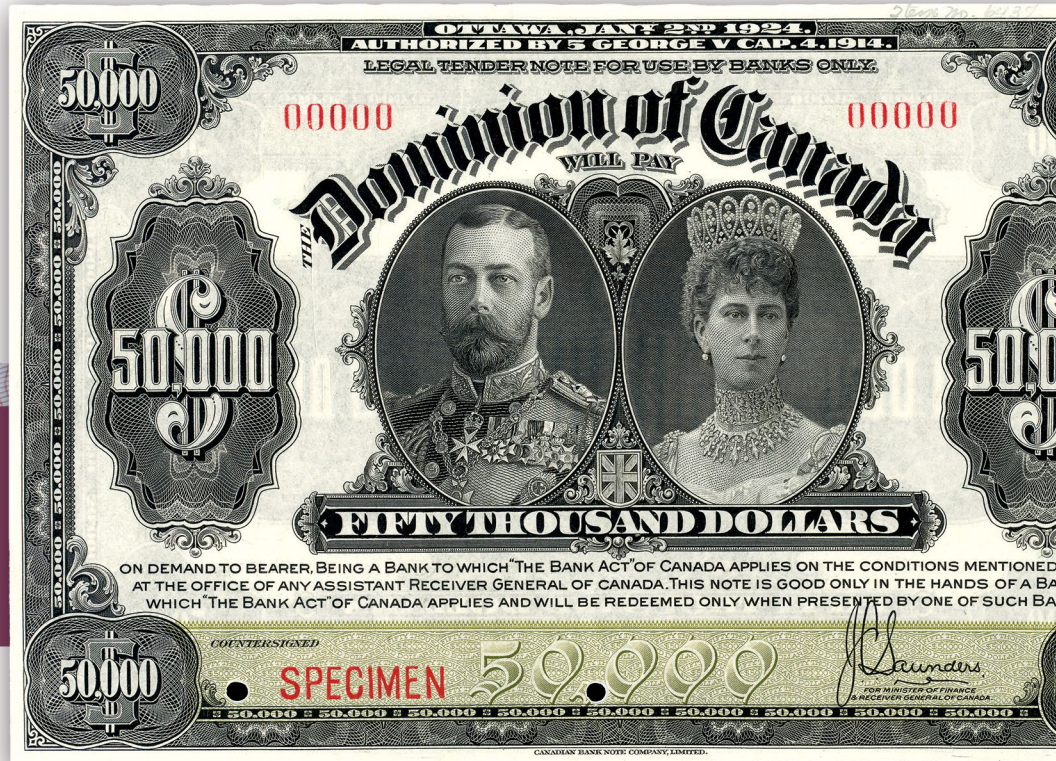




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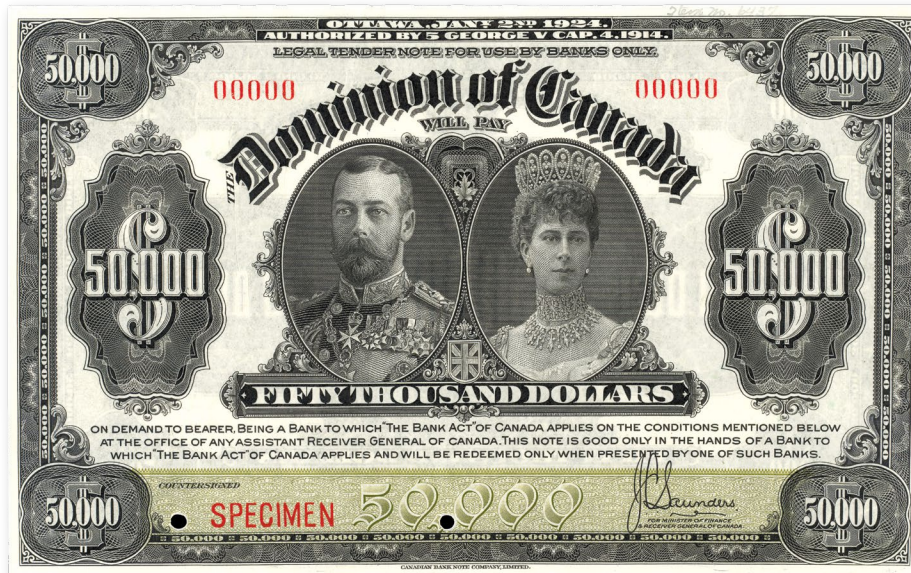
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Dominion of Canada, \$50,000 bank legal (specimen), 1924

For most of the 19th century, Canadian banks physically moved high-denomination, publicly negotiable bearer notes to settle their debts with each other. In 1896, to address the threat of robbery and make it easier for banks to hold their reserves, the federal government began issuing large-value notes, called bank legals, which could

only be used by banks. Initially, denominations of legals ranged from \$500 to \$5,000, but in 1918 and 1924 the government issued \$50,000 notes because settlement values had increased. In 1935, chartered bank reserves were transferred to the Bank of Canada, and these notes were no longer used.

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Reinventing the Role of Central Banks in Financial Stability

Domenico Lombardi, Centre for International Governance Innovation, and Lawrence Schembri, Bank of Canada

- Central banks have always played a significant role in promoting financial stability, especially in their capacity as lender of last resort. However, the 2007–09 global financial crisis has sparked a re-examination of this role.
- Central banks can contribute importantly to reducing the risk of financial stress and crises. Their efforts would be enhanced by coordinating with other domestic agencies within a well-articulated financial stability regime that incorporates micro- and macroprudential regulation and supervision and a clearly defined governance framework.
- Central banks are well positioned to identify, assess and communicate financial vulnerabilities and risks and engage in stress-testing activities with other prudential agencies because of their system-wide macro-financial perspective and understanding, their analytical capacity and their independent status.

Historically, the origins of many central banks, especially those established in the 20th century, can be traced to efforts to promote financial stability as a lender of last resort (LLR).¹ To take a significant example, the US Federal Reserve was initially created in 1914 to provide a central source of emergency liquidity, which was a policy gap revealed by the 1907 banking crisis. During the postwar period, however, central banks shifted their focus away from maintaining financial stability toward conducting monetary policy, with an emphasis on macroeconomic stability. The 2007–09 global financial crisis sparked a reassessment of central banks' roles, however, especially since it underlined that macroeconomic stability is necessary, but not sufficient, for financial stability (and vice versa).

Central banks are well placed to offer a systemic perspective to financial stability, given their macrofinancial focus. Efforts to incorporate a systemic perspective into financial regulation and supervision began in the aftermath of the Asian financial crisis (1997–98), which had macrofinancial origins.² The global financial crisis, however, greatly accelerated these developments, especially at the G20 level.³ The severe economic fallout from the crisis spurred a renewed focus on systemic risks to financial stability and

¹ See Bagehot (1873).

² Refer to Crockett (2000) for a discussion of the growing significance of financial stability in economic and financial policy at the turn of the century. Crockett also acknowledges that in understanding how to address financial stability, “the journey has probably just begun.”

³ See Lane (2013) for a discussion of the sizable macroeconomic impact of the crisis.

the development of financial policy frameworks. These frameworks chiefly enhanced global minimum standards for regulation and supervision to support the resilience of the financial system and seek to prevent or mitigate the buildup of financial imbalances or vulnerabilities. Regimes for financial system oversight at the national level are now being put in place to implement these global policies. Such regimes may need to be tailored to each jurisdiction's specific circumstances to achieve the desired prudential outcomes at the national level while still promoting global financial stability and global financial economic integration.

Central banks are playing a critical role in developing and implementing these new policy frameworks to reduce systemic risks to financial stability. Reinhart and Rogoff (2013, 48) suggest that “the pendulum is swinging back to place a greater weight on [its] initial mandate of financial stability.” While it remains to be seen how far the pendulum will swing, the role of central banks in promoting financial stability, especially in terms of financial crisis prevention, remains an active area of research and debate.

This article contributes to this discussion by synthesizing and building on the proceedings of a May 2016 workshop between policy officials and academics that was co-hosted by the Bank of Canada, the Centre for International Governance Innovation (CIGI), the Peterson Institute for International Economics (PIIE) and the International Monetary Fund (IMF).⁴ It provides a critical overview of the current thinking on the appropriate scope and functions of central banks in financial stability regimes and discusses how the role of central banks may continue to evolve.

The Pursuit of Financial Stability

The financial system plays a vital role in supporting the real economy by directing savings toward investment and by diversifying and hedging risk. An effective financial system contributes to strong rates of fixed capital formation and helps sustain employment and economic growth over the long run.

Systemic risk is the risk that the financial system as a whole becomes impaired and that the provision of critical financial services breaks down, with potentially serious consequences for the real economy. The experience leading up to the crisis and its aftermath highlighted that increasing financial vulnerabilities that lead to financial system instability can generate two broad types of costs to society: (i) the misallocation of resources during financial booms (leading to excess investment in one or more sectors, often housing, and to undue indebtedness and leverage) and (ii) the severe recessions caused and exacerbated by financial stress and crises.⁵

A financial stability policy regime that guards against these risks often involves a trade-off between the resilience of the system and its efficiency in supporting economic growth. Thus policies must balance the social costs of financial instability with the social benefits of a well-operating financial system.

The financial system is dynamic; new markets, instruments and institutions are constantly being developed. The majority of these innovations improve the efficiency of the financial system, but others—particularly those motivated by regulatory arbitrage—can create new and potentially destabilizing

◀ *Policies must balance the social costs of financial instability with the social benefits of a well-operating financial system*

⁴ The joint workshop, “Re-Inventing the Role of Central Banks in Financial Stability” was held in Ottawa on 5 and 6 May 2016. An earlier version of Tucker (2016) was prepared for this conference.

⁵ See Tucker (2016).

financial vulnerabilities.⁶ It is difficult to distinguish *ex ante* the innovations that improve the efficiency of the financial system from those that create new vulnerabilities.⁷

The next section lays out a conceptual framework for a regime that aims to reinforce the resilience of the financial system to withstand shocks, ensure that appropriate mechanisms are in place to handle crises and achieve a more forward-looking approach to mitigating the misallocation of resources.

Defining a financial stability regime

Efforts to address systemic risk and build resilience in the financial system span several policy areas, including microprudential supervision and regulation, macroprudential policy, liquidity provision, and management of the national balance sheet and related policy domains, such as the exchange rate regime and tax policy. They therefore involve the co-operative work of governments, central banks and financial supervisory and regulatory authorities.⁸

Tucker (2016) elaborates on a regime for financial system resilience or, as it is called in this article, a “financial stability regime” consisting of five elements:

- (i) a clear definition of a “standard of resilience,”
- (ii) microprudential regulation and supervision,
- (iii) macroprudential surveillance,
- (iv) macroprudential regulation, and
- (v) crisis-management tools and policies.

Establishing an explicit “standard of resilience” for the financial system is a useful starting point for an operationally effective financial stability regime because it sets out the basic financial stability objective that the authorities must seek to achieve. At the core of this standard is a clear and explicit designation of that jurisdiction’s tolerance of risk for crises. The standard of resilience determines the appropriate *aggregate* balance of costs and benefits for the financial system. The jurisdiction’s tolerance for crises should ideally be established through democratic processes. The central bank, however, can inform these processes through its analysis. Furthermore, once the standard has been defined, the central bank’s analysis can contribute to two additional elements that are necessary to articulate it clearly to the general public: (i) mapping out the processes by which shocks are transmitted through the financial system and (ii) identifying the first-round losses from those shocks.⁹

⁶ Regulatory arbitrage occurs when financial system participants innovate primarily for the purpose of avoiding existing regulation, thereby creating regulatory gaps.

⁷ Of course, some efficiency-improving processes may also increase financial stability risks. Indeed, new financial instruments or markets that initially increase efficiency can mutate into more vulnerable forms, for example, commercial paper and (illiquid) asset-backed commercial paper.

⁸ Tucker (2016) envisions a framework for stability that consists of four regimes: an inter-temporal macroeconomic stability regime that prioritizes domestic monetary stability; a national balance-sheet-management regime that seeks to avoid debt overhang and other resource misallocation; a global macroeconomic balance-sheet regime that aims to improve the stability of current account balances to support a more efficient allocation of global savings and investment; and a financial stability regime, which is the focus of this paper.

⁹ It should be noted that an important—but missing—element of this standard is how the choices concerning the *allocation* of the costs and benefits of the financial system are made throughout the various segments of society. While this is a crucial consideration, it is also best left to be determined by elected policy-makers.

In this framework, the other four components of the financial stability regime constitute the policy tools to monitor, identify and respond to emerging risks and manage the resulting financial stress should these risks materialize. Given its systemic macrofinancial perspective and its LLR role, the central bank is best placed to contribute to the last three components of the regime.¹⁰ Historically, the central bank's role in financial stability has primarily been to manage financial stress as the LLR, but in recent decades this role has broadened to also include stress or crisis prevention.

◀ *Historically, central banks have played the role of lender of last resort, but that role has broadened to include stress or crisis prevention*

Macroprudential surveillance involves analysis of the *system* to identify key linkages and behavioural feedback loops among and between financial markets and financial intermediaries. In doing so, surveillance helps identify financial market participants who are engaging in risky behaviour or regulatory arbitrage (which Tucker [2016] describes as “hidden actions”) that are detrimental to system-wide stability and economic activity.

Macroprudential regulation involves developing specific policy measures and strategies to mitigate the buildup of imbalances that create excessive financial system stability risks, such as credit booms and resource misallocation, during periods of strong economic expansion.

The financial crisis revealed serious weaknesses in the microprudential framework in several jurisdictions. For instance, non-banks that engaged in various forms of highly leveraged credit intermediation were not effectively regulated and supervised. In addition, most jurisdictions did not have an effective macroprudential authority (a single agency or an inter-agency committee) that is both responsible for monitoring, identifying and responding to systemic risks *and* empowered to address these risks.¹¹

The final component of the financial stability regime—crisis management—becomes operative when the measures to identify or mitigate key emerging risks are inadequate or when the adopted standard for resilience is breached and a financial crisis ensues.

The financial stability governance framework

Although the arrangements described above clearly identify and distinguish the critical elements necessary for an effective financial stability regime, there is no one-size-fits-all approach to its governance. Indeed, the exact roles of government (including the ministry of finance), the central bank and prudential authorities will vary by jurisdiction as a result of the diverse institutional structures, legal frameworks and financial system characteristics. In practice, a variety of institutional configurations for pursuing financial stability have emerged. Limited experience to date suggests that the effectiveness of one regime over another is dependent on the context, with no one framework being ideal for all jurisdictions (Lombardi and Siklos 2016).

Ultimately, two elements are paramount for an effective financial stability regime, regardless of the specific institutional configuration. First, the agencies responsible for each of the functions of a regime must be assigned clear mandates and empowered with sufficient policy tools to implement

¹⁰ While effective microprudential regulation and supervision are critical to the success of the financial stability regime, there is no consensus on whether the central bank should be allocated microprudential, regulatory or supervisory responsibilities. See Goodhart (2000) and Nier et al. (2011) for an overview of this ongoing debate.

¹¹ Since 2009, G20 leaders and policy-makers have been developing and implementing a comprehensive program to reform regulation at the global level to address these stability issues across the financial system (Knight 2014 and 2015). Policy-makers have accelerated their efforts toward establishing responsible authorities as a result of pressures to ensure that accountability for financial stability is clearly allocated (Lombardi and Moschella 2016; Lombardi and Siklos 2016).

those mandates.¹² Failing to assign and delineate responsibilities for financial stability, including implementing a framework for macroprudential policy, will hinder a given regime's ability to pursue the financial stability objective and may also put the central bank in a difficult position since its role in promoting financial stability may not be well understood by the public.¹³ Second, multiple governments and agencies at the national and international levels have important and often complementary roles in promoting financial stability in the present international financial system because it is highly integrated across jurisdictions and spans a wide range of financial markets and institutions. Given this integration, and the opportunity for regulatory arbitrage, the various parties need to work together to monitor emerging vulnerabilities and to develop and consistently implement minimum global regulatory and supervisory standards. The next section highlights the characteristics and existing roles of central banks that make them well suited to play a vital role in the financial stability regime.

The Evolving Role of Central Banks

The pursuit of financial stability is at the very core of the mandates and functions of central banks. In particular, they have a natural role to play as LLR in response to financial stress, and they usually have broad responsibility for the oversight and operation of the payments and settlements infrastructure. In addition, central banks, given their macro perspective, are generally responsible for monitoring and reporting on systemic risks. Some central banks, such as the Bank of England or the US Federal Reserve Board, have broader prudential regulatory and supervisory responsibilities. As discussed below, financial stability concerns also factor into decision making since they relate to the objectives and effectiveness of monetary policy.¹⁴

Central banks are well placed to contribute importantly to the financial stability regime for several reasons. To start with, they have a system-wide perspective and consider macrofinancial linkages when analyzing business and financial cycles. Further, they have significant technical and modelling capacities associated with their macroeconomic stability objectives. There are also several operational features of central banks that further bolster their ability to contribute to the financial stability objective. For example, central banks acquire market intelligence through their conduct of financial market operations to implement monetary policy, to manage their balance sheets and, in some cases, to carry out foreign reserve and government financial transactions. Moreover, to the extent that they are independent from political pressures, central banks can arguably be more objective in undertaking risk analysis and making remedial policy recommendations. Finally, they are able to actively exchange information and consult with a wide range of public and private sector participants in the financial system on the monitoring and mitigation of financial vulnerabilities, and they often have the legal authority to acquire relevant data (Duffie 2016; He 2016; Mosser 2016).¹⁵

◀ *Central banks are well placed to contribute importantly to the financial stability regime*

¹² Clear mandates with sufficient accountability are necessary for reducing inaction bias when taking appropriate policy actions to pursue financial stability. Inaction bias is primarily driven by the fact that the costs of policy actions to mitigate the buildup of financial imbalances have negative short-term implications that are very visible, while the benefits of long-term economic gains from the maintenance of sustained financial stability are less easily perceived. Not implementing the necessary policy tools because they may increase the cost or decrease the availability of credit is an example of an inaction bias (Houben 2016).

¹³ See Goodfriend and King (2015) for an analysis of this type of circumstance with regard to the Swedish Riksbank from 2010 to 2015.

¹⁴ For a thorough discussion on the interaction between the price stability and financial stability mandates and the role of monetary policy in pursuing financial stability, see IMF (2015).

¹⁵ The collection and construction of data, however, are normally best left to other independent agencies.

That said, a central bank's reputation and credibility may be at risk should it be solely responsible (or perceived by the general public as being primarily responsible) for maintaining financial stability. In particular, central banks typically have authority over only a small set of tools for mitigating systemic vulnerabilities and risks and therefore should not be held accountable, in all instances, for inadequate defence against the buildup of financial imbalances. In addition, experience suggests that some financial systems may be particularly prone to instability and crises because of a lack of political will to establish an effective financial stability regime. Assigning sole responsibility for financial stability to a central bank in such circumstances could contribute to public dissatisfaction, which would erode central bank credibility more broadly (Johnson 2016) and thus undermine both financial and economic stability if not addressed.

Enhancing traditional roles

Central banks have traditionally played an important role in financial crisis management by acting as the LLR. After more than a century, the objectives and principles elaborated by Walter Bagehot remain at the core of the LLR function. But, the scope and application of the LLR function has evolved with the creation of new financial products and the development of new ways of originating financial instruments. Lessons from the financial crisis suggest that several possible extensions of the LLR function should be considered. Policy-makers should, for example, consider providing liquidity to a wider range of regulated financial institutions as well as to financial market infrastructures (FMIs) and against a broader range of collateral. Many central banks ended up creating new liquidity facilities during the crisis and have subsequently adjusted their policy frameworks to provide exceptional market-wide access to liquidity in times of severe stress.¹⁶ The Bank of Canada, for example, recently enhanced its LLR policies along the lines described above, requiring that financial institutions have a credible recovery and resolution framework to be eligible for emergency lending assistance (ELA) and by allowing designated FMIs to be eligible for ELA (Bank of Canada 2015). While the LLR capacity is a crucial component of the crisis-management regime, it remains exactly that—a policy of last resort.

Monetary policy—particularly its role in promoting financial stability—is another central bank responsibility that has been revisited based on the lessons learned from the financial crisis. The debate on the “lean versus clean” roles of monetary policy to manage financial vulnerabilities has been supplanted by a more nuanced approach. This approach argues that monetary policy is too blunt an instrument to mitigate these vulnerabilities alone. Instead, it should remain focused on achieving its inflation-target objective yet complement macroprudential policy in managing financial vulnerabilities by adjusting the horizon over which it achieves its inflation target.¹⁷ The Bank of Canada, for example, has adopted a risk-management approach to monetary policy decision making that incorporates both risks to inflation and risks to financial stability to achieve its primary inflation-target objective.¹⁸

◀ *The scope and application of the lender of last resort function has evolved with the creation of new financial products and the development of new ways of originating financial instruments*

¹⁶ Refer to BIS (2014) for a discussion on rethinking the design and application of LLR after the crisis.

¹⁷ Similarly, monetary policy should not be viewed as the last line of defence against financial stability risks but should be part of a comprehensive approach to mitigate financial vulnerabilities and reduce the risk of financial instability. See Schembri (2016).

¹⁸ See Poloz (2015).

Expanding communication and systemic risk analysis

As discussed earlier, most central banks are already responsible for monitoring systemic financial vulnerabilities and risks and communicating their assessments to other domestic agencies and the public. There are several ways that central banks can build on these activities and contribute more broadly to maintaining financial stability (beyond any microprudential responsibilities they may have). Specifically, as elaborated by Schembri (2016), central banks can

- (i) encourage prudence by borrowers and lenders by publishing financial vulnerability and risk assessments;
- (ii) enhance market discipline through increased transparency about financial vulnerabilities and risks, including the provision of relevant data, so that market participants can better price and manage risk;
- (iii) help strengthen financial regulation and supervision by participating in macro stress-testing exercises on the banking system and by analyzing the effectiveness and possible unintended consequences of regulations on the functioning of the financial system; and
- (iv) contribute to the development and implementation of macroprudential policies, including by analyzing the effects of such policies, investigating how financial innovation affects financial stability, and identifying regulatory arbitrage.

All of these functions are related to macroprudential surveillance. The first two are focused specifically on communicating vulnerability and risk assessments to strengthen self-discipline by increasing public awareness and reducing information externalities to financial market participants. The importance of communicating risk assessments, however, goes much deeper than simply increasing information on financial vulnerabilities and risks. Accountability for the accuracy of these assessments rises when risk assessments are made public, thereby increasing the incentive to improve the quality of data in a virtuous circle. Greater public awareness also helps generate support for implementing policies to mitigate financial stability (He 2016).

Publicly communicating risk assessments therefore plays a fundamental role in supporting the financial stability regime by ensuring that it is empowered to address the buildup of imbalances. For example, to try to leverage some of the benefits of greater communication, the European Central Bank (ECB) recently published its first biannual *Macroprudential Bulletin*, which is intended to raise the visibility of the ECB's macroprudential policy mandate, with the objectives of improving the transparency of its analysis and increasing knowledge of national and European macroprudential policies (Constâncio 2016a).

There are, however, several challenges to communicating risk assessments. To start with, clearly defining the objective of financial stability is a challenge because it is a long-term phenomenon whose costs and benefits are difficult to identify and quantify *ex ante*. Furthermore, it is difficult to communicate systemic risks in a way that is well understood by the public: financial system risk involves complex processes that must be translated into comprehensive, yet intuitive, risk profiles (Mosser 2016).

There are also several potential costs inherent in communicating risk to the public. First, the public and financial market participants might have unrealistic expectations about the central bank's ability to predict when risks will be realized. This is because these are unlikely tail events: vulnerabilities can persist for some time before a shock that triggers the realization of the related risk. Over time, the misalignment of the public's expectations with the central bank's capabilities could damage the institution's credibility. Second, the communication of risk could trigger the risk as a result of an excessive market reaction during times of high stress or risk aversion. Third, the confidentiality of the financial data of individual or small groups of institutions must be maintained (He 2016).

Roles in macroprudential policy

Central banks can play important roles in informing the development of micro- and macroprudential policy. Because they have the necessary system-wide perspective and technical capacity, as well as the institutional features listed at the beginning of this section, central banks are able to contribute significantly to developing and deploying macroprudential stress tests. Stress tests are an important tool for quantifying systemic risks, translating crisis scenarios into quantitative shocks, creating conditional forecasts and identifying fault lines to help prevent and manage future crises (He 2016).

Traditionally, financial stress testing has focused on whether individual institutions have enough capital and liquidity to withstand various economic and financial shocks. Macroprudential stress tests go beyond these individual assessments by considering banks' reactions to scenarios; two-way interaction between banks and the real economy; contagion effects among financial institutions (including non-banks), financial markets and financial infrastructure; and analysis of interactions with other non-financial sectors relevant for banks' risk management (Constâncio 2016b).

Macroprudential stress tests can also be used as an active surveillance tool within the financial stability regime because they go beyond static and largely qualitative assessments to construct quantifiable macroeconomic risk scenarios, with explicit triggers to determine the level of resilience that financial institutions must maintain. Stress tests can therefore be used to identify vulnerabilities and as a basis to inform policy discussions to address them. The fact that these stress tests are concerned with institutional resilience does, however, blur the line between micro- and macroprudential supervision. In this respect, Tucker (2016) suggests that "the enterprises of microprudential supervision and system-wide surveillance simply don't make sense—are incoherent—as stand-alone activities." Thus, all components of the stability regime should ideally be coordinated rather than operate independently.

The practical work of macroprudential regulation is a dynamic activity that consists of identifying and assessing these vulnerabilities and risks and taking the necessary mitigating actions. Tucker (2016), for example, suggests that the transmission of shocks and the realization of risks that generate losses could be in any phase of the financial cycle—whether normal, exuberant or depressed. In the exuberant stage, for example, when credit and leverage are increasing rapidly, stronger macroprudential regulation, including the implementation of the countercyclical capital buffers, is likely necessary to increase financial resilience and mitigate the buildup of financial imbalances.

◀ *All components of the financial stability regime should ideally be coordinated rather than operate independently*

Conclusion

The financial system is by its nature ever-changing. An effective financial stability regime must, therefore, be dynamic. It must combine vigilance with flexibility to identify, assess and respond to new vulnerabilities as they emerge. The regime should progress as understanding deepens on the interactions between the financial system and real economy, as analytical and modelling capabilities advance and as the quality of data improves. By working in tandem with other agencies, central banks can make important contributions to the stability regime, based on their system-wide macrofinancial perspective and their analytical capacity.

Because developing and implementing financial stability regimes remains a work in progress across jurisdictions, there are a number of priority areas for further research to better understand how to implement macroprudential policy and what role central banks should play in this process. First, it will be desirable to define as clearly as possible the standard of resilience in each jurisdiction. Second, to better understand the channels of financial and economic feedback, including contagion, the macroprudential policy framework should be extended by expanding the stress-testing framework beyond regulated banks to include other sectors of the financial system. Finally, more thinking is needed to develop effective co-operative approaches across public authorities to monitor, share information on and mitigate (or prevent) hidden actions, including financial innovation or mutation and regulatory arbitrage, especially cross-border.

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Market Operations and Liquidity Provision at the Bank of Canada

Mark de Guzman, Financial Markets Department

- The Bank of Canada has a responsibility to conduct monetary policy to maintain a low and stable rate of inflation and, in co-operation with other agencies, to promote the stability and resilience of Canada's financial system.
- To achieve its monetary policy and financial stability objectives, the Bank has established a clear framework to guide its financial market operations, support the provision of routine liquidity to facilitate settlement in the payments system, and respond to extraordinary or emergency liquidity needs.
- Although the framework was generally effective throughout the 2007–09 global financial crisis, the Bank recently updated it to help ensure that it remains so. Going forward, the Bank must continue to be proactive and respond to the evolving financial system in a prudent and calibrated fashion, considering and making future enhancements to the framework as needed.

This article provides a concise overview of the Bank of Canada's framework for market operations and liquidity provision.¹ Throughout the discussion some of the enhancements to this framework that have recently been implemented are described. These enhancements were motivated by developments in the financial market environment during and following the 2007–09 global financial crisis.

The Bank of Canada's Framework for Market Operations and Liquidity Provision

The Bank conducts a range of financial market operations as part of its regular responsibilities and provides liquidity to the Canadian financial system as required. Each of the operations and facilities, or tools, is designed to achieve one or both of the following objectives:

- implement monetary policy by reinforcing the Bank's target for the overnight rate
- support financial stability by facilitating the efficient functioning of Canadian financial markets and by providing backstop liquidity under extraordinary circumstances

¹ For the complete framework, including terms and conditions and other related information, see <http://www.bankofcanada.ca/markets/market-operations-liquidity-provision/framework-market-operations-liquidity-provision>.

The Bank's framework is predicated on using targeted and well-designed tools to provide market participants with an incentive to trade with each other. The tools focus on liquidity—providing or absorbing it—as a means of influencing short-term interest rates under normal market conditions. These tools can also be used to help resolve a more protracted liquidity shortage, whether it is broad-based or at a specific Canadian financial institution. Factors related to liquidity provision, such as distribution, timing and amount, are therefore important considerations to ensure the effectiveness of the Bank's framework. The tools are facilitated by—and influence—the size, structure and management of the Bank's balance sheet.

Under normal market conditions, the Bank prefers to adopt a less active role in markets to help minimize potential distortions from its activities. It uses its tools only when necessary to reinforce its monetary policy and financial stability objectives and relies on its counterparties to redistribute central bank liquidity. Under this approach, the Bank's counterparties facilitate the transmission of its policy objectives to the broader Canadian financial system, given that these counterparties are the system's main market participants and play a central role in influencing liquidity conditions.

In situations of severe market-wide liquidity stress, the Bank generally continues to rely on its counterparties to redistribute liquidity. It is quite likely, however, that the Bank would take on a more active role in providing liquidity, as it did in response to the 2007–09 global financial crisis when it activated a number of temporary market-wide facilities. The parameters of these facilities varied along different dimensions, including eligible counterparties, eligible securities and terms. As well, the Bank might, for example, provide market-wide liquidity more frequently, perhaps even make it readily available, or it might respond to persistent liquidity shortages of specific financial institutions directly.

◀ *The Bank of Canada prefers to adopt a less active role in markets under normal conditions to help minimize potential distortions from its activities*

Ensuring the Bank's Framework Remains Effective

Financial markets are dynamic, constantly evolving and adapting to change. To help ensure the effective implementation of monetary policy and to support the smooth and efficient functioning of the Canadian financial system, it is important for the Bank to be alert to any changes. The Bank's aim is to be proactive and respond to the evolution of the financial system in a prudent and calibrated fashion.

For these reasons, in 2013 the Bank began a review of its framework for market operations and liquidity provision that was completed in 2015. The review took into account experiences in responding to the global financial crisis both in Canada and in other jurisdictions as well as the evolving operational practices at other major central banks. Following the review, the Bank published a consultation paper in which several framework enhancements were proposed.² The underlying objectives of the enhancements were to increase the effectiveness of the overall framework in response to the ongoing and expected changes in the external environment, including lessons learned from the crisis, and to manage the expected future growth in the Bank's balance sheet.

Some of the changes considered in the external environment relate to the ways financial institutions manage their liquidity needs. In Canada, for example, liquidity across the system has typically been distributed by the

² See <http://www.bankofcanada.ca/2015/05/public-consultations-bank-canada-framework-financial-market-operations> for further information about the Bank's consultation papers.

major banks and primary dealers. At present, there are 17 participating financial institutions in the Large Value Transfer System (LVTS)—Canada’s main payment system and a key part of monetary policy implementation. These institutions have accounts at the Bank of Canada and execute payments with each other throughout the day. But primary dealers of Government of Canada securities are the main counterparties to the Bank in its market operations. These institutions can access and redistribute central bank liquidity more broadly over the normal course of their business activities.

Over the past few years, however, this liquidity redistribution channel has evolved. Specifically, the Bank has observed that financial institutions have become somewhat less willing to borrow extra liquidity through the Bank’s operations and redistribute it to others. It appears that these institutions have become more focused on meeting their own liquidity needs. More broadly, financial institutions have been rationalizing the use of their balance sheets and moving away from balance-sheet-intensive and low-margin business lines. Although there have been no major liquidity disruptions from this change in financial institutions’ behaviour, it was prudent to consider such behaviour when the Bank’s framework was being updated.

Other considerations were the changing dynamics in core funding and government debt markets, including increased demand for such high-quality liquid assets, and the degree of Government of Canada securities trading “on special,” that is, at repo rates well below the general collateral rate. From 2013 to 2015, a growing number of Government of Canada bonds were persistently being traded on special, causing tightness, or pressure, in the repo market. Repo tightness typically reflects an imbalance between the demand for and availability of certain securities in the repo market. Protracted repo tightness can affect the cash prices of these bonds and contribute to a reduction in market liquidity. It can also lead to an increase in settlement fails.³

Several structural and cyclical factors had been at play in causing this more widespread and persistent repo tightness over this period, including the following:

- increased foreign ownership of Government of Canada bonds,
- changes in the activities of financial institutions in the repo and securities-lending markets,
- greater demand for high-quality assets (partly to meet regulatory requirements) and
- lower financial incentives to lend out bonds given low interest rates.⁴

Another important consideration was the changing dynamics in the Bank’s balance sheet. Although the volume of currency in circulation—the largest liability for the Bank—has recently outpaced the growth of nominal gross domestic product (GDP), it has historically increased in line with GDP and was assumed to do so. This would increase the Bank’s asset requirements accordingly. As part of its market operations, the Bank had been purchasing

◀ *One of several changes the Bank of Canada has observed is that financial institutions have become less likely to borrow extra liquidity through the Bank’s operations to redistribute to others*

³ A settlement fail occurs when, on the settlement date of a trade, either the seller does not deliver the securities in due time or the buyer does not deliver funds in the appropriate form.

⁴ The incidence of bonds trading on special in Canada has declined significantly over the past year because overall holders were more active participants in the repo and securities-lending markets.

a fixed share of 20 per cent of each nominal bond at auction for its balance sheet and, in some scenarios, that share would have to be raised further if no changes were made to the Bank's purchases.⁵

An increase in the Bank's participation at each auction would further reduce the tradeable float of Government of Canada securities in an environment of increasing investor demand for such securities, in part reflecting regulatory changes. Such a reduction was expected to have some effect on the liquidity of Government of Canada securities, and the Bank's purchases of these securities were therefore considered part of the potential enhancements.

After completing its review, the Bank concluded that its framework for financial market operations and liquidity provision has generally been effective in achieving its objectives but that making some enhancements in several areas would be prudent. Interested parties were invited to provide comments on the proposed enhancements, and the Bank also held a series of meetings with industry associations and other stakeholders.

Respondents were supportive of the overall direction of the Bank's proposed changes. The comments acknowledged the Bank's efforts to enhance certain areas of its financial market operations to improve the effectiveness of the overall framework in light of ongoing and expected changes in the external environment. Respondents also acknowledged the Bank's efforts to manage its balance sheet in a manner appropriate to achieving its monetary policy and financial stability objectives.

Taking into consideration the feedback received, the Bank implemented several changes to its framework for financial market operations and to its Emergency Lending Assistance (ELA) policy, which have been in place since 1 October 2015.⁶ The framework described below is the Bank's current framework that reflects these enhancements. **Table 1** at the end of this article summarizes the Bank's framework for market operations and liquidity provision.

◀ *Changes to the Bank of Canada's framework for financial market operations and its Emergency Lending Assistance Policy have been in place since 1 October 2015*

Reinforcing the Target for the Overnight Rate

The Bank of Canada conducts monetary policy by setting and reinforcing the target for the overnight interest rate, often referred to as the policy rate, through its market operations. This directly influences the interest rates at which banks and other financial system participants borrow and lend funds for a term of one business day. The level of the overnight interest rate and expectations about its future path also influence other longer-term interest rates as well as a broader range of asset prices.

Because almost all wholesale payments (measured by value) flow through the LVTS, it is the focus of the Bank's monetary policy operating framework.⁷ To facilitate trading at the target rate, the framework includes the operating band, or interest rate corridor, which is in turn supported by standing deposit and lending facilities.⁸ The midpoint of the operating band

5 See http://www.bankofcanada.ca/wp-content/uploads/2010/07/statement_policy.pdf for further information on the Bank's policy for acquiring and managing financial assets for its balance sheet.

6 The revised ELA policy was published in December 2015. See <http://www.bankofcanada.ca/markets/market-operations-liquidity-provision/framework-market-operations-liquidity-provision/emergency-lending-assistance/> for more information on the ELA policy.

7 See <http://www.bankofcanada.ca/core-functions/financial-system/canadas-major-payments-systems/#lvts> to learn more about the LVTS.

8 There are two standing lending facilities: the Standing Liquidity Facility, which is available to LVTS participants, and the Overnight Standing Repo Facility (formerly the Overnight Standing Purchase and Resale Agreement Facility), which is available to primary dealers.

is the Bank’s target for the overnight rate, and the presence of the standing deposit and lending facilities provides strong incentives for transactions between major participants in the overnight market to take place at or near the target rate.

The level of the settlement balances available in the system can also be adjusted to address some frictions in the payments system, such as timing differences or forecast errors, and to further support trading at the target for the overnight rate.⁹ Unexpected payment frictions in the market can, however, sometimes put pressure on liquidity and cause the overnight rate to move away from the Bank’s target rate during the day. If the Bank judges that this deviation stems from broad-based payment frictions, it can offset this pressure by adding or withdrawing liquidity using overnight repo or overnight reverse repo operations.

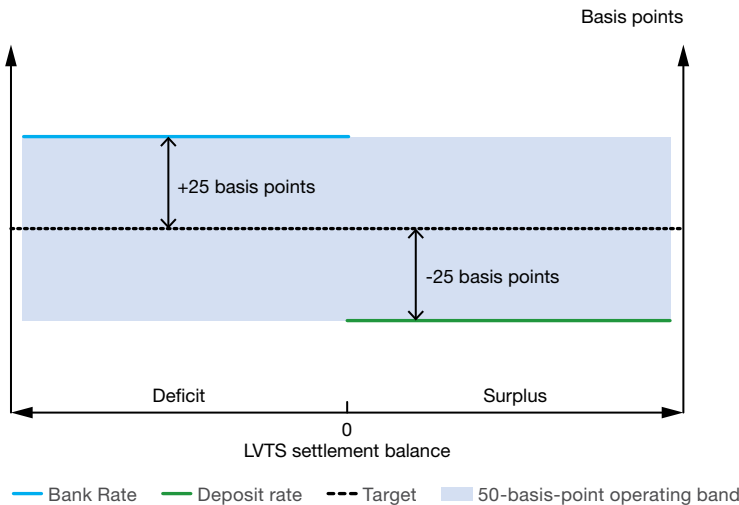
◀ If the Bank judges deviation of the overnight rate stems from broad-based frictions, it can offset pressure by adding or withdrawing liquidity with routine operations

Operating band

The Bank’s operating band is an interest rate corridor of 50 basis points around the Bank’s target for the overnight rate (Figure 1). LVTS participants in a positive position in the LVTS at the end of each day must leave these funds on deposit with the Bank in their settlement account. The remuneration rate for these settlement accounts is the “deposit rate” (the target rate minus 25 basis points), which is the bottom of the operating band.

Conversely, LVTS participants in a deficit position at the end of the day must ensure that the balance in their settlement account is at least zero. To offset their deficit position, these participants must take an overnight collateralized advance from the Bank through the Standing Liquidity Facility (SLF) at the Bank Rate (the target rate plus 25 basis points), which is the top of the operating band.

Figure 1: The Bank of Canada’s operating band



⁹ On a daily basis, there can be uncertainty about the timing of specific market transactions, such as the settlement date for when a merger and acquisition can occur, or forecasting errors, particularly on high volume days, because of the challenges that LVTS participants face in estimating both their own cash flows and those of their clients.

These arrangements encourage transactions for overnight funds in the marketplace to be at rates within the operating band. This is because participants know that if they have a positive balance they will earn the deposit rate, at a minimum, and will not need to pay more than the Bank Rate to cover shortfalls in their settlement account. Given that the opportunity costs of borrowing from and depositing funds with the Bank at the end of each day are generally the same when using the midpoint of the operating band as a reference (i.e., ± 25 basis points), participants have an incentive to trade with each other at or near the Bank's target for the overnight rate.

Standing Liquidity Facility

Through the SLF, the Bank of Canada can routinely provide overnight credit (advances) to participants in the LVTS that are experiencing temporary liquidity shortages as a result of unexpected payment frictions.¹⁰ Advances extended by the Bank to LVTS participants under the SLF must be secured using a wide range of high-quality collateral.¹¹ By enabling overnight settlement in the LVTS payments system, the SLF reinforces monetary policy and facilitates the smooth functioning of the financial system.

The Bank reinforces monetary policy with the SLF because LVTS participants accessing the SLF pay the Bank Rate. The higher cost of using the SLF provides an incentive for LVTS participants to cover their net deficit positions by trading with other participants at rates within the operating band before settling using the SLF. While only LVTS participants have access to the SLF (and a deposit facility), this incentive supports the Bank's monetary policy objectives more generally by influencing the behaviour of a broader group of market participants through their interactions with LVTS participants.

The SLF also encourages the smooth functioning of the financial and payment systems by providing overnight liquidity to institutions that are unable to borrow from their LVTS counterparts. In the majority of cases, LVTS participants are able to borrow from each other to settle any end-of-day net deficit position in the payments system. There may be occasions, however, when a participant finds itself unable to find a lending LVTS counterpart on short notice because of cash flow timing differences or technical and operational reasons, such as reaching constraints on its risk-management counterparty credit limit. The SLF ensures that LVTS participants are able to cover temporary shortfalls in funds that can arise from the daily flow of LVTS payments.

Institutions experiencing persistent liquidity shortages—shortages that would typically reflect a more structural funding stress at the institution—should not be accessing the SLF. In such extraordinary circumstances, the institution should consider requesting ELA from the Bank.

Overnight Standing Repo Facility

In 2009, the Bank introduced a new standing facility, the Overnight Standing Repo Facility (formerly the Overnight Standing Purchase and Resale Agreement Facility), intended to provide a source of funding for primary dealers in Government of Canada securities that do not have access to the SLF. The facility provides a funding backstop at the Bank Rate to primary

¹⁰ See <http://www.bankofcanada.ca/core-functions/financial-system/canadas-major-payments-systems> to learn more about Canada's major payment systems.

¹¹ Eligible collateral includes securities issued or guaranteed by the Government of Canada or a province as well as other high-quality securities that meet the Bank's SLF collateral policy. For more information on collateral eligible for the SLF, see <http://www.bankofcanada.ca/2015/06/assets-eligible-collateral-under-bank-canadas-standing-liquidity-15-june-2015>.

dealers on an overnight secured basis. It helps address potential gaps with respect to the implementation of monetary policy through the payments system by ensuring that all main participants in the overnight funding market have similar access to secured overnight liquidity at the Bank Rate, reinforcing the top of the operating band.

Adjustments to the level of settlement balances

At the end of each day, the Bank sets a target for LVTS settlement balances that is effective for the following day. This helps set trading conditions for the overnight market. As well, changes in the targeted level of settlement balances can act as a powerful signal of the Bank's resolve to reinforce its target for the overnight rate.¹²

The LVTS is a closed system, which means that the net overall cash position of the entire system will always be zero. LVTS participants with deficit positions therefore know that there is at least one participant in the system with an offsetting surplus position and that this participant is a potential counterparty for transactions at market rates. The Bank is also a participant in the LVTS and provides positive settlement balances to the other participants by simply targeting a deficit LVTS position for itself. The settlement balances provided by the Bank help reduce transaction costs and other frictions during the end-of-day process. As a result, they lessen the need for participants in deficit positions to take frequent small advances from the Bank because participants should be able to cover a deficit position by borrowing from other participants.

Changing the level of settlement balances is an effective policy tool for reinforcing the Bank's target for the overnight rate, particularly when it is facing somewhat persistent or seasonal upward pressure, such as around quarter-ends and the fiscal year-end of commercial banks.¹³

Increasing the level of settlement balances provides a strong incentive for LVTS participants to lend their cash, thus putting downward pressure on the overnight rate because higher settlement balances will result in some participants being in a positive position at the end of the day. These funds must be deposited overnight through the Bank's deposit facility and remunerated at the deposit rate.

Overnight repo and overnight reverse repo operations

The Bank conducts overnight repo and overnight reverse repo operations to further support the effective implementation of monetary policy by injecting or withdrawing intraday liquidity, thereby reinforcing the Bank's target for the overnight rate.

If transactions in the Canadian overnight market for general collateral are generally being conducted at rates above the Bank's target, the Bank may inject liquidity using overnight repo operations by purchasing Government of Canada securities from primary dealers, with an agreement to resell those securities to the same counterparty the next business day. Conversely, the Bank may withdraw liquidity using overnight reverse repo operations.

¹² See <http://www.bankofcanada.ca/markets/market-operations-liquidity-provision/framework-market-operations-liquidity-provision> for more information on how the Bank achieves its target level for settlement balances.

¹³ In spring 2009, amid the global financial crisis, the Bank temporarily adjusted its operating framework when the target for the overnight and the deposit rates were both set at 0.25 per cent. To steer the overnight rate to this value, the Bank set the target level for settlement balances at \$3 billion, its highest level since the inception of the LVTS.

Before 1 October 2015, these operations were conducted at a fixed rate equal to the Bank's target. Following an internal review of the Bank's market operations framework, however, these operations have since been conducted using a competitive auction and have higher counterparty and aggregate limits. This change in the way funds are distributed allows them to be channelled to counterparties that need them most.¹⁴ If necessary, the Bank is prepared to offer multiple rounds of overnight repo or reverse repo operations.

◀ *The change in the way the Bank distributes funds in its overnight repo operations allows them to be channelled to counterparties that need them the most*

Facilitating the Efficient Functioning of Canadian Financial Markets

The Bank undertakes financial market transactions with eligible counterparties to support monetary policy and the efficient functioning of Canadian financial markets. These transactions typically involve the purchase and sale of financial assets. The size of the Bank's holdings of financial assets is generally driven by its role in issuing currency, specifically bank notes or paper money, and the amount of it in circulation. The issuance of currency creates a liability for the Bank, the largest on its balance sheet. Government of Canada deposits, including those supporting the government's prudential liquidity plan, typically represent the Bank's second-largest liability.

To offset these liabilities, the Bank needs to hold financial assets. A small amount of these are foreign assets, primarily shares in the Bank for International Settlements (BIS). Apart from the BIS shares, these assets are mainly denominated in Canadian dollars, as are the Bank's liabilities, and composed mostly of investments in Government of Canada securities and term repos.¹⁵ Decisions about acquiring and disposing of financial assets and managing the Bank's balance sheet are based on the guidelines of neutrality, prudence and transparency.¹⁶

The Bank maintains neutrality by conducting its transactions in as broad a manner as possible to limit market distortions from its investment activities. Prudence is exercised primarily by selecting assets that have a low credit risk, and the Bank achieves transparency by communicating its balance-sheet activities to the public.¹⁷

Government of Canada Securities Portfolio

The Bank's outright holdings of Government of Canada nominal bonds and treasury bills are structured to broadly reflect the composition of the federal government's stock of nominal domestic marketable debt.¹⁸ Typically, a fixed percentage of Government of Canada bonds is acquired at each

¹⁴ Overnight repos are traded at rates equal to or higher than the Bank's target rate, depending on market conditions and bidding behaviour at the auction. Similarly, overnight reverse repos are traded at rates equal to or lower than the Bank's target rate.

¹⁵ The Bank's purchases of Government of Canada nominal bonds and treasury bills are conducted on an outright basis through non-competitive bids at Government of Canada securities auctions. The Bank may also acquire previously issued Government of Canada securities that are already trading in the market.

¹⁶ When market conditions warrant, the Bank can implement unconventional monetary policies, which may involve targeted purchases to affect certain segments of the yield curve or purchases of other assets. See the December 2015 speech by Poloz titled, "[Prudent Preparation: The Evolution of Unconventional Monetary Policies](#)" and the Annex included in the April 2009 *Monetary Policy Report* at <http://www.bankofcanada.ca/wp-content/uploads/2010/03/mpr230409.pdf> to learn more about the Bank's framework for conducting monetary policy at low interest rates.

¹⁷ This requirement for transparency may be waived under exceptional circumstances.

¹⁸ The Bank does not purchase or hold Government of Canada Real Return Bonds given the low level of issuance of such bonds and to avoid any perceived conflict with monetary policy.

bond auction to achieve the target structure for asset allocations.¹⁹ The Bank's minimum purchase amount, which was reduced to 15 per cent on 1 October 2015, is disclosed ahead of the relevant bond auction, and the actual amount purchased is disclosed in the bond auction results.²⁰ The public would also be notified of any change to this fixed percentage of purchases. This helps support the efficient functioning of Canadian financial markets because the neutrality and predictability of the purchases help mitigate potential market volatility or price distortions in the Government of Canada securities market.

Term repo operations

Following the Bank's review of its financial market operations framework, term repo operations—the temporary acquisition of high-quality assets through the repo market—were added as part of the Bank's routine operations beginning on 1 October 2015. The rationale behind this decision was to promote the orderly functioning of Canadian financial markets, help manage the Bank's balance sheet and provide the Bank with information on conditions in short-term funding markets.²¹

Term repos reduce the need for the Bank to acquire Government of Canada securities outright for its balance sheet, improving the liquidity of these securities and thereby supporting the efficient functioning of Canadian financial markets. Because the Bank's holdings of Government of Canada securities are generally held to maturity, purchasing fewer of them improves their liquidity because there are more available in the market for investors and other market participants to trade. These term repo operations may encourage the further development of, and liquidity in, the longer-term repo market in Canada. They also enhance the Bank's flexibility in its asset management.

Securities-Lending Program

The Bank established its Securities-Lending Program in 2002 to help support the liquidity of Government of Canada securities by providing a secondary and temporary source of these securities to the market. Under this program, the Bank can lend a portion of its holdings (up to 50 per cent) of Government of Canada securities to primary dealers when the Bank judges that a specific bond or treasury bill is trading below a certain threshold, or is unavailable, in the repo market. Securities are lent through a tender process for a term of one business day.

This program helps support the liquidity of the Government of Canada securities market and is designed to support efficient clearing and price discovery. A liquid and transparent market for Government of Canada securities is important for the efficient functioning of Canadian financial markets. It helps the government and other borrowers in their financing activities and supports the Bank's objectives in the transmission of monetary policy.

¹⁹ Government of Canada treasury bills and cash-management bills are acquired in variable amounts, based on Bank staff projections of expected future demand for bank notes and other liabilities as well as on the maturity profile of its current holdings of treasury bills at the time of each auction.

²⁰ Auction details, including the Bank's minimum purchase amount, are disclosed approximately one week before each bond auction in the bond's Call for Tender. Results are provided on the day of the bond auction.

²¹ Term repos transacted by the Bank typically have approximately one- and three-month terms. The Bank may also conduct term repos for different terms—for example, to offset seasonal fluctuations in the demand for bank notes.

Providing Liquidity Under Extraordinary Circumstances

Under extraordinary circumstances, the Bank has the authority to provide exceptional liquidity to support financial system stability. The Bank can provide market-wide liquidity in a number of ways to respond to severe system-wide liquidity stress, including by providing secured advances and by conducting buy and sell-back securities transactions.²² However, to address funding shortages at specific financial entities, ELA would typically be the appropriate tool.

The origin of the financial stress is a key factor in determining whether liquidity should be provided on a market-wide basis versus a bilateral basis (for example, ELA).²³ More specifically, the Bank considers the degree to which the origin of the pressure is generalized or not. The stress could be experienced across Canadian financial markets, for example, and driven by general risk aversion or factors outside of Canada, or it could be localized at a Canadian financial institution, such as an LVTS participant. Market-wide liquidity facilities are designed to address the former case, while ELA is used to address the latter.

To provide an example of the use of market-wide facilities, global financial markets experienced severe pressure in 2008 driven by a series of failures and near-failures of financial institutions in the United States and Europe. Liquidity was impaired for both financial and non-financial entities, with market-based financing proving difficult for many of these borrowers. In Canada, liquidity in financial markets also declined, though the deterioration was much less severe than that in other markets. Given that the stress was market-wide and not driven by a severe and idiosyncratic liquidity shortage of a specific Canadian financial institution, the Bank expanded its provision of market-wide liquidity and activated a number of temporary market-wide liquidity facilities.

Providing market-wide liquidity

In response to a severe system-wide liquidity shortage, the Bank could expand existing tools (e.g., overnight repo/overnight reverse repos, term repos) along different dimensions to support the efficient functioning of Canadian financial markets. If, however, the Bank judges that the liquidity shortage may become more intense or might require additional flexibility, it can introduce additional market-wide liquidity facilities to further support liquidity needs. In terms of assessing system-wide stress, the Bank's regular term repo operations provide details on short-term funding markets that complement information gathered by the Bank through market intelligence.

Expanding existing tools

In terms of expanding existing tools, the Bank could increase the size or overall amount of liquidity provided (possibly alongside an increase in the level of settlement balances), the term of the operations and/or their frequency. Additional expansions of existing operations could include broadening the set of eligible collateral and/or increasing the list of eligible counterparties, subject to any criteria deemed appropriate by the Bank.

◀ *The origin of the financial stress is a key factor in determining whether liquidity should be provided on a market-wide basis versus a bilateral basis*

²² The provision of such advances would be subject to the Bank's Rules Governing Advances to Financial Institutions. See <http://www.bankofcanada.ca/wp-content/uploads/2015/12/rules-governing-advances-financial-institutions.pdf> for more information.

²³ Canadian financial institutions or financial market infrastructures experiencing persistent liquidity shortages can consider requesting ELA from the Bank and must meet certain eligibility requirements.

A key benefit to expanding existing tools to respond to system-wide liquidity stress is that the stigma associated with their use during such an event would be low, given they are routine. Those counterparties experiencing more severe liquidity stress might therefore be more willing to make use of the Bank's expanded liquidity tools, which may help normalize the situation more quickly. Helping resolve the system-wide liquidity stress may, however, require increased flexibility beyond expanding the Bank's existing tools.

◀ *Helping resolve system-wide liquidity stress may require increased flexibility beyond expanding the Bank's existing tools*

One factor that may necessitate increased flexibility is that the Bank's operations are typically auction-based and conducted at fixed intervals, a format that might not always be the most effective. Under certain stress scenarios, for example, those institutions that need the liquidity the most may not have sufficient access or may be unable to access liquidity—even if the Bank conducts operations more frequently. Similarly, as expectations for increased system-wide liquidity pressure mount, market participants might engage in hoarding activity, becoming less inclined to redistribute central bank liquidity.

Distribution and timing could therefore prove to be critical when responding to market-wide liquidity stress or actively trying to limit its intensification. Accordingly, an additional tool the Bank could use more proactively to provide market-wide liquidity with greater flexibility is to activate the Contingent Term Repo Facility (CTRF), which would become a standing (readily available) bilateral facility once activated.

◀ *Once activated, the Contingent Term Repo Facility would offer greater flexibility to provide market-wide liquidity on a standing basis*

Contingent Term Repo Facility

The Bank's standing facility to respond to severe market-wide liquidity stress is the CTRF. Upon activation, the CTRF would offer eligible counterparties liquidity directly on demand. This facility would provide the Bank with the flexibility to offer liquidity beyond primary dealers and their affiliates, at the Bank's discretion, should the Bank deem it necessary to support the stability of the Canadian financial system. Counterparties beyond primary dealers and their affiliates would need to demonstrate significant activity in the Canadian money and/or bond markets, be subject to federal or provincial regulation and meet any other conditions the Bank requires.

Activation and deactivation of the CTRF would be at the Bank's sole discretion, as warranted. CTRF terms and conditions would also be published upon activation. This not only helps reassure counterparties that an extraordinary market-wide liquidity facility is in place but also helps mitigate the inherent moral hazard because activation and the terms are at the Bank's discretion. This facility would not be used to address idiosyncratic liquidity shocks at individual institutions.

If the CTRF is activated, the Bank would undertake prudent disclosure procedures, such as preserving counterparty confidentiality, that are consistent with helping mitigate the potential stigma that could be associated with this facility. An appropriate degree of transparency, such as operation dates, amounts, terms and rates, would also be provided to the public at the proper time.

Emergency Lending Assistance

ELA is a loan or advance to eligible financial institutions and financial market infrastructures at the Bank's discretion. The provision of ELA is extraordinary and designed to provide last-resort liquidity to individual financial institutions or financial market infrastructures that are facing serious liquidity problems.

For further information on the Bank’s ELA policy and its recent changes, see the article entitled “Recent Changes to the Bank of Canada’s Emergency Lending Assistance Policy” in this issue of the *Bank of Canada Review*.

Conclusion

Financial markets have evolved and, given their dynamic nature, they are expected to continue to do so. To ensure that its monetary policy and financial stability objectives are achieved, the Bank will continue to regularly monitor developments in the financial market environment and to prudently consider appropriate enhancements to its framework to respond to shifts in the external landscape.

Table 1: Summary of the Bank’s framework for market operations and liquidity provision

Reinforcing the target for the overnight rate		
Purpose	Tool	Key features
To deal with temporary end-of-day liquidity surpluses resulting from unexpected payment frictions in the Large Value Transfer System (LVTS)	Deposits at the Bank of Canada	<ul style="list-style-type: none"> ▪ Counterparty’s discretion ▪ Overnight term ▪ Deposit rate ▪ Liquidity absorbing ▪ Available to LVTS participants
To deal with temporary end-of-day liquidity shortages resulting from unexpected payment frictions in the LVTS	Standing Liquidity Facility Overnight Standing Repo Facility	<ul style="list-style-type: none"> ▪ Counterparty’s discretion ▪ Overnight term ▪ Bank Rate ▪ Liquidity providing ▪ Standing Liquidity Facility: <ul style="list-style-type: none"> ▪ Secured advance ▪ Available to LVTS participants ▪ Overnight Standing Repo Facility: <ul style="list-style-type: none"> ▪ Repo transaction ▪ Available to primary dealers
To help reduce counterparty searches and other frictions intraday and during the end-of-day LVTS process	Adjustments to the level of settlement balances	<ul style="list-style-type: none"> ▪ Bank’s discretion ▪ Usually set above zero ▪ Liquidity providing ▪ Available to LVTS participants
To deal with generalized intraday liquidity pressure	Overnight repos Overnight reverse repos	<ul style="list-style-type: none"> ▪ Bank’s discretion ▪ Overnight term ▪ Multi-price auction ▪ Liquidity providing or absorbing ▪ Repo transaction ▪ Available to primary dealers

(continued...)

Table 1: Summary of the Bank's framework for market operations and liquidity provision (continued...)

Supporting the efficient functioning of Canadian financial market		
Purpose	Tool	Key features
To manage the Bank's balance sheet in a prudent, market-neutral and transparent manner	Primary market purchases of Government of Canada treasury bills and nominal bonds	<ul style="list-style-type: none"> ▪ Purchases structured to broadly reflect the composition of the federal government's stock of nominal domestic marketable debt ▪ Fixed percentage of bonds acquired at each auction on a non-competitive basis, variable amount of treasury bills acquired to manage the Bank's balance-sheet needs
To manage the Bank's balance sheet and promote the orderly functioning of Canadian short-term funding markets	Term repos	<ul style="list-style-type: none"> ▪ Schedule announced in advance ▪ Variable but typically one- and three-month terms ▪ Liquidity providing ▪ Multi-price auction ▪ Repo transaction ▪ Available to primary dealers
To help support the liquidity, efficient clearing and price discovery of the Government of Canada securities market	Securities-Lending Program	<ul style="list-style-type: none"> ▪ Program threshold triggers ▪ Overnight term ▪ Multi-price auction ▪ Collateralized loan ▪ Available to primary dealers
Providing liquidity under extraordinary circumstances		
Purpose	Tool	Key features
To respond to severe system-wide liquidity stress	Expanding existing operations	<ul style="list-style-type: none"> ▪ Expand existing operations along different dimensions, such as <ul style="list-style-type: none"> ▪ amount of liquidity provided or absorbed ▪ term ▪ eligible collateral ▪ frequency ▪ Available to primary dealers but could be expanded
To respond to severe system-wide liquidity stress with expanded flexibility	Contingent Term Repo Facility	<ul style="list-style-type: none"> ▪ Bank's discretion to activate ▪ Counterparty's discretion once active ▪ Repo transaction ▪ Terms and conditions published upon activation ▪ Available to primary dealers but could be expanded
To provide last-resort liquidity to individual financial institutions or financial market infrastructures that are facing serious liquidity problems	Emergency Lending Assistance	<ul style="list-style-type: none"> ▪ Secured loan/advance at Bank's discretion ▪ Maximum term of six months, renewable at Bank's discretion ▪ Minimum rate is the Bank Rate ▪ Available to members of Payments Canada ▪ Other eligibility criteria: <ul style="list-style-type: none"> ▪ Federally regulated financial institutions: credible recovery and resolution framework ▪ Provincially regulated financial institutions: credible recovery and resolution framework, provincial indemnity, important to stability of financial system ▪ Financial market infrastructures: designated for Bank of Canada oversight

Recent Changes to the Bank of Canada's Emergency Lending Assistance Policy

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- Emergency Lending Assistance (ELA) is a last-resort collateralized loan or advance provided by the Bank of Canada, at its discretion, to eligible financial institutions (FIs) and financial market infrastructures (FMIs) that are facing serious liquidity problems.
- After consulting with relevant stakeholders, the Bank revised its ELA policy in December 2015. The revisions aim to ensure the policy remains effective given ongoing changes in the Canadian financial system and lessons learned from the 2007–09 global financial crisis.
- The updated ELA policy clarifies the role that ELA can play as a temporary source of liquidity in supporting the recovery and resolution of eligible FIs. It also expands the list of eligible collateral to include mortgages, which can significantly increase an eligible institution's capacity to borrow under ELA. Recent revisions also provide greater clarity for the eligibility criteria and conditions for the provision of ELA to provincially regulated deposit-taking institutions and FMIs.

Similar to central banks in other jurisdictions, the Bank of Canada acts as a “backstop” provider of liquidity to the Canadian financial system. This “lender-of-last-resort” (LLR) function has been a fundamental role of central banks since the 19th century. It aims to prevent or mitigate financial instability by providing liquidity support, either to particular financial institutions (FIs) and financial market infrastructures (FMIs) or to financial market participants more broadly.¹

FIs that fund illiquid loans with redeemable deposits or short-term wholesale funds can face liquidity risks, and even a well-managed, solvent bank could suffer an unexpected liquidity shortage. FMIs also face liquidity risk, notably in the event that one of their participants defaults, requiring them to convert securities received as collateral into cash to meet the defaulter's payment obligations. While FMIs must have adequate financial resources and arrangements to manage extreme but plausible scenarios, these may not be sufficient in every eventuality. For example, the FMI's private liquidity facilities may prove insufficient in the most extreme cases or the providers of such facilities may be unable or unwilling to meet their commitments.

¹ The *Bank of Canada Act* and the *Payment, Clearing and Settlement Act* (PCSA) together give the Bank the power to make secured loans or advances to members of Payments Canada (formerly the Canadian Payments Association) and operators of FMIs designated for oversight under the PCSA. See paragraph 18(h) of the *Bank of Canada Act*; section 7 of the PCSA.

Emergency Lending Assistance (ELA) represents one element in the Bank of Canada's LLR tool kit.² Through ELA, the Bank has the discretion to provide a loan or advance to eligible individual FIs and FMIIs that are facing serious liquidity problems. ELA is intended to be drawn on an extraordinary basis; the last time it was provided was to Continental Bank in 1986.

In December 2015, the Bank of Canada revised its ELA policy, which had been in place since 2004, incorporating four main updates.³ The revised policy (i) replaced the requirement for a financial institution's solvency with the requirement for a credible recovery and resolution framework, (ii) expanded the range of eligible collateral to include mortgages, (iii) clarified the eligibility requirements for provincially regulated financial institutions, and (iv) clarified the conditions for ELA provision to FMIIs.

This article discusses each of these updates in turn, with a focus on the factors that motivated them.

Key Updates to the Bank's ELA Policy

Credible recovery and resolution framework

Under the former policy, only FIs that were judged to be solvent were eligible for an ELA loan. The Bank's updated policy now requires that FIs have a credible recovery and resolution framework in place. This change reflects the evolution of the Canadian financial system in the wake of the 2007–09 financial crisis.

Given the interconnected nature of the financial system, stress or disorderly failure of certain FIs can lead to contagion to other FIs, with potentially destabilizing effects on the broader financial system. In Canada, this led the Office of the Superintendent of Financial Institutions (OSFI) to identify the six major Canadian banks as systemically important.⁴ The financial crisis demonstrated that in the absence of effective resolution regimes for these systemically important FIs, authorities would be expected to bail out failing banks—potentially at great expense to taxpayers—to mitigate the disruptive impact of their failure.

Since the crisis, jurisdictions around the globe, including Canada, have taken important steps to establish effective regimes that can help a distressed institution return to viability or support its orderly liquidation. Authorities have been working to ensure that FIs consider, in advance, *recovery* actions they could take (e.g., raising capital or funding or restructuring business lines) if they were under stress to restore the market's confidence in the firm's financial soundness. However, under extreme shocks, FIs could still fail to recover on their own. In this case, the appropriate authority could place the institution into *resolution*.⁵ Through the resolution process, authorities seek to maintain operations that are critical to the functioning of the real economy and for financial stability while undertaking actions to restore the firm's capital adequacy and return the FI to viability. For example, resolution of a systemically important FI could be achieved through a "bail-in" of senior debt holders,

◀ *The Bank's updated policy now requires that financial institutions have a credible recovery and resolution framework in place*

² For a description of other LLR tool kit elements, see the article entitled, "Market Operations and Liquidity Provision at the Bank of Canada" in this issue of the *Bank of Canada Review*.

³ The updated ELA policy can be found on the Bank's website: <http://www.bankofcanada.ca/markets/market-operations-liquidity-provision/framework-market-operations-liquidity-provision/emergency-lending-assistance>.

⁴ The six major Canadian banks are Bank of Montreal, Bank of Nova Scotia, Canadian Imperial Bank of Commerce, National Bank of Canada, Royal Bank of Canada and Toronto-Dominion Bank of Canada.

⁵ Resolution involves any action taken by a national authority, with or without private sector involvement, that is intended to address serious problems in an FI that imperil its viability (BCBS 2010).

restructuring and/or sale of businesses.⁶ Examples of resolution tools for non-systemically important firms could include a merger, a bridge bank or an orderly, court-supervised liquidation process.⁷

In Canada, the Canada Deposit Insurance Corporation (CDIC) is the resolution authority for federally regulated deposit-taking financial institutions.⁸ The federal government has recently strengthened CDIC's resolution tool kit with the introduction of a bail-in regime. Financial safety net authorities have also collaborated to establish and enhance recovery and resolution planning for FIs.⁹ In this context, Canadian safety net agencies agree that there is a role for Bank of Canada ELA to support effective recovery and resolution. Under the Bank's updated policy, ELA will continue to support FI recovery. If a firm's recovery actions should ultimately be unsuccessful, however, there is also a role for ELA in supporting the FI resolution process (i.e., return to viability or orderly liquidation).

Although the provision of ELA to a firm in resolution (including firms that may be temporarily insolvent) is a departure from the previous approach,¹⁰ recent international guidance from the Financial Stability Board supports a role for central bank liquidity as one of several possible mechanisms for funding an orderly resolution process.¹¹ While private sources of funding are preferred, temporary public sector backstop funding may be needed. The existence of public sector backstop funding can also promote market confidence and support the broader efforts of authorities to resolve the FI in an orderly fashion.

In addition to ELA, temporary public sector funding for a firm in resolution may be drawn from alternative sources, such as a resolution fund, deposit insurance fund or other funding managed by the resolution authority or finance ministry. For example, in Canada, CDIC can provide financial assistance to federally regulated deposit-taking institutions using its investment portfolio and/or its borrowing authority with the Government of Canada or capital markets, subject to approval by the Minister of Finance. Taken together, ELA and these alternative sources of funding complement each other and form a tool kit for temporary public sector funding assistance for an FI in resolution. ELA brings the following advantages to this tool kit:

- **ELA is timely.** The Bank can create Canadian-dollar liquidity instantaneously and has established mechanisms to take and price the necessary collateral and deliver funds to the receiving FI through the Large Value Transfer System (LVTS). Other funding tools may take additional time to deploy. For instance, other authorities may require time to borrow the necessary funds through financial markets.

◀ *There is a role for Bank of Canada Emergency Lending Assistance to support the effective recovery and resolution of financial institutions*

⁶ A bail-in allows authorities to recapitalize a failing systemically important bank by converting eligible long-term debt of the bank into common shares.

⁷ Authorities can transfer all or part of the failing FI's business to a bridge bank until a buyer can be found.

⁸ For more detail on the tools CDIC can use to facilitate resolution, see <http://www.cdic.ca/en/about-cdic/resolution/Pages/tools.aspx>.

⁹ For federally regulated FIs, the financial safety net agencies consist of OSFI, CDIC, the Bank of Canada, Finance Canada and the Financial Consumer Agency of Canada. For more information on Canada's federal financial safety net, see <http://www.cdic.ca/en/about-cdic/partners/Pages/financial-safety-net.aspx>.

¹⁰ Traditionally, ELA has been positioned as a tool to provide temporary liquidity to a solvent firm that is experiencing persistent liquidity problems. This is a common view of the role of the central bank as lender of last resort, tracing its roots to Walter Bagehot in the 19th century.

¹¹ <http://www.fsb.org/2016/08/guiding-principles-on-the-temporary-funding-needed-to-support-the-orderly-resolution-of-a-global-systemically-important-bank-g-sib>

- **ELA capacity is sizable.** ELA capacity is based on the FI's eligible collateral, and the Bank of Canada has considerable discretion concerning the assets it can choose to accept (e.g., a non-mortgage loan portfolio). Other public sector funding sources may be more limited in the amount of funds they can raise in a short period of time.
- **ELA is designed to mitigate credit risk and moral hazard** (i.e., the risk that potential borrowers engage in excessive risk taking because a liquidity backstop exists). ELA is fully collateralized, with appropriate haircuts imposed on the value of assets pledged. This helps protect the Bank from credit risk. ELA is also priced at a penalty interest rate that is higher than the rate that would be charged in the market in normal times.¹² Taken together, these factors introduce a disincentive to use ELA for an extended period. This encourages the firm to return to private funding sources when available. Although they may have other means to mitigate credit risk, alternative public sector funding sources may not be fully collateralized and may expose the government to credit risk.

Given these benefits, ELA is well suited to play an important role in a coordinated public sector approach to funding a Canadian FI in resolution. In this context, it is important to note that ELA is a means for the Bank to provide temporary *liquidity* support. It is impossible to use ELA to recapitalize an FI because ELA is a loan, creating both an asset (the proceeds from the loan) and a liability (the obligation to repay the loan) on the borrower's balance sheet. ELA therefore does not provide additional equity or capital to the FI.¹³

To ensure that ELA supports either an FI's return to viability or its orderly liquidation, the Bank of Canada requires that borrowers have a credible recovery and resolution framework (RRF). Broadly speaking, an RRF is credible if it provides the relevant authorities, including the Bank of Canada, with a high degree of confidence that a troubled institution can be returned to long-term viability or be resolved in an orderly manner, without systemic disruption.¹⁴

This new requirement for a credible RRF and the elimination of the previous solvency requirement both reflect the possible need to provide ELA temporarily to *insolvent* institutions to support an effective resolution process (Dobler et al. 2016). For example, providing ELA to an insolvent FI could allow the time needed for authorities to recapitalize the institution as part of the broader resolution process. Requiring solvency in this situation could delay or prevent ELA from being provided. If alternative sources of temporary public sector liquidity assistance are limited in the amount of funds they can raise in a short period, the FI in resolution may not have enough liquidity to pay its obligations. This could potentially place orderly resolution and broader financial system stability at risk.

◀ *Emergency Lending Assistance is a means to provide temporary liquidity support; it cannot be used to recapitalize a financial institution*

¹² The minimum rate that the Bank charges on ELA loans is the Bank Rate, which is the rate of interest that the Bank charges on one-day loans to major FIs. While the Bank has the discretion to charge an interest rate higher than the Bank Rate, historically, the Bank has charged the Bank Rate for ELA.

¹³ ELA provides liquidity in the form of a loan that is secured by eligible collateral. In terms of the balance sheet, this creates a liability for the borrowing institution. It does not create capital, which requires an entirely different type of transaction: the issuance and purchase of equity or other forms of regulatory capital from the borrower. As such, while ELA can provide liquidity support, recapitalization of a distressed FI would either take place in private markets or be done by public authorities such as the government or resolution authority. A strategy for recapitalization would be one part of a broader credible recovery and resolution strategy.

¹⁴ For additional details on the requirement for a credible recovery and resolution framework, see the current ELA policies on the Bank's website: <http://www.bankofcanada.ca/markets/market-operations-liquidity-provision/framework-market-operations-liquidity-provision/emergency-lending-assistance>.

Removing the solvency requirement also recognizes that solvency and illiquidity are closely linked and, in periods of stress, authorities can have difficulty differentiating between the two (Nyberg 2000). Moreover, solvency represents an assessment of a firm's financial health at a specific point in time and does not necessarily reflect its long-term viability.

Acceptance of mortgage collateral

Given that the provision of ELA is extraordinary and designed to provide last-resort liquidity, it is possible that the institution requesting ELA will have already liquidated a significant proportion of its holdings of marketable securities. Accordingly, ELA loans may be made against collateral that is less liquid and more difficult to value. Recent revisions to the Bank's ELA policy clarify that, in addition to the Canadian-dollar non-mortgage loan portfolio (NMLP) and less-liquid securities such as collateralized own-name securities (e.g., self-securitized loans), the Bank of Canada, as a last resort, is willing to accept Canadian-dollar mortgages as collateral for ELA loans.¹⁵

This policy change further expands the range of acceptable collateral for ELA loans beyond that eligible for the Standing Liquidity Facility (SLF).¹⁶ Furthermore, the acceptance of mortgages significantly increases an eligible FI's capacity to borrow under ELA. Consider, for example, eligible collateral for Canada's six major banks. Assuming these FIs had already liquidated a significant proportion of their holdings of marketable securities, their combined ELA capacity before the 2015 policy update would have been largely represented by the value of their NMLPs less an appropriate haircut. Based on August 2016 figures, this notional amount (before haircut) would have been approximately \$587 billion. Following the 2015 ELA policy update, the acceptance of mortgage loan collateral represents an *additional* notional capacity (before haircut) of approximately \$590 billion, for a total notional capacity (mortgage and non-mortgage loans, both before haircut) of close to \$1.2 trillion.¹⁷

This additional capacity may become necessary in extreme stress—for example, when an FI's funding needs are large and ELA is provided as a source of temporary public sector liquidity to support the broader efforts of authorities to conduct an orderly resolution. Accepting mortgages as collateral also helps the Bank protect itself from credit risk since mortgages can be of comparatively good quality relative to some other assets. Including mortgages in the list of eligible collateral for ELA is also consistent with the International Monetary Fund's recommendation in the Financial Sector Assessment Program (FSAP) for Canada (IMF 2014).

The Bank is legally required to lend on a secured basis; thus, it must obtain a valid first-priority security interest in any collateral that is pledged or assigned for ELA. However, the legal process for perfecting the Bank's first-priority security interest in collateral backed by real property, such as mortgages and home equity lines of credit, is substantially more complicated than that for non-mortgage loans. The Bank must take transfer of legal title and then register this title in the land registry or title office where each *individual* mortgage is located, making the process extremely time-consuming.¹⁸

◀ *The Bank of Canada, as a last resort, is willing to accept Canadian-dollar mortgages as collateral for Emergency Lending Assistance loans. This significantly increases an eligible financial institution's capacity to borrow*

¹⁵ The *Bank of Canada Act* requires that all lending by the Bank be on a secured basis.

¹⁶ <http://www.bankofcanada.ca/2015/06/assets-eligible-collateral-under-bank-canadas-standing-liquidity-15-june-2015>

¹⁷ These figures exclude loans that have been securitized.

¹⁸ The process for perfecting a first-priority interest in loans that are not backed by real property requires filing a single financial statement in the personal property registry of the relevant province, making it relatively quick and simple.

Collateralized lending protects the Bank because the Bank can sell or retain the collateral to compensate against losses it may incur if the FI fails to repay the ELA loan.¹⁹ In the case of mortgages, however, both selling and retaining the collateral in the event of a default is likely more costly for the Bank than other types of eligible collateral.²⁰ While there is a market for buying and selling mortgage portfolios among banks and mortgage brokers, it is much less deep and liquid than the market for tradeable securities. As a result, market prices are either unavailable or unreliable, making the process for valuing this collateral more complex. Furthermore, the administration of mortgage loans would be operationally burdensome.²¹

Given these challenges, the Bank retains the right to accept only those mortgages for which it can adequately manage the associated financial, legal and operational risks. Furthermore, the haircuts for mortgages will be set on a case-by-case basis to reflect their particular risk characteristics.²² Pre-positioning collateral allows more time to examine documentation and conduct any necessary valuations before the collateral is accepted.²³

◀ *The Bank of Canada retains the right to accept only mortgages for which it can manage the associated risks*

Clarification of eligibility requirements for provincially regulated financial institutions

The Bank has authority, under the *Bank of Canada Act*, to make collateralized loans to members of Payments Canada (formerly the Canadian Payments Association), including provincially regulated FIs, credit union centrals and Caisse centrale Desjardins.²⁴ The provincial centrals can then pass on the liquidity to individual co-operatives that are not members of Payments Canada but meet all other eligibility criteria.²⁵

As of 2015, the Canadian co-operative system included 694 credit unions and caisses populaires, which accounted for 9.6 per cent of Canadian financial system assets and 12 per cent of total deposits (Canadian Credit Union Association 2015). Co-operatives generally operate within their home provinces and are regulated by provincial authorities. Their business models typically focus on loan and mortgage activity, with their funding mostly generated through member deposits.

Recent revisions to the Bank's ELA policy clarify the criteria for providing ELA to these provincially regulated deposit-taking institutions. These criteria reflect the fact that provinces are responsible for the stability of their own financial institutions. They also reflect differences in the provincial regulatory frameworks and seek to mitigate moral hazard, while taking the unique features of the Canadian co-operative system into account. The criteria also reinforce

◀ *Revisions to the Bank's policy clarify the criteria for providing Emergency Lending Assistance to provincially regulated deposit-taking institutions*

¹⁹ A credible recovery and resolution framework should significantly mitigate the likelihood that a borrower will default on an ELA loan.

²⁰ If the defaulting institution is wound up under the *Winding-up and Restructuring Act*, a liquidator will have the option of allowing the Bank to realize on its collateral or require that the collateral be transferred to the liquidator for realization.

²¹ Administering a mortgage involves various functions, including, but not limited to, monitoring and processing mortgage payments, selling the underlying property, discharging mortgages and ensuring that the underlying properties have adequate insurance.

²² The Bank's haircut policy protects the Bank against valuation risk and potential further declines in collateral value.

²³ Pre-positioning collateral entails reaching agreement on the terms of all necessary legal and financial documentation, without necessarily executing the legal agreements required to secure the Bank's prospective advance.

²⁴ Co-operative centrals provide trade association services, financial services, IT services and liquidity to their member co-operatives.

²⁵ Federal credit unions are subject to the same eligibility criteria as other federally regulated deposit-taking institutions.

that ELA is the last line of liquidity defence; the provincial co-operative systems should have sufficient liquidity contingency arrangements in place without planning to rely on ELA.

These arrangements, which fall under the responsibility of provincial authorities, include the co-operatives' individual liquidity contingency planning as well as liquidity from their provincial centrals and any other inter-central liquidity arrangements that may be in place. If these arrangements are insufficient, ELA can provide a last resort liquidity backstop if all eligibility criteria are met.

The eligibility criteria for provincially regulated financial institutions are as follows:

- **Indemnity requirement.** Bank of Canada policy requires that the province with responsibility for the prudential oversight of the provincial institution indemnify the Bank for any residual losses resulting from default if the value of the collateral or guarantees from other institutions prove insufficient. This requirement reflects the fact that provincial authorities have the legislative powers to regulate local co-operatives and therefore are responsible for the stability of the provincial financial sector.
- **Credible recovery and resolution framework.** Before providing ELA, the Bank of Canada must have a high degree of confidence that a troubled provincially regulated FI can be returned to long-term viability or resolved in an orderly manner. This is similar to the new requirement for eligible federally regulated FIs to have a credible recovery and resolution framework in place and helps to ensure that the provision of ELA is consistent with recovery and resolution actions taken by the FI or provincial authorities. Additionally, a credible recovery and resolution framework enhances the resilience of the Canadian co-operative system, thereby reducing vulnerabilities in the broader financial system.
- **Importance to the stability of the financial system.** The Bank of Canada would provide ELA to a provincially regulated FI only if the distress or disorderly failure of the institution would have significant adverse consequences for the broader financial system or economy. This criterion clarifies that the Bank's ELA would be provided only in extreme scenarios and reflects the responsibility of provincial authorities and centrals to establish liquidity support mechanisms for co-operatives in their jurisdictions, under most circumstances.

In determining the importance of an institution's distress or failure to broader financial stability, the Bank will consider the potential for distress in a provincial or regional co-operative system to severely impair financial conditions or regional economic activity or to spread through national co-operative frameworks and infrastructures. For example, distress of one large co-operative or a number of smaller co-operatives simultaneously could have large adverse economic effects on a regional basis that could, in turn, pose risks to the broader financial system.

Before providing ELA to a provincially regulated FI, the Bank requires information and institution-specific data from the relevant provincial supervisors and resolution authorities to make an informed judgment about the credibility of the institution's recovery and resolution framework as well as the importance of the FI to the stability of the broader financial system. The Bank is currently negotiating with provincial authorities to establish such information-sharing arrangements. These arrangements would also help the

Bank share information of mutual interest—including the Bank's assessment of financial system vulnerabilities and risks—with provincial regulators on a regular basis.

Clarification of conditions for ELA provision to FMIs

FMIs facilitate the clearing, settling and recording of payments, securities, derivatives and other financial transactions, which in turn enable consumers and firms to safely and efficiently purchase goods and services, make financial investments and transfer funds. By legislation, the Bank of Canada oversees FMIs that have the potential to pose either systemic risk to the financial system or payments system risk as defined by the *Payment Clearing and Settlement Act* (PCSA).^{26, 27, 28} Currently, the Bank has designated five FMIs as systemically important, with one additional FMI designated as having the potential to pose payments system risk.²⁹ The Bank's risk-management standards for designated FMIs minimize the likelihood that those FMIs would ever require ELA.³⁰ Nonetheless, even in the presence of stringent standards, FMIs may experience a liquidity shortfall in extraordinary circumstances, for example, when an FMI's private liquidity providers are unable or unwilling to fulfill their commitments.

Under the PCSA, the Bank has the authority to extend liquidity to the operator of designated clearing and settlement systems. The Bank's updated ELA policy clarifies the policy framework that would guide such lending.

Canadian-domiciled designated FMIs are eligible for Canadian-dollar ELA at the Bank's discretion. Moreover, where it is operationally feasible, the Bank could provide foreign-currency ELA, if needed, to prevent a Canadian-domiciled designated FMI from failing to meet its obligations to a foreign FMI.³¹

Foreign-domiciled designated FMIs are generally not eligible for ELA because the primary responsibility for overseeing these systems and ensuring the availability of emergency liquidity rests with the FMIs' lead central bank.

As part of its oversight, the Bank requires designated FMIs to have a credible recovery plan, which the Bank expects all designated systemic FMIs to have in place by the end of 2016. While a credible recovery and resolution framework is not an ELA eligibility requirement for FMIs, such ELA could be

◀ *The updated Emergency Lending Assistance Policy clarifies the framework that would guide the Bank's extension of liquidity to financial market infrastructures*

²⁶ The Bank's oversight of FMIs is conducted in close collaboration with FMI operators and relevant authorities, such as Finance Canada, provincial regulators and, in the case of the foreign-domiciled designated FMIs, the Bank of England and the US Federal Reserve Board.

²⁷ Section 2 of the *Payment Clearing and Settlement Act* defines payments system risk as the risk that "a disruption to or a failure of a clearing and settlement system could cause a significant adverse effect on economic activity in Canada by (a) impairing the ability of individuals, businesses or government entities to make payments, or (b) producing a general loss of confidence in the overall Canadian payments system, which includes payment instruments, infrastructure, organizations, market arrangements and legal frameworks that allow for the transfer of monetary value."

²⁸ Systemic risk for an FMI is the risk that the inability of a participant to meet its obligations in an FMI as they become due or that a disruption to or a failure of an FMI could, by transmitting financial problems through the FMI, cause (i) other participants in the FMI to be unable to meet their obligations as they become due, (ii) FIs in other parts of the Canadian financial system to be unable to meet their obligations as they become due, (iii) the FMI's clearing house or the clearing house of another FMI within the Canadian financial system to be unable to meet its obligations as they become due, or (iv) an adverse effect on the stability or integrity of the Canadian financial system.

²⁹ FMIs currently designated as systemically important for Canada are the LVTS, CDSX, the Canadian Derivatives Clearing Service (CDCS), CLS Bank and SwapClear. In addition, the Automated Clearing Settlement System (ACSS) is designated as having the potential to pose payments system risk.

³⁰ In particular, designated FMIs are required to have sufficient and highly reliable liquid resources to cover the default of their largest participant under extreme market conditions.

³¹ A domestic FMI could require intraday access to foreign currency to meet its obligations to a foreign FMI; thus, foreign currency ELA could prevent an unnecessary and costly default of the domestic FMI.

used to support effective recovery and orderly resolution in much the same way as described previously for FIs. In 2016, the Bank of Canada and the Canadian Securities Administrators (CSA) issued guidance on FMI recovery planning that clarifies certain international expectations in a Canadian context.³² This guidance covers aspects such as the key components of a recovery plan, tools used for recovery and implementation of the recovery plan. The Bank and other relevant federal authorities are also examining a Canadian resolution regime for designated FMIs.

Conclusion

Key updates were made in December 2015 to the Bank of Canada's ELA policy. As a result, the Bank has strengthened its ability to promote stability in the Canadian financial system.

By requiring a credible recovery and resolution framework as an eligibility criterion for FIs, the Bank ensures that ELA is provided as part of a broader plan by authorities to return failing institutions to long-term viability or facilitate their orderly liquidation, thereby avoiding the costly economic impact of a disorderly failure. The Bank is also now willing to accept Canadian-dollar mortgages as collateral as a last resort, effectively expanding the potential capacity of firms to draw on ELA, if needed.

The updated ELA policy also clarifies the conditions that must be met for provincially regulated FIs to be eligible for ELA. In providing ELA to eligible provincially regulated FIs, the Bank can provide ELA to support the long-term viability of such institutions when their disorderly failure would have significant adverse consequences for the broader financial system or economy, while recognizing that provincial governments are responsible for the FIs they regulate.

Finally, the Bank has clarified the conditions under which it would provide ELA to FMIs, to ensure these firms have access to sufficient liquidity in times of extraordinary stress, allowing them to continue providing the services that underpin the smooth functioning of the financial system.

The 2015 updates to the Bank's ELA policy reflect an ongoing commitment to ensuring that the Bank of Canada can act effectively as the lender of last resort and that the policy guiding the Bank's provision of ELA reflects the evolution of the Canadian financial system. This commitment will continue, and the Bank will periodically review its ELA policy.

³² See "Policy guidance on the Bank of Canada's risk-management standards for systemic financial market infrastructures," available at <http://www.bankofcanada.ca/wp-content/uploads/2016/06/standard-24-recovery-plans.pdf>.

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Commodity Price Supercycles: What Are They and What Lies Ahead?

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- Commodity prices tend to go through extended periods of boom and bust, known as supercycles. In general, commodity price movements are important for Canada because they help determine the country's terms of trade, exchange rate, employment, income and inflation.
- Bank of Canada research shows that there have been four broad-based commodity price supercycles since the early 1900s. The current supercycle started in the mid-1990s and is now in its downswing phase.
- One potential driver of these supercycles is the interaction of large, unexpected demand shocks and slow-moving supply responses. This interaction is widely accepted as the source of the current supercycle, which was driven by rapid growth in China and other emerging-market economies.

Global commodity prices greatly influence Canada's terms of trade, employment, income and ultimately inflation. Canada's commodities trade has grown substantially over the past 15 or so years. In 2015, commodities constituted 43 per cent of Canada's nominal exports, up from 34 per cent in 1999. This increase was particularly concentrated in crude oil, whose share rose from 3 to 9 per cent over the same period. While increased commodity exports have made Canada richer, they have also made the economy more vulnerable to shifting price cycles. In particular, the sharp fall in commodity prices that occurred after mid-2014 has led to a decline in Canadians' income and wealth and triggered a complex and costly adjustment in Canada's economy (Champagne et al. 2016; Lane 2015). While Canada cannot do much to prevent these global resource price shocks, Canada's inflation-targeting framework and floating exchange rate support necessary adjustments to mitigate their effects (Poloz 2015).

In this article, we examine why commodity prices tend to go through multi-year periods of boom and bust, known as supercycles. We present evidence showing that extended swings in commodity prices have been occurring since the early 1900s. While economists continue to debate the reasons behind these movements, many believe that the upswing phase in supercycles results from a lag between unexpected, persistent and positive shocks to commodity demand in conjunction with slow-moving supply responses. Eventually, as supply finally expands and demand growth moderates, the cycle enters a downswing phase. This article focuses on the

current commodity price supercycle, which we estimate started in the mid-to late 1990s and has been in its downswing phase since 2011. Finally, we discuss factors that could prolong or shorten the current downswing phase.

How Are Commodity Price Supercycles Identified?

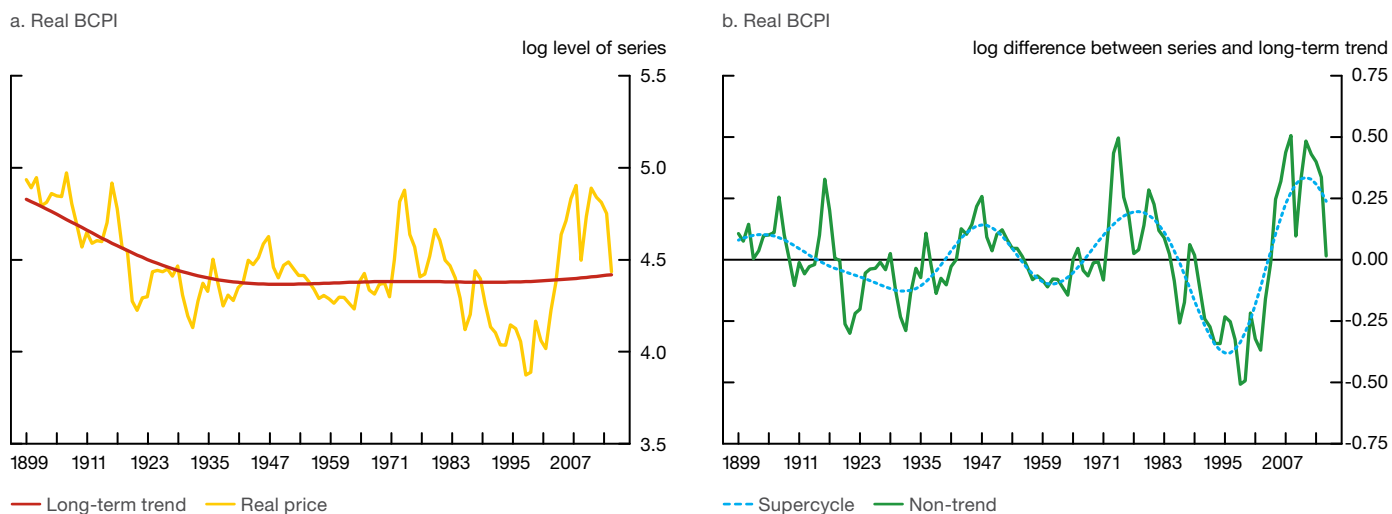
Commodity price supercycles are extended periods during which commodity prices are well above or below their long-run trend. They are expected to last much longer than business cycles, which, in Canada and the United States, have lasted six years on average in the post-war period.¹ Indeed, these supercycles are generally thought to take decades to complete a trough-to-trough movement. A growing number of economists are conducting research to find ways to better identify supercycles. One technique used in this article, an asymmetric band pass filter, was developed by Christiano and Fitzgerald (2003). Their technique is to identify regular fluctuations in commodity prices that occur over a horizon of between 20 and 70 years.

◀ This article uses an asymmetric band pass filter to identify regular fluctuations in commodity prices that occur over a horizon of between 20 and 70 years

Chart 1 shows the results of this filter when applied to a fixed-weight version of the Bank of Canada commodity price index (BCPI) going back to 1899.² The left panel displays the log of the real BCPI as well as its long-term trend as produced by the filter. The difference between these two series is shown in the right panel. If we remove the short-term oscillations from this detrended component, we are left with the supercycle of the real BCPI (represented by the blue line in the right panel). This chart shows that supercycles can vary by up to 40 per cent from their long-term trend at peak.

Studies that adopt the asymmetric band pass filter generally find four distinct commodity price supercycles since 1899. Four supercycles also appear in the real BCPI, as shown in Chart 1, with summary statistics presented in Table 1. On average, a full trough-to-trough supercycle in commodity prices takes 32 years (the current supercycle is excluded from this calculation

Chart 1: Supercycles in the Bank of Canada commodity price index (BCPI)



Source: Bank of Canada calculations

Last observation: 2015

1 Data related to recessions in the United States are from the National Bureau of Economic Research; data for recessions in Canada are from Cross and Bergevin (2012).
2 This version of the BCPI is deflated by the US Producer Price Index and is based on the work of Coletti (1993).

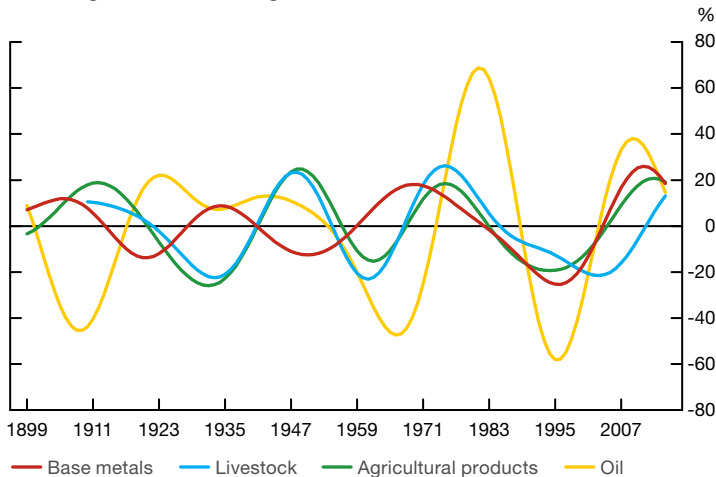
Table 1: Supercycles in commodity prices (BCPI weights)

	1899–1932	1933–61	1962–95	1996–present
Peak year	1904	1947	1978	2011
Peak of supercycle from long-term trend (%)	10.2	14.1	19.5	33.5
Trough of supercycle from long-term trend (%)	-12.9	-10.0	-38.1	23.7
Length of cycle from trough-to-trough (years)	33	29	34	20
Upswing (years)	5	15	17	16
Downswing (years)	28	14	17	ongoing

Note: BCPI means Bank of Canada commodity price index

Chart 2: Supercycles across major commodity groups

Percentage deviation from long-term trend



Source: Bank of Canada calculations

Last observation: 2015

because it is ongoing). No two supercycles are the same, however, and the length of the upswing and downswing phases can vary considerably from cycle to cycle. It can take anywhere from 5 to 17 years, for example, for the cycle to reach its peak and another 14 to 28 years to reach its trough. Note that this technique has some limitations. However, testing suggests that these results are relatively robust to different specifications.³

◀ No two supercycles are the same, and the length of the upswing and the downswing phases can vary considerably from cycle to cycle

Chart 2 shows the supercycles of major subcomponents of the BCPI, including base metals, agricultural products, livestock and oil. Much like the BCPI, each major subcomponent shows four distinct peaks and troughs, with the exception of oil, which only has three. What sets the current supercycle apart from its predecessors is that the prices of all subcomponents start increasing at roughly the same time, whereas previous ones tended to only show a large degree of overlap.

³ These limitations include the “end-of-sample problem” known to most filters as well as the appropriate periodicity that the filter should use (i.e., the minimum and maximum amount of time over which a supercycle can occur). Robustness tests show that the BCPI continues to exhibit four supercycles even if the periodicity is adjusted by 13 years on either end. Beyond that, the BCPI starts to show only three supercycles, with the periods before and after the Second World War merging into a single supercycle.

What Causes Commodity Price Supercycles?

It is generally accepted that commodity price supercycles are likely triggered by unexpected increases in demand. Table 2 presents regressions that examine the relationship between global economic growth and real commodity prices.⁴ In all cases, the immediate effect of a change in global gross domestic product (GDP) on commodity prices is fairly large. The results show that an increase in global economic growth of 1 percentage point leads to a rise in oil prices of 14 percentage points. The increase in oil is higher than the rise of 9 percentage points in base metal prices or the rise of 7 percentage points in agricultural prices.

Table 2: Sensitivity of real commodity prices to a change in real global economic growth, 1991Q1–2015Q4, percentage points

	Price elasticity of global output growth
Oil	14.0
Base metals	9.2
Agricultural products	7.2
BCPI	9.9

Note: Generalized method of moments reduced-form regression, 1991Q1 to 2015Q4, all coefficients significant at 5 per cent level

Many researchers (Erten and Ocampo 2012; Cuddington and Jerrett 2008b) note that supercycles tend to roughly coincide with periods of rapid industrialization in the global economy. The first cycle, for example, generally coincides with the industrialization of the United States in the late 19th century; the second, with the onset of global rearmament before the Second World War in the 1930s; the third, with the reindustrialization of Europe and Japan in the late 1950s–early 1960s. The current commodity price supercycle began in the mid- to late 1990s, the same time as a series of important reforms were occurring in China, including its eventual accession to the World Trade Organization (WTO) in 2001.

There are a number of ways in which long periods of industrialization can have long-lasting effects on commodity prices. If the increase in demand is unexpected, then prices should temporarily rise above their long-run equilibrium until new production capacity is built. For commodities, the delay is further exacerbated by the high start-up costs for many projects. These can cause firms to delay investments until they have a better sense of the sustainability of the unexpected demand shock and the long-term profitability of new projects (Majd and Pindyck 1987). Small forecasting errors on the part of firms have been found to have large consequences for prices in other industries with high start-up costs and long-lived projects, such as shipping (Greenwood and Hanson 2015).

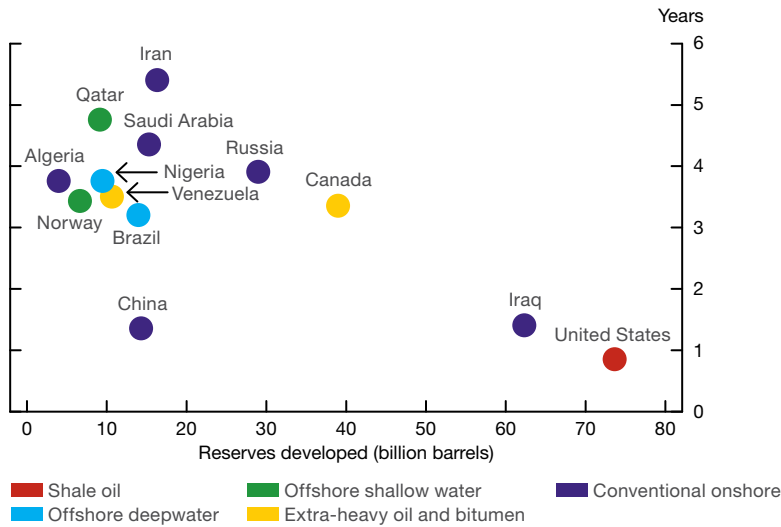
It is important to note that not all commodity supply will react in the same way. Start-up costs are generally higher for oil and base metal projects than they are for agricultural products. It can take more than five years for a new mine to generate cash flow after initial spending (Radetzki et al. 2008), for

◀ *Not all commodity supply will react in the same way. Start-up costs are generally higher for oil and base metal projects than they are for agricultural products*

⁴ The price elasticity of global output growth encompasses both the income elasticity of demand (i.e., the effect of stronger global economic growth on commodity prices) and the price elasticities of demand and supply (i.e., the effect of commodity price changes on demand). The relationship is estimated on a quarterly basis from 1991 to 2015. The regressions are estimated using generalized method of moments. Up to four lags of both global growth and the dependent variable are used as instruments. Note that GDP growth is an imperfect proxy for commodity demand, so these results should not be seen as definitive. Other estimation techniques have found similar results. Cuddington and Jerrett (2011), for example, find similar price elasticity by regressing real metal and oil prices on the cyclical and trend component of GDP using simple regressions.

Chart 3: US shale versus other oil investment, by country

Average lead times after final investment decision (FID) announcement (2000–14)



Source: International Energy Agency

example. In contrast, the supply of most agricultural products can generally react much more quickly, usually within the next growing season. Start-up costs can also change over time as a result of technological advances. The maturation of technologies for producing shale oil has significantly reduced the time needed to develop new oil production capacity. As shown in **Chart 3**, most oil projects, including unconventional sources such as the Canadian oil sands, take between three and six years to construct after a firm’s final investment decision. In contrast, shale oil projects in the United States can take less than one year to develop (International Energy Agency 2015). Shale’s advent means there is now a sizable portion of the oil supply that acts more like a standardized manufacturing process than a traditional high-fixed-cost project (Dale 2015).

There is a growing body of empirical work that supports this broad narrative. Erten and Ocampo (2012) show that supercycles in non-oil commodities follow supercycles in global GDP. Jacks and Stuermer (2015) provide evidence that demand shocks strongly dominate supply shocks in driving the real prices of 14 different commodities between 1850 and 2012. A historical analysis by Radetzki (2006) notes that most post-war commodity price booms were preceded by sharply accelerating macroeconomic activity (though other factors, such as tight production capacity and relatively small inventories, were also necessary). Other research that focuses on specific commodities also finds an important role for demand factors. Stuermer (2014) presents a model of mineral commodities where demand shocks have lasting effects on prices for approximately 7 to 12 years. Kilian (2009) finds that once movements in the demand and supply curves have been properly identified, the biggest contributions to oil price movements are due to both aggregate and oil-specific demand shocks. Unfortunately, there has been less empirical investigation thus far on whether the downswing phases of supercycles reflect the delayed supply response to past (positive) demand shocks.

Nonetheless, commodity-specific supply-side shocks have also played a role in commodity price supercycles and, in many cases, likely act in tandem with demand factors. One prominent example is the oil embargo imposed by the Organization of the Petroleum Exporting Countries (OPEC)

that led to a surge in oil prices in the 1970s. Cuddington and Jerrett (2008a) and Radetzki et al. (2008) speculate that supercycles could actually be primarily supply-driven, resulting from a “race” between rising commodity depletion rates and new, cost-reducing technologies. There is not yet enough evidence to judge how important this mechanism is in practice.

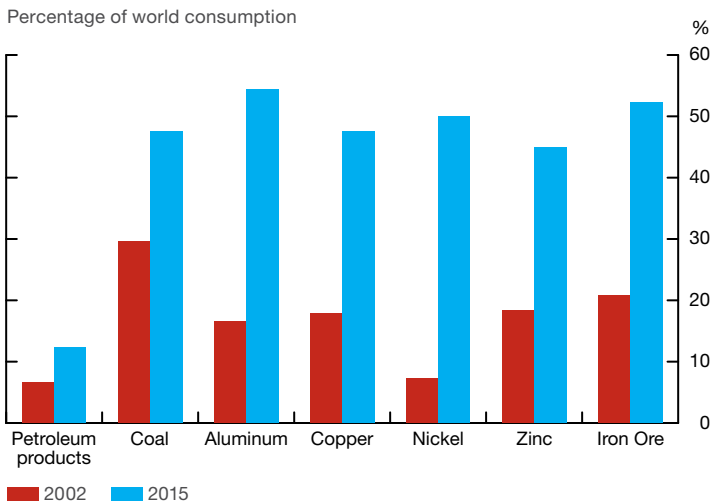
Triggers of the Current Commodity Price Supercycle

The simultaneous price increase across commodities at the beginning of the current supercycle coincided with rapid economic growth in China and other emerging-market economies (EMEs). The evidence suggests these two events are closely linked. Between 2002 and 2014, the increase in Chinese demand was large enough to account for all of the increase in global metals consumption and more than half of the increase in global oil consumption. **Chart 4** shows that China accounted for roughly 50 per cent of the world’s consumption of most base metals in 2015, compared with 18 per cent in 2002. In contrast, agricultural commodity demand, which has been found to be sensitive to population growth as well as income growth (World Bank 2016), has been underpinned by EMEs as a whole rather than by any particular country.

As noted in **Table 1**, commodity prices reached their peak in the current supercycle in 2011, rising 33 per cent above their long-run trend. Since then, they have started to decline and, as of 2015, are now only 23 per cent above trend. The recent decline has been driven by the forces outlined in the previous section, particularly a delayed supply response from commodities to higher prices.

Technological innovation in the resource industry, particularly in crude oil production, has also played an important role. **Chart 5** and **Chart 6** show that future oil production in both the United States and Canada was under-predicted over the course of the past decade because forecasters persistently underestimated the sectors’ capacity for technological innovation.

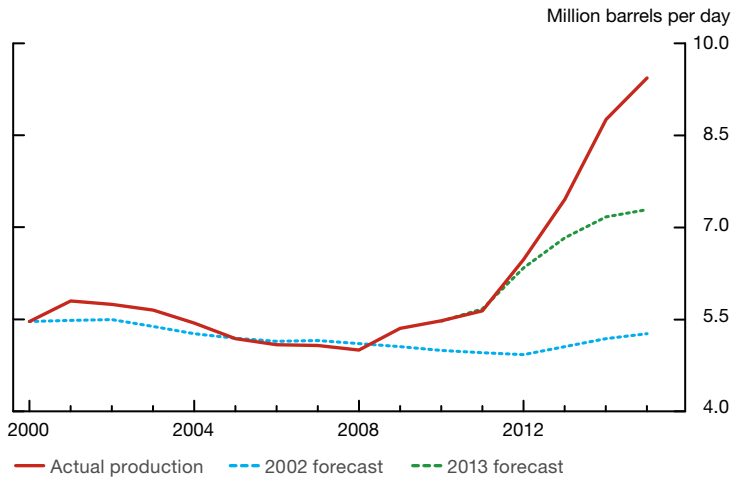
Chart 4: Consumption of industrial commodities in China



Note: Latest coal consumption data are for 2012.

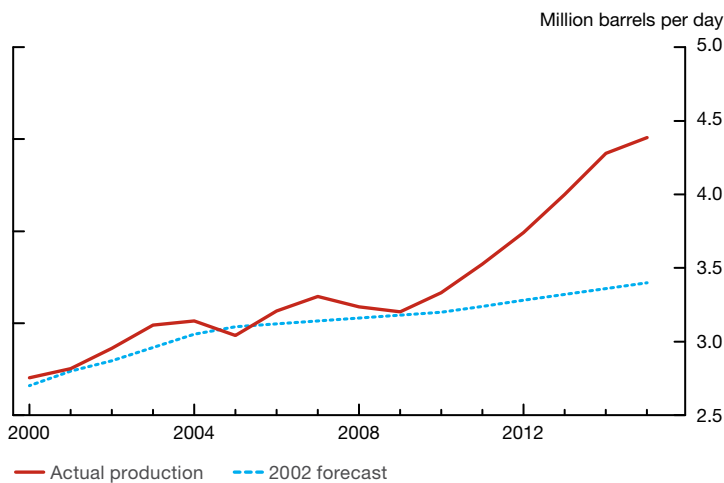
Source: World Bureau of Metal Statistics, US Geological Survey, Haver Analytics and Bank of Canada calculations

Last observation: 2015

Chart 5: US oil production

Source: US Energy Information Administration

Last observation: 2015

Chart 6: Canadian oil production

Source: International Energy Agency

Last observation: 2015

Growth in commodity demand has also declined as a result of a reduction in global economic growth. In the same way that unexpected positive demand shocks boost commodity prices, a string of negative demand shocks have the opposite effect. Since 2011, many economic forecasters, including the Bank of Canada, have systematically overestimated the level of global economic growth (Gu enette et al. 2016). In addition, commodity demand growth has been decreasing even faster than the recent slowdown in global GDP would suggest. Developments in China play an important role in explaining this change. In China, the economy is rebalancing away from investment-driven growth toward less commodity-intensive sectors like domestic consumption, especially services consumption. Furthermore, growth in Chinese spending on residential investment, which is base-metal-intensive, is expected to slow in the near future because of a substantial overhang in housing inventories (Kruger, Mo and Sawatzky 2016).

What Lies Ahead for Commodity Prices?

If commodity price supercycles are driven by unexpected movements in demand or improvements in technology, it will be difficult to assess their starts and turning points in real time. Note that in the past, the downswing phase of a commodity price supercycle has generally taken 14 to 28 years. Since we are currently into the fifth year of the downswing phase of the current supercycle, it could be argued that, on average, there is still some time for prices to fall further. Each cycle is different, however, and below we outline some factors that could either prolong or reduce the length of the current downswing phase.

◀ *While the downswing phase of the current supercycle is only into its fifth year, there are a number of factors that could either prolong or reduce the length of the current phase*

How will the slowing and rebalancing of the Chinese economy affect commodity demand?

As growth in China's industrial economy slows and rebalances, its pattern of commodity consumption will change. Demand growth for industrial commodities (iron ore, copper and coal) should slow from the robust pace of the past decade. However, a new stream of demand-side pressures could emerge for high-value consumer-related commodities such as meat, dairy and gasoline. Whether this will merely lead to a shift in demand across commodities rather than an overall slowdown in demand remains to be seen. Note that the Chinese economy is six times larger now than it was when the current commodity price supercycle began.⁵ As a result, China's contribution to demand for commodities should still remain elevated, even if its future GDP growth is materially slower than it has been over the past 10 years (Roberts et al. 2016). China's copper imports are an illustrative example. In 2015, China imported an additional 1.46 million tonnes of copper ore and concentrates compared with its level in 2014. That growth is actually higher than China's total level of imports in 1999, which was only 1.24 million tonnes.

Will economic growth in other EMEs create new commodity price pressures?

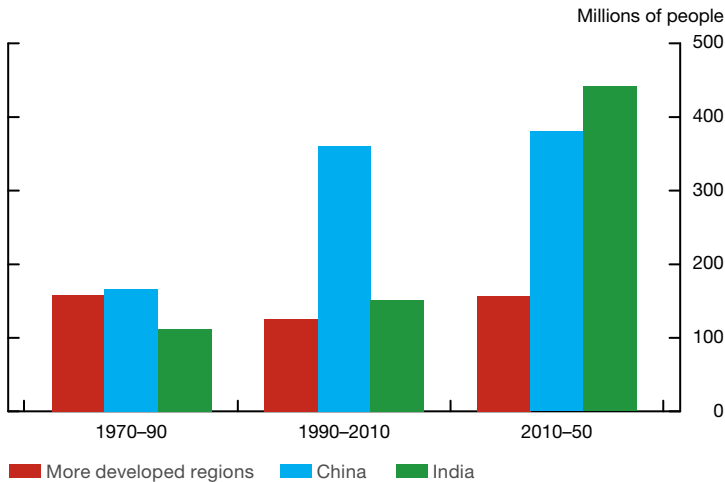
Infrastructure and construction projects are very commodity-intensive. Commodity demand growth in India and other EMEs could strengthen, given the infrastructure deficit in these countries compared with their more developed peers. In particular, India shares many similarities with China before its economic liftoff, notably its large population and relatively closed economy. India's urbanization rate is currently slightly above 30 per cent, well below that of advanced economies (more than 80 per cent) or China (55 per cent). **Chart 7** shows United Nations estimates for Indian urban population growth, suggesting it will rise by almost half a billion through 2050—about 20 per cent higher than the increase in China over the past two decades.

There are significant challenges before commodity demand in EMEs outside of China reaches the critical levels needed to support a new supercycle. Structural reforms will likely be necessary to sustain rapid economic growth, and these can be politically difficult to implement (Bailliu and Hajzler 2016). Even if successful, these countries will be starting off from a relatively small commodity consumption base. **Chart 8** shows that, for early stages of economic development, GDP per capita and base metal consumption per capita tend to increase in tandem. This points to a strong upside to metal demand in India and Brazil. That said, we also note that metal consumption per capita in India and Brazil is below what one would expect, given their current level of economic development.

◀ *Structural reforms will likely be necessary to sustain rapid economic growth in emerging-market economies outside of China*

⁵ Real GDP, 2010 dollars.

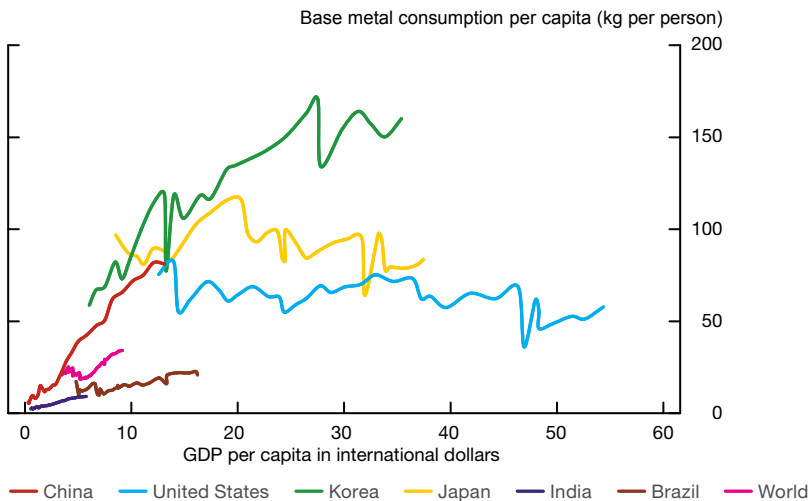
Chart 7: Expected change in urban population



Source: United Nations, *World Urbanization Prospects*, 2014

Last data plotted: 2050

Chart 8: Base metal consumption versus GDP per capita



Note: Data spans from 1968–2014 for world, 1980–2014 for all countries except Korea, and 1988–2014 for Korea.

Sources: Bloomberg, Angus Madison, International Monetary Fund *World Economic Outlook* and Bank of Canada

Last observation: 2014

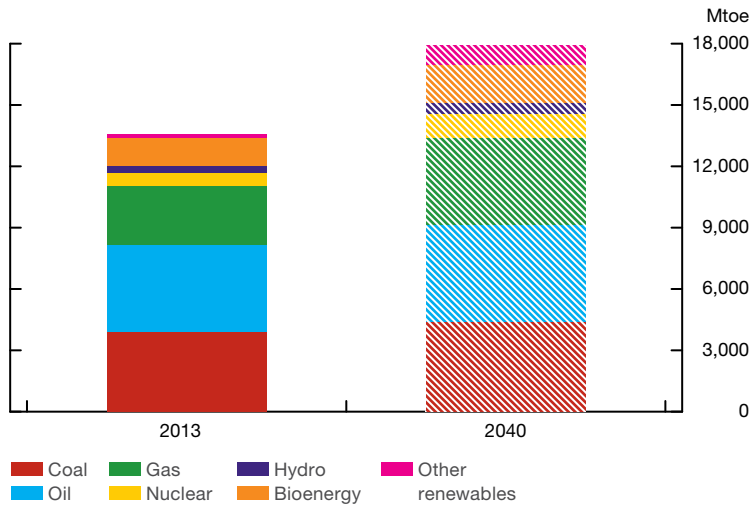
How could environmental policies affect commodity prices?

A growing focus on environmental concerns should affect the future demand for energy commodities. Most countries are now committed to slowing or even reversing the adverse effect of commodity consumption on air and water quality and the climate, especially after the 21st Council of the Parties agreement on climate change signed in December 2015.

The International Energy Agency (IEA) expects most energy demand over the course of the next two decades will be driven by EMEs (IEA 2015) and, at present, alternative energy resources to fossil fuels (coal, petroleum, etc.) are not cost-competitive substitutes. As a result, the IEA still expects that fossil fuels will make up the majority of primary energy demand by 2040, compared with 81 per cent in 2013 (Chart 9). However, it also expects a significant shift toward less carbon-intensive fossil fuels, with a rising share of natural gas rather than oil or coal.

◀ *The International Energy Agency expects that fossil fuels will make up 75 per cent of energy demand by 2040*

Chart 9: Projections of primary energy demand by fuel according to the International Energy Agency



Note: Mtoe means million tonnes of oil equivalent

Source: International Energy Agency *World Energy Outlook*

Last data plotted: 2040

How quickly will supply capacity react to future commodity price changes?

The outlook for commodity supply is subject to two-sided risks. On the one hand, technological improvements, such as the US shale revolution, continue to unlock previously inaccessible resources, lower the cost of production and reduce the time needed for supply to adjust to a shift in demand. These developments should help sustain robust supply growth and limit commodity price growth. On the other hand, the current low level of commodity prices reduces the incentive to invest in new projects. The capital expenditure budgets of major oil producers, for example, have fallen for the second consecutive year and are now down by half, relative to their peak in 2014. Given the long lead times needed to build most conventional oil projects, this could limit future supply and lead to a spike in oil prices (Büyükhahin et al. 2016).

Conclusion

In this article, we examine the notion that commodity prices tend to experience extended periods of boom and bust, often referred to as supercycles. The results from our analysis support the view that there have been four broad-based commodity price supercycles since the early 1900s, likely as a result of large, unexpected demand shocks interacting with slow-moving supply responses. The current supercycle fits this view. In the mid- to late 1990s, commodity demand was driven by rapid growth in EMEs, especially China. After an important increase in supply capacity and faltering global growth, the current supercycle has entered its downswing phase. How long this current downswing phase will last depends on a number of factors, such as the industrialization of India, that are currently very uncertain.

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Structural Reforms and Economic Growth in Emerging-Market Economies

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- Growth prospects in emerging-market economies (EMEs) are an important element of the global outlook. These economies now account for 60 per cent of world gross domestic product. Since the 2007–09 global financial crisis, however, growth has slowed in many large EMEs.
- Structural reforms can increase productivity by allocating resources more efficiently and could thus have substantial potential effects on growth. The literature suggests, however, that these gains depend critically on supportive fiscal and monetary policies and on the sequence in which reforms are implemented.
- In 2009 the G20 launched a strategy for achieving strong, sustainable and balanced growth. Promoting structural reforms across its membership was a key element of this initiative. In several large EMEs, significant progress toward these reform objectives is under way.

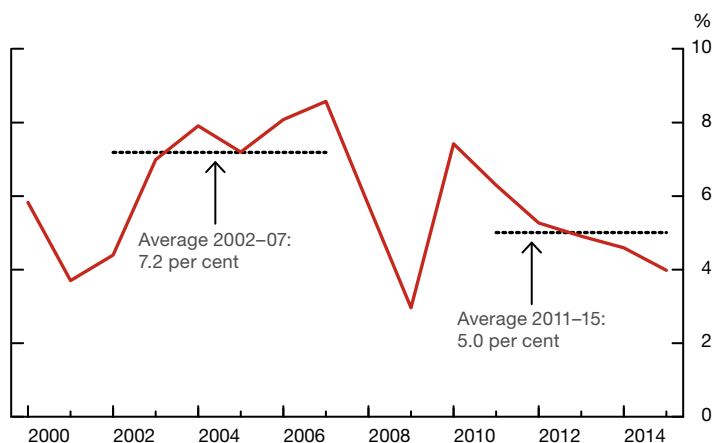
Growth has slowed markedly in many emerging-market economies (EMEs) since the 2007–09 global financial crisis (Chart 1).¹ The World Bank (2014) estimates that about two-thirds of the slowdown in EMEs is due to a decline in the cyclical component of growth, while the other third is structural, driven by slowing growth in total factor productivity (TFP). Because the global economic environment is expected to remain challenging in the foreseeable future and populations will age in parts of the emerging world, it will be increasingly important for EMEs to raise potential growth by maintaining steady progress on structural reforms. Although reforms should take into account country-specific needs, they share common goals of promoting efficient investment and reducing structural and institutional barriers to productivity growth.

Economic performance in EMEs is a key driver of global growth, given that EMEs now account for more than 60 per cent of global gross domestic product (GDP) and 75 per cent of its growth. In addition, since the emerging world is an important consumer of commodities and many large EMEs represent rapidly expanding markets for Canadian exports, the prospects for these countries are important to the Canadian economy. Thus, Canadian monetary policy needs to be informed by an understanding of the role of structural reforms in driving EME growth.

¹ If China is excluded, growth of gross domestic product (GDP) has slowed from about 6 per cent to around 4 per cent.

Chart 1: Growth in emerging-market economies since the global financial crisis

Year-over-year percentage growth in real GDP in emerging markets



Source: International Monetary Fund

Last observation: 2015

This article first discusses how structural reforms support growth. It then reviews major episodes of reforms in EMEs and discusses the structural reform priorities for these countries. An assessment of how the structural reforms affect potential output growth in several large EMEs follows.

What Are Structural Reforms and Why Are They Important for EME Growth?

Structural reforms aim to increase productivity by reducing barriers to efficient investment, employment, product and services trade, and innovation. The variety of barriers to efficient resource allocation is extensive, corresponding to an equally wide range of potential reform policies to address them. Some common barriers include cumbersome licensing, permit and tax procedures; poor contract enforcement; inflexible labour markets; and regulations that favour local monopolies and state-owned enterprises. Poor infrastructure quality can also result in lower investment and productivity by increasing the time and outlays required to establish and operate a business.

Recent research by the World Bank indicates that domestic structural impediments have contributed to the recent slowdown in productivity growth in many EMEs, particularly in Brazil, Russia, India and China (Didier et al. 2015).² Without credible reform plans, these impediments, combined with unfavourable demographics and domestic political uncertainty, will continue to weigh on growth.³ With such a wide array of potentially beneficial reform policies, however, prioritizing these measures is challenging. Moreover, a number of factors must be considered when identifying the appropriate mix, sequence and timing of reforms for an individual country. These include institutional weaknesses, current economic conditions, available fiscal space and the success of any previous reforms.

◀ *Structural reforms aim to increase productivity by reducing barriers to efficient investment, employment, product and services trade, and innovation*

² The authors of this article estimate that declining potential output growth in EMEs accounts for about one-third of the growth slowdown since 2010, with roughly half of this slowdown attributed to declining productivity growth.

³ Even conventional monetary and fiscal policies aimed at reducing economic slack can be rendered ineffective when investment and bank lending incentives are highly distorted (IMF 2015).

In outlining some of these challenges, we focus on five broad reform categories emphasized in the literature as having significant potential for raising growth in EMEs: (i) market competition and regulation, (ii) labour market policy, (iii) quality of governance and institutions, (iv) infrastructure quality and (v) trade and financial sector liberalization. The main takeaway from this overview is that the expected benefits from progress in any one of these areas depend on the state's capacity to implement complementary sets of policies and on the sequence in which they are implemented. These conditions will vary across country contexts, reflecting both current macro-economic conditions and the history of reforms already undertaken.

This suggests that no single reform package should be expected to work equally well across all EMEs. Nevertheless, a few general lessons emerge. For example, the positive growth effects of trade liberalization are complemented by fewer regulatory barriers to competition and infrastructure bottlenecks, suggesting a lockstep approach to such reforms may be beneficial. Moreover, while some EMEs may benefit from improved infrastructure quality and financial sector liberalization, these reforms can have negative consequences in countries with relatively weak governance and institutions. Financial sector liberalization and openness can also be destabilizing in the presence of significant trade barriers. However, the optimal sequence and timing in which these reforms are implemented depends on the feasible pace of reform as well as the scope for supportive fiscal and monetary policies.

Key areas of reform in EMEs

The potential benefits from trade and financial market liberalization are well documented in existing studies. However, reforms to product market regulation (PMR) and investment in infrastructure are receiving increasing attention. Drawing on new data sets, recent studies indicate that improvements in PMR and infrastructure investment can have just as great an impact on expansion as opening the economy to international trade and capital flows, the effect of which has been found to be substantial.⁴

There are several potential explanations for the recent shift in focus toward PMR reforms and infrastructure observed not only in the economics literature, but also in the reform priorities of emerging markets. First, the World Bank and others have identified deteriorating quality of infrastructure as a crucial impediment to EME growth.⁵ Second, policy-makers often have a limited capacity to leverage the political support and government resources necessary to implement far-reaching structural reforms. The opportunity cost of pursuing further trade and financial liberalization may have risen relative to the benefits, particularly in markets where the largest gains from previous reforms in these areas have already been reaped.⁶

◀ *The expected benefits from progress in any one of these areas depend on the state's capacity to implement complementary sets of policies and on the sequence in which they are implemented. These conditions will vary across country contexts*

4 Djankov, McLiesh and Ramalho (2006) find that improving a country's business regulatory environment from the worst to the best quartile is associated with 2.3 per cent higher annual growth. Nicoletti and Scarpetta (2003) and Loayza, Oviedo and Servén (2005) obtain similar estimates based on alternative measures of business regulations. By comparison, liberalizing trade or capital accounts from "low" to "moderate" levels adds an estimated 1 to 2 per cent to average annual growth over the medium term (e.g., Sachs and Warner 1995; Honig 2008; Wacziarg and Welch 2008; and Saadi Sedik and Sun 2012). For evidence of the equally large effects of infrastructure, see Calderón and Servén (2010), among others.

5 See Calderón and Servén (2008), IMF (2014) and the October 2014 World Bank press release, "World Bank Group Launches New Global Infrastructure Facility," available at <http://www.worldbank.org/en/news/press-release/2014/10/09/world-bank-group-launches-new-global-infrastructure-facility>.

6 See Poloz (2016) for a discussion on the lower marginal benefits from further trade liberalization. Moreover, many EMEs appear to have made the least controversial reductions in trade barriers under previous rounds of negotiations completed by the World Trade Organization, and governments may find that eliminating the remaining barriers is costly politically.

Finally, the benefits from any single reform effort can only stretch so far without appropriate supporting policies or regulations in place. Hausmann, Rodrik and Velasco (2008), for example, develop a framework that illustrates how the benefits from reform depend crucially on addressing the most binding constraints first. As discussed in the next section, many EMEs already embarked on extensive trade and financial sector liberalization reforms during the 1980s and 1990s. Therefore, even if the gains from further liberalizations could be large under the right set of circumstances, it may be optimal to prioritize other areas of reform where recent progress has been relatively limited (such as PMRs and infrastructure). In fact, some theoretical perspectives in economics suggest that too much international goods trade or too many financial flows could even be harmful to growth if barriers to domestic competition and the accountability of governing institutions are high.⁷ Evidence in favour of this perspective is provided by Chang, Kaltani and Loayza (2009), who show that the relationship between trade openness and growth may be negative for economies that have neglected public infrastructure investment, financial market deepening and the reduction of barriers to entry for entrepreneurs.

Complementary structural reform policies

Several other reform categories are characterized by complementary policies. For example, although infrastructure investment increases the benefits from trade liberalization by lowering trade costs, policy-makers may also need to strengthen government accountability at the same time. (See Esfahani and Ramírez [2003], who find that gains from infrastructure investment depend crucially on the quality of contract enforcement and government credibility.) One reason improving accountability in governance matters is that the absence of appropriate checks and balances can lead to fewer public services or a misallocation of funds. Recently, some EME governments (e.g., Brazil, China and Indonesia) have taken a direct approach to addressing this problem through national anti-corruption campaigns, devoting greater resources to monitoring and investigating the actions of public officials. However, reducing administrative barriers to entry for entrepreneurs may also reduce corruption indirectly while having direct economic benefits. This is because a lighter regulatory burden for private enterprises leaves fewer opportunities for public officials to extract bribes (Djankov et al. 2002; Caselli and Gennaioli 2008).

Whether financial liberalization promotes growth in EMEs also depends on the quality of governance and institutions (Prati, Onorato and Papageorgiou 2013; Christiansen, Schindler and Tressel 2013). Financial liberalization boosts growth by reallocating capital to more efficient firms⁸ and by lowering the financing costs of firm entry and research and development.⁹ Interestingly, however, some research has found that financial sector liberalization may be detrimental to growth in countries with poor institutional quality (Prasad, Rajan and Subramanian 2007). One reason for this is the tendency for

◀ *The absence of appropriate checks and balances can lead to fewer public services or a misallocation of funds*

⁷ More generally, according to the “theory of the second best,” if certain economic barriers or market failures cannot be immediately removed, it is possible that the next-best solution requires decisions to be made in other policy areas that would not otherwise be optimal.

⁸ See Galindo, Schiantarelli and Weiss (2007) and Abiad, Oomes and Ueda (2008) for emerging-market evidence.

⁹ See Rajan and Zingales (1998) and Gorodnichenko and Schnitzer (2013).

corrupt bureaucrats or corporate insiders to embezzle funds. Opportunities for embezzlement increase with more open financial markets and poor enforcement of contracts.¹⁰

Policy-makers also need to consider cyclical factors when determining the appropriate mix of structural reforms because the cost of some reforms can be amplified during recessions. Bordon, Ebeke and Shirono (2016) show, for example, that gains from labour market reforms tend to be offset in the first few years by a greater rate of job destruction if reforms are implemented during periods of economic slack.¹¹ They also show that PMR reforms do not increase employment during periods of fiscal consolidation or monetary tightening.

Optimal sequencing of reforms

The sequence in which a complementary set of reforms is implemented may also matter. Reflecting on the failure of trade liberalization in Latin America during the 1970s, Edwards (1984), Frenkel (1982) and others asked whether one reason liberalization benefited some countries and not others is that in many cases trade and foreign capital flows were not liberalized in the right sequence. They argue that liberalizing capital flows without having first liberalized trade had destabilizing effects through large initial exchange rate movements.¹²

More recent research also makes a case for liberalizing trade before initiating other key reforms. Specifically, strengthening property rights and removing domestic barriers to competition (for example, through PMR reforms) before liberalizing trade may encourage relatively inefficient firms to enter the market, lowering aggregate productivity (Asturias et al. 2016). In contrast, other research suggests that if reforms in all three of these areas cannot be accomplished in reasonably short succession, improving contract enforcement and reducing competition barriers should be prioritized because they can produce immediate benefits while considerably augmenting the efficiency gains from more open trade down the road (see Chang, Kaltani and Loayza 2009; Bolaky and Freund 2004). Ultimately, then, the ideal sequence in which these three areas of reform are addressed will depend on the political and financial capacity of governments to tackle the reforms quickly.¹³

◀ *The sequence in which a country implements a complementary set of reforms may also matter*

Major Episodes of Structural Reforms in EMEs

Structural reforms in EMEs have progressed in four big waves (IMF 2008). The first wave started in the 1980s in the aftermath of the debt crisis. It focused on trade liberalization and represented a break with unsuccessful

¹⁰ See Blackburn and Forges-Puccio (2010), La Porta et al. (2000), and Djankov et al. (2008). These perspectives are also consistent with evidence in Herwartz and Walle (2014), who find that very high levels of financial openness generally erode the growth-promoting role of financial market development while high trade openness strengthens it.

¹¹ Additional evidence is provided in Bouis et al. (2012).

¹² Liberalizing the capital account with a simultaneous reduction in barriers to trade can result in productivity losses because of an initial overshooting of both capital inflows and the real exchange rate, with the latter eroding the country's export market competitiveness. See also Johnson (1967) for a similar perspective.

¹³ In contrast, in many post-Communist transition economies, the interconnectedness of reforms was the motivation for the "big bang" approach—trying to deal with all the major distortions early and simultaneously—with varied results. The political-economy models of Dewatripont and Roland (1995) and Wei (1997) show why such big bang strategies have sometimes failed to receive the political support necessary to be effective. They also illustrate how the ideal sequence of reforms under a more gradualist approach depends on the pace in which reforms can be feasibly implemented.

Box 1

G20 Initiatives to Promote Structural Reforms

In 2009, leaders of the G20 launched the Framework for Strong, Sustainable, and Balanced Growth. Structural reforms that foster private demand and strengthen long-run potential output growth have formed a key element of this strategy (IMF 2016a).

At the 2014 Brisbane Summit, G20 leaders endorsed the Comprehensive Growth Strategies Initiative, which was designed to lift GDP by more than 2 per cent above the baseline trajectory over the following five years. In addition to stimulating short-term demand, the strategies were designed to raise potential growth through (i) product and labour market reforms, (ii) investment in public infrastructure, (iii) tax reforms, and (iv) innovation policies. The

G20 members have since proposed more than 1,000 structural policy measures to achieve their growth commitment.

Implementation of these structural reform initiatives has so far been uneven and incomplete. Analysis by the International Monetary Fund, the World Bank and the Organisation for Economic Co-operation and Development suggested that implementation of structural reforms to date would raise global GDP growth by only about one-third of the target (IMF 2016a). At their Chengdu meeting in July 2016, G20 finance ministers and central bank governors noted the relatively weak implementation of structural reforms and reaffirmed their importance in bolstering growth in potential output.

policies that focused on import substitution.¹⁴ As part of these efforts, EMEs participated in several rounds of multilateral and regional trade negotiations during the 1980s and 1990s.

In the early 1990s, the second wave of reforms started, focusing on opening both the domestic financial sector and the capital account. These reforms are believed to be key to sustaining growth performance by raising investment, spurring innovation, facilitating technology transfer and promoting a more efficient allocation of capital (Dabla-Norris et al. 2014). The third wave of reforms, which focused on the adoption of more market-friendly agricultural policies, gathered speed during the 1990s (IMF 2008). The final wave of EME reforms, which focused on deregulation of the telecommunication and electricity sectors, started in the second half of the 1990s.

These structural reforms, coupled with a favourable external environment, likely boosted TFP growth.¹⁵ Over the past 15 years, however, the pace of structural reforms has stalled. This slowdown is thought to be an important factor behind the post-crisis moderation in EME growth.¹⁶ Recognizing this key link and in an attempt to stimulate global growth, the G20 launched a strategy, in 2009, for achieving strong, sustainable and balanced growth, with the promotion of structural reforms across its membership (which includes both advanced economies and EMEs) a key element of this initiative (Box 1).

◀ *The pace of structural reforms has stalled over the past 15 years*

Recent Structural Reforms in Major EMEs and Priority Needs

Although progress on structural reforms is highly varied across EMEs, several recently announced reform initiatives appear to target the most binding constraints and therefore offer significant scope for elevating potential output

¹⁴ An import-substitution strategy entails raising import barriers in targeted industries to encourage local production for local consumption, rather than producing for export markets, with the aim of generating employment, reducing foreign exchange demand and/or promoting self-sufficiency.

¹⁵ For example, Cubeddu et al. (2014) found that TFP growth rose by 1.5 percentage points in the period leading up to the global financial crisis and argues that structural reforms from previous decades were a factor driving this rise in TFP growth.

¹⁶ See Didier et al. (2015, 43–44), among others.

growth.¹⁷ Most major EMEs have identified at least one priority for product market reform and most have committed to increase public spending for infrastructure significantly between 2015 and 2018. Several have also prioritized reductions in barriers to foreign investment and in the prevalence of inefficient state-owned enterprises. However, many of the proposed policy packages are ambitious, and implementation has been challenging.

A review of recently initiated reform agendas across several large EMEs reveals variable progress in the five broad reform categories identified above. In Brazil, India and Indonesia, structural impediments to growth appear to be substantial across all categories.¹⁸ China faces relatively few bottlenecks in terms of infrastructure and labour market flexibility, but it lags behind the other EMEs in terms of openness to international trade and investment and absence of barriers to competition. Turkey, by contrast, is relatively open to international trade and investment, though labour and product market regulations appear to be larger reform priorities.

In general, although reforms to date have been uneven and incomplete, they appear to be focused on priority needs: reasonably steady progress on reforms has been observed in three out of every four areas where we have noted critical structural impediments. These reforms should boost potential growth, with larger gains in China, India and Mexico, where the most severe structural blockages are being more aggressively targeted. Large public infrastructure investments and much-needed PMR reforms are being implemented in these three markets. Moreover, as suggested by the recent research on the complementarity of various reforms, improvements in infrastructure and a number of policies aimed at reducing regulatory burdens could augment the gains from trade liberalization that has occurred over the past two decades. China, India, Indonesia and Mexico have also recently taken steps to increase foreign investment and strengthen investor and creditor protection laws. These steps are expected to improve corporate governance and complement previous and ongoing financial sector liberalization.

Brazil and Turkey face several obstacles to meeting their reform objectives. The slower pace of reform implementation in these economies is, in part, attributable to adverse cyclical conditions combined with fiscal constraints and high inflation. Previous studies indicate that significant gains from some reforms critically depend on supportive fiscal and monetary policies. Thus, in these markets, improving fiscal and monetary policy space may be an important first step toward further reforms, particularly public infrastructure investment and employment and benefits legislation.¹⁹

◀ *Reforms to date have been uneven and incomplete, but they appear to focus on priority needs*

¹⁷ Several major reform proposals are described in the G20 Comprehensive Growth Strategies summarized in Box 1. However, a number of additional policies have been planned independently as part of ambitious national reform packages such as China's 2013 Third Plenum and Mexico's 2012 "Pacto por México." We draw on these various sources to identify a list of 90 significant reform objectives announced across the six largest emerging markets (Brazil, China, India, Indonesia, Mexico and Turkey) and track policy steps taken toward meeting these objectives.

¹⁸ Our assessments of structural bottlenecks are based on multiple indicators for each reform category. For example, in evaluating the extent of market competition and regulation, the indicators we consider are the OECD Product Market Regulation Index, the OECD Services Trade Restrictiveness Index (which captures restrictions on foreign competition in the network and financial services sectors), the cost of business start-up procedures as a percentage of gross national income (from the World Bank's Doing Business Survey), and the average number of hours required by businesses to prepare and pay taxes (also from the Doing Business Survey). Data used to evaluate all reform categories are for 2010–14 and are obtained mainly from OECD.Stat's regulation and tax indicators, IMF Article IV market assessments and the World Bank. Our assessments on reform progress are based on information compiled from a range of media reports, publicly available OECD and IMF documents, and national government sources.

¹⁹ Targeting severe structural bottlenecks in areas with benefits that do not critically depend on maintaining accommodative fiscal and monetary policies may be necessary to alleviate these constraints. As weak growth persists, domestic tax revenues shrink relative to social spending and debt financing, further eroding fiscal policy space (Didier et al. 2015).

Another potential hurdle for EMEs facing recessions is that they can be politically difficult to implement during downturns because the costs of reforms are paid early on while their benefits accrue slowly over time. Indeed, when the economy is sluggish, those who benefit from barriers to competition may be better able to leverage resistance to change. Ultimately the capacity to build broad political support for structural reforms will depend on the outcomes of bargaining between various interest groups (IMF 2015).

Quantifying the Impact of Structural Reforms on Potential Growth in EMEs

What will be the potential contribution of the recently implemented and planned structural reforms to economic growth in these markets? An extensive literature provides valuable insights into the potential benefits of various types of reform and into the conditions on which they depend. However, drawing on these insights to quantify the economic impacts of different reform policy agendas in particular countries presents several data and modelling challenges.

To quantify the effects of the recent wave of diverse structural reform objectives in large EMEs, we use the semi-structural, augmented Solow growth model developed by the Organisation for Economic Co-operation and Development (OECD). This model combines average empirical relationships based on estimates from a large number of cross-country linear regression models (capturing the effects of dozens of reform indicators) to construct a unified model of the aggregate economy. We summarize key features of the model in **Box 2**.

Our analysis focuses on the EMEs that have been the most active in implementing and planning reforms since 2014: China, India, Indonesia and Mexico. Because we do not have access to the detailed OECD survey data necessary to directly impute the changes in model indicators associated with each structural reform, assumptions must be made on how these indicators change with respect to recent reforms. We assume that a significant policy reform improves the relevant indicator value to equal the score of the next least-restrictive country.²⁰ To capture the effects of recent and planned infrastructure initiatives, we estimate the implied changes in the stock of infrastructure capital between 2014 and 2018 (based on the difference between average pre-reform expenditures and planned expenditures) and use Bom and Ligthart's (2014) meta-analysis output elasticity estimate to impute the effects on output.²¹

The estimated impacts from 2016 to 2018 are reported in **Table 1**. These estimates indicate that the contributions to potential output from each PMR reform, trade and foreign direct investment reform, and infrastructure construction could be substantial, increasing GDP growth in these markets by as much as 2 percentage points annually by 2018. For PMR and trade liberalization reforms, almost all of the estimated contribution is additions to TFP growth.²²

◀ *The contributions of anticipated structural reforms could be substantial, increasing GDP growth in these markets by as much as 2 percentage points annually by 2018*

²⁰ Depending on the indicator, the data sample varies from 12 to 25 EMEs. In most instances, this assumption results in rather conservative counterfactual changes in the associated index. Limited time series data on both past reforms and these various index measures for EMEs preclude direct estimation of average index changes in response to specific reforms. Given that our assumed policy impacts are constrained by limited data, they should be taken to be suggestive.

²¹ Bom and Ligthart's mid-point estimate from recent studies of the elasticity of GDP with respect to infrastructure capital is approximately 0.15, implying that an increase in infrastructure capital of 10 per cent raises the level of GDP by 1.5 per cent.

²² Because the impact of infrastructure investments is estimated based on assumptions outside of the model, we are unable to decompose the productivity impacts into TFP contributions and additions to the aggregate capital stock.

Box 2

A Quantitative Model of Structural Reforms

Researchers from the Organisation for Economic Co-operation and Development (OECD)¹ have developed a model mapping reforms into changes in labour productivity (and real GDP) based on the following empirical conditional convergence relationship:

$$\Delta \ln y = (0.09 - 0.02 \cdot PMR) \cdot (\ln y^* - \ln y),$$

where $\ln y$ is output per hour worked, $\ln y^*$ is long-run output per hour worked and PMR is an index of product market regulations (with higher values indicating more extensive restrictions). Current and long-run output per work-hour, in turn, are endogenously determined by a large number of empirically estimated relationships linking various exogenous policy, regulatory and market friction indicators (including the product market regulation index) to investment, trade, foreign direct investment, human capital accumulation, employment and research and development.²

The International Monetary Fund (IMF) and the OECD have combined a similar framework with the IMF's global general-equilibrium model to estimate the country impacts of the G20 reform commitments discussed in Box 1. The effects that reforms have on growth in output per worker and employment are estimated by simulating shocks to each of the relevant policy indicators in the model, based on the change in the indicators implied by country survey responses or imputed based on past changes in the indicator as a result of similar reforms.

The estimated changes to employment and labour productivity are then used to simulate the effects on global GDP using the IMF's general-equilibrium G20 model, which is able to capture international spillovers resulting from international trade and global price changes. The IMF G20 model is also used to estimate the effects of each country's public infrastructure investments, which are not directly captured by the OECD model.³

1 Full model details are documented in Barnes et al. (2013). Model parameters are based on estimates of the average marginal effects of policy on economic outcomes taken from several OECD studies.

2 Most of the model parameters are based on empirical, reduced-form relationships that have been estimated independently using cross-country data (mainly from OECD members). A few parameters are calibrated by assumption. The model consists of 24 endogenous variables and 26 policy-related exogenous variables. Many of the policy-related indicators are constructed by coding responses of national governments to periodic surveys on several regulatory and legal measures. For details, refer to the OECD website: <http://www.oecd.org/eco/growth/indicatorsofproductmarketregulationhomepage.htm#Sources>.

3 Because infrastructure investment is not explicitly modelled in the OECD framework, it is necessary to supplement this framework with estimates of the effects of this key area of reform based on a second model or using empirically estimated output elasticities. The full methodology used by the G20 to obtain their reform impact estimates is described on the OECD website: <https://www.oecd.org/g20/summits/brisbane>.

Table 1: Impact of anticipated structural reforms on potential output growth
Average annual percentage-point increase in real potential GDP, 2016–18

	China	India	Indonesia	Mexico
Product market regulation reforms	0.62	0.42	0.27	0.27
Trade and FDI liberalization	0.47	0.68	-	0.72
Infrastructure ^a	0.72	0.36	1.20	0.95
Other	0.18–0.26	0.02	0.19–0.30	-
Total	2.0–2.1	1.5	1.7–1.8	1.9

a. Estimates are based on full implementation of announced investment plans from 2015 to 2018. Realized investments may be lower. In the case of Mexico, there is no estimated addition to potential output in 2016, given 2015 realized expenditures.

Note: FDI means foreign direct investment.

Although these estimates capture complementarities between various structural reforms, they do so in a rather rudimentary way. In the model, structural reforms affect labour productivity growth by raising both the long-run level and the incremental rate at which this level is reached. Thus, by increasing long-run productivity, improvements in one reform indicator magnify the incremental growth impacts of other reforms. Because of its relatively simple structure, however, the model does not capture potentially important, general-equilibrium effects of reforms that micro-founded, general-equilibrium (GE) models do, such as spillover effects resulting in changes to relative prices. Moreover, the sequence of reforms does not play a meaningful role within this framework.

Simulating reform impacts using country- and reform-specific GE models is a practical alternative approach for evaluating the short- and long-run spillover effects of a particular reform on distinct but interconnected sectors (or markets) of the economy, as in García-Santana and Pijoan-Mas (2014). These models also allow the researcher to compare outcomes under alternative, counterfactual reform scenarios. This comparison is useful, for example, in studying the optimal sequence of reform implementation, as in Asturias et al. (2016). However, while GE models work well when evaluating only a handful of key reforms and spillovers across sectors or markets that are of primary interest, they can become analytically and computationally intractable when analyzing a broad set of reform policies such as those analyzed here.²³

Given that the OECD model parameters are estimated largely based on historical, average relationships for OECD countries, mainly advanced economies, these simulations could underestimate the impact of reforms in EMEs. As Didier et al. (2015) note, the dispersion of productivity and misallocation of capital and labour among sectors tend to be greater for EMEs. Moreover, recent reform initiatives in China, India, Indonesia and Mexico have been broad-based. Therefore, complementarities that are not captured by the model are likely to exceed the historical relationships among advanced economies.

Our simulations may also overstate the contributions of reforms in these EMEs for several reasons. Some of the initiatives considered in this analysis are at early stages. This suggests that the benefits may be realized with a longer lag than we assumed in our simulations, and several of the previously outlined challenges currently facing EMEs may result in unanticipated delays in implementation. The large growth contributions from infrastructure, for example, are based on planned fiscal expenditures over this period, but restraints on budgets may result in lower actual investments. The impact of these policies also depends on the reform sequence, and some of the reforms may have less impact than the OECD average if necessary legal and institutional pillars are not already well established.

Conclusion

The future global economic environment will not be as supportive for EMEs as it was in the decade leading up to the financial crisis. EMEs will need to implement structural reforms to achieve sustainable robust growth and to foster convergence to higher income levels. Governments in several large EMEs have recently been making significant progress on their reform

²³ Calibrating model parameters for several EMEs is a potentially data-intensive exercise (particularly if the reforms studied necessitate multi-sector models) that may require data that are not readily available for some EMEs.

agendas. These reforms are expected to contribute to higher TFP growth and to support capital accumulation, and our model estimates suggest the impacts could be substantial. Given that the emerging world now accounts for the better part of world GDP, such growth prospects are an important determinant of the global outlook. Although the focus of this article is EMEs, securing sustainable growth in advanced economies also requires the implementation of structural reforms. As the IMF (2016b) stipulated, reforms that entail fiscal stimulus, such as infrastructure spending and reducing labour tax wedges, in addition to reforms that lower barriers to entry in product and services markets, may be most valuable at the current juncture since they would enhance both near- and medium-term GDP growth. Such reforms would also benefit EMEs by helping to strengthen global demand.

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