

Central Counterparties and Systemic Risk

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INTRODUCTION

Financial market infrastructures played an important role in the financial crisis of 2007–09. In some cases, they were a stabilizing force, allowing transactions to continue to settle even when uncertainty about the credit exposures of participating institutions reached its peak.¹ For instance, Canadian payment and settlement systems functioned well during the crisis, and even in countries most directly impacted by the crisis, domestic large-value payment systems continued to operate smoothly.² In addition, despite record volumes in foreign exchange (FX) markets, CLS Bank continued to effectively manage settlement risk in FX markets during the financial crisis and the period that followed.³

In other cases, weaknesses in financial market infrastructures led to heightened uncertainty, resulting in disruptions to markets and increased systemic risk.⁴ For example, deficiencies in the infrastructure for over-the-counter (OTC) derivatives markets may have exacerbated the crisis (Wilkins and Woodman 2010; Duffie, Li, and Lubke 2010).⁵ And in the repo market, uncertainty about the valuation of collateral and the network of bilateral exposures among financial institutions led to heightened aversion to

counterparty risk, causing many participants to withdraw from trading (BIS 2010b). The resulting illiquidity in repo markets was a major factor that led to the near-collapse of Bear Stearns and its subsequent purchase by J.P. Morgan Chase in March 2008 (Fleming, Hrung, and Keane 2010).

To address some of the problems experienced during the crisis, policy-makers have promoted greater use of a particular type of financial market infrastructure known as a “central counterparty” (CCP)—a financial entity that takes a buyer or seller position in every trade through the “novation” process. The benefits traditionally associated with CCPs include reduced counterparty credit risk, enhanced netting efficiencies, and reduced potential for the transmission of stresses through the financial system.

Given these benefits, leaders at the G-20 Pittsburgh Summit in September 2009 agreed that “[a]ll standardized OTC derivative contracts should be [. . .] cleared through central counterparties by end-2012 at the latest” (Group of 20 2009).⁶ This commitment was reaffirmed at the Toronto Summit in June 2010 (Group of 20 2010). More generally, “[a] number of ongoing policy initiatives are examining the use of CCPs or other centralised clearing infrastructure mechanisms as a potential solution addressing issues of market infrastructure resiliency, market opacity, orderly collateral liquidations, and the management of counterparty credit risk” (CGFS 2010, 20). One of these policy initiatives in Canada is the development of a CCP for the Canadian repo market by the Canadian Derivatives Clearing Corporation (CDCC) (Box 1).⁷

- 1 See, for example, Bank of England (2009, 5); ECB (2009, 29); and IMF (2010, 4).
- 2 The smooth functioning of large-value payment systems highlights the success of coordinated efforts on the part of central banks over the past two decades to minimize credit risk in these systems.
- 3 Settlement risk refers to “the risk that settlement in a funds or securities transfer system will not take place as expected” (CPSS-IOSCO 2004, 66). Although the elimination of settlement risk by CLS Bank helped FX markets to operate without disruption, some FX markets (forwards and swaps in particular) experienced periods of illiquidity during the second half of 2008 (CLS Group 2009, 12).
- 4 Systemic risk is broadly defined as the probability that the financial system is unable to support economic activity (M. Carney 2010).
- 5 Banque de France (2010) also provides some interesting views on issues pertaining to OTC derivatives and financial stability.

- 6 Leaders at the G-20 Pittsburgh Summit also agreed that “all standardized OTC derivative contracts should be traded on exchanges or electronic trading platforms, where appropriate” (Group of 20 2009).
- 7 See Bank of Canada (2009b).

The Canadian Derivatives Clearing Corporation: Becoming a CCP for the Canadian Repo Market

The Bank of Canada has identified the repurchase agreement (repo) market as a core funding market for financial institutions (Fontaine, Selody, and Wilkins 2009).¹ At the height of the financial crisis in September–October 2008, the repo market experienced periods of illiquidity as institutions became increasingly concerned about counterparty credit risk and balance sheets became constrained.

To ensure that this core funding market remains continuously open, the Investment Industry Association of Canada, with the support of the Bank of Canada, issued a request for proposal for the development of CCP services for repos. In December 2009, the Canadian Derivatives Clearing Corporation (CDCC) was selected to provide

these services. The CDCC currently operates Canada's main CCP for exchange-traded financial derivatives and is now working with its stakeholders to develop a CCP repo service in a phased-in approach commencing in 2011. Given the important role that the CDCC's new services will play in supporting the repo market, the Bank plans to formally oversee the system once the new services commence operations. To oversee a clearing and settlement system, the Governor of the Bank of Canada must designate it under the Payment Clearing and Settlement Act, and the Minister of Finance must agree that the designation is in the public interest.²

¹ See also M. Carney (2008) for a discussion of continuous markets.

² For more background on the Bank of Canada's role in the oversight of clearing and settlement systems and the designation process, see Engert and Maclean (2006).

A well-designed CCP will enhance the resilience of the financial system. In order to deliver the maximum benefits, CCPs need to have strong risk controls and should be subject to rigorous oversight. In this regard, the Committee on Payment and Settlement Systems (CPSS) and the International Organization of Securities Commissions (IOSCO) are reviewing their standards pertaining to the safety and soundness of financial market infrastructures, including CCPs.⁸ As they implement these standards through their oversight activities, authorities such as the Bank of Canada need to take a system-wide perspective and ensure that the risk controls and operating practices of CCPs are compatible with well-functioning financial markets. In this report, we discuss three critical elements that should be addressed by authorities in a coordinated manner going forward: the procyclicality of CCP margin requirements; CCP default-management practices; and capital requirements and resolution mechanisms for CCPs.

BENEFITS AND CHALLENGES OF CCPs

To provide some context, we begin by describing the three main benefits traditionally associated with CCPs.

First, a CCP can facilitate the management of credit risk for its clearing members. Through novation (**Box 2**), the credit risk of the original transacting parties is transferred to the CCP. This does not imply that credit risk is eliminated; rather, it is managed by the CCP and redistributed according to a predefined set of rules as to who incurs losses if a clearing member defaults (Ripatti 2004). A well-managed CCP can prevent excessive concerns about counterparty credit risk

from affecting markets in times of crisis. It can also reduce the informational costs and asymmetries associated with managing credit risk, since each participant can rely on the CCP, which has a clearer overall view of the interconnections and exposures in the system (Bliss and Steigerwald 2006). The enhanced transparency of markets arising from the introduction of a CCP can also facilitate the monitoring and mitigation of systemic risk by regulators.

A second important benefit offered by CCPs is the enhanced efficiency of netting.⁹ A clearing member may have offsetting contracts; i.e., buyer and seller positions on the same product. After novation to the CCP, the offsetting contracts are netted against each other, thereby minimizing the outstanding contracts and the exposures arising from these contracts in the form of payment or securities obligations. In addition, the payment and securities obligations associated with these reduced outstanding contracts can be netted. By netting contracts, as well as payment and securities obligations, the CCP simultaneously reduces the counterparty and liquidity risks faced by each individual clearing member. This multilateral netting can result in collateral savings to the members, since they are required to pledge against a smaller net exposure. It may also provide participants with balance-sheet relief. Allowing participants to simultaneously offset liabilities and assets associated with these contracts enables them to manage their balance sheets more efficiently. In times of stress, this may alleviate the pressure for disruptive deleveraging, as witnessed in some markets during the financial crisis.

⁸ For more background on the standards review, see BIS (2010a).

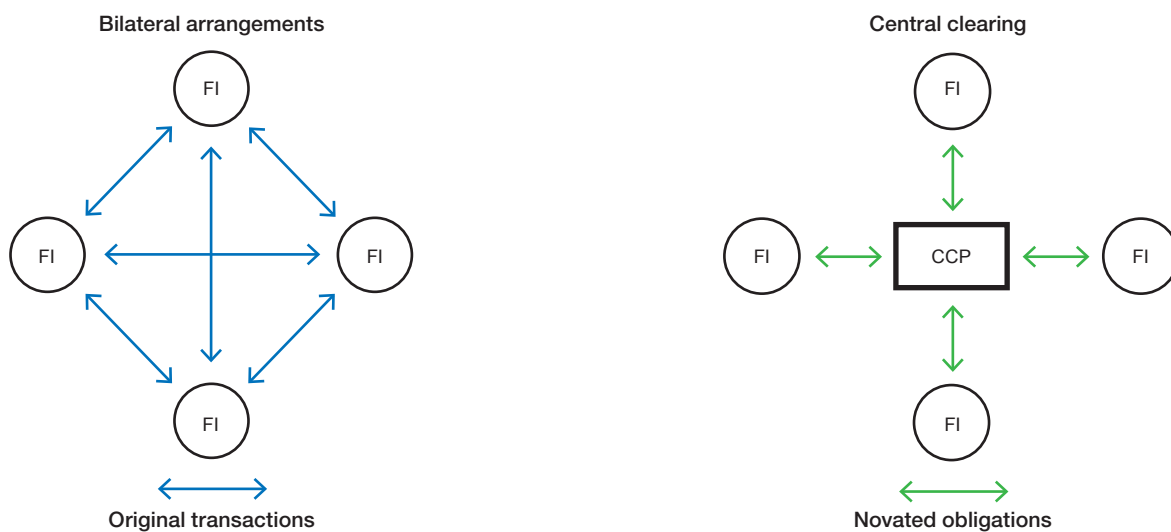
⁹ Moving from bilateral settlement arrangements to CCPs may not improve netting in all cases—for example, if there is too much fragmentation of clearing activity across separate CCPs (Duffie and Zhu 2010).

The Novation Process

A CCP is a financial market infrastructure that interposes itself between two parties in a trade. Through a process known as “novation,” the original transaction is cancelled and replaced by two equivalent transactions: one between the seller and the CCP, and the other between the buyer and the CCP. Once the transaction is novated to the CCP,

the associated obligations are no longer between the financial institutions that originally contracted, but rather with the CCP. This is the fundamental distinction between central clearing through a CCP and decentralized clearing through bilateral settlement arrangements (Bliss and Steigerwald 2006).

Figure 1



Third, in the event that a clearing member defaults, if the CCP has a robust default-management mechanism, there is a reduced likelihood of contagion spreading to the other members and to broader markets. If the resources pledged to a CCP by the defaulting member are insufficient, residual losses are shared among the survivors in accordance with pre-arranged loss-sharing agreements, which helps to reduce uncertainty in times of stress. By distributing losses across the entire membership, the impact on any individual institution is reduced, mitigating the potential for contagion (Bliss and Papathanassiou 2006).

To maximize these benefits, CCPs must be well managed and have robust risk-management mechanisms and effective oversight. This is because, by definition, a CCP concentrates into one entity the risks that are decentralized in bilateral settlement.¹⁰ For example, as the counterparty to all clearing members, credit risk is concentrated within the CCP and, as a result, it may incur losses if a clearing member were to default. Valuation risk is also concentrated within the CCP, which calculates counterparty credit

exposure using market prices and a pricing model. Moreover, a CCP faces liquidity risk since, in the event of a default, it must continue to fulfill its obligations to non-defaulting members in a timely manner. In addition, operational risk is particularly relevant for a CCP because system deficiencies, human errors or disruptions from external events can have wide-ranging impacts. A CCP also faces settlement banker risk if a commercial bank that provides the CCP with an account for cash settlement is no longer willing or able to provide it with those services.¹¹ Given the concentration of these risks within the CCP, it must be designed to effectively mitigate their impact.

Overall, CCPs have tremendous potential to reduce systemic risk and reinforce financial stability by addressing the deficiencies associated with existing bilateral settlement arrangements.

¹⁰ See CPSS-IOSCO (2004, 8) for a summary of the risks that CCPs must manage.

¹¹ To mitigate this banker risk, CCPs often maintain settlement accounts with central banks rather than with commercial banks.

PROTECTING THE FINANCIAL SYSTEM

As CCPs take on a more prominent role, it is crucial that they be properly protected by rigorous risk controls and effective oversight. Significant work has already been done to establish high standards for strong risk-management practices by CCPs. Through the CPSS and IOSCO, central banks and securities regulators have published the CPSS-IOSCO Recommendations for Central Counterparties (CPSS-IOSCO 2004), which articulate 15 international standards that CCPs should comply with to properly address the major risks they face. Areas covered by these recommendations include legal risk, participation requirements, counterparty credit risk, default procedures and operational risk, as well as CCP governance and transparency. In addition, the CPSS and IOSCO have issued guidance on the application of the Recommendations for Central Counterparties for CCPs that clear OTC derivatives (CPSS-IOSCO 2010).

Given the regulatory push to strengthen financial market infrastructures, the CPSS and IOSCO are currently enhancing their standards, including those pertaining to CCPs. The revised standards will likely put even more emphasis on the need for sufficient financial resources (including capital and liquidity) to handle one, or even two, large defaults. Ensuring that individual CCPs are properly risk-proofed and are subject to robust oversight is clearly important for reducing systemic risk.

For CCPs to accomplish the goals set out by policy-makers, authorities must think beyond risk-proofing individual CCPs and ensure that risk controls and operating practices are consistent with the promotion of a well-functioning financial system.

In this section, three key issues for the protection of the financial system will be discussed: (i) the procyclicality of margins; (ii) managing the default of a member; and (iii) capital requirements and resolution mechanisms for CCPs.

Procyclicality of margins

Procyclicality refers to the feedback loops between the financial system and the real economy, which can amplify the business cycle and exacerbate financial instability.¹² For example, in times of market stress, collateral requirements and haircuts can increase dramatically, owing to the volatility or illiquidity of the underlying assets.¹³ Leaders at the June 2010 Toronto G-20 Summit agreed to seek ways to reduce the procyclicality of haircuts and margining

¹² Procyclicality in the financial system is discussed in a number of reports in Bank of Canada (2009a).

¹³ The large collateral calls seen in bilateral settlement arrangements can be destabilizing. JPMorgan's collateral call on Merrill Lynch might have motivated its sale to Bank of America on 14 September 2008 (J. Carney 2008). JPMorgan also demanded \$8.6 billion in collateral from Lehman Brothers over the four days leading up to its bankruptcy on 15 September 2008, including \$5 billion on the last day (Stempel 2010).

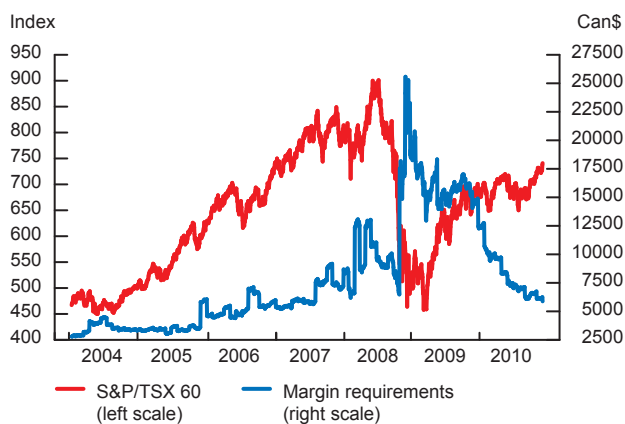
practices for securities financing and OTC derivatives transactions (Group of 20 2010).

CCPs can help address procyclicality arising from bilateral arrangements in several ways (Cecchetti, Gyntelberg, and Hollanders 2009; CGFS 2010). For instance, by mitigating concerns about counterparty credit risk during periods of stress, CCPs can encourage trading in markets that might otherwise become illiquid. As well, since collateral is required from every clearing member, the potential increase in collateral requirements in a stress event would be smaller than if no collateral had been initially collected, which has often been the case in bilateral settlement arrangements.¹⁴ And because the netting efficiencies associated with CCPs reduce clearing members' outstanding contracts, the increase in collateral requirements following sudden market volatility affects fewer outstanding contracts.

Although CCPs can help to decrease procyclicality, they still face certain challenges. Their risk management relies heavily on the calculation and collection of margins to cover the exposures they face with clearing-member contracts that have been novated.¹⁵ These calculations are typically based on historical price observations covering a relatively short period. As a result, collateral requirements imposed on clearing members can increase abruptly in times of sudden market volatility.

Chart 1: Margin requirements can be procyclical

Margin requirements associated with the SXF (S&P/TSX 60 Index Futures)



Sources: Bloomberg and Canadian Derivatives Clearing Corporation

Last observation: 5 November 2010

As **Chart 1** shows, margin requirements charged by the CDCC for the SXF, a futures contract on the S&P/TSX 60 Index traded on the Montréal Exchange, can be procyclical. For instance, large increases in margin requirements took

¹⁴ For example, in OTC derivatives markets, a large part of the counterparty risk is undercollateralized (Singh 2010).

¹⁵ Margins cover the maximum movement in the value of a contract over a given confidence interval and liquidation period. The clearing fund is a secondary pool of collateral to be used if the defaulter's margin is insufficient, and is typically calculated using stress scenarios.

Box 3

Clearing-Member Default in a CCP

A default refers to a breach of any requirement imposed by the CCP, and can include non-payment of cash obligations, non-delivery of securities or a failure to satisfy collateral requirements. Non-payment and non-delivery are the most critical, since the CCP owes the corresponding cash payments and/or securities to other clearing members. If additional collateral requirements were not met following sudden market volatility, the CCP would still be able to meet its obligations to its clearing members, but it would be exposed to uncovered credit risk (as measured by its risk model). This would result in losses for the CCP

and/or survivors following non-payment or non-delivery only if the defaulter had not pledged sufficient collateral.

In the event of a member's default, the CCP can transfer or hedge the defaulter's contracts. This can take some time, especially in stressed markets, and can require significant human and technical resources. As a last resort, a CCP can use its discretion to close out contracts, which could lead to losses for surviving clearing members that might have to replace them amid stressed markets.

place as the S&P/TSX 60 Index was falling dramatically during the financial crisis. Of particular note, the margin requirements in dollar amounts increased by 149.7 per cent on 10 October 2008 relative to the previous day.

By requesting higher levels of collateral in times of increased volatility, CCPs can put pressure on already fragile market participants, potentially destabilizing them. While a CCP needs to be able to properly protect itself against risk, it must also consider the procyclical effects of its actions on the functioning of markets.

To address the procyclicality of margin practices in secured lending and derivatives transactions, the Committee on the Global Financial System (CGFS) has recommended that authorities and CCPs consider the implications of imposing through-the-cycle (TTC) margins and haircuts (CGFS 2010). A TTC approach can help to prevent an accumulation of excessive leverage in good times and disruptive deleveraging in bad times.

There are various potential approaches to TTC margins, but there is no extensive literature on the subject nor consensus as to which approach may be most appropriate. One option may be to use a margin floor, which is a minimum level of margin intervals (expressed in per cent) that each clearing member must maintain. A margin floor can help to prevent a buildup of excessive leverage during the expansionary phase of the financial cycle, because, even as volatility falls, members must continue to pledge the minimum level of collateral. The trade-off is a higher cost of collateral during periods of low volatility, but smaller increases in required collateral in times of stress. Another option may be for CCPs, in consultation with authorities, to expand the list of acceptable collateral in stressful times, albeit with conservative haircuts. In crisis periods, clearing members may have plenty of lower-quality collateral to pledge with no alternative uses. Allowing members to pledge lower-quality collateral would be less disruptive than rapidly liquidating

derivatives contracts or acquiring additional high-quality collateral on short notice amid stressed markets.

In summary, as CCPs take on an expanding role in the financial system, they need to develop margining practices that are less procyclical. Doing so requires that CCPs and authorities re-evaluate the structure of the existing risk-management frameworks.

Default-management practices

With regulators promoting greater use of CCPs and potentially mandating CCP clearing for certain financial products, CCPs have to be ready to manage clearing-member defaults in order to protect themselves, non-defaulting clearing members and the broader financial system. Since the default-management process is dynamic and uncertain, CCPs typically retain significant discretion (**Box 3**).

In a default, the CCP, its members and the financial system will face considerable challenges. Moreover, because the defaulter's affiliates may be suspended in other CCPs (as occurred when Lehman Brothers Holdings Inc. filed for bankruptcy), a number of large CCPs may be attempting to transfer, hedge or close contracts simultaneously. The introduction of linkages between CCPs across different jurisdictions, which global customers are likely to demand, will further complicate the default-management process.¹⁶

Given the complexity associated with the default-management process, it is difficult to accurately predict the amount of financial resources that a CCP will need in order to properly manage such an event, especially in times of stress. This is due, in part, to the limited number of bidders that may be willing to acquire large portfolios and are capable of doing so. For instance, in September 2008, the division acting as CCP for the CME Group (CME Clearing)

¹⁶ Areas of concern include the sharing of risk-management responsibilities, accounting reconciliation and the resolution of cross-jurisdictional legal claims that may arise upon default.

chose not to liquidate the proprietary derivatives contracts of Lehman Brothers Inc. in the open market.¹⁷ Instead, the CME conducted two auctions on 14 and 17 September 2008, with potential bidders selected by CME on the basis of their capital and risk-management expertise, as well as their potential concentration in the market (Valukas 2010, 1846). In the first auction, five out of the six firms submitted bids, but “all of the bids involved substantial losses” to Lehman Brothers Inc. in the form of collateral transfers (Valukas 2010, 1846). Following the second auction, three out of the five bidding firms acquired the contracts of Lehman Brothers Inc. (Valukas 2010, 1851). And in this particular case, the CME had placed Lehman Brothers Inc. on liquidation-only status due to “general financial insecurity reasons related to [Lehman Brothers Holdings Inc.’s] bankruptcy filing” (Valukas 2010, 1848). In other words, CME did not actually have to deal with unmet payment, security delivery or margin obligations on the part of Lehman Brothers Inc., which would have been even more challenging for CME to manage.

Having sufficient collateral to cover potential losses is one challenge, but having access to sufficient cash and securities to meet payment and delivery obligations on time is another. To manage this liquidity risk, CCPs accept high-quality liquid collateral, monitor haircuts and concentration limits, and maintain liquidity lines with financial institutions and central banks.¹⁸ By imposing standards for acceptable collateral and using concentration limits, CCPs can liquidate collateral while minimizing losses and market impacts. However, selling collateral sometimes entails settlement delays.¹⁹ Liquidity lines, which generally have to be collateralized by the CCP, can cover the gap between the CCP’s obligations at any point in time and the amount of collateral it can turn into cash. These lines also allow CCPs to meet their cash obligations in a timely manner, without having to sell collateral so quickly that markets are affected through disorderly sales. Because liquidity support can lessen the impact of a default on the financial system, it is crucial that CCPs have robust liquidity lines in place.

As already noted, the events surrounding a default are dynamic and uncertain, and for that reason CCPs typically retain significant discretion in their rules. For instance, CCPs are not normally tied to specific timelines to meet their cash and securities obligations following a default. This level of discretion provides a CCP with the flexibility to protect itself and its surviving members, and to minimize market impact when it manages the defaulter’s contracts, liquidates collateral or obtains securities. However, in using

this discretion, a CCP could adversely affect financial stability if it attempts to minimize losses through indiscriminate sales of assets or by hastily transferring, hedging or closing out the defaulter’s contracts. Thus, as CCPs gain importance, they will need to develop certain principles, in consultation with stakeholders, to guide the use of this discretion in order to promote transparency and strike the right balance between safeguarding the interests of the CCP and its non-defaulting members and promoting financial stability.

In summary, to reduce systemic risk through greater use of CCPs, authorities need to be sure that the default-management practices that CCPs have in place are suited to the challenges they face.

Capital requirements and resolution mechanisms

The proposal to reduce the interconnectedness of the financial system through CCPs entails creating entities that concentrate risks. Although CCPs rarely fail, history shows that it does happen.²⁰ Thus, clear frameworks should be designed that address CCPs’ management of capital and provide mechanisms for their orderly resolution should they become non-viable.

The important work of developing standards for capital management is just beginning. These standards should include minimum capital requirements for CCPs as a preventive measure, but also as a buffer in the event of default or as a protection against risks unrelated to default. Requirements pertaining to the safety of a CCP’s capital assets should be developed as well. Moreover, authorities should consider requiring a CCP to expose some of its own capital before survivors’ capital in the event of a default. This practice, which is already followed by many CCPs, reinforces their incentives to implement strong risk-management practices. Finally, any capital-management plan should take into account the role played by capital in protecting CCPs from residual credit risk.

To minimize potential disruption from a failure or near-failure, CCPs and regulators should prepare ex ante resolution mechanisms that include:

- credible ex ante plans for raising additional capital should the level fall below minimums;
- early-intervention tools that would allow authorities to take over CCPs in difficulty; and
- exit or transition plans that minimize systemic disruptions.

¹⁷ Lehman Brothers Inc. was an affiliate of Lehman Brothers Holdings Inc.

¹⁸ Central bank liquidity support is generally a last-resort measure, drawn on in the event of systemic pressure when private sector support is unavailable or insufficient. CCPs constituted as banks have access to central bank facilities, although this is not necessarily the case for non-bank CCPs.

¹⁹ In Canada, Government of Canada treasury bills settle the same day in CDSX, but other Government of Canada bonds can take up to three days to settle; consequently, a CCP would not receive the cash in time to meet its obligations on the day of default.

²⁰ Three examples of CCP failures are: Caisse de Liquidation, Paris (1974); Kuala Lumpur Commodity Clearing House (1983); and Hong Kong Futures Guarantee Corporation (1987). (See Ripatti 2004, Appendix 1.) Failures in risk management, as well as financial bubbles and crashes, were involved in all three cases.

CONCLUSION

CCPs can reduce systemic risk and reinforce financial stability. To ensure their success, they must be properly risk-proofed and must be subject to effective oversight. To this end, international standards pertaining to the safety and soundness of financial market infrastructures, such as CCPs, are being enhanced. Authorities must also recognize that, as CCPs take on a more prominent role, they need to operate in a way that promotes the integrity of the financial system as a whole. Issues of particular importance that should be addressed by authorities in a coordinated manner include the procyclicality of CCP margin requirements, default-management practices and resolution mechanisms.

REFERENCES

- Bank for International Settlements (BIS). 2010a. "Standards for Payment, Clearing and Settlement Systems: Review by CPSS-IOSCO." Press Release, 2 February. Available at <<http://www.bis.org/press/p100202.htm>>.
- . 2010b. "Strengthening Repo Clearing and Settlement Arrangements." Available at <<http://www.bis.org/publ/cpss91.pdf>>.
- Bank of Canada. 2009a. "Reports: Procyclicality in the Financial System." Bank of Canada *Financial System Review* (June): 31–63.
- . 2009b. "Bank of Canada Welcomes Initiative to Improve Infrastructure for Canadian-Dollar Core Funding Markets." Press Release, 15 December. Available at <<http://www.bank-banque-canada.ca/en/press/2009/pr151209.html>>.
- Bank of England. 2009. "Payment Systems Oversight Report 2008." Available at <<http://www.bankofengland.co.uk/publications/psor/psor2008.pdf>>.
- Banque de France. 2010. "Derivatives—Financial Innovation and Stability." *Financial Stability Review* 14 (July).
- Bliss, R. and C. Papathanassiou. 2006. "Derivatives Clearing, Central Counterparties and Novation: The Economic Implications." Paper presented at a Symposium held by the European Central Bank and the Federal Reserve Bank of Chicago, "Issues Related to Central Counterparty Clearing," April 2006. Available at <http://www.ecb.int/events/pdf/conferences/ccp/BlissPapathanassiou_final.pdf>.
- Bliss, R. and R. S. Steigerwald. 2006. "Derivatives Clearing and Settlement: A Comparison of Central Counterparties and Alternative Structures." Federal Reserve Bank of Chicago *Economic Perspectives* (Fourth Quarter): 22–29.
- Carney, J. 2008. "Blood on the Street: JP Morgan Pushed Merrill Lynch into Bank of America Merger." *Business Insider*, 7 October.
- Carney, M. 2008. "Building Continuous Markets." Speech to the Canada–United Kingdom Chamber of Commerce, London, England, 19 November.
- . 2010. "The G-20's Core Agenda to Reduce Systemic Risk." Speech to the International Organization of Securities Commissions (IOSCO), Montréal, Quebec, 10 June.
- Cecchetti, S. G., J. Gyntelberg, and M. Hollanders. 2009. "Central Counterparties for Over-the-Counter Derivatives." *BIS Quarterly Review* (September): 45–58.
- CLS Group. 2009. "Briefing on the Global FX Market and the Role of CLS Bank." Available at <<http://www.cls-group.com/Publications/FX%20Market%20Role%20of%20CLS%20FINAL.pdf>>.
- Committee on the Global Financial System (CGFS). 2010. "The Role of Margin Requirements and Haircuts in Procyclicality." CGFS Paper No. 36. Available at <<http://www.bis.org/publ/cgfs36.pdf>>.
- CPSS-IOSCO. 2004. "Recommendations for Central Counterparties." Available at <<http://www.bis.org/publ/cpss64.pdf>>.
- . 2010. "Guidance on the Application of the 2004 CPSS-IOSCO Recommendations for Central Counterparties to OTC Derivatives CCPs: Consultative Report." Available at <<http://www.bis.org/publ/cpss89.pdf>>.
- Duffie, D., A. Li, and T. Lubke. 2010. "Policy Perspectives on OTC Derivatives Market Infrastructure." Federal Reserve Bank of New York Staff Report No. 424.
- Duffie, D. and H. Zhu. 2010. "Does a Central Clearing Counterparty Reduce Counterparty Risk?" Stanford University Graduate School of Business Research Paper No. 2022.
- Engert, W. and D. Maclean. 2006. "The Bank of Canada's Role in the Oversight of Clearing and Settlement Systems." Bank of Canada *Financial System Review* (June): 57–64.
- European Central Bank (ECB). 2009. "Eurosystem Oversight Report 2009." Available at <<http://www.ecb.int/pub/pdf/other/eurosystemoversightreport200911en.pdf>>.
- Fleming, M. J., W. B. Hrungr, and F. M. Keane. 2010. "Repo Market Effects of the Term Securities Lending Facility." Federal Reserve Bank of New York Staff Report No. 426.
- Fontaine, J.-S., J. Selody, and C. Wilkins. 2009. "Improving the Resilience of Core Funding Markets." Bank of Canada *Financial System Review* (December): 41–46.

- Group of 20. 2009. “Leaders’ Statement: The Pittsburgh Summit.” Available at <<http://www.pittsburghsummit.gov/mediacenter/129639.htm>>.
- Group of 20. 2010. “The G-20 Toronto Summit Declaration.” Available at <<http://www.g20.utoronto.ca/2010/to-communique.html>>.
- International Monetary Fund (IMF). 2010. “United States: Publication of Financial Sector Assessment Program Documentation—Technical Note on Selected Issues on Liquidity Risk Management in Fedwire Funds and Private Sector Payment.” IMF Country Report No. 10/122. Available at <<http://www.imf.org/external/pubs/ft/scr/2010/cr10122.pdf>>.
- Ripatti, K. 2004. “Central Counterparty Clearing: Constructing a Framework for Evaluation of Risks and Benefits.” Bank of Finland Discussion Paper No. 30.
- Singh, M. 2010. “Collateral, Netting and Systemic Risk in the OTC Derivatives Market.” IMF Working Paper No. 10/99.
- Stempel, J. 2010. “Lehman Sues JPMorgan for Billions in Damages.” *Reuters*, 26 May.
- Valukas, A. R. 2010. “Lehman Brothers Holdings Inc. Chapter 11 Proceedings Examiner’s Report.” Available at <<http://lehmanreport.jenner.com>>.
- Wilkins, C. and E. Woodman. 2010. “Strengthening the Infrastructure of Over-the-Counter Derivatives Markets.” Bank of Canada *Financial System Review* (December): 35–41.