# The Market for Collateral: The Potential Impact of Financial Regulation

*Jorge Cruz Lopez, Royce Mendes and Harri Vikstedt*

## Introduction

The 2007–09 financial crisis highlighted the need to increase the resilience of a range of financial markets. During the crisis, unsecured lending and over-the-counter (OTC) derivatives markets in particular proved vulnerable to market freezes and runs on institutions, which contributed to deteriorating liquidity and credit conditions across the financial system more broadly. Since 2009, private market participants have been increasing their reliance on collateral to secure financial transactions (see **Box 1**), responding at least in part to new regulatory rules. To date, the effects of this transition have been primarily reflected in the decreasing use of unsecured relative to secured funding arrangements such as repurchase agreements (repos) and covered bonds.

New regulations aim to broaden the use of collateral underpinning a range of financial transactions. Key elements of these regulatory reforms include promoting the central clearing of standardized OTC derivatives contracts and new margin (collateral) requirements for OTC contracts that continue to be non-centrally cleared. In addition, rules are being considered to limit the reuse of collateral in certain transactions and to set minimum haircuts for collateral pledged in repo agreements.[1]

This new regulatory environment will substantially increase the demand for assets suitable for use as collateral, particularly for high-quality liquid assets (HQLA). At the same time, liquidity requirements under Basel III will create further demand for these types of assets.[2] It is estimated that, together, these reforms will raise the demand for HQLA by between US$2 trillion and US$4 trillion over a multi-year phase-in period.

This report analyzes the effect of the new regulations on the demand for and supply of collateral assets. We conclude that the greater demand for collateral is not likely to be large in relation to the outstanding stock of eligible assets, either globally or in Canada. Nevertheless, the transition to a more collateralized financial system may have important implications for financial stability that need to be understood and monitored carefully.

## Changes in Demand and Supply

Fluctuations in the demand for and supply of collateral can arise from structural and cyclical sources. Structural sources are persistent changes originating from regulatory, operational or organizational changes in the market. In contrast, cyclical sources are transitory changes in market dynamics stemming from variations in the business cycle, temporary monetary and fiscal interventions, or deteriorations in sovereign or private finances. **Table 1** provides a breakdown of these sources and their expected directional impact on the demand for and supply of collateral.

### Changes in demand

The financial crisis was associated with a contraction in unsecured financing, since many financial institutions had to pledge collateral to obtain access to adequate market funding. During this period, investors relied increasingly on collateral to cover the credit-risk exposure posed by their counterparties, and the net effect was an increase in the demand for collateral. However, to the extent that the greater use of collateral reflects cyclical factors during the crisis, it is expected to be reversed as macroeconomic fundamentals improve and confidence increases in markets.

1 Collateral haircuts, which are set by asset recipients, are price adjustments used to account for variations in the credit quality, volatility and liquidity of pledged assets.

2 For a more detailed discussion of the Basel III liquidity standards, see the report "The Basel III Liquidity Standards: An Update" on page 37 in this issue.

Box 1

## What Is Collateral?

Collateral has traditionally been used by financial market participants to protect against credit exposures, especially for secured lending, repurchase agreements (repos) and derivatives transactions. Depending on the nature and risk of the transaction being covered, collateral can take many forms, ranging from cash or liquid government securities to corporate debt, equities or even gold. Loans on the balance sheets of banks have also been used as collateral. For example, mortgages have been used to support covered bonds, and corporate loans have been used to obtain liquidity in central bank operations.

The focus in this report is on two overlapping definitions of collateral. Both define a set of assets suitable for use as collateral in a wide range of transactions. The first definition is based on market practice and includes financial assets that have a low risk of default. These assets are known as high-quality assets (HQA). The second definition is based on financial regulation and encompasses high-quality liquid assets (HQLA), the subset of HQA that is deemed sufficiently liquid to meet the requirements of the Basel III Liquidity Coverage Ratio.

**Table 1: Expected sources of additional demand for and supply of collateral**

| | Changes in demand | | Changes in supply | |
|---|---|---|---|---|
| Structural sources | Basel III (Liquidity Coverage Ratio) | ↑ | Broadening the collateral eligibility criteria | ↑ |
| | OTC derivatives reform | ↑ | Limits to collateral rehypothecation and reuse | ↓ |
| | Foreign exchange reserve management | ↑ | Long-term sovereign financing needs | ↑↓ |
| | Increase in market transparency | ↓ | Long-term private financing needs | ↑ |
| | | | Financial innovation (e.g., collateral transformation) | ↑ |
| Cyclical sources (stress periods) | Increase in risk aversion | ↑ | Increase in sovereign risk | ↓ |
| | Increase in credit risk | ↑ | Decline in securitization | ↓ |
| | Decline in unsecured money market activity | ↑ | Fiscal policy response | ↑ |
| | Monetary policy response (demand for HQA) | ↑ | Monetary policy response (supply of HQLA) | ↑ |

Note: The symbols ↑ (↓) represent an expected increase (decrease) in demand or supply.

On the other hand, the crisis also uncovered structural vulnerabilities in the financial system that were characterized by freezes in market liquidity, derived in part from concerns about solvency in the context of asymmetric information. As a result, a wide-ranging regulatory reform agenda is being implemented globally. Two elements of this agenda are expected to generate a permanent increase in the demand for collateral: the OTC derivatives (OTCD) reforms currently being put into place by the G-20 countries, and the enhanced liquidity requirements mandated under Basel III.[3]

### *Reforming the OTC derivatives market*

The G-20 countries have committed to centrally clear standardized OTC derivatives and to increase capital and margin requirements on contracts that will remain non-centrally cleared (to provide an incentive to standardize and centrally clear all bilateral derivatives transactions).[4] Their aim is to increase the transparency of derivatives markets through greater standardization and to improve financial stability and resilience by reducing the under-collateralization that was prevalent before and during the financial crisis (Cruz Lopez forthcoming).

3 In this report, we focus only on the regulatory changes that are expected to have a direct impact on Canada.

4 The regulations governing the initial margin requirements for bilaterally traded contracts are currently being finalized, and minimum risk-management standards for central counterparties (CCPs) have been announced. For more information, see the "Principles for Financial Market Infrastructures" (CPSS-IOSCO 2012).

Box 2

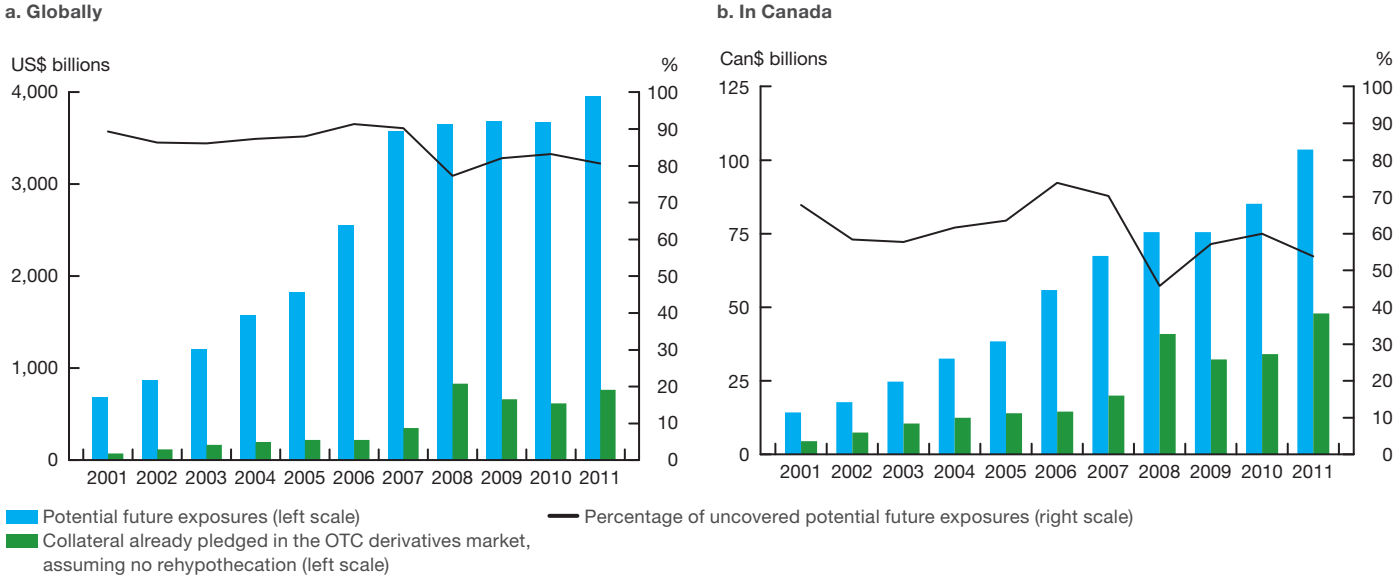
## What Is Rehypothecation?

Rehypothecation refers to the right of a market participant to repledge, reassign or invest the collateral that it has received to secure a financial transaction. The term (collateral) "reuse" is often used interchangeably with rehypothecation; however, reuse has a much broader meaning, including the ability to repledge collateral through a (temporary) change in ownership.

The ability to rehypothecate could reduce both the aggregate demand for collateral and the liquidity requirements of traders, since pledged assets can be repledged to support more than one transaction. This could lower the cost of trading and improve market liquidity (Singh 2011). However, rehypothecation can also increase leverage and procyclicality in the market, both of which might undermine the stability and resilience of the financial system. Thus, some restrictions on collateral rehypothecation are currently being considered in the new regulations.[1]

1 See Singh (2010, 2011) for a discussion of the effect of the financial crisis on the rehypothecation and reuse of collateral.

**Chart 1: Potential future exposures and collateral currently pledged in OTC derivatives markets**




Note: The black lines in Chart 1a and Chart 1b show the percentage of potential future exposures (PFEs) that would be left uncovered if all the collateral already pledged in the OTC derivatives market was used as initial margin. This percentage therefore represents an estimate of the amount of additional initial margin that would be needed if all outstanding positions in the OTC derivatives market were centrally cleared. The PFE of a derivatives contract corresponds to the maximum dollar amount that an investor could lose in its positions in the OTC derivatives market during a pre-specified period of time (usually the next five to ten days), assuming a set of scenarios or distributions. In the context of central clearing, PFEs are determined through scenario analysis, and an equivalent amount of initial margin is collected by the clearing house to protect it against potential losses.

Sources: Cruz Lopez (forthcoming), BIS (2012a, 2012b) and ISDA (2012).
In addition, for Chart 1b: OSFI (2012)

Last observation: 2011

The reforms are expected to result in a permanent increase in the demand for collateral by (i) requiring initial margin on most OTC derivatives transactions[5] and (ii) limiting the rehypothecation of pledged assets (**Box 2**). Due to the lack of granular data on OTC derivatives transactions, there has been a wide range of estimates of the potential increase in the demand for collateral that will result from the reforms. Studies by the Bank for International Settlements (Heller and Vause 2012) and the International Monetary Fund (Singh 2010) suggest that the additional initial margin required to centrally clear OTC derivatives in normal market conditions could be between US$100 billion and US$700 billion. In addition, the Quantitative Impact Study conducted by the Basel Committee on Banking Supervision (BCBS) and the International Organization

5 Under the new regulations, however, centrally clearing standardized contracts could decrease the amount of collateral needed (relative to that required for collateralizing non-centrally-cleared transactions) because credit exposures can be netted more efficiently.

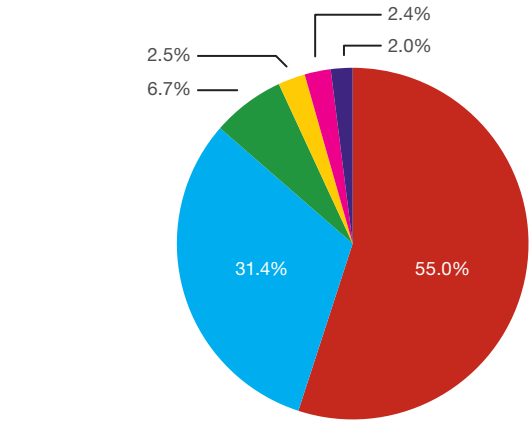
of Securities Commissions (IOSCO) in 2012 suggests that between €0.7 trillion and €1.7 trillion in initial margin would be required over a four-year phase-in period to collateralize transactions that are expected to remain non-centrally cleared. The lower estimate of €0.7 trillion assumes, as currently proposed, a €50 million exposure threshold under which no collateral would be required (BCBS-IOSCO 2012, 2013).

Cruz Lopez (forthcoming) has estimated that, under current market conditions, the total amount of additional collateral (i.e., initial margin) that would be required to cover all potential future exposures, in the absence of rehypothecation, and across all asset classes and products (i.e., standardized and non-standardized OTC derivatives), would be approximately US$3 trillion globally (**Chart 1a**). In Canada, an additional Can$56 billion would be needed (**Chart 1b**). However, the global estimate should be viewed as the maximum amount of collateral that would be needed to collateralize the entire OTC derivatives market, because it includes products that might not be covered under the new regulations. The estimate only considers outstanding netting agreements and ignores the additional netting benefits derived from central clearing. This work also shows that, relative to the rest of the world, Canadian banks have historically collateralized a larger percentage of their exposures and are therefore in a relatively good position to comply with the upcoming OTC derivatives regulations.[6]

## *Basel III liquidity requirements*

The Basel III Liquidity Coverage Ratio (LCR) is aimed at ensuring that banks have sufficient HQLA to survive a 30-day stress period. This rule will result in a permanent structural increase in the demand for HQLA. According to the 2010 Quantitative Impact Study conducted by the BCBS, the LCR is expected to increase worldwide demand for HQLA by €1.8 trillion—approximately 3 per cent of the total assets held by the banks included in the study (see BCBS 2010b, 2012a). It is important to note, however, that while this estimate gives us an idea of the directional effect of the LCR on collateral demand, it may substantially overestimate the actual additional collateral needed to comply with this rule. There are at least three reasons for this. First, revisions to the definition of the LCR since the 2010 Quantitative Impact Study are likely to moderate the increase in the demand for HQLA. Second, global banks already hold significant amounts of collateral that are primarily concentrated in marketable government securities (**Chart 2**). Since these HQLA holdings are not evenly distributed across banks, there is a potential upward bias in the HQLA requirement reported by the BCBS. Specifically, as collateral becomes relatively scarcer, its price is likely to increase, giving banks that currently hold excess balances an incentive to trade or swap HQLA with banks that have deficits. Third, banks can increase their LCR either by shortening the duration of their assets (lending) or by lengthening the duration of their liabilities (funding). To the extent that they take either of these steps, the additional HQLA required may be lower.

**Chart 2: Composition of the holdings of high-quality liquid assets by global banks**




Note: LCR = Basel III Liquidity Coverage Ratio
Source: BCBS (2012b)

Assuming that an exposure threshold of €50 million is adopted, below which no initial margin is required for non-centrally-cleared derivatives, and that foreign exchange OTC derivatives will be exempted from the initial margin requirements, we estimate that the total additional collateral needed globally to comply with the OTCD market reforms and the LCR could be between US$2 trillion and US$4 trillion.[7]

6 The estimates reported by the studies mentioned in this section are static and highly dependent on the assumptions (e.g., regarding market conditions, market structure and investor behaviour after the implementation of the new regulations) and the methodologies used to calculate them.

7 The upper (lower) bound of the estimate of collateral demand equals the sum of €1.8 trillion (€900 billion) arising from the LCR, US$700 billion (US$100 billion) from the initial margin required to centrally clear OTC derivatives, and €700 billion from the initial margin required for transactions that will remain non-centrally cleared. The €900 billion used for the LCR is based on our assumption that changes to the LCR rules since the 2010 Quantitative Impact Study will potentially halve the initial amounts reported by the BCBS (2010a). All other figures correspond to the upper and lower estimates reported in the previous section. An exchange rate of US$1.3/€ is used for the calculations.

### *Foreign exchange reserves and central bank policy*

Another source of demand for HQLA in recent years has been the public sector, through its management of foreign exchange reserves. According to a report prepared by the Committee on the Global Financial System (CGFS 2013), holdings of foreign exchange reserves increased from US$6.7 trillion to US$10.5 trillion between the end of 2007 and the second quarter of 2012. Demand is concentrated primarily in the highest-rated sovereign debt issues and has been largely driven by emerging-market economies. For example, the proportion of non-resident holdings of Canadian federal government debt has risen steadily, from 14.6 per cent in 2006 to 25.2 per cent in 2012, chiefly as a result of reserve diversification. While the pace of the increase has moderated, foreign demand for HQLA could continue into the future, at least until developing economies can generate enough HQLA to support their financial systems (IMF 2012).

The large increase in the balance sheets of some central banks has also stimulated debate about the impact of current unconventional monetary policies on the demand for collateral. However, central banks employing these policies have been effectively providing additional HQLA (including cash) to market participants in exchange for any HQA acquired through (i) the expansion of collateral eligibility criteria and (ii) the creation of additional central bank liabilities (excess reserves) by means of unsterilized asset purchases.

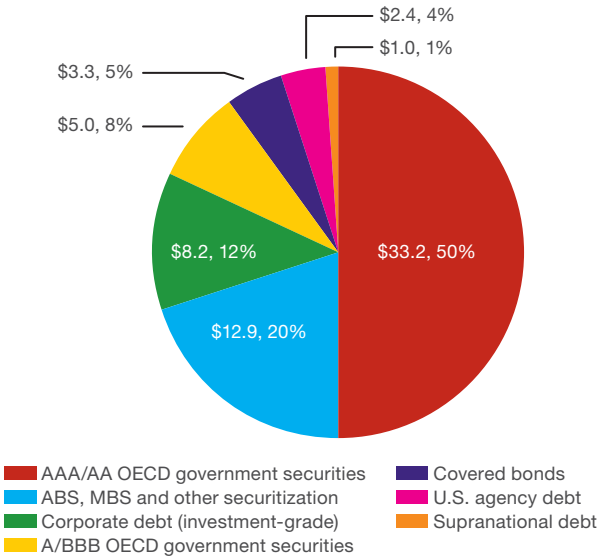
## Changes in supply

Collateral assets can be supplied by both public and private entities. **Chart 3** and **Chart 4** show, respectively, the current outstanding amounts of fixed-income assets that could be used as collateral, globally and in Canada. The largest source of collateral is highly rated sovereigns (i.e., those with AAA and AA ratings). The second-largest source is the private sector, through securitization, including asset-backed and mortgage-backed securities (ABS and MBS, respectively). Highly rated corporate bonds account for less than 20 per cent of collateral assets, and covered bonds account for approximately 5 per cent or less, both globally and in Canada. An additional potential source of collateral is equities, which currently have a global market capitalization of more than US$55 trillion.

Recent sovereign downgrades, particularly in Europe, and the significant decrease in the issuance of securitized assets in the United States, other things being equal, tend to decrease the supply of collateral. However, overall, the amount of government debt issued by countries that remain highly rated has more than offset the decrease in collateral from the sovereign downgrades of relatively large countries such as Italy and Spain (**Chart 5**).

**Chart 3: Outstanding amounts of potential global sources of collateral**

Trillions of U.S. dollars and percentage of total

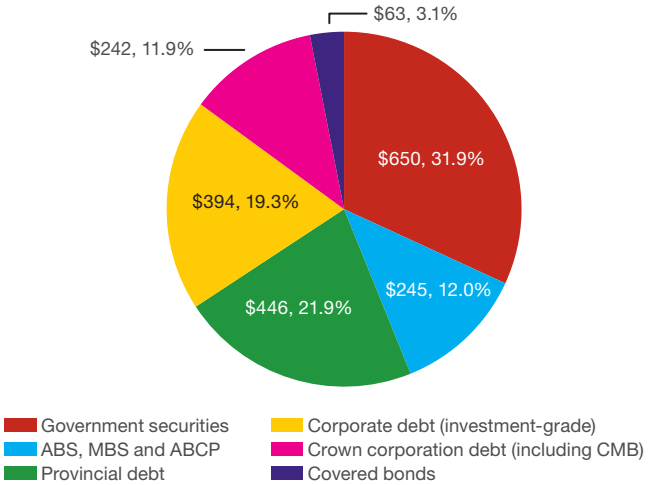



Note: Data for government securities and corporate debt are as of 2011Q2; supranational debt and gold are as of end-2011; covered bonds are as of end-2010; and U.S. agency debt and securitization are as of 2011Q3; ABS = asset-backed securities; MBS = mortgage-backed securities; OECD = Organisation for Economic Co-operation and Development

Source: International Monetary Fund

**Chart 4: Outstanding amounts of marketable high-quality assets in Canada**

Billions of Canadian dollars and percentage of total
(includes only Canadian-dollar-denominated debt)

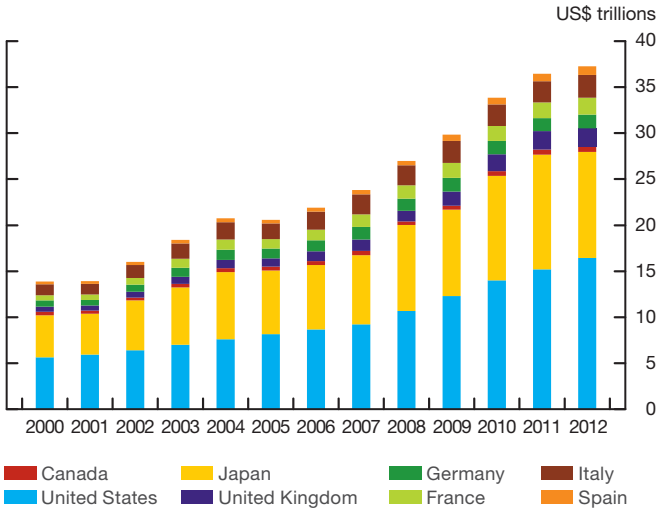



Note: Data for government securities and corporate debt are as of March 2013; covered bonds are as of January 2013; Crown corporation debt is as of March 2012; ABS, MBS and ABCP are as of December 2012, where MBS includes all outstanding National Housing Act Mortgage-Backed Securities not included in CMB; ABS = asset-backed securities; MBS = mortgage-backed securities; ABCP = asset-backed commercial paper; CMB = Canada Mortgage Bonds.

Sources: Statistics Canada, Bank of Canada,
Bank of America Merrill Lynch, DBRS and Department of Finance

**Chart 5: Government debt outstanding**

Trillions of U.S. dollars, annual data




Sources: U.S. Treasury, Statistics Canada, Statistical Office of the European Communities, Deutsche Bundesbank, Agence France Trésor, Banca d'Italia, Banco de España and Haver Analytics Last observation: December 2012

The estimated US$4 trillion upper limit of the additional demand for collateral presented in the previous section represents only a small fraction of the current outstanding amount of potentially eligible assets (**Chart 3**). In comparison, the sovereign debt of the United States and Japan combined has increased the amount of outstanding collateral assets by US$11 trillion since 2007 (**Chart 5**). In addition, market participants are often allowed to use cash as collateral in derivatives transactions, which increases the amount of collateral assets available. Furthermore, since the new regulations will be phased in over a multi-year period, the impact on the demand for collateral will take place gradually, mitigating the risk of sudden market disruptions. The phase-in period will also allow regulators to monitor the adoption of new rules over time.

In addition, there is widespread consensus that the supply of HQLA is likely to continue to increase for the foreseeable future, offsetting further increases in the demand for collateral. For example, the IMF (2012) predicts that the total outstanding sovereign debt of advanced economies will grow by US$2 trillion by 2016. Singh (2013) suggests that net issuance of debt by AAA and AA sovereign and corporate entities will add about US$1 trillion annually to the market, while Levels and Capel (2012) from the Dutch central bank estimate that the supply of high-quality collateral in the euro area will grow by US$1 trillion between 2012 and the end of 2013.[8]

8 Levels and Capel (2012) consider assets rated BBB- and above as high-quality collateral. They report that "the amount of high-quality assets will increase by €488 billion in 2012 and €304 billion in 2013" in the euro area. Using an exchange rate of US$1.3/€, this implies an increase of approximately US$1 trillion.

## Potential imbalances in supply and demand

Thus, on an aggregate global basis, the estimated increase in the demand for collateral is much less than the potentially available supply. While particular events might create temporary imbalances in the supply of and demand for collateral in certain markets, we expect endogenous market adjustments to eventually correct any persistent discrepancies. The important issue is to distinguish between relative scarcity and shortages. Structural and cyclical increases in demand or decreases in the supply of collateral can lead to relative scarcity (i.e., temporary misalignments of supply and demand). However, provided their functioning is unimpaired, markets should efficiently allocate scarce resources, including collateral, through price adjustments. Therefore, only deficiencies in price mechanisms can give rise to actual shortages, but there is no evidence of price impairments or systematic frictions that would prevent the market from clearing in most developed economies (Gourinchas and Jeanne 2012; Cœuré 2012).

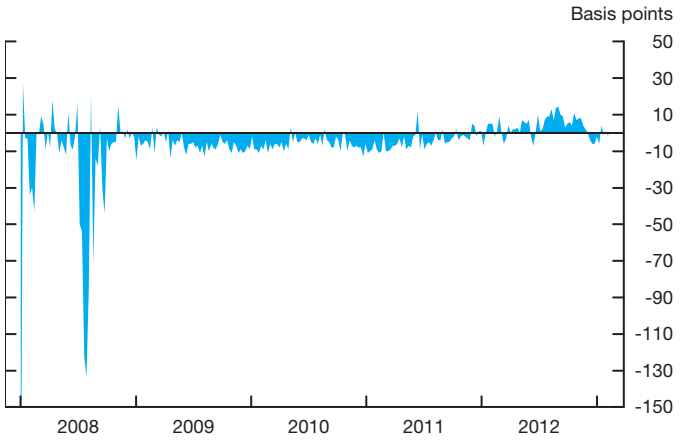
Concerns might arise, however, if market adjustments occurred abruptly over a short period of time. For example, during the failure of Lehman Brothers in 2008, increases in credit risk and risk aversion led to a surge in the price of U.S. Treasury collateral (**Chart 6**). A similar effect can be observed during the sovereign debt crisis in Europe, beginning in the summer of 2011 (**Chart 7**). In cases like these, regulators and market participants have tools at their disposal to smooth the transition to a new equilibrium state. For example, during both of these episodes, central banks expanded their collateral eligibility criteria to mitigate the liquidity risk associated with certain assets and to increase the number of assets that were accepted as high-quality collateral from, and among, market participants.[9] As central banks step back from these unconventional activities, the expectation is that private institutions will fulfill a similar role. Central counterparties, for example, may have an incentive to prudently broaden their collateral eligibility criteria within the more conservative provisions of the new regulations.[10] In addition, institutions with access to unencumbered HQLA could provide collateral transformation services to meet the needs of investors facing collateral deficits. Large holders of government debt, such as sovereign wealth funds, and other institutions holding large foreign

9 During the financial crisis, some central banks also allowed participants to borrow liquid (HQLA) securities against potentially less-liquid eligible collateral (HQA). For example, the Federal Reserve introduced the Term Securities Lending Facility (TSLF) in March 2008 to provide liquidity in U.S. Treasury and other collateral markets. The TSLF offered market participants U.S. Treasury securities held by the System Open Market Account through a one-month loan against other program-eligible collateral. This was done through a competitive weekly auction. The program was terminated in February 2010.

10 In the United States, for example, the Chicago Mercantile Exchange (CME) expanded its collateral eligibility criteria to include corporate bonds with a 20 per cent haircut.

**Chart 6: Relative increase in the price of collateral during the 2007–09 financial crisis**

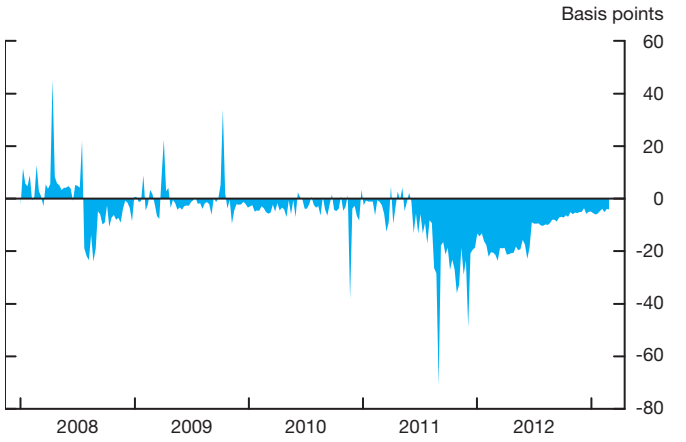
U.S. Treasury repo overnight index relative to the federal funds effective rate, weekly data




Source: Bloomberg Last observation: 8 March 2013

**Chart 7: Relative increase in the price of collateral during the European sovereign debt crisis**

European Banking Federation repo rate index relative to the European overnight index average, weekly data




Source: Bloomberg Last observation: 8 March 2013

exchange reserves can also support the efficient functioning of financial markets by increasing their securities-lending operations if specific collateral shortages do occur.

Finally, as collateral becomes more valuable, financial institutions have an incentive to manage their collateral assets more efficiently. The perceived increase in the relative value of collateral assets since 2007, for example, has led financial institutions to increasingly adopt enterprise-wide collateral-management systems to optimize their use of collateral. These adjustments have helped to mitigate additional demand pressures and to liberate collateral that was previously attached to relatively inefficient operations. We expect this trend to continue, thus allowing collateral to be allocated to its most efficient uses.

## Implications for Financial Stability

While the potential collateral imbalances mentioned in the previous sections seem manageable, based on current projections, some financial stability implications arising from the ongoing shift to an increasingly collateralized financial system should be noted.

First and foremost, the additional liquidity buffers and collateralization introduced by the new regulations should help to make financial markets more resilient by mitigating liquidity, credit and systemic risks. This should reduce the likelihood of destabilizing flights to safety and large abrupt shifts from unsecured to secured sources of funding, so that any procyclicality arising from liquidity shortages and credit events should decrease as the new policies are adopted.[11]

During periods of extreme financial stress, however, the relative increase in asset encumbrance resulting from the new regulatory regime may compound some of the negative effects of changes in collateral prices and haircut policies. Price declines or an increase in haircuts (for example, from credit-rating downgrades, increases in risk aversion and volatility, or downturns in real economic activity) could trigger the need for market participants to source additional assets to meet margin calls or restore liquidity buffers (Gorton 2009). Similar events could also trigger margin spirals; i.e., cases when financial institutions, in an effort to meet margin calls, liquidate some of their assets, causing further price declines that might trigger additional margin calls (Brunnermeier and Pedersen 2009). The likelihood of margin spirals will decrease, however, as the additional liquidity buffers are adopted. Moreover, the promotion of minimum through-the-cycle haircut floors would make drastic haircut adjustments much less likely (CGFS 2010).

The greater demand for collateral stemming from regulatory compliance could also lead to changes in the relative pricing of assets. More specifically, widely eligible collateral assets (i.e., those deemed to be of the highest quality) could demand a premium that might widen during financial downturns, when collateral is needed the most, as happened during the financial crisis. This segmentation between the prices of eligible and non-eligible collateral assets could potentially create cliff effects for borderline eligible assets that become, or could become, ineligible, owing to a decrease in their credit quality (IMF 2012). But well-designed collateral policies and appropriate haircuts should mitigate such risks.

Finally, market-driven responses to an increase in the relative value of collateral assets could generate externalities (Lawton 2012). For example, the Financial Stability Board recently noted that market participants

11 In this case, procyclicality can be understood as large and frequent swings in financial activity that can initiate or exacerbate downturns in real economic activity.

are increasingly using collateral transformation services to mitigate the effects of collateral scarcity (FSB 2013).[12] Although this type of response might help to smooth the structural shift in the demand for collateral, if not managed carefully, it could give rise to some unintended consequences. Collateral transformation could increase the interconnectedness of financial institutions and the complexity of financial markets, both of which could make it more difficult for investors and regulators to monitor certain vulnerabilities. In addition, collateral transformation services could concentrate counterparty risk in a few large financial institutions (FSA 2012). Nevertheless, collateral transformation activity is currently not large (or central) enough to be of concern for financial stability (Stein 2013) and the focus, for now, should be on monitoring its evolution (FSB 2013). Moreover, any increase in interconnectedness from this source should be viewed against the backdrop of the probably much larger decrease in interconnectedness that is the intended result of, for example, much greater central clearing.

12 This involves the upgrade (swapping) of assets not deemed eligible for use as collateral to assets that are eligible (or to cash). This is somewhat analogous to securities lending and the use of repos.

## Conclusion

The recent financial and sovereign debt crises made it clear that regulatory changes were needed to address weaknesses in the global financial system. While some of these policy changes will increase the structural demand for collateral, the prevailing view is that widespread shortages are unlikely to occur, for at least four reasons. First, price adjustments will correct any imbalances in demand and supply and provide incentives to efficiently redistribute collateral from those with a surplus to those with a deficit. Second, recent and future expected increases in the amount of HQLA should satisfy most, if not all, of the expected additional demand. Third, the multi-year time frame over which new regulations will be implemented should mitigate any abrupt changes in collateral prices or business practices. Fourth, regulators and market participants can expand their collateral eligibility criteria on a risk-adjusted basis, or provide prudent collateral transformation services to increase the pool of assets regarded as safe or to help efficiently allocate collateral across market participants.

Authorities should closely monitor the transition to a more collateralized financial system, however, to assess and alleviate the potential risks posed by private sector responses to any collateral scarcity that might arise.

## References

Bank for International Settlements (BIS). 2012a. "Statistical Release: OTC Derivatives Statistics at End-December 2011."

———. 2012b. "Statistical Release: OTC Derivatives Statistics at End-June 2012."

Basel Committee on Banking Supervision (BCBS). 2010a. "Results of the Comprehensive Quantitative Impact Study."

———. 2010b. "Basel III: International Framework for Liquidity Risk Measurement, Standards and Monitoring." Consultative Document.

———. 2012a. "Results of the Basel III Monitoring Exercise as of 30 June 2011."

———. 2012b. "Results of the Basel III Monitoring Exercise as of 31 December 2011."

Basel Committee on Banking Supervision and Board of the International Organization of Securities Commissions (BCBS-IOSCO). 2012. "Margin Requirements for Non-Centrally-Cleared Derivatives." Consultative Document.

———. 2013. "Margin Requirements for Non-Centrally-Cleared Derivatives." Second Consultative Document.

Brunnermeier, M. K. and L. H. Pedersen. 2009. "Market Liquidity and Funding Liquidity." *Review of Financial Studies* 22: 2201–238.

Cœuré, B. 2012. "Collateral Scarcity—A Gone or a Going Concern?" Speech to the Joint Central Bank Seminar on Collateral and Liquidity in Amsterdam, 1 October.

Committee on Payment and Settlement Systems and Technical Committee of the International Organization of Securities Commissions (CPSS-IOSCO). 2012. "Principles for Financial Market Infrastructures." Policy Report.

Committee on the Global Financial System (CGFS). 2010. "The Role of Margin Requirements and Haircuts in Procyclicality." CGFS Papers No. 36.

———. 2013. "Asset Encumbrance, Financial Reform and the Demand for Collateral Assets." CGFS Papers No. 49.

Cruz Lopez, J. A. "Mind the Gap: Under-Collateralization in the Global and Canadian OTCD Markets." Bank of Canada Discussion Paper (forthcoming).

Financial Services Authority (FSA). 2012. "Collateral Upgrade Transactions (Includes Liquidity Swaps)." Consultative Report. Finalised Guidance No. FG/12/06.

Financial Stability Board (FSB). 2013. "Meeting of the Financial Stability Board in Zurich on 28 January." Press release.

Gorton, G. 2009. "Information, Liquidity, and the (Ongoing) Panic of 2007." *American Economic Review* 99 (2): 567–72.

Gourinchas, P.-O. and O. Jeanne. 2012. "Global Safe Assets." Unpublished manuscript, University of California and Johns Hopkins University.

Heller, D. and N. Vause. 2012. "Collateral Requirements for Mandatory Central Clearing of Over-the-Counter Derivatives." BIS Working Paper No. 373.

International Monetary Fund (IMF). 2012. "Safe Assets: Financial System Cornerstone?" Chapter 3 in IMF *Global Financial Stability Report: The Quest for Lasting Stability*, 81–122.

International Swaps and Derivatives Association, Inc. (ISDA). 2012. "ISDA Margin Survey 2012." Available at http://www2.isda.org/functional-areas/research/surveys/margin-surveys/.

Lawton, D. 2012. "EMIR: The Bigger Picture and Looking Forward." Speech to the Tradetech Conference, 22 November.

Levels, A. and J. Capel. 2012. "Is Collateral Becoming Scarce? Evidence for the Euro Area." *Journal of Financial Market Infrastructures* 1 (1): 29–53.

Office of the Superintendent of Financial Institutions Canada. 2012. "Financial Data—Banks." Retrieved from http://www.osfi-bsif.gc.ca/osfi/index_e.aspx?ArticleID=554 on 12 November 2012.

Singh, M. 2010. "Collateral, Netting and Systemic Risk in the OTC Derivatives Market." International Monetary Fund Working Paper No. WP/10/99.

———. 2011. "Velocity of Pledged Collateral: Analysis and Implications." International Monetary Fund Working Paper No. WP/11/256.

———. 2013. "The Changing Collateral Space." International Monetary Fund Working Paper No. WP/13/25.

Stein, J. 2013. "Overheating in Credit Markets: Origins, Measurement, and Policy Responses." Speech to a Research Symposium at the Federal Reserve Bank of St. Louis, 7 February.