

Access to Central Clearing Services for Over-the-Counter Derivatives

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INTRODUCTION

The recent financial crisis revealed several weaknesses in the global financial system, one of the most important being the high degree of interconnectedness among market participants and a lack of transparency regarding the associated counterparty exposures. The failure of Lehman Brothers in 2008, for example, caused shocks to cascade through the market for credit default swaps, severely disrupting that market and placing many other financial institutions at risk. In contrast, markets that were backed by a sound central clearing infrastructure to help mitigate and manage counterparty risk performed much better through the crisis. Exchange-traded products and interest rate swaps, for example, were less disrupted by the Lehman default.¹

In this context, the G-20 committed to reduce risks to the global financial system by having all standardized over-the-counter (OTC) derivatives contracts cleared by central counterparties (CCPs) by the end of 2012. The use of CCPs with proper risk-management controls reduces systemic risk by centralizing counterparty risk—thereby making its management more uniform and transparent—and by lowering system-wide exposures to counterparty risk through multilateral netting and risk mutualization. As a result, greater use of CCPs should reduce uncertainty regarding exposures and the likelihood that a default will propagate across the network of major market participants.²

Broad access to central clearing will be necessary to fully realize the expected benefits of systemic-risk reduction from the increased use of CCPs. The evolving configuration of access to CCPs may, however, have unintended consequences for the structure of the global OTC derivatives market. As the use of CCPs is mandated or strongly encouraged and thus becomes widespread, access requirements could have important implications for market innovation, concentration, competition and the resilience of local financial markets. For example, requirements that limit access based on size considerations could help to perpetuate and expand the dominance of very large dealers. They could also reduce the ability of local markets to withstand financial shocks. The importance of achieving fair and open access to CCPs has been recognized by the Financial Stability Board (FSB) Working Group on OTC Derivatives (FSB 2010), as well as other international groups.³ According to CPSS-IOSCO (2011),

Fair and open access to [financial market infrastructure] services encourages competition among market participants and promotes efficient and low-cost clearing and settlement. . . . participation requirements should therefore encourage broad access, including access by participants, other market infrastructures, and where relevant service providers, in all relevant jurisdictions, based on reasonable risk-related participation requirements.

Access to CCPs is of particular concern to countries like Canada that are not home to the important global CCPs.⁴ Unlike some of these countries, Canada has large dealers

¹ The contagion channels between dealers are explained in Duffie (2010a). Norman (2011), Monnet (2010) and CCP12 (2009) discuss how central counterparties helped protect some markets during the Lehman default.

² A thorough account of the benefits of CCPs is provided in FSB (2010); Brunnermeier (2009); Duffie, Li and Lubke (2010); Kiff et al. (2010); and Chande, Labelle and Tuer (2010).

³ Among them are the Committee on the Global Financial System (CGFS), the Committee on Payment and Settlement Systems (CPSS), the International Organization of Securities Commissions (IOSCO) and the OTC Derivatives Regulators Forum (ODRF).

⁴ For an overview of reforms undertaken in OTC derivatives markets in Canada, see Wilkins and Woodman (2010).

that can access global CCPs, and many products of importance to the Canadian market are already cleared through global CCPs. But global CCPs may not provide a level playing field to Canadian dealers that are smaller than the global dealers and that face additional challenges from cross-jurisdictional access to clearing. In addition, offshore clearing may not provide the public sector with sufficient scope for oversight or control to mitigate and manage the effects of a financial crisis.

This report describes the challenges of achieving fair and open access to CCP services for OTC derivatives, as well as the potential effects of limited access for the resilience of financial markets and financial system stability. It then presents two strategies for addressing the consequences of restricted access to CCPs for systemic risk. The first strategy would require global CCPs to create access requirements that are proportional to risk. The second is to establish domestic CCPs that are appropriately aligned to market conditions and risks in different jurisdictions. Commensurate with these initiatives is a need to develop principles and a framework for co-operation in oversight arrangements, as well as for liquidity provision and failure resolution for CCPs.

ACCESS CHALLENGES AT GLOBAL CCPs

A market participant can clear transactions at a CCP in one of two ways: either by becoming a direct clearing member of the CCP, or by clearing indirectly, as a client of a direct clearing member. Each method poses potential challenges for mid-tier financial institutions or for those that are not based in the CCP's home jurisdiction.⁵

Active participants in OTC derivatives markets may be unable to obtain cost-effective direct membership in global CCPs as currently structured

Currently, the criteria for direct membership in existing global CCPs for OTC derivatives are based principally on the size of the institution, as well as the volume and breadth of its OTC derivatives activities. These criteria can result in the exclusion of mid-tier global institutions (because they do not meet size requirements) and institutions that specialize in particular products, geographic areas or client types (because they cannot participate in default management for market segments where they have no expertise), even though these institutions may be of extremely high quality and pose very low risk to the CCP and other clearing members.⁶

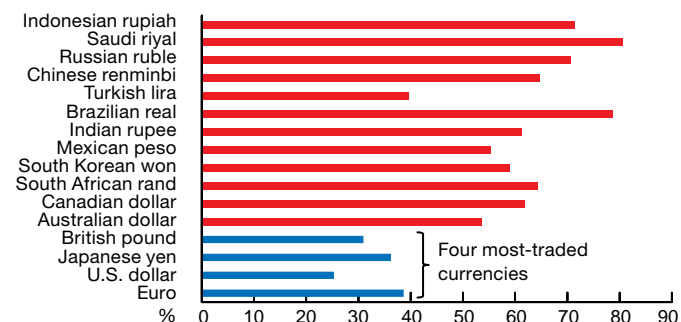
⁵ While CCPs exist in many countries, the dominant CCPs for OTC derivatives are currently based in the United States (ICE Trust, CME) and the United Kingdom (LCH.Clearnet SwapClear, ICE Clear Europe).

⁶ A recent proposal by the United States Commodity Futures Trading Commission would restrict the minimum capital requirement to \$50 million or lower and prevent CCPs from excluding non-dealers as members.

Smaller jurisdictions are particularly affected, since they tend to have mid-sized and smaller firms dealing heavily in derivatives denominated in the local currency. **Chart 1** shows that market participants who are not among the largest 14 derivatives dealers (the G14) are very active in interest rate swaps (IRS) outside the four most-traded currencies.⁷ For Canadian-dollar IRS, over 60 per cent of G14 dealers' transactions involve non-G14 counterparties.⁸ Moreover, 55 per cent of OTC transactions in Canadian IRS involve a Canadian bank on at least one side of the transaction (**Chart 2**).

Chart 1: Excluding the four most-traded currencies, the majority of IRS trades include participation from non-G14 dealers

Share of the notional amount outstanding of G14 dealers' transactions with non-G14 counterparties

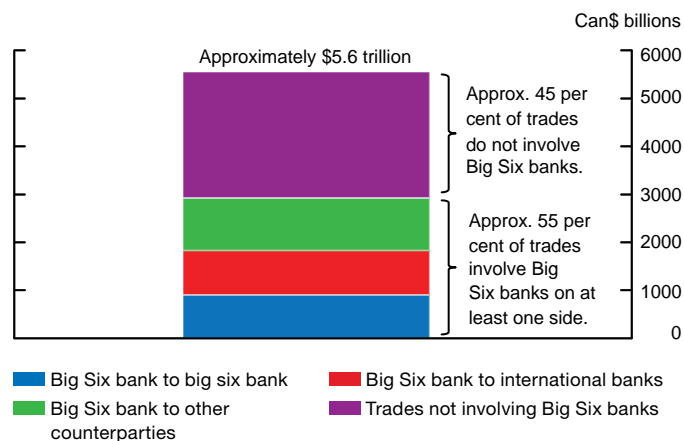


Note: Currencies are ordered on the y-axis from the smallest to the largest notional amounts outstanding of OTC derivatives.

Source: TriOptima Last observation: 25 February 2011

Chart 2: The Big Six banks participate in more than half of Canadian-dollar IRS trades

Can\$-denominated IRS notionals



Sources: Canadian Market Infrastructure Committee (October 2010) and BIS Triennial Survey (June 2010) Last observation: 31 October 2010

⁷ The G14 consists of Bank of America Merrill Lynch, Barclays Capital, BNP Paribas, Citigroup, Credit Suisse, Deutsche Bank, Goldman Sachs, HSBC, J.P. Morgan, Morgan Stanley, Royal Bank of Scotland, Société Générale, UBS and Wells Fargo.

⁸ We thank Mark Chambers of the Reserve Bank of Australia for suggesting that we look at these data.

Several of the largest Canadian banks qualify to be direct members of LCH.Clearnet's SwapClear, and some are already members.⁹ But even where Canadian banks are able to become direct clearers at a global CCP, the fee structures may put them at a competitive disadvantage. Existing CCPs for OTC derivatives sometimes offer important volume discounts or put ceilings on fees, in effect charging proportionally lower fees to larger clearers. In some cases, volume discounts may be an appropriate response to the cost structure of the CCP. But fees that are designed to cover risks that are proportional to clearing activity should also be proportional; for example, placing a ceiling on contributions to a default fund allows larger clearers to take on more risk without fully paying their way.

In addition to the access issues described above, there are several challenges associated with cross-jurisdictional access to central clearing. CCPs may impose additional haircuts on offshore collateral and charge an extra initial margin to control for the liquidity risk of smaller currencies.¹⁰ While this may be justified from a risk-management perspective, it could result in additional costs and risks for Canadian market participants using offshore CCPs, which could hinder the liquidity of Canadian financial markets. Offshore clearing could also create challenges for the public sector in establishing adequate oversight and in configuring emergency liquidity and resolution procedures.

Indirect access may not be the preferred solution for mid-tier market participants

As with most clearing and settlement systems, indirect clearing is an option for institutions that do not qualify as direct clearing members. Smaller institutions may prefer indirect clearing, since they can avoid the large fixed costs associated with direct membership, including operational costs and contributions to a default fund. (They will still pay a proportional share of these costs through clearing fees imposed by their direct clearers.)¹¹ But indirect clearers of OTC derivatives may face additional costs that could put them at a competitive disadvantage relative to direct clearers:

- *Higher capital charges:* Transactions cleared directly with CCPs that meet CPSS-IOSCO standards will face lower regulatory capital charges than bilateral trades.

Indirect clearers will get the same low charges only under certain conditions.¹² If they are unable to meet these conditions, indirect clearers will not obtain this capital relief, although they will avoid capital charges on default-fund contributions.

- *Higher demands for posting margin/collateral:* The requirements for posting margins for indirect clearers are set by their direct clearing members and are typically higher than the margins charged by the CCP for direct clearing. The additional margin charges are necessary to mitigate the increased risks associated with indirect clearing.
- *Exposure to the market power of the direct clearer:* A direct clearer controls its fees and margins to protect itself from the default risk of its indirect clearers; it could use this power to gain a competitive advantage over an indirect clearer that is also a competitor.¹³ Indirect clearers may also perceive a risk that their direct clearer, who might be their competitor, could benefit from access to information on their clearing flow, despite internal measures (e.g., governance) to reduce the risk of this happening. The degree of market power depends on how much competition exists between direct clearers for indirect business and how easy it is for an indirect clearer to switch to another direct clearer.

CONSEQUENCES OF LIMITED ACCESS

The existence of global systemically important financial institutions may be reinforced by limited access to CCPs

The G-20 reform agenda for OTC derivatives can potentially reduce the dominance of very large market participants by promoting standardization, transparency and electronic trading. Broader use of CCPs could further level the playing field in OTC derivatives, because CCPs reduce the need to monitor the default risk of each counterparty. But mandating central clearing in a setting where cost-effective direct access to CCPs is limited to the largest dealers may transform a market that was tiered for economic reasons into one where tiering is reinforced by the structure of international regulation and market infrastructure.¹⁴ This new market structure may reflect,

⁹ SwapClear is the current market leader in IRS and clears swaps in 14 currencies, including Canadian-dollar swaps out to 30 years.

¹⁰ There are also legal risks associated with uncertainty over the finality and irrevocability of payments, bankruptcy resolution and rights over collateral, given the possibility of conflicting laws across jurisdictions.

¹¹ Chapman, Chiu and Molico (2008) show that small players might not want to pay the direct participant costs, and may be extended only limited credit by other participants in the settlement system, since they do not have sufficient reputation to join.

¹² The rules proposed by the Basel Committee on Banking Supervision will extend reduced capital charges to an indirect clearer if "(i) any assets of the non-member bank related to such trade are segregated and bankruptcy remote from the clearing member; and (ii) the non-member bank is legally ensured that another CCP member will take over such trade if the original clearing member counterparty cannot perform" (BCBS 2010). Current indirect clearing set-ups do not meet the second requirement.

¹³ Lai, Chande and O'Connor (2006), for example, construct a model to examine a direct clearing member's incentives to gain a competitive advantage over its indirect clearers in the market for retail payment services.

¹⁴ Harris (2006) discusses the unintended consequences on competition of regulation in the futures market.

in part, the considerable influence wielded by the largest global dealers over the rules of CCPs for OTC derivatives through ownership, control of the risk committee and their market power in the purchase of CCP services.¹⁵

While the move to central clearing will reduce the interconnectedness of global systemically important financial institutions (G-SIFIs), their systemic importance could increase in a system that has limited access to CCPs, with significant unintended consequences:

- *A CCP that has only G-SIFI members as participants may be less able to handle a major systemic shock than a CCP that has a wide and diversified membership.* Mid-tier institutions with expertise in certain market segments could provide valuable risk- and default-management capacity without needing to participate in all segments of default management (Duffie 2010b).
- *G-SIFIs may gain market shares in other business lines if they have preferential access to CCPs.* This is because a lower cost of clearing OTC derivatives transactions may yield advantages in other business lines, such as bond underwriting and structured finance. These advantages could translate into advantages in the market for customized, bilaterally cleared derivatives, as well as other markets. For example, OTC derivatives are frequently used to hedge positions in bond markets, minimize funding costs using IRS and protect a loan portfolio using credit default swaps.
- *Reduced contestability of markets may weaken market resilience.* If there are fewer direct participants, the failure of any of them will be more important in terms of its impact on market liquidity. This could undermine the resilience of the market and increase the opportunity for systemic shocks to propagate. If mandated clearing under current access models reinforces the market dominance of G-SIFIs more generally, the risk that shocks to a single institution will have widespread effects on markets will be increased.

Mid-tier institutions may become more vulnerable in times of stress

Relative to global dealers, some Canadian institutions may face increased costs as indirect clearers, while the largest Canadian dealers may face additional costs as direct clearers. Although these costs may be small in normal times, margin requirements can increase dramatically in periods of stress, and the costs of supplying collateral may simultaneously climb. Market participants that depend on others for clearing services may find those services more difficult to obtain, decreasing liquidity and potentially contributing to increased procyclicality (CGFS 2010). Clearing

¹⁵ G14 dealers control the ownership of SwapClear (the dominant clearer of IRS) and the ICE risk committee (the dominant clearer of credit default swaps), and had substantial influence over the initial configuration of the CME Group's IRS clearing.

members are likely to tighten their requirements for client clearing and may also favour firms with which they have broader and more direct relationships.¹⁶

High costs of clearing may discourage central clearing and reduce activity in standardized OTC derivatives

Costs of clearing services in the form of direct costs or collateral requirements that are too high can have two adverse effects.¹⁷ They may encourage market participants to retain bilateral clearing practices, where feasible, possibly through greater use of non-standardized products that are not eligible for central clearing. If bilateral clearing is not possible, high clearing costs can reduce the use of OTC derivatives. While it may be appropriate to limit the use of derivatives to the extent that systemic risk in the market is not adequately controlled, restricted use of OTC derivatives can also reduce risk hedging, which can expose firms and the economy to more risk.

ELEMENTS OF AN EFFECTIVE SOLUTION

An effective strategy to mitigate the risk of unintended consequences arising from restricted access to CCPs must also include strong risk controls for CCPs, give financial authorities the tools to manage extreme shocks, and support a robust and efficient market in OTC derivatives.

One element of the solution is to improve direct access by recognizing the ability of high-quality mid-tier market participants to safely participate in direct clearing in proportion to their risk characteristics. A second element could be to manage risks in local markets using local CCPs.

Proportional access for mid-tier participants

To establish appropriate access conditions, it is important to develop access criteria that most effectively control risk at the CCP while protecting the stability and efficiency of the financial system. In place of measures of absolute size currently used by many CCPs, one strategy is to set access criteria and risk-management controls that are proportional to the risk profile of the clearing performed by each member.¹⁸

¹⁶ As the recent crisis demonstrated, at times of market stress, financial institutions tend to reduce client services, requiring them to take balance-sheet risk.

¹⁷ See Singh (2010) for a discussion of the potential collateral implications resulting from an increased central clearing of OTC derivatives.

¹⁸ CPSS-IOSCO (2011) suggests that "Where necessary, an FMI [financial market infrastructure such as a CCP] can establish less restrictive participation requirements in conjunction with appropriate risk-management controls. . . . Requirements should also reflect the risk profile of the activity; an FMI may have different categories of participation based on the type of activity. For example, a participant in the clearing services of a CCP may be subject to a different set of requirements than a participant in the auctioning process of the same CCP."

Membership criteria should be configured to enhance the CCP's ability to manage the default of one or more of its members. The criteria should aim to include institutions that can aid in managing defaults, and should exclude institutions that are more likely to default. By expanding membership to include high-quality medium-sized institutions, a CCP may increase the number of institutions that could bid for the failing member's positions, thereby increasing its total capacity for default management (Duffie 2010b).

Moreover, direct participation of local market participants whose credit is of high quality may be a source of strength for a CCP, particularly if they can offer market-making and pricing expertise in certain local products. For example, in the case of the default of a member with an important Canadian-dollar portfolio, Canadian institutions as direct clearers at the CCP may be best placed to manage the replacement of the portfolio and the liquidation of Canadian-dollar collateral. Canadian institutions would also be in a better position to monitor Canadian indirect clearers, since they would quite possibly already be monitoring the same clients in other areas of their business.

While it is beneficial to have a larger pool of members to aid in handling defaults, difficulties can arise when some members lack the operational capabilities to quickly price, buy and sell large defaulted portfolios in stressed market conditions. Although the increased use of electronic trading platforms should ease these difficulties somewhat, solving the difficulties may require modifications to a CCP's procedures for handling defaults. For example:

- Direct membership could be tiered to allow some members to play a less important role in the default process in exchange for larger default-fund or margin contributions.
- Parts of the default-management process (e.g., the responsibility to bid on the defaulting member's portfolio) could be partially or fully outsourced to sophisticated market participants.
- Default management could be partitioned to allow each clearing member to participate for the products in which it has the most expertise. If such partitioning is not possible in a global CCP, it could be accomplished by setting up local CCPs (see next section).

Each of these modifications entails its own set of risks. For example, outsourced default management may be less reliable in highly stressed situations, and partitioning may complicate and delay the process of hedging and replacing defaulted portfolios. It is important to determine the appropriate configuration of access criteria to ensure that the benefits of fair and open access outweigh the risks.

Local CCPs

Despite the existence of global CCPs for many OTC derivatives products, some jurisdictions have already responded to the G-20 commitments by creating local

CCPs, or are seriously considering doing so.¹⁹ In part, this is a response to the difficulty of reconfiguring access criteria for global CCPs. It is also consistent with related policy objectives that include simplified and direct oversight of systemically important financial infrastructure for local currency markets, as well as an ability to directly manage policies for liquidity provision and failure resolution. It may be possible to configure shared arrangements for oversight where officials from several jurisdictions co-operate to supervise a global CCP,²⁰ but a local CCP allows each jurisdiction direct control regarding regulation and oversight, as well as crisis management.

A stand-alone Canadian CCP may be able to protect Canadian markets from some global shocks, such as the default of a large offshore dealer or of an offshore CCP. While complete protection is not possible, owing to the many risk-propagation channels present in the global financial system, a decentralized structure for CCPs may reduce the risk inherent in concentrating the provision of market services in a small number of large entities.²¹ There is, however, less effective risk mutualization and netting in a local CCP. With narrow participation, a Canadian CCP would have fewer resources to absorb the default of a participant and would need to impose higher costs on its participants to compensate. Attracting the broad participation of global dealers would mitigate some of the adverse effects of narrow participation.

Greater knowledge of Canadian market conditions may allow a local CCP to adapt its risk-management practices to the Canadian market, thereby achieving more open access without increasing risk. This may allow more Canadian market participants to gain low-cost access to clearing services, which could promote liquidity in Canadian financial markets. Better integration into Canadian financial markets may also allow a Canadian CCP to better configure netting across certain asset classes, reducing collateral demands for participants.

A Canadian CCP may, however, impose substantial increased costs on Canadian clearers and reduce market efficiency if it reduces access to foreign counterparties and multilateral netting opportunities. If Canadian market participants are forced to divide their derivatives portfolios among multiple CCPs, this will likely decrease their ability to net positions against each other. They will therefore

¹⁹ Singapore, Hong Kong, Poland, Brazil, India, Japan and China all plan to have domestic CCPs for OTC derivatives. Other countries are investigating this option. Only a few global CCPs currently have significant clearing volumes in OTC derivatives, so it is not yet apparent how successful the local CCPs will be.

²⁰ For example, Canada and other jurisdictions share oversight of the CLS foreign exchange clearing system under the leadership of the Federal Reserve Bank of New York. Oversight of a CCP may, however, be substantially more complicated.

²¹ The Joint Regulatory Authorities of LCH.Clearnet Group (2008) also recognized the potential for multiple linked CCPs to decrease the risk arising from "a CCP being a single point of failure."

Links Between CCPs and Cross-Margining Agreements

Linking arrangements, including peer-to-peer links and cross-margining agreements, are used by local CCPs to improve collateral efficiencies.

Peer-to-peer links allow two CCPs to connect as equals and to co-operate to clear trades where one counterparty clears through each CCP. Some harmonization of risk management and operational requirements is necessary to effectively manage risks associated with trades cleared across the link. Consistent with the proposed CPSS-IOSCO standards, the CCPs would have to hold additional financial resources to protect themselves from their exposures to each other.

Cross-margining agreements between CCPs allow for the joint margining of transactions in designated products. Common clearing members are thus able to net exposures with offsetting risk characteristics across CCPs for the purposes of calculating margin requirements.

Links introduce numerous legal and operational risks to the clearing system, especially as the number of links between CCPs increases. The CPSS-IOSCO principles will require that additional capital be available to mitigate the increased risks from links. This will make clearing over links more expensive, depending on the nature of the trades through such arrangements.

be forced to supply more margin collateral and may also choose to stop transacting in certain market segments or with certain counterparties. To improve collateral efficiencies, a local CCP could, over time, develop cross-margining or linking agreements with other CCPs (see **Box 1**).

From a global perspective, a model where local CCPs are linked to each other or to global CCPs provides a potential middle ground that could combine some of the advantages of local CCPs and global CCPs and permit broad access to the widest range of derivatives. In general, links provide a way of reducing collateral demands for a local CCP through increased netting efficiency, while still permitting some local control. In terms of the benefits of risk mutualization and protection (insulation) from global shocks, a linked system may be at least as resilient as a small set of global CCPs or a large number of stand-alone local CCPs.²² But links also require that both the CCPs, as well as their respective regulators, agree on the terms and nature of the link. The arrangements will need to include appropriate risk controls to mitigate the additional risks that links introduce to the financial system, especially as the number of links between CCPs increases. At an international level, regulators are focused on links in cash markets. It is uncertain whether links will be a viable option for CCPs for OTC derivatives in the short term.

CONCLUSION

The G-20 countries, including Canada, have committed to increasing the central clearing of OTC derivatives transactions using CCPs in order to support financial stability; in particular, CCPs will reduce contagion arising from the interconnectedness of participants in OTC derivatives

markets and enhance the transparency of exposures arising from derivatives trades. The CCP infrastructure should be configured in the best interests of Canadian financial markets and institutions. It should provide the most effective policy tools to constrain the spread of a financial crisis, reduce the effects of externally or internally generated systemic shocks on the Canadian market, and support the liquidity and efficiency of Canadian financial markets.

Considerable progress has already been made by international organizations such as the FSB, CPSS, IOSCO, CGFS and ODRF on issues related to OTC derivatives CCPs. This report suggests two strategies for addressing the potential unintended consequences of restricted access to CCPs:

CCPs could develop policies and membership requirements that are proportional to risk. This could expand access to central clearing, deepen the risk-absorbing capabilities of CCPs, increase the liquidity and efficiency of OTC derivatives markets, and reduce the impact of the failure of a large global dealer.

A Canadian CCP that is better aligned to Canadian market conditions and risks could be developed. Such a CCP could provide simplified and direct oversight of systemically important financial infrastructure for Canadian-dollar OTC derivatives, particularly for Canadian-dollar interest rate derivatives. It could also provide Canadian authorities with the ability to directly manage policies for liquidity provision and failure resolution. The broad participation of global dealers or links between CCPs is critical to achieving the net benefits of a local CCP by preventing this decentralized approach from fragmenting market liquidity and the management of systemic risk.

In addition, co-operative oversight is essential to provide the foundations for safely expanding access to CCPs and establishing links between CCPs. To deal with shocks that

²² The optimal central clearing solution, in terms of resilience, depends on several factors, such as the degree of integration of the participants in each jurisdiction and the type and magnitude of the shocks (Renault 2010; Zigrand 2010).

a CCP cannot properly manage, co-operative policies are also required for emergency liquidity provision and, in extreme circumstances, failure resolution.

Canadian federal and provincial authorities are working with their international counterparts to promote broader access to central clearing and links between CCPs under stringent CCP risk controls (FSB 2011). Work is also under way with domestic market participants to ensure that the move to increased use of central clearing services for OTC derivatives transactions will reinforce the safety and efficiency of the financial system.

REFERENCES

- Basel Committee on Banking Supervision (BCBS). 2010. "Capitalisation of Bank Exposures to Central Counterparties." Bank for International Settlements.
- Brunnermeier, M. K. 2009. "Deciphering the Liquidity and Credit Crunch 2007–2008." *Journal of Economic Perspectives* 23 (1): 77–100.
- CCP12. 2009. "Central Counterparty Default Management and the Collapse of Lehman Brothers." Global Association of Central Counterparties. April.
- Chande, N., N. Labelle and E. Tuer. 2010. "Central Counterparties and Systemic Risk." Bank of Canada *Financial System Review* (December): 43–50.
- Chapman, J., J. Chiu and M. Molico. 2008. "A Model of Tiered Settlement Networks." Bank of Canada Working Paper No. 2008–12.
- Committee on the Global Financial System (CGFS). 2010. "The Role of Margin Requirements and Haircuts in Procyclicality." CGFS Paper No. 36. Bank for International Settlements.
- CPSS-IOSCO. 2011. "Principles for Financial Market Infrastructures." Committee on Payment and Settlement Systems, Technical Committee of the International Organization of Securities Commissions, and Bank for International Settlements.
- Duffie, D. 2010a. "How Big Banks Fail and What to Do about It." Princeton, New Jersey: Princeton University Press.
- Duffie, D. 2010b. "Minimal Size of Clearing Members." Email submission to the U.S. Commodity Futures Trading Commission, 24 August.
- 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.
- Financial Stability Board (FSB). 2010. "Implementing OTC Derivatives Market Reforms." 25 October.
- . 2011. "Progress in the Implementation of the G20 Recommendations for Strengthening Financial Stability." 10 April.
- Harris, L. 2006. "Breaking the Futures Monopoly." *Forbes Magazine*, 6 November.
- Joint Regulatory Authorities of LCH.Clearnet Group. 2008. "Investigation of Risks Arising from the Emergence of Multi-Cleared Trading Platforms." July.
- Kiff, J., R. Dodd, A. Gullo, E. Kazarian, I. Lustgarten, C. Sampic and M. Singh. 2010. "Making Over-the-Counter Derivatives Safer: The Role of Central Counterparties." International Monetary Fund *Global Financial Stability Report*, Chapter 3.
- Lai, A., N. Chande and S. O'Connor. 2006. "Credit in a Tiered Payments System." Bank of Canada Working Paper No. 2006–36.
- Monnet, C. 2010. "Let's Make It Clear: How Central Counterparties Save(d) the Day." Federal Reserve Bank of Philadelphia *Business Review* (Q1): 1–10.
- Norman, P. 2011. "The Risk Controllers: Central Counterparty Clearing in Globalised Financial Markets." Chichester, West Sussex: John Wiley & Sons.
- Renault, F. 2010. "Concentration Risk and the Optimal Number of Central Counterparties for a Single Asset." Banque de France *Financial Stability Review* (July): 169–76.
- Singh, M. 2010. "Collateral, Netting and Systemic Risk in the OTC Derivatives Market." International Monetary Fund Working Paper No. 10/99.
- Wilkins, C. and E. Woodman. 2010. "Strengthening the Infrastructure of Over-the-Counter Derivatives Markets." Bank of Canada *Financial System Review* (December): 35–41.
- Zigrand, J.-P. 2010. "What Do Network Theory and Endogenous Risk Theory Have to Say about the Effects of Central Counterparties on Systemic Stability?" Banque de France *Financial Stability Review* (July): 153–60.