proportion of total credit exposure eliminated by bilateral netting was 17 per cent, which is similar to the percentage reported in the 1998 survey.
- On-us settlement was equal to 5 per cent of daily FX settlement value. This value is heavily

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7. The survey was administered by member central banks of the BIS Committee on Payment and Settlement Systems (CPSS) Sub-Group on FXSR. The subgroup released a consultative report based on the survey findings in July 2007. The report is available at <<http://www.bis.org/publ/cpss81.htm>>.

8. Surveyed banks include the Bank of Montreal, Scotiabank, the Canadian Imperial Bank of Commerce (CIBC), National Bank of Canada, Royal Bank of Canada, and TD Bank Financial Group.

9. Where appropriate, comparisons have been provided between the current survey findings and the survey findings from 1998. In some cases, certain factors preclude an accurate comparison of these findings.

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10. This does not necessarily include all FX trades booked by each bank, since the survey focused primarily on trades booked within Canada. However, some banks did provide figures for trades booked outside of Canada as well.

Table 1  
**Daily FX Settlement Value by Currency<sup>a</sup>**  
 April 2006, percentage

Total	100
U.S. dollar	47
Canadian dollar	31
Euro	7
Japanese yen	4
U.K. pound	3
Australian dollar	3
All others	5

a. In terms of currency sold. Similar figures emerge for currency purchased.

Table 2  
**Canadian Banks' Use of Available Settlement Methods**  
 April 2006, percentage

Daily FX Settlement Value:	100 (US\$98.3 billion)
Proportion of which was:	
- settled gross non-PvP	55
- extinguished by bilateral netting	17
- settled on-us	5
- settled in CLS	23

concentrated in the Canadian dollar and the U.S. dollar, with a limited amount in the euro.

## The Canadian Environment: Management of FXSR

The survey also shed light on Canadian banks' management of exposure to FXSR.<sup>11</sup>

### Acknowledgement of exposure

All of the Canadian banks surveyed view their exposure to FXSR as a short-term credit exposure and have established a comprehensive framework for managing this risk. Clear lines of responsibility have been established within each bank, including the involvement of senior management.

### Measurement of exposure

All of the Canadian banks surveyed recognize that they are exposed to financial loss up to the principal value of each FX trade settling gross non-PvP and also for on-us trades settling on a non-PvP basis. With respect to bilateral netting, all banks maintain master bilateral netting agreements with certain of their counterparties and view these agreements to be legally binding.<sup>12</sup> Accordingly, five of the six banks measure the amount of their credit exposure stemming from bilaterally netted trades as the net amount owing from the counterparty in the purchased currency. One bank measures its exposure as the gross value owing, solely for administrative reasons.

11. Views in this section of the article are based on specific criteria identified by the CPSS subgroup—acknowledgement, measurement, and control of exposure. A comprehensive judgment about the management of FXSR at each institution would need to factor in the broader framework within which risk management takes place (e.g., an assessment of contingency planning and stress-testing procedures). For more on this issue, see BCBS (2000), which discusses supervisory guidance for managing FXSR exposure. A description of Canadian banks' broader risk-management practices can be found in Aaron, Armstrong, and Zelmer (2007).
12. Under these arrangements, the necessary legal documentation, including an ISDA agreement, must be signed with each counterparty and acceptable legal opinions for each respective currency jurisdiction must be received.

When measuring their FX settlement exposure, Canadian banks participating in CLS recognize the benefit of this system in eliminating credit risk.

Banks measure the duration of their exposure to FXSR when settling trades gross non-PvP (the largest source of the banks' exposure) as lasting between one and three calendar days, depending on the institution. With data provided by the banks on their timelines for gross non-PvP settlement, each bank's actual minimum and maximum exposure to FXSR is calculated for its major currency pairings and is compared with its measured duration of exposure.<sup>13</sup>

This comparison reveals that two of the six Canadian banks measure their FX settlement exposure in a way that covers both their minimum and maximum exposures for all major currency pairings settling gross non-PvP. Two banks measure their exposure in a way that covers their minimum but not their maximum exposure for some or all of the major currency pairings. And two banks measure their exposure in a way that covers neither their minimum nor their maximum exposure for some or all of the major currency pairings. A discussion of these findings is presented in the next section.

### Control of exposure

All of the major Canadian banks use daily settlement limits and apply them in a manner similar to that described earlier. Limits are binding and are usually programmed directly into the banks' internal credit-control systems so that all potential FX contracts are automatically applied against the respective DSL at the time of the trade. DSLs are usually established within the broad guidelines for granting counterparty credit set by senior management. That is, DSLs may be one of several corporate credit lines that a bank chooses to grant to its counterparty. DSL values are based on factors such as counterparty type, historical trading patterns, and projected business requirements. Limits are typically reviewed on an annual basis, but they may be reviewed more frequently if necessary.

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13. Major currency pairings are defined as those involving Canadian dollars, U.S. dollars, or euros against each other.

All banks have procedures in place to deal with failed trades. These typically include generating a formal report and distributing it to senior management. For all but one bank, the failed counterparty's DSL may be reduced until the purchased currency is received. All banks use discretion in dealing with failed trades. For example, if the value of the failed trade(s) is large enough, then the counterparty's DSL may be shut down completely, rather than just reduced. Banks typically encounter only a few failed FX trades per week. Temporary operational issues are the primary cause of these failures, and failed trades are generally resolved quickly.

It should be pointed out that, given current timelines for gross non-PvP settlement, by the time that banks are able to identify that a trade has failed (usually on the day after the settlement date), it may already be too late to cancel delivery of the sold currency to the counterparty for trades settling on that day. It might also not be possible to cancel delivery of the sold currency for trades settling on the following day. But this does not apply to trades involving the U. S. dollar, the Canadian dollar, or the euro, which make up the bulk of the settlement activity of major Canadian banks. Of course, this is a "worst-case" scenario, because it assumes, among other things, that a bank becomes aware of a counterparty problem only upon identification of the failed receipt, which is not likely to be the case in practice.

### The Canadian Environment: Discussion

The introduction of CLS since the CPSS-BIS survey in 1998 has led to a significant reduction in the degree of exposure to FXSR for participating Canadian banks. Nevertheless, the prominent use of gross non-PvP as a settlement method means that all banks continue to be exposed to a substantial amount of FXSR. That said, the management of this exposure by Canadian banks appears to have improved since 1998, although further improvement by some banks is still possible.

As observed in the 1998 CPSS-BIS report, Canadian banks continue to view their exposure to FXSR as a short-term credit exposure, and have established a comprehensive framework for managing this risk. Currently, the measurement

method used by two banks covers their maximum exposure. This is a slight improvement from 1998, when only one of these banks measured its exposure in this way. Other banks could improve by tightening their timelines for gross non-PvP settlement where possible, thereby reducing the duration of their minimum and maximum exposure.<sup>14</sup>

Improvements are also observed in banks' application of DSLs. In 1998, all but one bank monitored their exposures against these limits in real time. Moreover, DSLs were enforced on a global basis by only four of the six banks. Currently, all banks monitor their exposures in real-time and enforce counterparty DSLs on a global basis. Nonetheless, the procedures used by certain banks to deal with failed trades could be improved, as discussed earlier.

### Participation in CLS

Since CLS virtually eliminates the credit risk associated with FX settlement, central banks and supervisory authorities, including the Bank of Canada and the Office of the Superintendent of Financial Institutions, encourage banks to participate in and use this system (Goodlet 2006).

Three of the six major Canadian banks participated in CLS at the time of the 2006 survey. Royal Bank was the only Canadian settlement member of the CLS Bank, while National Bank of Canada and Bank of Montreal participated as third parties. CIBC was in the process of becoming a settlement member at the time of the survey.

As noted earlier, 23 per cent of the total daily FX value at Canadian banks was settled through CLS Bank in April 2006. Participating banks noted that they settle as many trades as possible through this system. There are, however, obstacles to greater use of CLS in Canada, largely related to the settlement of same-day Canadian dollar/U.S. dollar trades. Typically, these trades are agreed upon, settled, and reconciled all within the same business day, whereas CLS settlement, which occurs overnight in North America, is completed on the following day.

Same-day settlement is estimated at between 35 and 70 per cent of Canadian dollar/U.S. dollar daily settlement value, depending on the institution. Banks not participating in CLS cite the lack of same-day settlement as significantly hindering the business case for their participation. Those banks participating in CLS share that concern, but feel that participation by Canadian banks is important. All banks expressed a strong interest in the possibility of multiple daily settlement sessions in CLS to accommodate settlement of FX trades for same-day value.

Regardless of its current inability to settle same-day trades, the use of CLS Bank by Canadian banks continues to increase. CIBC began participating as a settlement member in September 2006. Because CIBC is an important counterparty in the Canadian-dollar FX market, this is expected to increase the total value settled through CLS Bank by Canadian banks and by other international users of CLS.<sup>15</sup>

### Conclusion

Canada's major banks are using a comprehensive framework to manage FXSR that focuses on governance, measurement, and control. While some improvement has been observed since the 1998 CPSS survey, there is still room for certain banks to make further progress in managing this risk.

Gross non-PvP settlement continues to be the primary source of exposure for Canadian banks; however, the proportion of their FX activity that settles through CLS Bank is increasing. Currently, four of the six major Canadian banks participate in this system. Greater use is hindered by the inability of CLS to settle same-day FX trades.

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14. For example, a bank could extend the cancellation deadline for paying out the sold currency with its correspondent bank, or perhaps identify its final and failed receipts earlier.

15. For a trade to be eligible for settlement through CLS, both counterparties must participate in the system.

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