The Canadian Foreign Exchange Market: Developments and Opportunities

Prepared by the Canadian Foreign Exchange Committee (CFEC)

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Executive Summary

The financial crisis has underscored the importance of markets to financial stability. The impact of the global financial crisis that began in 2008 varied across market products, both within the broader financial market spectrum and within the foreign exchange (FX) arena itself. That said, work is underway globally to identify opportunities to reinforce the resiliency of many markets, including FX. FX markets are central to the financial system, providing a means for funding foreign currency obligations, for hedging FX risks and for other services that enhance financial system efficiency. Canada is the 11th largest FX market by average daily volume and the Canadian dollar (CAD) is the 7th most traded currency in the world.[1]

This paper aims to inform the policy discussion by: i) providing a "primer" on the structure of the CAD wholesale FX markets and ii) reviewing the characteristics of these markets that supported resiliency over the crisis period, as well as the opportunities for improvement. It builds on work done by a number of FX committees, including the UK Foreign Exchange Joint Standing Committee and US Foreign Exchange Committee. There is a broad consensus that foreign exchange markets generally functioned relatively well over the crisis period with the spot market the least affected. Shorter dated transactions, including short-dated forwards and FX swaps, performed better than longer-dated forward or option contracts and cross-currency swaps all of which were viewed to have greater market and counterparty credit risk due to their longer duration. The relatively better financial position and balance sheets of Canadian financial institutions was one factor in providing greater stability to Canadian markets over this period with CAD FX swap and forward pricing remaining closer to theoretical values than those of the other main global currencies.

There are numerous risks related to engaging in FX transactions, some of which have implications for the financial system as a whole and that should be of particular interest to policy makers. These include settlement, counterparty, replacement cost, collateral and funding risks. The type and degree of risk varies across FX products; the further one moves from spot to longer maturities and the more complex derivative part of the FX market, the less standardised and subject to central infrastructure the market becomes, thereby increasing FX-related risks. Throughout the history of the FX market, banks have worked on a multilateral basis, with the encouragement and support of central banks, to address the risks associated with the FX market. The industry meets regularly through various domestic and global forums to continually improve risk mitigation processes.

There are several structural elements that currently mitigate these risks and thus support the resiliency of FX markets, not only in CAD but in other currencies as well. First, sound clearing and settlement processes help to reduce risk in portions of the FX market.

[1] BIS Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity in 2007.

For example, the CLS Bank[2] (CLS) provides payment-versus-payment settlement services in 17 currencies, eliminating the settlement risk due to the time lag between the payment and receipt of flows in two different currencies.[3] Efforts by CLS to increase the number of currencies, regions, products, and participants should be supported where possible, including the provision for same-day settlement in USDCAD spot FX. Some of the issues related to same-day settlement, including potential increased intra-day collateral requirements within the Large Value Transfer System (LVTS), would need to be considered with the Canadian banking community.

Systemic FX Related Risks

Type	Definition	Current Mitigating Mechanisms
Settlement	Risk that counterparty does not deliver a security or its value as per the contract when the other counterparty has already delivered the contracted security or cash.	Continuous linked settlement or bilateral netting.
Counterparty credit	Risk that a counterparty will not settle an obligation/contract for full value when due, or at any time thereafter. Credit risk contains both settlement and replacement cost risks.	Internal credit review processes, strict risk limits, standardized legal master agreements with credit support annexes.
Replacement Cost	Risk that the counterparty will be unable to meet the terms of the contract requiring the holder to replace the existing exposure.	Up-to-date trading systems with counterparty credit limits. Post trade confirmation processes.
Collateral	Risk that collateral requirements cannot be met.	Collateral posted on a net counterparty basis. Re-setting FX mechanism for longer dated cross-currency swaps.
Funding	Risk that positions cannot be funded.	Real-time trading systems with risk limits – VaR framework.

Second, mechanisms are available to manage counterparty credit risk in longer-dated FX products. These include internal credit review processes, strict risk limits and bilateral collateral agreements, such as ISDA's[4] Master Agreements and Credit Support Annexes (CSAs).[5] Netting counterparty credit exposure across financial over-the-counter (OTC) products, including non-FX related products, substantially reduces bilateral counterparty credit exposure, while CSAs provide a collateralized framework for risk reduction similar to the variation margin for exchange-traded products. Despite these types of mitigation mechanisms, and the fact that over 70% of Canadian FX trading is in products with a term less than 7-days, liquidity was disrupted and pricing in FX forwards moved away

[2] Continuous Linked Settlement.
[3] The failure of Lehman Brothers did not disrupt settlement of payments through CLS.
[4] The International Swap Dealer Association provides the industry standardized legal documentation for counterparties thereby reducing both legal and documentation risk. http://www.isda.org
[5] Some weaknesses with ISDA documentation were exposed during the Lehman crisis, see http://www.mayerbrown.com/publications/article.asp?id=8431&nid=6

from covered interest rate parity following the collapse of Lehman Brothers, which could reflect heightened concerns about counterparty credit risk.[6] Hence, ISDA's efforts to strengthen CSAs to further reduce counterparty risk should be supported.

The extension of central counterparty (CCP) type structures to certain FX products could help to further mitigate counterparty credit exposure, but could also increase transaction costs, especially for non-financial participants and increase concentration risk. The structure of any proposed CCP is crucial to determine the level of risk reduction and would require adequate risk-proofing, including elimination of settlement risk. The multilateral netting benefit of CCPs, resulting in efficient collateral requirements and potentially lower capital requirements, are most likely to apply if these CCPs are global and cover a wide variety of OTC products. The net benefit could also vary depending on whether the CCPs would apply only to the interbank market or all counterparties. CCPs may be most appropriate for longer-dated FX products due to the longer duration of their counterparty credit risk; however, these products are also less standardized and transparent requiring a higher level of monitoring of their inherent risk within the CCP. The potential benefits to the system as a whole of CCPs for longer-dated FX products may be limited by the very small volume of transactions currently taking place at those longer tenors (see Annex 2), although moving to a CCP could help to increase volumes due to the reduction in the counterparty credit risk.

Third, market-led policies have supported the creation of more transparent, standardized transactions, although more can be done in certain sectors. These include standardization of trade documentation to enable the confirmation process to become more automated. The documentation of the majority of FX transactions is highly standardized, and efforts are underway to improve standardization even further in some FX product areas, including options.

Finally, as is the case with any market, the resiliency of FX markets depends on a solid framework governing the behaviour of participants. For example, proper incentives and monitoring should reduce the prevalence of large maturity and currency mismatches within financial institutions that could result in lopsided one-way flows. This requires effective collaboration between central banks and the financial institutions' regulators, as well as appropriate access to information. It also requires sound prudential regulation, including appropriate capital, leverage and liquidity requirements in order to reduce the risk that counterparty risk becomes an overwhelming concern.

The assessment in this paper has led the CFEC committee to identify the following five priorities to support the resiliency of FX markets:

a) Establish same-day USDCAD settlement in CLS;
b) Increase use of CLS for FX transactions, including a broader spectrum of participants and extension to more currencies;
c) Better mitigation of credit risk through increased use of Master Agreements and CSAs. Future consideration of other mechanisms to mitigate credit risks such as CCPs where appropriate;

[6] Heightened counterparty risk could also have resulted from CSAs not being used in all transactions.

d) Broaden adoption of straight-through-processing, including increased electronic confirmation and settlement; and,
e) More formal standardization of NDF fixing conventions.

Moreover, given that FX markets are global in nature, the CFEC committee underscores the importance of conducting any increased oversight and regulation of these markets in a uniform consultative manner to avoid unintended consequences.

- Canadian Foreign Exchange Committee, March 2010

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The Canadian Foreign Exchange Market: Developments and Opportunities[7]

1. Introduction

The financial crisis has underscored the importance of markets to financial stability. The impact of the global financial crisis that began in 2008 varied across market products, both within the broader financial market spectrum and within the foreign exchange (FX) arena itself. That said, work is underway globally to identify opportunities to reinforce the resiliency of many markets, including FX.

This paper aims to inform the policy discussion by: i) providing a "primer" on the structure of the Canadian dollar (CAD) wholesale FX markets and ii) reviewing the characteristics of these markets that supported resiliency over the crisis period, as well as the opportunities for improvement. It builds on work done by a number of FX committees, including the UK Foreign Exchange Joint Standing Committee and US Foreign Exchange Committee.[8]

The remainder of this paper is organized as follows. Section 2 reviews the structure of the FX market, including market composition and size and the main risks and risk mitigation strategies associated with FX transactions. Section 3 assesses the performance of Canadian FX markets over the crisis. Section 4 assesses the strengths and weaknesses of Canadian FX markets. Section 5 outlines the recommended priorities identified by the Canadian Foreign Exchange Committee (CFEC) and the final section draws conclusions.

2. FX Market Structure

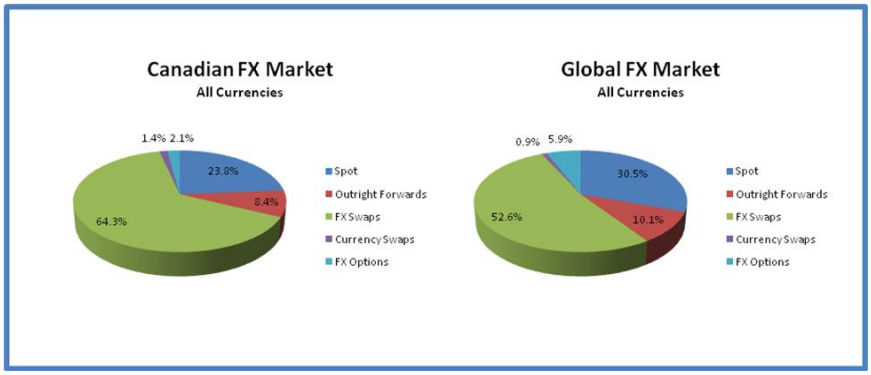
2.1 Market Composition and Size

FX markets are central to the financial system, providing a means for funding foreign currency obligations, for hedging FX risks and for other services that enhance financial system efficiency. Canada is the 11th largest FX market by average daily volume and the CAD is the 7th most traded currency in the world.[9] Canadian dollar transactions executed in Canada account for about 25% of global CAD turnover. Canadian banks are the largest liquidity providers in Canada though foreign banks are increasing their penetration into this area. The domestic FX market has varied participants, which include domestic and international banks including central banks, as well as corporations including exporters and importers, investment and money managers, sovereign wealth

[7] This paper was prepared by a Working Group of the Canadian Foreign Exchange Committee (members of the working group are in Annex 1).
[8] UK paper: http://www.bankofengland.co.uk/markets/forex/fxjsc/fxpaper090923.pdf
US paper: http://www.ny.frb.org/fxc/news/2009/overview_nov_2009.pdf
[9] BIS Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity in 2007.

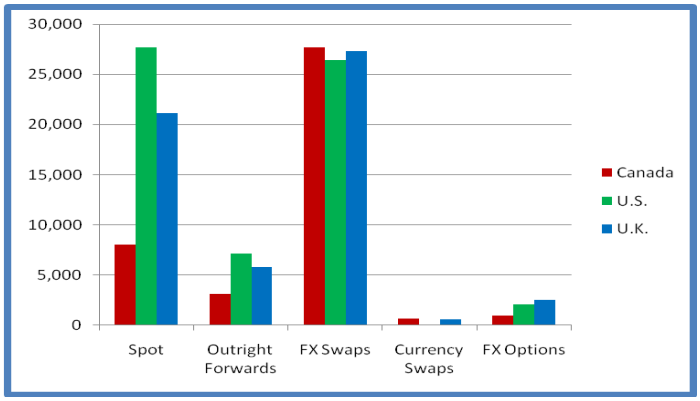
funds, government accounts and their agencies, pension funds, institutional investors, insurance companies, brokerage firms, hedge funds, commodity trading advisors and private retail clients.

Chart 1: Percentage Share by FX Product Type[10]



As shown in Chart 1, the Canadian FX market is made up of five main products: spot, outright forwards[11], FX swaps, cross-currency swaps and FX options. In contrast to the global FX market, FX swaps account for a much larger share of overall volume in Canada, while options have a lower share compared to global volume – see Charts 2 and 3, as well as Annex 2 for detailed CAD and Canadian-based FX volumes.

Chart 2: Average Daily USDCAD Volume by Region (millions)[12]



[10] BIS Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity in 2007; and CFEC October 2009 Foreign Exchange Volume Survey. The preliminary results for the 2010 triennial BIS survey are expected to be released at the end of August and the detailed report in November 2010.

[11] Non-deliverable currencies such as the Chinese Renminbi are traded through a non-deliverable forward (NDF) or option (NDO), which is an outright forward contract in which counterparties settle the difference between the contracted NDF price and the prevailing spot price on an agreed notional amount. Another alternative type of forward contract is a contract for difference (CFD) which is very similar to an NDF but is generally used in the retail market. Currency futures also trade on a forward basis.

[12] Based on October 2009 Canadian, New York and London Foreign Exchange Committee surveys. New York does not report cross-currency swap volumes.

Each of these products serves a different purpose:

i. **Spot FX** - the purchase or sale of currency for immediate delivery and settlement. Immediate settlement for wholesale USDCAD transactions is one working day (T+1), for many other currency pairs it is T+2, although transactions in USDCAD also take place on a same-day basis (T+0).[13] The daily global spot FX market for Canadian dollars against all currencies was $38.5 billion as of the time of the 2007 triennial BIS survey, approximately 4% of all currencies traded globally. CAD spot trading accounts for just under 20% of the total CAD trading volume in Canada according to the October 2009 CFEC survey. The interbank market – trades between banks – accounts for the majority of the market volume, with the end users being dominated by investment managers, as well as central banks/sovereign wealth funds, corporate accounts and hedge funds.

ii. **Outright forward** - the purchase or the sale of a currency for settlement at a future date beyond that of spot. It is typically used for hedging a future cash flow, but can also be used as an investment. This market accounts for about 11% of all CAD FX transactions. Similar to spot FX, interbank trading accounts for the majority of the volume.

iii. **FX swap -** the simultaneous borrowing and lending of one currency for another with two different value dates. An FX swap is typically composed of a spot and forward trade, although it can be structured for two different forward dates. FX swaps account for over 50% of all FX volume globally and over 68% of CAD trading in Canada, reflecting the fact that FX swaps are a core funding market for Canadian financial institutions and corporations. CAD FX swaps are typically for terms of 7-days or less, with a very small proportion (less than 1%) over one year. Since it is being used as a short-term funding source, a large proportion of FX swaps are for same-day settlement.

iv. **Cross-currency swap** – an FX agreement between two parties to exchange the principal and/or interest payments of a loan from one currency to another.[14] Interest payments can be either fixed or floating in either currency. Cross-currency swaps allow market participants to borrow at the best available rate regardless of currency by swapping the debt obligation into the desired currency and therefore hedging against exchange rate fluctuations. Cross-currency swaps are also used by investors to acquire foreign currency bonds and swapping them into the desired investment currency thereby increasing the available pool of potential investments. Less than 2% of CAD FX transactions are cross-currency swaps. Banks account for the majority of transactions, with government entities, corporations and credit investors also active.

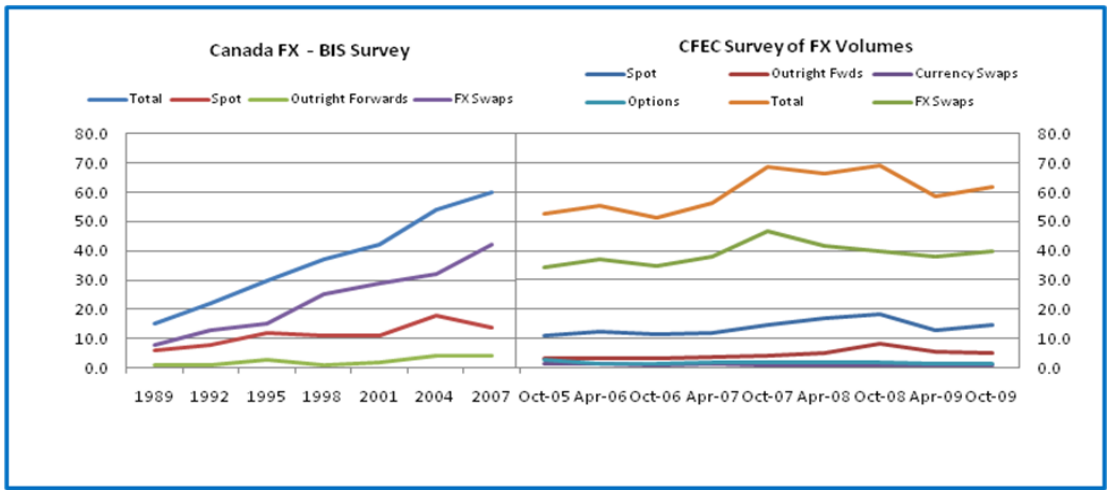
[13] CFEC Working Group estimates that same-day CAD trades represent approximately 10-20% of daily volume due to the high relative usage of overnight FX swaps in Canada.

[14] Principal is exchanged at both the beginning and end of the swap. Cross-currency swaps contrast with interest rate swaps where no principal is exchanged since payments are denominated in the same currency.

v. **FX options** – these give the buyer or holder of the option the right, but not the obligation, to buy or sell an underlying currency at a specific price over a specific period. They can be used by sophisticated participants to either hedge or speculate on FX movements with a known up-front cost. Broker and interbank transactions account for the vast majority of trades with both corporate and institutional clients being also active.

Total FX volume in the Canadian market has more than tripled over the past 20 years with the majority of the growth coming primarily from FX swaps, although volumes since the beginning of the CFEC semi-annual FX volume surveys in 2005 have been relatively stable.

Chart 3: Average Daily Trading Volumes (billions)



2.2 FX Market Structure

All global FX trades follow a similar type process beginning with market pricing and execution, followed by confirmation of the trade details, and finally settlement of the trade.

Market Pricing and Execution

The method for obtaining market pricing is dependent on the type of FX product and customer, while pricing is generally provided by banks. Pricing is disseminated and trades are executed through electronic pricing platforms (multi-dealer[15] or single-dealer), electronic broking platforms, voice brokers, and via telephone through banks' customer sales desks. Global surveys have shown a broad shift by customers to e-trading and electronic platforms and increasingly to multi-dealer platforms, particularly in the wake

[15] Multi-dealer pricing systems include FXall, LavaFX, Currenex, and Global Link (multi-asset class platform).

of the crisis, in order to ensure better pricing and a broader choice of pricing alternatives, as well as for increased operational efficiency and control.

In the USDCAD spot interbank market, the vast majority of spot trades are conducted through electronic broking platforms[16] with the balance executed between voice brokers and direct dealing between banks.[17] In the forward and option markets, the majority of interbank trades continue to be conducted through voice brokers, although electronic platforms are gaining market share for short-dated forward transactions. The majority of interbank cross-currency swap transactions continue to be executed through voice broking, although customers are increasingly using direct pricing platforms as liquidity on them has increased.

End users, including corporate accounts and investment managers, use a combination of voice dealing through banks' customer desks, and single- and multi-dealer platforms.

Confirmation

Once a trade is executed, counterparties confirm the details of the trade for audit purposes to minimize trading errors. Banks use a variety of options to confirm the details of a transaction, including a number of electronic systems[18], as well as fax, phone and e-mail. Over the past several years the FX market has been striving to increase the amount of trades that are electronically confirmed, for risk mitigation and productivity gains, and as a result, the majority of CAD interbank spot trades are now confirmed electronically. The use of standardized confirmation templates, together with electronic confirmation, has led to an increase in the straight-through-processing (STP) of trades. However, for other FX products, the use of electronic affirmation/confirmation platforms still has room for improvement.

Customer confirmation, especially with smaller corporate customers, is often less automated and confirmation is done primarily by phone, fax and e-mail. Further progress is warranted to automate confirmations with these smaller corporate customers.

Settlement

Settlement involves the exchange of the associated cash flows and can occur on a gross or net basis.[19] See next section for a further discussion of settlement risk.

2.3 FX-Related Risks

Risks related to FX transactions can be categorized into those that may have systemic implications and those that are most likely to impact individual participants directly –

[16] Currently primarily through Reuters Dealing.
[17] Source: CFEC Working Group.
[18] Including Misys, FXAll, Global Link (GTSS), CLS, SWIFT, MarkitWire, and Traiana's Harmony.
[19] Multiple trades with the same counterparty, in the same currency, may be netted, subject to appropriate legal agreements.

these are summarized in Tables 1 and 2. Risks vary across FX products; the further one moves from spot to longer maturities and the more complex derivative part of the FX market, the less standardised and subject to central infrastructure the market becomes, thereby increasing FX-related risks. However, the small size of these peripheral markets means that these risks may have fewer systemic implications, although individual participant risks can remain large. In general, participant's risk management frameworks take into account the increased risks associated with these peripheral markets.

Banks have worked on a multilateral basis, with the encouragement and support of central banks[20], to address the risks associated with the FX market. The industry meets regularly through various domestic and global forums to continually improve the risk mitigation processes.

2.3.1 Systemic Risks

The main risks that have potential systemic implications -- in that a failure could cause important adverse effects on the rest of the financial system -- are settlement, counterparty, replacement cost, collateral and funding risks.

Table 1: Systemic FX Related Risks

Type	Definition	Systemic Implications	Current Mitigating Mechanisms
Settlement	Risk that counterparty does not deliver a security or its value as per the contract when the other counterparty has already delivered the contracted security or cash.	Failing to settle could produce a cascading chain reaction in which firms that failed to receive payment could be unable or unwilling to make payments to others.	Continuous linked settlement or bilateral netting.
Counterparty credit	Risk that a counterparty will not settle an obligation/contract for full value when due, or at any time thereafter. Credit risk contains both settlement and replacement cost risks.	Depends on the size and importance of the counterparty – could have large temporary effect on market pricing for some FX products if an important counterparty fails.	Internal credit review processes, strict risk limits, standardized legal master agreements with credit support annexes.
Replacement cost	Risk that the counterparty will be unable to meet the terms of the contract requiring the holder to replace the existing exposure.	Limited except when the failed counterparty is an important market participant. This risk can be high for participants in illiquid currencies.	Up-to-date trading systems with counterparty credit limits. Post trade confirmation processes.
Collateral	Risk that collateral requirements cannot be met.	Forced liquidation of positions from increased system wide collateral requirements.	Collateral posted on a net counterparty basis. Re-setting FX mechanism for longer dated cross-currency swaps.
Funding	Risk that positions cannot be funded.	Potentially requires liquidation of positions with system-wide impacts on market liquidity.	Real-time trading systems with risk limits – VaR framework.

[20] For example, see Report of the Committee on Interbank Netting Schemes of Central Banks of the Group of Ten Countries (the "Lamfalussy Report"), Bank of International Settlements 1990.

Settlement Risk[21]

The most significant source of systemic risk in FX arises from settling of FX trades since the majority of FX contracts are based on notional settlement of the full cash amount for each leg of the trade.[22] The risk is that a counterparty does not deliver a security or its value as per the agreed contract when the other counterparty has already delivered the contracted security or cash. The failure of one counterparty to settle its side of a deal may trigger a cascading chain reaction of cross-defaults.

The FX industry, with the encouragement and support of central banks, created the CLS Bank[23] in 2002 to address this risk. CLS was created through the merger of two preceding FX netting organizations: Multinet in North America and ECHO in Europe. Trades settled through CLS are on a payment-versus-payment basis such that both legs of the FX trade are settled simultaneously, effectively eliminating settlement risk.[24] CLS does not guarantee settlement. However, it does guarantee against the loss of principal because one side of an FX contract is not allowed to settle unless both sides can be settled simultaneously.[25] CLS currently settles 17 currencies, including CAD, for payments arising in spot, forwards, FX swaps, non-deliverable forwards, and FX options.[26] Same-day settlement for FX trades is currently not available, which has limited the percentage of total CAD trades that settle through CLS since a large proportion of CAD FX swaps are for same-day settlement. CLS is currently assessing the solutions to potentially address same-day settlement for CAD and CFEC members see this as an important solution to increase the proportion of CAD trades that settle though CLS, particularly for FX swaps. Some of the issues related to same-day settlement, including potentially increased intra-day collateral needs within the Large Value Transfer System (LVTS) would need to be considered with the Canadian banking community. CLS is currently used for over 55% of all FX transactions globally (90% of the interbank market) with 59 direct users and over 6,000 other third-party participants[27], while it is used to settle only 25% to 50% of interbank FX trades in the Canadian market.[28]

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[21] Settlement risk is often called Herstatt risk after the small German bank (Bankhaus Herstatt) that defaulted in 1974 on an FX payment after having received its part of the transaction.

[22] The exceptions are NDFs, CFDs and FX futures where only the profit or loss on the trade is settled, as well as FX options where only the option premium is settled unless the option is exercised.

[23] The CLS Bank is supervised and regulated as a bank by the Federal Reserve Bank of New York. See P. Miller and C.A. Northcott "CLS Bank: Managing Foreign Exchange Settlement Risk" (Bank of Canada Review - Autumn 2002)

[24] CLS remains the effective repository for the vast majority of the FX industry's trade data. To support the current regulatory efforts aimed at developing trade data repositories, CLS Bank is working with its settlement members to further extend coverage of FX trade data and has committed to work with other interested industry participants to refine the reporting capabilities needed to satisfy the new regulatory requirements.

[25] Any failure to settle may leave a counterparty with an open market position with potentially an unrealized gain (or loss). The cost of this exposure, which is the cost of replacing the original transaction at current market prices, is known as replacement cost risk.

[26] Payments in settlement of Credit Default Swap transactions can also be settled via CLS.

[27] Foreign Exchange Committee, 9 November 2009.
http://www.newyorkfed.org/fxc/news/2009/overview_nov_2009.pdf

[28] Estimates by the CFEC Working Group.

An increase in the global use of CLS has emerged in the wake of the crisis in order to mitigate settlement risk. Participation is either as a direct Settlement Member, or as a Third Party through a Settlement Member. Participants are also becoming more aware of the risks associated with participating in CLS as a Third Party, specifically concentration risk or the risk that the Third Party member is reliant on the Settlement Member for access to CLS.

Settlement risk can be reduced for non-CLS settled currencies, or non-CLS eligible customers, or CLS eligible currencies that are settled same-day, through netting conducted under standardized ISDA Master Agreements. Netting reduces credit exposure between counterparties, where possible, by netting the amounts payable on the same day and in the same currency.

The majority of corporate customer trades continue to be bilaterally settled. However, banks globally are packaging FX trading with cash management services, helping to reduce their settlement risk with their corporate customer.

Counterparty Credit Risk

Counterparty credit risk refers to the risk that a counterparty will not settle an obligation/contract for full value when due, or at any time thereafter. Since the majority of FX transactions are less than 7-days in maturity, particularly with respect to FX swaps,[29] the duration of the counterparty credit risk in FX is lower than in other over-the-counter (OTC) markets with longer maturity horizons. This risk is managed, similar to other OTC markets, through counterparty credit analysis and monitoring. Additionally, banks use a risk management framework that includes standardised legal documentation and bilateral credit support arrangements between counterparties. According to some CFEC-member estimates, 75% of the wholesale non-spot CAD market use ISDA Master Agreements with supporting CSAs, with some product areas as high as 95%. CSAs provide a standardised framework to reduce risk and allow more efficient use of credit lines due to the daily margining of collateral between counterparties resulting from mark-to-market changes.[30] Credit exposure can be accurately calculated due to the transparency, liquidity and relative simplicity of the majority of FX products, thereby providing confidence that the collateral posted[31] will be adequate to offset any exposure. The CSA framework provides many of the risk-reducing benefits of a CCP while preserving the flexibility of OTC markets (e.g., in product design, terms, etc.). Under ISDA Master Agreements, counterparties can also use cross-product netting, which helps to further reduce counterparty credit exposure.

Although the majority of interbank trades are conducted using this type of risk mitigating framework, banks have been less successful in promoting this type of risk mitigation to their corporate customers, who are less accustomed to managing collateral for margin

[29] As shown in annex 2, 72.7% of all CAD FX trades are 7-days or less.
[30] CSAs typically provide for variation margin only above a defined threshold of net exposure, which is determined bilaterally.
[31] Posted collateral under CSAs is normally cash equivalent.

purposes, or who hold none. However, counterparty credit risk is still managed within the overall credit limit framework for those customers.

The extension of central counterparty (CCP) type structures to certain FX products could help to further mitigate counterparty credit exposure, but could also increase transaction costs, especially for non-financial participants and increase concentration risk. The structure of any proposed CCP is crucial to determine the level of risk reduction and would require adequate risk-proofing, including elimination of settlement risk. The multilateral netting benefit of CCPs, resulting in efficient collateral requirements and potentially lower capital requirements, are most likely to apply if these CCPs are global and cover a wide variety of OTC products. The net benefit could also vary depending on whether the CCPs would apply only to the interbank market or all counterparties. CCPs may be most appropriate for longer-dated FX products due to the longer duration of their counterparty credit risk; however, these products are also less standardized and transparent requiring a higher level of monitoring of their inherent risk within the CCP. The potential benefits to the system as a whole of CCPs for longer-dated FX products may be limited by the very small volume of transactions currently taking place at those longer tenors (see Annex 2), although moving to a CCP could help to increase volumes due to the reduction in the counterparty credit risk.

Stakeholders in foreign exchange, including regulators and the industry, need to evaluate the counterparty risk mitigation benefits, as well as increased operational efficiencies, arising from a CCP against the potentially increased transaction costs and concentration risks.

Replacement Cost Risk

This risk forms part of the counterparty credit risk and arises from the counterparty being unable to meet the terms of the contract requiring the holder to replace the position. Due to the short term nature of the majority of FX transactions, this risk is minimal for the liquid currencies which constitute the majority of global FX trading, but can be large for longer-dated FX products and for illiquid peripheral currencies. For longer-dated FX transactions this risk is mitigated using CSAs as discussed above, or alternatively using a CCP.

Replacement cost risk can also arise operationally through the booking of a wrong trade. This is mitigated, especially in the interbank market, through automated straight-through-processing (STP), standardized documentation, and same-day electronic confirmation of trades. The amount of automation is dependent on the type of FX product and is high for spot, forward, and FX swap transactions. Corporate trades remain less automated since many corporations have too few transactions to justify the cost of STP systems. However, the increased use of online trading platforms has increased the use of automated confirmation and settlement by the corporate sector.

Collateral Risk

This risk deals with the lack of sufficient collateral to cover either margin calls for existing transactions, resulting from CSAs, or from the ability to enter into new trades requiring new collateral. The inability to access collateral, for a margin call, could lead into forced liquidation of FX positions and temporarily increase volatility in the underlying product.[32] The collateral risk for longer term interbank cross-currency swaps has been addressed by resetting the FX rate on the swap on a quarterly basis in order to reduce the collateral needed to manage longer dated transactions.

The impact of CCPs on collateral requirements needs to be analysed to determine the overall impact on transaction costs and, in turn, hedging behaviour (particularly of clients). The cost implications of the up-front collateral requirements are likely the most significant in this regard. These factors need to be taken into account when assessing the net benefits of a CCP in reducing counterparty credit risk.

Funding Risk

Funding liquidity is crucial to FX market-making activities by banks as they may need to fund the currency that they have sold. Under certain conditions, market and funding liquidity are mutually reinforcing, leading to liquidity spirals, with market liquidity drying up due to banks liquidating their trading positions as a result of reduced funding liquidity. Funding risk is especially important for longer-dated transactions and any changes in the availability of money market funding will potentially impact the liquidity and pricing of longer-dated FX contracts. Banks can mitigate this risk by matching the maturity of both their FX assets and liabilities, and automated trading/risk-management systems allow banks to effectively monitor this risk (funding gap). When all participants have a lack of funding liquidity this risk could have severe systemic implications.

Intra-day funding liquidity is also important factor to consider for settling FX payments. The potential adoptation of same-day settlement in CLS could impact payment system flows and result initially in increased intra-day payment system collateral requirements.

2.3.2 Participant Specific Risks

Individual FX counterparties face numerous direct risks that can impact their profitability (Table 2). These risks need to be monitored and measured effectively, but in general do not represent significant systemic risk.

[32] According to a 2009 ISDA Margin Survey 36% of FX trade volume is currently collateralized.

Table 2: Participant Specific FX Related Risks

Type	Definition	Implications for Participants	Current Mitigating Mechanisms
Market	Risk that market prices change.	Impacts individual firm's profitability.	Real-time trading systems with risk limits – VaR framework.
Valuation	Risk that positions and/or collateral are difficult to value.	Impacts individual firm's profitability.	Majority of FX products are simple to value and prices are transparent. Collateral is usually cash equivalent.
System	Risk that a FX-related trading system fails.	Impacts individual firm's profitability. Could have a temporary impact on underlying liquidity.	Alternative execution systems, availability of back-up computer systems.
Operational	Risk of an operational error.	Impacts individual firm's profitability.	Well-integrated automated systems to facilitate straight-through-processing of trades with limited data entry. Electronic confirmation of trades.

Market Risk[33]

Market risk refers to the change in the market value of the firm's trading position due to changes in market prices and is, by its nature, part of the risk inherent in all FX trading where capital is allocated to outright trading positions. The amount of market risk taken by a participant is dependent on market conditions including the liquidity and volatility of the underlying market. It is closely monitored through the firm's risk management framework that is used to calculate and limit the amount of risk in the portfolio. In general, this is done through a Value-at-Risk (VaR) approach. Developments in market practices and trading strategies need to be constantly assessed when setting VaR and product limits.

Valuation Risk

Valuation risk deals with the ability to correctly assess the value of the underlying FX position. The simple and transparent nature of the majority of FX trades mitigates this risk for both banks and customers. However, valuation issues can arise for more complex options especially for customers that do not have the appropriate pricing models.

Systems Risk

With the increase in automation and reliance on electronic trading platforms in the FX market, the risk of system failure has increased both at the individual counterparty and system-wide level. This is mitigated by the availability of back-up systems, the ability to

[33] Market risk includes all price related risks for FX products, including spot delta, associated interest rate risk for forwards and swaps, and volatility for FX options – see Annex 3 for further discussion on market risks.

trade through alternative electronic execution networks, and the ability to temporarily switch back to manual processes. Note that with time, the knowledge for manual processes could disappear, unless firms actively maintain it through regular contingency operations exercises. The increased reliance on CLS, for settlement, has made the functioning of CLS crucial to the FX market infrastructure.

Operational Risk

The continued improvement in automating FX trading to achieve STP and therefore the reduced requirement for manual data entry has substantially reduced the risk of operational errors in the FX interbank market for spot, forwards and FX swaps. STP automation has facilitated a much faster confirmation process, thereby reducing the potential cost of trade errors. Participants continue to work on improving automation for more complex products, as well as improving customer connectivity.

3. Canadian FX Market Performance over the Recent Crisis

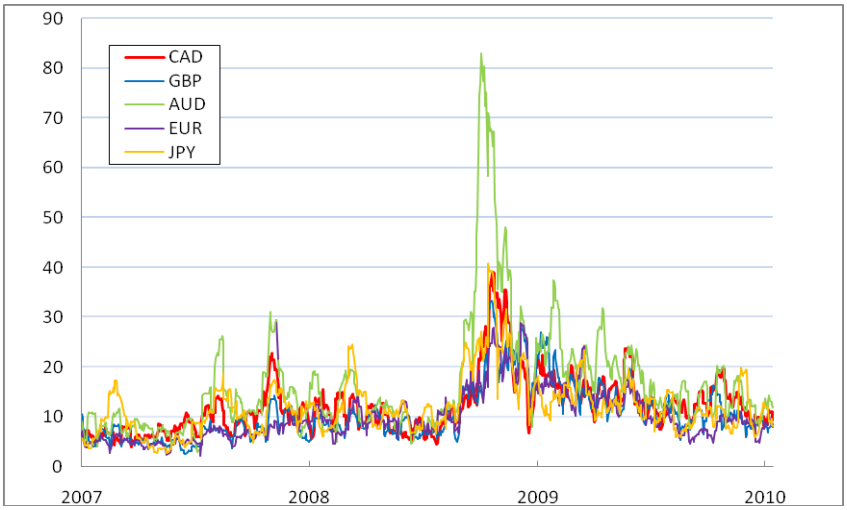
The consensus amongst market participants is that, compared with other financial markets, the global FX markets generally functioned relatively well over the Lehman crisis, although liquidity suffered in the longer-dated products. The global nature of FX, the large diverse participant base, the transparency of market pricing and the short maturity of the majority of FX transactions all helped to contribute to its relatively better functioning. The availability of payment-versus-payment settlement through CLS helped to facilitate confidence in conducting transactions by eliminating the primary non-market risk faced by market participants in FX.

In comparison to the global FX market, the overall assessment is that the CAD FX markets performed somewhat better despite increased volatility.

Spot FX – The heavily skewed directional bias for buying US dollars (USD) during the crisis, due to USD safe haven flows and funding needs, contributed to very volatile trading conditions with bid-offer spreads widening[34] and prices gapping – see Chart 4. Trading volumes soared as existing positions were reduced. However, trading continued to function relatively well, considering the one-way market flow, with ample liquidity available at a price. Market behaviour also changed, with customers no longer demanding two-way pricing and allowing dealers to work orders. Canadian banks were favoured by institutional clients in these transactions due to their strong balance sheets. In addition, multi-dealer electronic platforms increased in popularity over single-dealer platforms due to the wider range of pricing availability.

[34] Spot USDCAD spreads on amounts of $50 MM or more were about 8-10 pts before the crisis and widened up to 20-25 pts during the peak of the crisis.

Chart 4: Rolling 10-day Actual Annualized FX Volatility (%)



Credit limits were tightened across the FX market on increased counterparty risk concerns for longer term products. The proportion of trades through CLS increased to alleviate counterparty settlement risk.

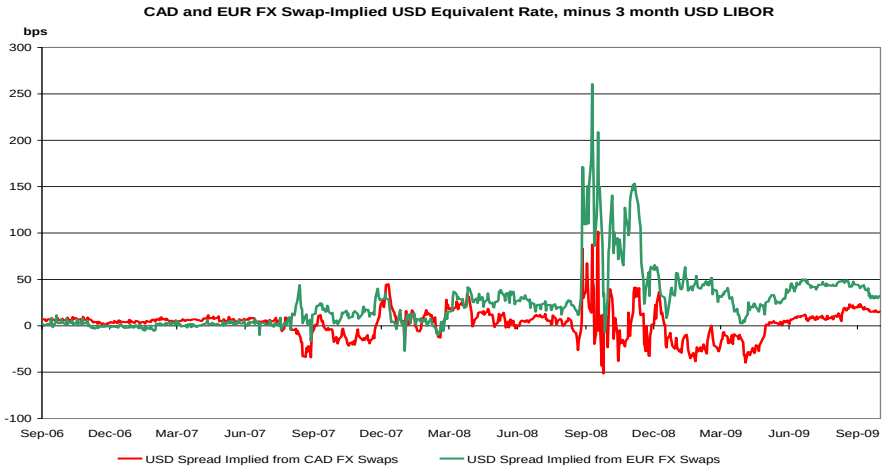
Spot pricing normalized very quickly after the initial shock of the Lehman bankruptcy. Spot volumes fell soon after the crisis into early 2009 but have since recovered to levels consistent with those in 2007. Since the peak of the crisis there has been an increase in the number of accounts in the Canadian market who have set-up up ISDA and CSA documentation, and globally the demand for participation in CLS has increased as efforts are devoted to further reduce risks.

FX forwards and swaps – The CAD forward and FX swap markets functioned better over the crisis than the other major currency markets, including EURUSD and GBPUSD, due to the high USD funding needs of European based banks, which caused severe dislocations in global money markets.

Although the Canadian money market was also affected by the crisis, it reacted better than other global money markets due to the stronger financial position of the Canadian banks, as well as their more limited USD funding needs.[35] The pricing dislocations in USDCAD forwards relative to theoretical values[36] were much lower than for the major European currencies – see Chart 5. CAD was being used, at times through the crisis, as a funding currency by foreign participants. Canadian banks were able to utilize these international flows to swap USD into low cost CAD funding through FX swaps.

[35] Canadian banks also operate in the same time-zone as the US banks.
[36] In general short term FX swaps and forwards trade relatively close to covered interest rate parity.

Chart 5: Deviation from Covered Interest Rate Parity



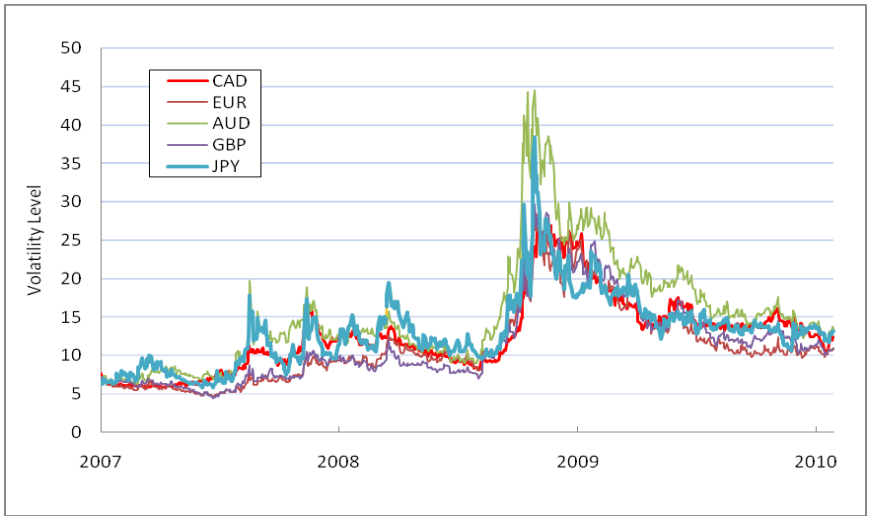
The global FX market continued to function through the crisis, although the implied cost of funding surged in USD and the tenor of transactions was substantially shortened. Balance sheet constraints and the preference for USD liquidity meant that the USD funding through FX swaps remained high for an extended period. However, many participants could not transact at published money market reference rates. Longer-dated transaction volumes declined and bid-offer spreads substantially widened due to increased uncertainty with respect to funding, as well as due to mark-to-market and counterparty credit risk concerns. Overall, total forward volumes increased as participants unwound positions, but FX swap volumes declined with correspondingly reduced money market activity as funding conditions deteriorated. The majority of forward trades during the crisis were "on-the-run" or straight one-, three- or six-month benchmark trades which effectively pooled available liquidity into those terms, while pricing for odd dates saw wider spreads.

Pricing and liquidity in both CAD forwards and FX swaps recovered to historical levels more slowly than spot due to the global uncertainty with respect to the availability of money market funding. However, the Canadian market improved much faster than in the other major currencies due to the stronger financial system in Canada. Current forward volumes are close to the highs experienced during the crisis but FX swap volumes are lower at 2007 levels.

FX options – FX options experienced a significant reduction in liquidity with a substantial widening of bid-offer spreads[37] as both actual and implied volatility increased across all tenors – see Chart 6. Both product and counterparty credit limits were tightened further exacerbating the reduced liquidity. Liquidity was especially impacted in longer tenors due to the perceived increase in credit and market risks.

[37] Option prices are a function of both forward prices and the expected volatility in these forward prices. The impact of the crisis substantially increased the volatility of these forward prices leading to much higher option pricing.

Chart 6: Implied 1-Month FX Option Volatility (%)



The interbank market pricing convention for FX options self-adjusted quickly and effectively to reflect the increased volatility in the forward market, as well as the increased credit risk.[38]

Liquidity has improved in the option market since the crisis but both liquidity and volumes have not returned to the levels seen just before the Lehman bankruptcy.

Cross-currency swaps – The general overall low level of activity in CAD cross-currency swaps contributed to market illiquidity during the Lehman crisis. Trading in cross-currency swaps was infrequent with much wider bid-offer spreads which increased the cost and difficulty in hedging swap spread risk. Volumes declined over the crisis period but conditions have improved steadily over the last year and liquidity has improved.

4. Assessment of the Strengths and Weaknesses of the Canadian FX Market

The strengths inherent in the structure of the FX market helped to promote the relatively good functioning of the market over the crisis, although severe dislocations did occur in peripheral FX markets and longer-dated products.

4.1 Market Strengths

i. **Product simplicity and transparency** – the majority of FX products are simple short-term products that are straightforward to value and for which there are readily available market prices. The availability of 24 hour market prices for spot

[38] Trading moved to both a forward premium and forward delta hedge basis. This was done to eliminate the credit risk on the option premium, as well as to reduce the disagreement between counterparties on the deposit rate used to calculate the forward price.

FX through various automated trading engines provides an immediate source of liquidity to market participants. Even though price transparency is not as high for short-dated FX swaps and forwards as for spot, it still is much higher than for many other financial products.

ii. **Large number of counterparties** – of all financial products the FX market is the most global in nature. This provides an easier off-set for risk, especially when market volatility increases and one segment of market participants may be under financial pressure. Only 25% of CAD volume is transacted in Canada.[39]

iii. **Short tenor** – over 70% of FX trading takes place in maturities less than 7-days, both globally and in Canada, limiting the amount of replacement cost risk faced by participants relative to other longer-dated OTC products.

iv. **CLS settlement –** removes the largest FX-related risk, loss of principal on settlement, faced by participants for the 17 currencies settled through CLS. CLS introduced on 26 January 2010 an aggregation service that is aimed at the growing low-value, high-volume FX market segment (FX prime brokerage, algorithmic trading, and retail aggregation activity). This service enables the aggregation of individual trades into a single large trade that can then be submitted to CLS for settlement, although currently no Canadian bank is an Aggregation Participant.[40]

v. **Credit risk mitigation structures** – the wide use of ISDA Master Agreements and CSAs provide bilateral risk mitigation for FX transactions. These provide some of the risk mitigation benefits of CCPs, while taking into account the global and customized nature (term) of the products.

vi. **Automation** – the majority of interbank trading is automated with straight-through-processing which minimizes operational error risk and facilitates accurate real-time risk management, while automation for non-bank counterparties continues to improve.

vii. **Self- regulation** – the FX market self-regulates with active regional foreign exchange committees recommending changes and promoting global standards, including setting best practices.[41] The main participants are typically regulated by prudential regulators. Effective self-regulation has allowed market structure to adjust quickly to new market requirements; this was clearly demonstrated by the change in the interbank option pricing convention during the crisis to minimize price risk.

[39] BIS Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity in 2007.
[40] Canadian banks can submit their low-value trades through Aggregation Participants.
[41] Standardized market practices and documentation is issued by the various Foreign Exchange Committees, ISDA, ACI, and EMTA amongst others.

4.2 Market Weaknesses

i. **Limited liquidity in some markets** – some FX product areas have limited number of participants and one-way trade flows can substantially distort market pricing. Large one-way flows can have spillover effects even in the most liquid currencies especially in times of stress. This weakness is exhibited in all financial products that have limited/concentrated participation and is not a function necessarily of the market infrastructure.

ii. **Settlement risk for non-CLS currencies and non-CLS counterparties**– only 17 currencies currently settle through CLS, although in value terms CLS trades account for the majority of global volume. CLS cannot currently settle trades on a same-day basis impacting the share of CAD trades that is settled through CLS. In addition, the number of participants able to use CLS remains relatively low due to cost and availability. CLS is currently evaluating same-day settlement and continues to work on increasing both the number of currencies settled through CLS as well the number of counterparties using CLS.

iii. **Concentrated liquidity providers** – although liquidity in the FX market has in the past been provided primarily by a limited number of large global banks, the growth of hedge funds and algorithmic trading engines[42], as well as multi-dealer pricing platforms has broadened the channels of liquidity.

iv. **Lack of standardization in some peripheral markets** – market conventions in some FX market segments remain non-standardized, thereby limiting automation, pricing transparency and potentially leading to valuation issues, especially for NDFs. Market participants continue to work, through various non-regulatory forums, on increasing standardization in peripheral FX markets.

v. **Non-spot FX reliant on other markets** – longer-dated FX products rely on the efficient functioning of global money and bond markets. The crisis clearly demonstrated the inter-dependence of the FX swap and forward market with that of the underlying funding markets. In order for these FX products to function effectively core funding markets must be made more resilient.

5. Priorities

The assessment in this paper has led the CFEC committee to identify the following five priorities to support the resiliency of FX markets:

a. Establish same-day USD CAD settlement in CLS;
b. Increase use of CLS for FX transactions, including a broader spectrum of participants and extension to more currencies;

[42] Although these engines stopped trading during the crisis due to the high market volatility.

c. Better mitigation of credit risk through increased use of Master Agreements and CSAs. Future consideration of other mechanisms to mitigate credit risks such as CCPs where appropriate;
d. Broaden adoption of straight-through-processing, including increased electronic confirmation and settlement; and,
e. More formal standardization of NDF fixing conventions.

Moreover, given that FX markets are global in nature, the CFEC committee underscores the importance of conducting any increased oversight and regulation of these markets in a uniform consultative manner to avoid unintended consequences.

6. Conclusions

Overall the FX market functioned relatively well through the crisis with some products experiencing substantial increases in traded volume. Spot and shorter-dated products functioned better than those with longer maturities and more complex structures. The relative better financial position and balance sheets of Canadian financial institutions was one factor in providing greater stability to the Canadian markets over this period with CAD FX swaps and forwards performing better than those of the other main global currencies.

There are several structural elements that supported the resiliency of FX markets, not only in CAD but in other currencies as well. First, sound clearing and settlement processes helped to reduce settlement risk in portions of the FX market. Second, bilateral netting and collateral agreements provided an effective mechanism to manage counterparty risk in longer-dated FX products. Third, transparent and standardized transactions, for the majority of FX trades, provided for efficient and automated trading.

Even though the FX market functioned relatively well, more can be done to make the market more resilient to crisis. Efforts by CLS to increase the number of currencies, regions, products, and participation should be supported where possible, including the provision for same-day settlement in USDCAD FX. ISDA's efforts to strengthen CSAs to further reduce counterparty risk should be promoted as a first priority to further reduce counterparty credit risk. Future work should include determining the net benefit of CCPs to mitigate counterparty credit risk where appropriate. Efforts to improve and further standardize FX products, including options and NDFs, should continue to be made.

Annex 1: CFEC Working Group on the Functioning of CAD FX Markets

Name	Title	Institution
Steve Boucouvalas	Managing Director FX Trading	HSBC Bank Canada
Andy Busch	Global FX Strategist	BMO Capital Markets
Steven Butler	Director	Scotia Capital
Jeff Feig	Managing Director	Citigroup
Mark Johnson	Managing Director	RBC Capital Markets
Moti Jungreis	Managing Director Global Head of FX - Wholesale	TD Securities
Richard Poirier	Managing Director	National Bank
Duncan Rule	Managing Director - FX Trading	CIBC World Markets
Carolyn Wilkins (Working Group Chair)	Deputy Chief, Financial Markets	Bank of Canada
Harri Vikstedt	Assistant Director	Bank of Canada
Rhonda Staskow	Senior Analyst	Bank of Canada
Rob Ogrodnick	Secretary, CFEC	Bank of Canada

Annex 2: Summary Statistics for FX Market by Product Type

CAD Turnover v. Global Currency Turnover

Instrument	Average Daily Volume – BIS 2007		Percentage of total FX Volume – BIS 2007		Average Daily Volume – October 2009 CFEC	Percentage of Market Share – October 2009 CFEC
	CAD	Global	CAD	Global	CAD	CAD
Spot FX	$38.5 bln	$1,004.9 bln	27.0%	30.2%	$8.0 bln	19.8%
Outright Forwards	$15.3 bln	$361.7 bln	10.7%	10.9%	$3.1 bln	7.7%
7 days	$6.2 bln	$154.2 bln	4.3%	4.6%		
Over 7 days and up to One year	$8.8 bln	$200.4 bln	6.2%	6.0%		
Over One year	$0.2 bln	$7.1 bln	<1%	<1%		
FX Swaps	$76.0 bln	$1,714.4 bln	53.3%	51.6%	$27.7 bln	68.6%
7 days	$59.0 bln	$1,329.0 bln	41.4%	40.0%		
Over 7 days and up to One year	$15.9 bln	$364.6 bln	11.2%	11.0%		
Over One year	$1.06 bln	$17.7 bln	<1%	<1%		
Currency Swaps	$2.4 bln	$31.5 bln	1.6%	1.0%	$0.7 bln	1.7%
FX Options	$10.4 bln	$211.7 bln	7.3%	6.4%	$0.9 bln	2.2%
Total	$142.6 bln	$3,324.2 bln	100.0%	100.0%	$40.4 bln	100.0%

Adjusted for local and cross-border interdealer double counting.

Canadian Market FX Turnover v. Global Markets FX Turnover

Instrument	Average Daily Volume – BIS 2007		Percentage of total FX Volume – BIS 2007		Average Daily Volume – October 2009 CFEC	Percentage of Market Share – October 2009 CFEC
	Canada	Global	Canada	Global	Canada	Canada
Spot FX	$13.6 bln	$1,304.9 bln	21.3%	30.5%	$14.8 bln	23.9%
Outright Forwards	$4.3 bln	$433.6 bln	6.7%	10.1%	$5.2 bln	8.4%
FX Swaps	$41.9 bln	$2,249.5 bln	65.5%	52.6%	$39.9 bln	64.3%
Currency Swaps	$1.6 bln	$39.7 bln	2.5%	.9%	$0.8 bln	1.3%
FX Options	$2.6 bln	$253.3 bln	4.1%	5.9%	$1.3 bln	2.1%
Total	$64.0 bln	$4,281.0 bln	100.0%	100.0%	$62.0 bln	100.0%

a) Adjusted for local interdealer double-counting.

Sources: BIS Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity in 2007 and the Canadian Foreign Exchange Committee Semi-annual Foreign Exchange Volume Survey for October 2009.

Annex 3: Detailed Description of Market Risks

Market Risks include the following:

1. Spot FX Risk, also called "Delta Risk" is where changes in spot FX rates cause gains or losses in portfolios. The positions are static and the gains/losses are linear
2. Interest Rate Risk. Any foreign exchange contract that is not set for delivery on the spot date, be it a forward or an option has interest rate risk, ie, the value of the contract will changes based on changes in interest rates. This is generally additive to the "delta" risk in the portfolio, meaning the delta is the spot FX risk and the interest rate risk combined in a contract or a portfolio of contracts.
3. Gamma Risk is caused by positions that have embedded optionality within the portfolio. Gamma refers to the change in the FX position caused by a change in FX rate. Gamma can exponentially increase or decrease the value of FX positions. Systemic risk could be created by overly large short gamma positions as the position sizes could increase beyond where an end-user economically hedging an exposure. While it is unlikely that any short gamma position would be large enough to cause systemic risk in the major currencies, in smaller, less liquid markets short gamma positions could pose a problem.
4. Digital or Barrier risk exists with more exotic options, generally known as first generation exotic options that have barrier strikes embedded in their structures. These contracts create non-linear risks in portfolios and thus can contain significant gamma at defined points.
5. Vega risk is defined as the change in the value of a portfolio due to changes in implied volatility. These risks tend to move in a linear fashion
6. Theta risk is the time value in a portfolio caused by a combination of positive or negative carry on a currency pair and the change in value of an option due to the change in time.
7. Strike risk is the risk in an FX options portfolio caused by the concentration of a large position at the time of expiry,
8. There are times, particularly at market opens when the market moves significantly in one direction with very little trading thus gapping between prices. Gap risk is the inability to get orders filled at prices within the gap.
9. Liquidity risk is similar to gap risk but is based on the size of the positions needed to be filled. There are currency pairs or times of the day that have less liquidity and thus counterparties or investors trying to execute trades to experience some liquidity risk.

While the market has experienced significant volatility through this crisis, end-users and market makers were able to access the market and transact their business. The market risks defined above need to be monitored and measured effectively, but in general do not represent significant systemic risk.