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Union Bank of Canada, 10 dollars, 1907

The Union Bank of Canada, which operated from 1865 to 1925, was one of the first Canadian banks to open branches in Western Canada following the Canadian government's purchase of Rupert's Land from the Hudson's Bay Company in 1870. In 1912, the bank moved its head office from Québec to Winnipeg. This Western focus may have influenced the design of the bank's 1903 and 1907 note series. This \$10 note, featuring a cowboy roping steers, is in the style of American painters Frederic Remington and Charles Marion Russell, whose images of Western life were popular at the time.

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Is Slower Growth the New Normal in Advanced Economies?

Abeer Reza and Subrata Sarker, International Economic Analysis

- There are a number of potential explanations for continued slow growth in advanced economies after the 2007–09 global financial crisis. In this article, we critically review and examine some of the main alternative explanations.
- Some observers view the current muted recovery as a prolonged cycle in the face of multiple headwinds and emphasize the role of private and public deleveraging in the aftermath of a financial crisis. Others suggest that slow growth is due to a structural inadequacy of demand leading to a long-lasting liquidity trap, while others view it largely as supply side in nature, reflecting demographic and technological factors.
- We think that a structural inadequacy of demand leading to a long-lasting liquidity trap or persistently subdued growth in potential output resulting from reduced innovation and technology adoption are extreme and, therefore, less likely characterizations of the slowdown that is occurring. Demographic trends do, however, suggest slower potential output growth in the future.
- These factors are unlikely to act as constraints to the conduct of conventional monetary policy in advanced economies in the future.

Seven years after the 2007–09 global financial crisis, growth in many advanced economies continues to disappoint. Annual growth in advanced economies averaged around 3.6 per cent between 1985 and 2007 and fell to 1.4 per cent during the recovery years, from 2010 to 2014. Typically growth rates during recovery years are often stronger than long-run averages as economies strive to catch up on lost activity. This time, however, growth has continuously disappointed, and forecasters have regularly adjusted their forecasts downward (**Chart 1**).

This has led some commentators to wonder whether slower growth has become the "new normal." Central to this debate is the question of whether the slowdown in growth is a cyclical phenomenon, the result of some long-term factors or some combination thereof. Has slower growth been in the making for a long time primarily because of a slowdown in the growth of productive capacity (Gordon 2014)? Does it reflect structural inadequacy of demand leading to a long-lasting liquidity trap (Summers 2014; Krugman 2014)? Or is it cyclical even though the recent downturn was unprecedented in its magnitude and length? If it is cyclical, can growth be expected to pick up, albeit to a lower level than the pre-crisis average, as soon as the persistent factors restraining global economic growth dissipate?

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Note: Advanced economies include Australia, Austria, Belgium, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, New Zealand, Norway, Portugal, San Marino, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Taiwan, the United Kingdom and the United States.

Source: International Monetary Fund World Economic Outlook (2009–15)

Last observation: 2014

The Bank of Canada recently discussed the relationship between slow growth and the conduct of monetary policy (Wilkins 2014; Mendes 2014). This article complements those discussions by critically reviewing and reconciling the main debates over the drivers of a slowdown in growth that are being put forth in the current literature and economic commentary.

It is important for inflation-targeting central banks to make the distinction between cyclical and long-term structural factors in choosing the appropriate stance of monetary policy (Wilkins 2014). In the absence of cyclical shocks from the demand side, an economy's output is expected to be at its potential level, which is defined as the amount an economy can naturally produce without generating inflationary pressures. Potential output depends on the actual level of capital, trend labour inputs and the state of technology. When cyclical disturbances threaten a fall in output below its potential level and consequently cause inflation to move away from the target, inflation-targeting central banks tend to reduce interest rates to maintain or move toward the target.

Long-term factors, in contrast, influence the conduct of monetary policy because of how they affect the medium-to-long-run real neutral rate of interest—the interest rate that should prevail once all shocks have dissipated and the economy has reached its potential. In a closed economy, this is the rate of interest that equates long-term desired savings with desired investment. For a small, open economy, this rate is given by the global equilibrium between desired savings and desired investment. A slow growth of potential output or a structural inadequacy of demand that continues to create an excess of desired savings over desired investment leads to a low medium-to-long-run neutral rate of interest.¹ In an extreme case, if this rate is sufficiently negative, conventional monetary policy may be constrained to maintaining a neutral stance over the medium to long term if the nominal neutral rate is bounded by zero. If inflation expectations are

¹ As discussed in Mendes (2014), output is expected to be at the potential level in the long run. The interest rate is therefore the only mechanism through which desired savings can match the desired investment. In contrast, output will adjust to maintain this equality in the short run.

anchored at the target inflation rate of 2 per cent over the medium term, a zero nominal interest rate will imply a real policy rate of -2 per cent. If the real medium-term neutral rate is below -2 per cent, there will be excess savings over investment even with a zero nominal interest rate.²

A low medium-term neutral rate can also pose a challenge for short-term stabilization policies, which relate more to the idea of a contemporaneous neutral rate that makes the economy reach its potential period by period, given the shocks (Wilkins 2014; Mendes 2014; Woodford 2003). If the medium-term neutral rate is very low to begin with, the contemporaneous neutral rate needed to close the output gap today can be even lower for large negative shocks.³

This article first discusses the cyclical impediments to growth in the aftermath of the financial crisis and then explores the effects of long-term factors in advanced economies from both supply and demand perspectives. It then provides an analysis of the long-term effects of persistence in some of the cyclical factors. Finally, it briefly discusses the implication of slower growth for the conduct of monetary policy in advanced economies.

Cyclical Impediments Remain Persistent

The key issue is how cyclical factors could continue to persist even seven years after the crisis. Some commentators view the effect of deleveraging after the financial crisis as the key factor prolonging the downturn and suggest that such a muted recovery is actually not that uncommon historically. Reinhart and Rogoff (2009) point out that the aftermath of severe financial crises is accompanied by deep and prolonged declines in asset prices and in output and employment. Looking at 63 systemic banking crises in advanced economies, Reinhart and Rogoff (2014) find that, on average, per capita gross domestic product (GDP) falls by 9.6 per cent from peak to trough, and it takes 7.3 years for a country's per capita GDP to return to its pre-crisis peak.

Chart 2 puts the current U.S. and euro-area recoveries in historical perspective. For the United States, the current decline is more severe, and the recovery more prolonged, compared with its collective experience of post-war business cycles (shaded area). However, the path of the current recovery (red line) is more comparable with the average of the "big five" modern financial crises (blue line) identified by Reinhart and Rogoff (2009). In contrast, the euro-area recovery has been much slower and real output per capita has not yet reached its pre-crisis level.⁴

Historically, recoveries following financial crises are over when deleveraging completes its natural course. The debt-to-GDP ratio, a key indicator of leverage, can be reduced through growing output or through active debt repayment or restructuring by different agents in the economy: households, firms or governments. In the runup to the 2007–09 crisis, demand in the United States and the euro area was supported by a marked increase in private sector leverage. Although the household

- 2 Such a low level of the medium-to-long-run neutral real rate is extremely unlikely, but some commentators have argued that this possibility exists (Summers 2014).
- 3 Monetary authorities will still have access to unconventional monetary policies, such as quantitative easing, forward guidance and negative nominal interest rates, which are briefly discussed at the end of this article. See Wilkins (2014) and Mendes (2014) for more detailed discussions of how slow growth affects monetary policy.
- 4 Growth in the euro area has been particularly hampered by a series of factors, such as prolonged and continual resurfacing of banking and sovereign debt crises in periphery countries, the erosion of business confidence and resulting low investment. The initial absence and subsequent slow development of architecture across the euro area to manage the crises in peripheral countries also severely impeded financial repair and the economic recovery.

 Some commentators suggest that a muted recovery following a financial crisis is not that uncommon historically debt-to-income ratios in some hard-hit countries (the United States, the United Kingdom, Ireland and Spain) have decreased significantly from their highest levels, further debt repayment or write-down may still be under way in other economies, especially in the euro area (Dobbs et al. 2015).



Note: The big five modern financial crises, as described in Reinhart and Rogoff (2009), are Spain (1977), Norway (1987), Finland (1991), Sweden (1991) and Japan (1992). Business cycle peaks are indexed at zero. The U.S. peak occurs in 2007Q4 and the euro area peak occurs on 2008Q1.

Sources: Bureau of Labor Statistics, Census Bureau, Bureau of Economic Analysis, Organisation for Economic Development and Co-operation, United Nations and Bank of Canada calculations

Last observation: 2015Q1

In a best-case scenario, the negative pressure on aggregate demand arising from active debt repayment in one sector (say, the household) in the economy can be mitigated by support from another sector (say, the government). At the height of the financial crisis, many countries sought to provide fiscal stimulus to support demand. As a consequence, public debt rose sharply (**Chart 3**). The subsequent fiscal consolidation has been a barrier to a robust recovery for many advanced economies.

Other cyclical factors, such as repairs to the financial sector and reduced access to credit, fragmentation in financial markets (especially in Europe) and policy uncertainties, also acted as a barrier to robust recoveries. Despite their persistence, however, these impediments can be expected to lessen in the medium term.



Chart 3: Household deleveraging is under way, but public debt

Long-Term Factors Can Impede Recovery and Growth

Some commentators argue that behind the current slow growth is a reduction in the economy's capacity to supply goods because of certain long-term factors, such as a decline in total factor productivity growth or demographic trends. Others argue that the world may be in a state of "secular stagnation," whereby a host of structural factors-some of which are similar to the factors mentioned above—have been generating a chronic and structural deficiency in aggregate demand since well before the onset of the crisis that has manifested itself through a persistent output gap. These views are discussed below.

Speed limits from the supply side

Gordon (2014) and Fernald (2014) interpret the post-crisis slowdown in total factor productivity growth as a permanent shift back to its historical norm. In this view, high levels of productivity growth in the United States during the five decades preceding the 1970s as well as from the mid-1990s to the early 2000s were exceptional (Chart 4). From the early 19th century until the 1970s, historically high productivity growth had been spurred by a series of significant inventions (e.g., the combustion engine, the telegraph, indoor plumbing and electricity). It is often argued that productivity boosts from the latest cycle—in Internet communication technology, robotics, etc.-are unlikely to be as transformative as those from the earlier cycle.⁵

Some view the post-crisis slowdown in total factor productivity growth as a permanent shift back to its historical norm

According to this view, the benefits from the information technology revolution have already 5 been reaped. Potential future innovations, such as driverless cars, are unlikely to change business practices much. For example, delivery to retail stores will still require someone to take the products to store shelves. Similarly, Gordon (2014) argues that innovations such as robotics or three-dimensional printing are "evolutionary," rather than "revolutionary," and are unlikely to be used for mass production.

Chart 4: U.S. Long-term average productivity growth is back to its historical norm Per cent change at annual rate



Long-term demographic trends, in contrast, may have a more discernably negative effect on growth than slowdowns in technology adoption. **Chart 5** shows that the growth rate of the working-age population is negative in Japan and the euro area and is declining in the United States and Canada. Although a portion of the decline in the growth rate of the working-age population has historically been offset by an increase in the participation rate of women in the labour force as well as an increase in the average age for retirement, there is likely less scope now for these trends to continue.⁶ Gordon (2014), Rachel and Smith (2015) and several others have also mentioned the possibility of advanced economies gradually reaching an education plateau as the number of years of schooling per worker cannot continue to increase forever. Unless these demographic forces are offset by rising productivity or higher immigration, they will result in slower potential growth for any given rate of labour productivity.

⁶ The labour force participation rate in the United States has been declining for some time, but the participation rate in other advanced economies has stagnated.





Long-term decline in demand: secular stagnation

Summers (2014) and Krugman (2014) propose a demand-side mechanism, referred to as secular stagnation, as the source for the slowdown in economic growth. According to this view, chronic demand deficiencies influenced by a number of long-term factors, such as demographics, rising inequality or changing technology, can result in desired savings exceeding desired investment and thereby cause the medium-to-long-term neutral rate to be negative. This may lead to a long-lasting liquidity trap where conventional monetary policy cannot, usually, set the nominal interest rate below zero. Assuming inflation expectations are anchored at the target inflation rate of 2 per cent, a zero nominal interest rate will imply a real policy rate of -2 per cent. If the real medium-term neutral rate is below -2 per cent, there will be excess savings over investment even with a zero nominal interest rate. The economy may thus become stuck in a persistent output gap for a long time.⁸ In addition, even if full employment is achieved at a very low medium-to-long-term neutral rate, any significant negative shock would challenge conventional monetary policy in the short-run since the necessary contemporaneous market-clearing rate may turn deeply negative.⁵

A number of factors can lead to excess savings over investment demand. First, demographic trends can strongly influence total household consumption and savings rates. The proportion of the population aged 50 to 64 will reach a peak in the next few years in the euro area and the United States. As individuals save for retirement, total household savings for these economies can rise and put downward pressure on the neutral rate. A shrinking working-age population may also reduce investment demand as fewer capital goods will be needed to equip new

- 7 Although it may be tempting to use this term, first proposed by Alvin Hansen in the 1930s, to mean slow growth in general, we follow the recent literature and use it to refer solely to the Summers (2014) and Krugman (2014) argument of slow growth resulting from a chronic deficiency in demand.
- 8 Summers (2014) and Krugman (2014) argue that the advanced economies had been in such a trap even before the crisis and that the U.S. and euro-area economies avoided weak growth before the crisis only by permitting the buildup of unsustainable financial imbalances (e.g., the technology bubbles of the late 1990s and the housing bubble of the 2000s in the United States; bubble-like financial flows to the periphery in Europe).
- 9 Other policies, such as unconventional monetary policies as well as fiscal policy, can still be effective in stimulating the economy.

 Others view that there is a chronic demand deficiency influenced by a number of long-term factors workers. Second, rising inequality in advanced economies may also lead to increased savings. Because wealthier people are more inclined to save, the more that income gets shifted toward the wealthy, the greater the upward pressure on national savings and downward pressure on the interest rate (Summers 2014).

Third, a secular decline in the relative price of investment goods implies that a dollar of savings can now purchase more capital than ever before, causing excess savings over investment (Summers 2014). In addition, firms focusing on technological products increasingly need to invest less in physical capital to be successful.¹⁰ Finally, a structural shift to a more service-oriented economy may also result in less demand for physical investment.

Note that some of these demand-side factors can be closely linked to the supplyside factors mentioned in the preceding section. For example, a slowdown in growth due to demographics and low productivity would lead to a lower trend in desired investment. This will then lead to less future capital stock and, consequently, lower potential output. Conversely, chronically weak demand may also lead to limited productivity growth and low labour force participation.

How likely is a scenario of perpetually stagnant growth driven by long-term factors?

Long-term factors may indeed be contributing, in varying degrees, to slow growth in the advanced economies. We, however, find the above-mentioned characterization of their effects by both the supply- and demand-side analysts to be somewhat extreme, and the likelihood of these scenarios actually playing out to be small.

First, predictions about technological trends are difficult to make. Mokyr (2014) and Glaeser (2014) argue that we may be on the verge of several other technological revolutions (e.g., biotechnology, three-dimensional printing) that could have a significant positive impact on productivity. Brynjolfsson and McAfee (2011), meanwhile, believe that even if the current slow growth in productivity is attributed to a lower scale and scope of technology adoption, it is not a sufficient reason to predict that this is going to persist in the future. Mankiw (2015) argues that there are still large untapped returns from education, especially in the United States. Second, the effect of demographics on the neutral rate is far from certain. As baby boomers start depleting their savings in their retirement years, total savings may fall, putting upward pressure on the neutral rate in the future, contradicting the liquidity trap mechanism highlighted by proponents of secular stagnation. Third, the effect of inequality on the savings rate is also unclear because the savings rate in the United States was falling over the past decade, while, simultaneously, inequality was on the rise.¹¹ Fourth, the secular decline in the relative price of investment has stabilized since the mid-2000s and no longer implies a continuous decline in investment demand going forward. Finally, any decline in physical investment demand resulting from a growing share of investment in the service sector may be offset by more investment in intellectual property products, such as software and other research and development.

¹⁰ Summers (2014) emphasizes this point by noting that the market capitalization of WhatsApp is comparable with that of Sony, while its requirement for physical investment is negligible in comparison.

¹¹ Some argue that the decline in savings was largely driven by an unsustainable pre-crisis credit boom, when low-income households were encouraged to consume beyond their means (e.g., sub-prime lending) (Rajan 2011; Summers 2014). Now that the credit cycle has turned, household savings have reverted to normal, more sustainable levels.

Overall, these long-term factors may lead to a low medium-term real neutral interest rate in advanced economies, but they are unlikely to make it negative. Hamilton et al. (2015), for example, find the medium-term real neutral rate in the United States to be between 0 and 2 per cent. Moreover, from a global perspective, these demand-side factors are less relevant for other parts of the world than they are for many advanced economies. If there are profitable investment opportunities elsewhere, it is not clear why the desired investment in the advanced economies should be limited by domestic investment opportunities. Theoretically, both the U.S. economy and other advanced economies should be able to run current account surpluses against the rest of the world and thereby exhaust the excess domestic savings over investment, if any.

Bernanke (2005, 2015) provides an alternative explanation of the higher global savings and why such a global rebalancing of demand is not taking place. He emphasizes that the "global savings glut" has been coming mainly from emerging-market economies and oil-exporting countries (**Chart 6**). Many policy-induced distortions in emerging-market economies, such as excessive reserve accumulation, have been contributing to this rise in savings and flow toward the advanced economies (Dodge 2006). Oil prices have, however, fallen recently and current account surpluses from oil-exporting countries are likely to remain low. But further structural reforms as well as a full commitment to a flexible exchange rate regime in the emerging economies, especially China, are necessary for higher consumption and a lower savings rate. Unless there is a sustained rebalancing of global demand toward the emerging-market economies, the savings glut will continue to be a drag on growth in advanced economies.







Prolonged Cyclical Downturns Can Pull Down Potential Growth

Another explanation for the slow growth is that a prolonged cyclical downturn can, itself, pull down potential growth (Congressional Budget Office 2014; Reifschneider, Wascher and Wilcox 2013; Hall 2014; IMF 2015). Potential output depends on the actual level of capital and trends in labour inputs as well as the state of technology. A prolonged reduction in any of these components can have a negative effect on potential growth in the medium term.

The investment-to-output ratio in advanced economies fell to 19.5 per cent in 2009 from an average of around 24 per cent between 1980 and 2007 and has not yet returned to its pre-crisis levels. Decreased investment has reduced the amount of capital available for production, and when a reduction is persistent enough, it may pull down potential output. The effect of this decrease in capital stock can be magnified when firms have limited access to credit or when firms are less inclined to invest as a result of heightened uncertainty about expected returns on investment.

A prolonged cyclical downturn can also temporarily reduce potential labour input. The recent great recession and the subsequent slow recovery have hit labour markets around the world particularly hard, with a disproportionate increase in long-term and youth unemployment. This reduces future opportunities to find jobs and erodes work skills. It also dampens potential labour force participation as some people decide to retire early, while others become discouraged and drop out of the labour force entirely.

Finally, prolonged recessions may reduce both actual and trend total factor productivity by cutting business spending on improvements in production methods and slowing the rate at which workers upgrade their skills to keep up with evolving technological needs. Limited access to credit hinders the creation of new firms and, thereby, also hinders innovation and efficient allocation of capital and labour resources.

Factors such as capital deepening and potential labour input can be expected to rebound, albeit quite slowly. It is less likely, however, that the reductions in productivity growth and the decline in participation rates related to demographics will rebound. Accordingly, the International Monetary Fund (2015) suggests that, although potential output growth in the advanced economies is expected to be higher than the post-crisis experience so far, it might remain lower than the precrisis average (**Chart 7**). While actual numbers vary widely, this seems to be the general conclusion in several other studies. Some commentators have also suggested that the estimates for potential output were too high before the crisis. Growth was fuelled by an unsustainable credit boom, so there is no reason to expect that it will return to the pre-crisis level. However, near-target inflation during the pre-crisis period casts doubt on this view.



Chart 7: Potential output is expected to grow at a slower pace than before the crisis in advanced economies

Implications for Monetary Policy

As mentioned earlier, slow growth in the medium to long run affects the conduct of conventional monetary policy by reducing the neutral rate of interest (Mendes 2014). Estimates for the medium-to-long-run neutral rates in the advanced economies suggest the possibility that the rate has declined compared with those of a decade earlier. In the United States, such estimates put the long-run real neutral rate at between 0 and 2 per cent (Hamilton et al. 2015). Yellen (2015) suggests that the rate may be at 1.75 per cent. Recent research by the Bank of Canada (Mendes 2014) suggests that, in Canada, the current real neutral rate is more likely in the range of 1 to 2 per cent.¹²

Even if the situation is not as extreme as suggested by the proponents of the secular stagnation hypothesis, a reduction of the neutral rate can potentially increase the likelihood of zero-lower-bound episodes and act as a constraint on conventional monetary policy. But as Côté (2014) emphasizes, there are factors working in the opposite direction as well. First, regulatory reforms of the financial sector globally should reduce the likelihood of a large financial crisis and, therefore, the need for negative contemporaneous real interest rates. Second, recent experience has shown that central banks can still provide monetary stimulus through unconventional policies, such as forward guidance or quantitative easing. Lastly, many advanced economies have recently shown that the effective lower bound for nominal rates can be below zero. The Bank of Canada will carefully analyze these issues for the 2016 renewal of the inflation target.

12 Given the headwinds faced by the Canadian economy, the contemporaneous neutral rate in Canada would be well below this range (Wilkins 2014).

Conclusion

Overall, there is increasing evidence that growth in advanced economies may remain slow in the immediate future compared with its pre-crisis average, as a result of a combination of cyclical and structural factors. While persistent cyclical factors, such as private and public sector deleveraging, will eventually disappear, longer-term supply factors, such as demographic trends, may continue to exert downward pressure on potential growth.

We do not, however, find the arguments made by the proponents of secular stagnation to be fully convincing. Even though a decline in potential growth may reduce the neutral rate in many economies, monetary policy-makers still have ample room to manoeuvre. Current estimates of medium-term real neutral rates are lower than before but are far from being a constraint on monetary policy over the medium term. In addition, other public policy initiatives, such as structural reforms and fiscal stimulus, wherever feasible, should be able to support both potential growth and aggregate demand. G20 leaders have already recognized the need and pledged to undertake measures to revive both demand and potential growth rates.¹³

 Current estimates of mediumterm real neutral rates are lower than before but are far from being a constraint on monetary policy over the medium term

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¹³ See G20 Leaders' Communiqué, November 2014, where they have pledged to undertake measures to raise G20 GDP by an additional 2 per cent by 2018.

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A Survey of Consumer Expectations for Canada

Marc-André Gosselin and Mikael Khan, Canadian Economic Analysis

- The Bank of Canada recently launched a quarterly survey to measure the expectations of Canadian households: the Canadian Survey of Consumer Expectations (CSCE).
- The data collected provide comprehensive information about consumer expectations for inflation, the labour market and household finance, as well as about consumer uncertainty in those areas.
- Information from the CSCE will help the Bank analyze and forecast inflation, assess labour market conditions and monitor issues related to financial stability. It will also improve our understanding of how households form and update their expectations.
- The methodology used for the new survey is largely inspired by the Federal Reserve Bank of New York's *Survey of Consumer Expectations*.

For an inflation-targeting central bank like the Bank of Canada, monitoring the behaviour of inflation expectations is critical to gauging current and prospective inflation pressures. To perform these tasks efficiently, the inflation expectations of various types of economic agents must be measured regularly. This article provides background information and preliminary results from a new Bank of Canada survey—the *Canadian Survey of Consumer Expectations* (CSCE). This new survey addresses gaps in existing sources of information on household behaviour.

Why Do We Consider Expectations?

As discussed in Boivin (2011), economic outcomes result from people's collective decisions, and these decisions depend on what people expect the future to bring. In other words, how people anticipate the future affects the decisions they make in the present. For example, when deciding to buy a house, people will factor in their expectations of future income, interest rates and the value of real estate. This has a significant impact on current economic outcomes. Given that consumer expectations affect how the economy evolves, they need to be considered when setting monetary policy.

In particular, since expected inflation influences current wage negotiations, price setting and financial contracting for investment, it is one of the main drivers of current inflation. This connection means that central banks can affect current and future inflation by better anchoring people's expectations for long-term inflation. Accordingly, measures of longer-term inflation expectations are particularly useful for central banks because they provide signals about the credibility of

Measures of longer-term inflation expectations are particularly useful for central banks because they provide signals about the credibility of monetary policy

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monetary policy. Inflation expectations are thus an important part of the information used by central banks to understand, forecast and control inflation, which is why it is important to have adequate measurements of these expectations.¹

Measures of Inflation Expectations Available in Canada

There are two main ways to measure inflation expectations in Canada: surveybased measures and market-based measures. As discussed in Cunningham, Desroches and Santor (2010), there are advantages and disadvantages to each type of measure. In general, available measures differ considerably in their breadth of coverage, the frequency and time span over which they are accessible, and the extent to which they may be distorted by certain biases. It is therefore preferable to use a variety of measures that complement each other when conducting monetary policy. This section provides an overview of the two broad types of measures as well as a list of specific measures available for Canada (**Table 1**).

	Participants	Start date	Frequency	Organization	Measure and horizon
Survey-based	· · · · · · ·				·
onfidence 500 firms 1987 Quarterly		Quarterly	Conference Board of Canada	Price increases over the next 6 months	
usiness Outlook 100 firms 1997 Quarterly Bank Cana		Bank of Canada	Expected annual rate of CPI inflation for the next 2 years		
Survey of Forecasters	Less than 10 forecasters	1999	Quarterly	Conference Board of Canada	Calendar-year inflation forecasts
Consensus forecast	Around 15 forecasters	1989	Monthly	Consensus Economics Inc.	Inflation forecasts for the next 1, 2, 3, 4, 5, and 6 to 10 years ^a
Survey of private sector forecasters	Around 15 forecasters	1994	Quarterly	Finance Canada	Calendar-year inflation forecasts (CPI and core CPI)
Survey of economic expectations	More than 40 economists	1982	Annual	Towers Watson	Inflation forecasts for the next 1, 2 to 5, and 6 to 15 years
Market-based					
Break-even inflation rate	Not applicable	1991	Monthly	Not applicable	Spread on nominal/Real Return Bonds, long term
Term-structure model	Not applicable	1992	Monthly	Not applicable	Inflation expectations implicit in nominal yield for the next 1 and 2 years

Table 1: Measures of inflation expectations available for Canada

a. Longer-term inflation forecasts are provided on a quarterly basis.

Source: Bank of Canada

Survey-based measures

Surveys of firms typically ask respondents what they expect inflation to be in the next four to eight quarters and beyond. In its *Survey of Business Confidence*, the Conference Board of Canada asks approximately 500 chief executive officers of Canadian businesses about their expectations for price increases over the coming six months. The Bank of Canada's *Business Outlook Survey* (BOS) conducts inter-

views with 100 firms across Canada in sectors that broadly reflect the composition of gross domestic product (GDP). The survey asks firms about their forecasts of annual consumer price index (CPI) inflation over the next two years. In 2014, the Bank introduced a new question in the BOS that measures uncertainty around expectations.

Surveys of forecasters usually follow a calendar-year horizon and report the mean of respondents' inflation forecasts. In its *Survey of Forecasters*, the Conference Board of Canada collects the opinions of a small number of forecasting organizations on their outlook for the Canadian economy. Similarly, Consensus Economics conducts a monthly survey of a cross-section of professional forecasters, asking each for their predictions for inflation, as well as for economic growth, unemployment, and short- and long-term interest rates. Inflation expectations are provided for various horizons, as far as 6 to 10 years ahead. Finance Canada also regularly surveys private sector forecasters for their views on inflation and other economic variables.² Towers Watson surveys business economists and portfolio managers on an annual basis and reports forecasts of macroeconomic and financial variables at various horizons.

Market-based measures

Inflation expectations can also be inferred from asset prices, such as by calculating the break-even inflation rate (BEIR). The BEIR is the difference between the nominal yield on a fixed-rate bond and the real yield on an inflation-linked bond (or Real Return Bond) of the same term and maturity. Reid, Dion and Christensen (2004) find that the BEIR in Canada has been higher, on average, and more variable than survey-based measures of inflation expectations, which may be explained by the effects of market-based risk premiums and other distortions embedded in the BEIR. To help address these shortcomings, term-structure models can be used to provide market-based estimates of the average expected inflation rate. These models decompose nominal yields into real yields, expectations of future inflation and inflation risk premiums.

This review of the existing measures of inflation expectations highlights a significant data gap: there has been no measure of household inflation expectations available in Canada.³

International Experience with Measuring Household Inflation Expectations

While a regular survey of household inflation expectations did not exist in Canada until recently, such measures of household inflation expectations are common in other countries. Central banks from most advanced economies use information about household inflation expectations as inputs into their monetary policy deliberations and in communications with the public.⁴ For example, the Bank of England uses three different surveys to monitor household inflation expectations. The results of these surveys are analyzed and communicated in the Bank of England's *Inflation Report* and *Quarterly Bulletin*.

- 2 The average of private sector forecasts forms the basis for the economic assumptions that Finance Canada uses for fiscal-planning purposes.
- 3 The only regular survey of household opinions in Canada is the Conference Board's monthly *Consumer Confidence Survey*, which asks about consumers' level of optimism regarding current economic conditions but does not cover issues related to inflation expectations.
- 4 According to a survey by the Centre for Central Banking Studies, 85 per cent of central banks use measures of inflation expectations from consumers.

Central banks from most advanced economies use information about household inflation expectations when setting monetary policy In the United States, the most widely used survey of consumer inflation expectations is the Reuters/University of Michigan Survey of Consumers. A different random sample of individuals is selected monthly for this telephone survey, which asks respondents about their point forecasts for the change in "prices in general" over the next 12 months as well as 5 to 10 years into the future by selecting from a range of options.

Recently, the Federal Reserve Bank of New York launched a new survey, the *Survey of Consumer Expectations* (SCE, **Box 1**). Other central banks using surveys of household inflation expectations include those from the euro area, Sweden, New Zealand and Australia.

Box 1

The Federal Reserve's Survey of Consumer Expectations

The Federal Reserve Bank of New York formed a team of economists and psychologists to study the feasibility of improving the measurement and analysis of consumer inflation expectations. Through several cognitive interviews and experimental surveys, they assessed the content of the information that could be gathered using different survey questions. For example, they examined the difference between asking about "prices in general" and asking directly about the rate of inflation. They found that when asked about prices in general, consumers tend to focus on a few prices specific to their personal experience. In contrast, questions about the rate of inflation tend to elicit responses more closely related to the broader macroeconomic concept that economists are interested in. This research led to the design and implementation of the *Survey of Consumer Expectations* (SCE). The SCE is innovative because, in addition to asking respondents for a point forecast, it uses probability-based questions to generate the respondents' density forecast (**Box 2**). The density forecasts can then be used to construct measures of individual forecast uncertainty. The Federal Reserve Bank of New York has found that individuals are as willing and able to respond to well-written probability questions as they are to traditional attitudinal questions on the same subject.

The SCE also measures expectations about labour market conditions and household finance.

Creating a Survey of Consumer Expectations for Canada

Based on the experience and recent research of other central banks, the Bank of Canada developed a survey to measure the expectations of Canadian households on a regular basis. The methodology the Bank used for this survey largely follows that of the Federal Reserve Bank of New York's SCE, which was deemed to represent the cutting edge of consumer survey design.

The CSCE is a nationally representative, web-based quarterly survey of 1,000 heads of households that is administered by a large polling firm on behalf of the Bank of Canada. A rotating panel of respondents is used to track the same individuals over time. Respondents participate in the panel for up to a year, with a roughly equal number rotating in and out of the panel each quarter. This reduces the variability caused by changes in sample composition, leading to greater stability and precision in the estimates. The survey also collects information on income, age, gender, region and numeracy, so the results can be analyzed for different consumer groups. The web-based approach allows a great deal of flexibility to ask new questions and makes it considerably easier to pose more complex probability-based questions. It is also the most cost-effective way to collect information.⁵ As in the SCE, the new survey not only covers issues related to expectations about inflation, but it also takes the opportunity to ask questions about a broader range of expectations related to consumer economic behaviour, from current and prospective labour market conditions to household finances.

Inflation module

The inflation module begins with general questions about consumer sentiment. Respondents are then asked about their perception of the current 12-month rate of inflation as well as their point predictions (i.e., single-value forecasts) for inflation over the next 12 months, the following 12 months, and five years into the future. Respondents are also asked for their point predictions of changes in the price of various goods and services for one year ahead.⁶ Tracking expectations for prices of specific goods can help explain changes in overall inflation expectations.

Following the SCE approach, a key aspect of the CSCE is that, in addition to traditional point forecasts, it also measures inflation expectations using density forecasts, where participants are asked to assign probabilities to intervals of future inflation outcomes (**Box 2**). Probability-based questions capture respondents' beliefs more fully and therefore allow for a more accurate and complete representation of individuals' subjective expectations.

Using the survey responses to track uncertainty of inflation forecasts provides insights into the credibility of a central bank and its ability to communicate monetary policy effectively. In other words, an increase in uncertainty about future inflation outcomes may be an early warning of eroding central bank credibility.⁷ More generally, such measures may be useful to improve the accuracy of inflation forecasts and to detect potential turning points in inflation expectations. Another important advantage of density forecasts over point predictions is that they allow interpersonal comparisons; when relying on point predictions, the measure of central tendency reported (mean, median or mode) is not clear.

Labour market module

The labour market module collects information about employment status and expectations of future wage growth, including uncertainty about future wage changes. In addition, it elicits year-ahead expectations of the following: (i) the likelihood of voluntary job exits (resignations) and involuntary job exits (layoffs); (ii) the likelihood of finding and accepting a job within three months if the respondent were to become unemployed today; and (iii) the likelihood of moving during the next year. Together, these expectations represent a rich set of indicators of current and prospective labour market conditions.

- 6 These include food, gasoline, gold, medical care, rent and education.
- 7 If individuals were to become less certain about how the central bank responds to shocks that push inflation away from the target, measures of uncertainty about the future level of inflation may rise. Measures of uncertainty are also helpful for assessing the importance that people attach to various outcomes, such as the risk of deflation.

The new survey asks questions about a broad range of expectations related to consumer economic behaviour, from current and prospective labour market conditions to household finances

⁵ There is also some evidence that web-based surveys have higher response rates to personally sensitive questions.

Box 2

Examples of Survey Questions

In the *Canadian Survey of Consumer Expectations*, the sequence of questions regarding inflation expectations over the next 12 months is as follows:

Over the next 12 months, do you think that there will be inflation or deflation? (Note: deflation is the opposite of inflation.)

Please choose one.

- □ Inflation
- Deflation (the opposite of inflation)

What do you think the rate of [inflation/deflation] will be over the next 12 months? Please give your best guess.

Please enter a number greater than 0 or equal to 0.

Over the next 12 months, the rate of [inflation/deflation] will be _____%.

In your view, what would you say is the per cent chance that, over the next 12 months,¹

The rate of inflation will be 12% or higher	per cent chance
The rate of inflation will be between 8 and 12%	per cent chance
The rate of inflation will be between 4 and 8%	per cent chance
The rate of inflation will be between 2 and 4%	per cent chance
The rate of inflation will be between 0 and 2%	per cent chance
The rate of deflation (opposite of inflation) will be between 0 and 2%	per cent chance
The rate of deflation (opposite of inflation) will be between 2 and 4%	per cent chance
The rate of deflation (opposite of inflation) will be between 4 and 8%	per cent chance
The rate of deflation (opposite of inflation) will be between 8 and 12%	per cent chance
The rate of deflation (opposite of inflation) will be 12% or higher	per cent chance
TOTAL	100

1 This specific set of possible answers replicates the approach taken by the Federal Reserve Bank of New York, which is based on historical patterns as well as initial findings from a set of pilot surveys and cognitive interviews. Answers to probabilitybased questions must sum to 100 for respondents to proceed.

Household finance module

The final component of the survey collects year-ahead expectations of household income, spending, house price growth, taxes and interest rates. Additional questions ask about the ability to make a debt payment over the next three months, as well as expectations and perceptions of changes in access to credit. This information provides a real-time picture of the perceptions of Canadian households of their financial situation and credit supply as well as rich and unique data for use by policy-makers, researchers and the public. While other surveys, such as the Statistics Canada *Survey of Financial Security*, provide data on the finances of Canadian families, few data sources provide timely information on such a broad set of information.

Initial Findings and Next Steps

The first wave of the CSCE covered the fourth quarter of 2014. At the time of writing, data through to the third quarter of 2015 are available. Since this relatively short time span limits the scope of analysis, we focus on insights gleaned from cross-sectional findings. What follows is by no means exhaustive; it is simply intended to demonstrate the potential of the CSCE.

We find a high level of engagement among survey respondents, with about 70 per cent indicating that the survey is "somewhat" or "very" interesting (**Chart 1**). Respondents also perform favourably on numeracy tests (**Chart 2**), the overall scores of which are determined by answers to five questions related to basic principles of mathematics and statistics. Finally, an overwhelming majority of respondents report that they understand the concept of inflation (**Chart 3**). This bodes well for the quality of responses to questions related to inflation expectations.

We also find that survey respondents are highly willing and able to provide answers to probability-based questions, which have response rates close to 100 per cent (**Table 2**). Respondents make extensive use of the bins to which they can assign probabilities, particularly for inflation and house prices. Not surprisingly, respondents demonstrate less uncertainty regarding their wage expectations (as seen by the fewer bins used) since they are being asked about their personal experience rather than a macroeconomic concept. About 70 per cent of respondents found the Canadian Survey of Consumer Expectations "somewhat" or "very" interesting



Source: Bank of Canada

Table 2: Household expectations, for one year ahead

	Inflation	House prices	Wages
Response rate (%)	99.9	99.9	97.1
Proportion with positive probability in more than one bin (%)	91.9	85.8	68.8
Average number of bins with positive probability	5.1	5.1	3.6

Source: Bank of Canada

Consistent with the U.S. experience (Bruine de Bruin et al. 2009), we observe significant variation in inflation expectations across different demographic characteristics. For instance, we find inflation expectations to be higher among less-educated, lower-income and younger households. These characteristics are also associated with a greater degree of uncertainty regarding future inflation. We also see that, irrespective of demographic characteristics, inflation expectations tend be somewhat higher than recent or average CPI inflation in Canada. This is a common feature of consumer inflation expectations and suggests that it will be more informative to examine differences between groups and changes over time rather than absolute levels (**Table 3**).⁸

Demographic characteristic	Median point forecast	Interquartile range ^a
Female	3.0	4.0
Male	2.5	1.0
High school or less	4.0	8.0
College degree	3.0	3.0
University degree	2.5	1.4
Household income < \$80,000	3.0	4.0
Household income ≥ \$80,000	2.5	1.0
Age 15 to 24	4.0	9.0
Age 25 to 54	2.5	3.0
Age 55 +	3.0	2.0
Numeracy score < 80 per cent	3.0	8.0
Numeracy score ≥ 80 per cent	2.5	2.0

Table 5. One-year-aneau mination expectations, by demographic tharacteristi	Table 3: One-y	/ear-ahead inflation ex	pectations, by	v demograp	phic characteristic
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a. The interquartile range provides a measure of statistical dispersion by taking the difference between the upper and lower quartiles of point forecasts for year-ahead inflation expectations.

Source: Bank of Canada

In addition to providing data on household expectations, the CSCE can provide valuable insights into how those expectations are formed and updated. For example, one area of future work will be to investigate how inflation expectations evolve with expectations for category-specific inflation rates. The literature suggests that consumer inflation expectations can be quite sensitive to news about rising prices, which, in turn, tends to focus mostly on gasoline prices (Ehrmann, Pfajfar and Santoro 2014).

The CSCE also elicits information about expectations of labour market turnover, an important gauge of labour market health for which available Canadian data are limited.⁹ These statistics tend to vary significantly, depending on the level of education attained. Less-educated workers perceive a higher likelihood of being laid off and are less likely to voluntarily quit a job, but they are also more confident that they will find a new job should the need arise (**Table 4**). Monitoring the evolution of these turnover probabilities will be particularly interesting in the Bank's efforts to deepen our understanding of the Canadian labour market.

 It will be more informative to examine differences between groups and changes over time rather than absolute levels

⁸ A number of possible explanations for this phenomenon have been proposed. For example, the expectations of some consumers may be unduly influenced by price changes in a narrow set of categories (such as food and energy) that tend to undergo large and frequent price movements.

⁹ There is no Canadian equivalent to the U.S. Job Openings and Labour Turnover Survey.

Level of education	Lose job	Leave job	Find job
High school or less	19.5	16.0	53.8
College	19.9	16.5	49.8
University	15.3	21.7	43.7

Table 4: Average job exits and job-finding probabilities

Source: Bank of Canada

The CSCE can also be used to shed light on issues related to financial stability, an area of growing consideration to the conduct of monetary and macroprudential policy. For example, **Chart 4** and **Chart 5** show responses to questions aimed at assessing the financial vulnerability of Canadian households. We find that very few respondents express concern about meeting their financial obligations. Households also claim to be relatively immune to a sizable decline in the value of their homes.

Finally, an important advantage of the CSCE is that special one-off questions can be included to help deepen the Bank's understanding of recent economic developments. For example, the CSCE for the first quarter of 2015 included a question about how the large decline in gasoline prices, which had occurred in the months before the survey, affected consumer expenditures. Responses to this question suggested that consumers were unlikely to significantly increase their spending in light of potential savings from lower gasoline prices. This aspect of the CSCE will be leveraged extensively in future surveys.







Conclusion

The new *Canadian Survey of Consumer Expectations* is a major innovation because it contains information not previously collected from Canadian consumers on a regular basis. The survey fills gaps in existing sources of information on household behaviour, including data on household inflation expectations, as well as expectations regarding the labour market and household finances. Information gleaned from data on consumer expectations will be useful in several ways. First, it will help enhance our understanding of how expectations are formed and updated and, ultimately, of how expectations affect actual household behaviour. Second, it will improve our ability to build models of expectations beyond traditional ones based on rational expectations. Third, and perhaps most importantly, data on consumer expectations will provide valuable input into the evaluation of the economic outlook and the formulation and communication of monetary policy.

 The survey fills gaps in existing sources of information on household behaviour The survey will provide useful and timely information about the current financial situation of Canadian households as well as how households anticipate their financial situation will change. By monitoring expectations of future outcomes, such as income and access to credit, policy-makers will be able to use important insights from this survey to formulate effective policy. Finally, the time series produced by the new survey will be of great value to economists who study the extent to which expectations influence actual economic outcomes. Data from the CSCE will be made available to the public in 2016.

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Measuring Durable Goods and Housing Prices in the CPI: An Empirical Assessment

Patrick Sabourin, Canadian Economic Analysis, and Pierre Duguay¹

- The treatment of owner-occupied housing in the consumer price index remains the object of intense debate, with no consensus emerging and different countries using different approaches.² Yet there is no so such debate for durable goods, which, like housing, also provide services well beyond their purchase date.
- The treatment of both durable goods and housing could be brought closer to that for a cost-of-living concept by focusing on the cost of the services that these assets provide over time.
- The official treatment of housing over the past 15 years, which is based on a partial user-cost approach, yields results that are relatively close to (and somewhat smoother than) the enhanced (more comprehensive) user-cost approach that we propose, thus offering an acceptable compromise in the current environment of low and stable inflation. For automobiles, the official approach, which is based on the price paid at the time of acquisition, also yields results that are very close to those obtained from a user-cost approach.
- Nonetheless, we suggest that it would be worthwhile to consider treating housing and durables in the same way and bringing the actual CPI closer to a cost-of-living index.

The goal of the Bank of Canada is to foster confidence in the value of money by maintaining an environment of low, stable and predictable inflation, where inflation is defined as a persistent increase in the average prices of consumer goods and services—in other words, a trend increase in the cost of living. To achieve this goal, the Bank has targeted inflation since 1991. The target is set in terms of the 12-month increase in the total consumer price index (CPI) because it is the most relevant estimate of the cost of living for the majority of Canadians (Bank of Canada 2011).

- 1 Pierre Duguay served as a Deputy Governor of the Bank of Canada from January 2000 until his retirement from the Bank in July 2010. Special thanks to Richard Dion for his seminal contribution to this work.
- 2 Recent Canadian examples include F. Poschmann and A. Jacobs, "Improving on the CPI: A Proposal for a Better Inflation Indicator," C. D. Howe Institute E-Brief (2015); and P. Bergevin, "Housing Bubbles and the Consumer Price Index: A Proposal for a Better Inflation Indicator," C. D. Howe Institute Commentary No. 362 (2012). Both papers are available at www.cdhowe.org.

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However, while the CPI is the most commonly used and a reasonably adequate measure of inflation, it is not fully consistent with a true cost-of-living index (COLI). The main advantage of a true COLI is that it is a welfare-oriented measure grounded in the theory of consumer substitution behaviour.³ This approach is well suited to the Bank's mandate to promote the economic and financial welfare of Canada. For services and non-durable goods, quality-adjusted transaction prices tend to satisfy the requirements of a COLI, since they reflect the instantaneous utility derived from the purchase. This is not true of durable goods and housing, however, from which consumers derive utility well beyond the purchase date.^{4, 5} When constructing the CPI, Statistics Canada uses purchase prices to measure the costs of durable goods and a partial user-cost approach to measure the cost of owner-occupied housing (also known as owned accommodation), but it omits two key elements of that approach: the cost of owner's equity and the expected rate of housing appreciation. This article explores ways to better capture changes in the cost of living by reviewing different approaches to measuring durable goods and housing prices in the CPI.⁶ Implications for monetary policy are also discussed.

Measuring the Prices of Durable Goods and Housing

There are essentially three ways to measure the prices of durable goods and housing included in the CPI. The first simply takes the prices paid for durables and housing at the time of acquisition (the net acquisition approach). The second calculates the imputed cost of the services provided by the use of durable goods or housing; it can be implemented through either a rental-equivalence or a user-cost approach. The third measure (the payment approach) focuses on the out-of-pocket expenses required to use or acquire a durable good or a house. In this article, we will focus on the net acquisition, rental-equivalence and user-cost approaches.

Net acquisition

The net acquisition approach,⁷ which uses the price paid for a good at the time of acquisition rather than the cost of the service flows arising from the purchase, is not strictly compatible with a COLI. The main advantage of the approach is that it relies solely on observed prices and costs for current transactions. However, its departure from a COLI makes the approach questionable for indexation purposes and, to a lesser extent, from a monetary policy perspective.

Because people purchase durable goods and housing at irregular intervals, only a small fraction of households purchase these goods in any given year. The amount spent collectively by households on durables and housing in a given year would thus be equivalent to the depreciation (or amortization) part of the user cost of consuming these goods plus the growth in the stock of such goods. If that growth is

- 3 For further details on the advantages of a COLI, see Triplett (2001).
- 4 In the CPI, durable goods include automobiles, furniture, appliances, household tools (e.g., snow removal equipment), and audio and video equipment. Non-durable goods include fresh food products, gasoline and natural gas.
- 5 Quality-adjusted transaction prices approximate the requirements of a COLI for semi-durable goods (e.g., clothing) because they depreciate rapidly enough.
- 6 The official CPI also differs from a true COLI because it is based on an asymmetric weighting (fixed-basket) formula (the Lowe index) rather than a symmetric weighting formula (such as a Fisher index), which would be required by a COLI to avoid a substitution bias. By updating the consumer basket every two years instead of every four and reducing the delay in introducing new weights into the CPI (from 18 to 13 months), Statistics Canada is striving to lower the size of such a bias. Ideally, Statistics Canada should endeavour to eliminate the bias by resorting to a symmetric weights become available.
- 7 This approach considers only newly produced goods and excludes goods exchanged among households (e.g., existing homes or used cars).

 Statistics Canada uses purchase prices to measure the costs of durable goods and a partial user-cost approach to measure the cost of owneroccupied housing, but it omits the cost of owner's equity and the expected rate of housing appreciation

 The net acquisition approach focuses on prices related to the current production of durable goods and housing, which is meaningful for monetary policy commensurate with the real financial opportunity cost component of the user cost (defined in **Box 1** on p. 29), the net acquisition approach would yield similar results to a COLI and thus could not be dismissed out of hand. Further, the approach focuses on prices related to the current production of these goods, which is also meaningful for monetary policy.⁸

Rental equivalence

The rental-equivalence approach seeks to capture the value of the services consumed. Conceptually, it is well suited to measuring the prices of durable goods and housing because it is fully compatible with a COLI. However, successfully implementing the approach greatly depends on the availability of a rental market and the degree of segmentation between the ownership and rental markets. Imputations must be made with this approach, using paid rents as a proxy for equivalent rents, which can be difficult if there is no active rental market or if the market is distorted (e.g., by rent controls).

For most durable goods, a rental market is nearly non-existent, except for automobiles, some household equipment, and audio and video equipment. The leasing market for automobiles accounted for about one-fifth of motor vehicle purchases in 2014, and there is little segmentation between the purchase and leasing markets for cars .^{9,10} A rental-equivalence approach to measuring automobile prices could therefore be justified in principle.¹¹

With regard to housing, there is a relatively active rental market for multiple-unit dwellings such as apartments and condominiums, but not for single-family homes. Specifically, the rental and home-ownership markets are highly segmented because of the different demographic and socio-economic characteristics of tenants and owners, the various types and locations of housing (multiple-unit dwellings versus single-family homes), and rent controls.¹² This poses important challenges to implementing the rental-equivalence approach for the owned-accommodation (OA) category in the CPI and can lead to measurement errors for both weights and the component price index.

User cost

The limitations noted above may favour the user-cost approach, particularly for single-family housing. This approach involves pricing the inputs to durable (housing) services, including the financing cost (or financial opportunity cost if owned resources are used) and depreciation. Based on capital market theory, ¹³ the user-cost and rental-equivalence approaches should, in principle, yield similar results to, and be compatible with, a COLI. The main challenge with the user-cost approach is that it requires extensive information on the average return on

- 8 However, since purchases of durable goods (particularly houses) vary considerably over the business cycle, large weight changes can occur whenever the CPI basket is updated, which can be problematic.
- 9 This share is down from 45 per cent in 2005 (Ross Marowits, Canadian Press, 23 May 2014, available at <u>www.moneysense.ca/spend/auto/car-leasing-regaining-traction-but-canadians-prefer-to-own-their-wheels</u>).
- 10 In particular, similar models of cars are purchased and leased. However, car leases tend to be of shorter duration than the average life span of owned cars.
- 11 There could be challenges with this approach; for example, the car leasing market dried up during the 2008–09 financial crisis.
- 12 In addition, the utility generated from the house may not be the same for owners and renters: homeowner-occupiers may derive enjoyment from owning their living accommodation and tend to take better care of their homes than renters and their landlords.
- 13 Capital market theory implies that the price of an asset (e.g., a house) would be equal to the discounted value of the flow of income or services (e.g., rents) that it provides over the lifetime of the asset.

 The rental-equivalence approach seeks to capture the value of the services consumed

 The user-cost and rentalequivalence approaches should, in principle, yield similar results to, and be compatible with, a cost-ofliving index household financial assets and the expected future appreciation of housing to estimate the financial opportunity cost. As well, because the expected future appreciation of housing translates into a reduction in the opportunity cost of OA, the user cost can decline sharply at times of an accelerated increase in house prices, which could materially reduce inflation and increase its volatility. This could create problems for communicating monetary policy and for the public credibility of the CPI.¹⁴

Statistics Canada's approach

For durable goods such as motor vehicles, Statistics Canada uses the net acquisition approach. When accounting for car leases, for example, it converts the cost of leasing into an equivalent imputed purchase price. From a COLI perspective, a preferable approach would be to use price information from the car-leasing market to assess the cost of car services to car owners, following a rental-equivalence approach.

For housing, the official measure can be seen as a truncated version of the user-cost approach. It prices mortgage interest costs¹⁵ and depreciation costs but excludes two defining elements of the capital theory foundation of the approach: the expected appreciation of owner-occupied dwellings and the financial opportunity cost of homeowner equity in these dwellings.

International practices

International statistical agencies have unanimously adopted the net acquisition approach for durables, but there is no consensus about the best approach to the treatment of OA in the CPI¹⁶ (**Table 1**). Rental equivalence is the most popular approach among countries belonging to the Organisation for Economic Cooperation and Development.¹⁷ Johnson's (2015) recent review of the U.K. CPI proposes using CPIH, which includes the costs of OA and is based on a rental-equivalence approach, as the U.K.'s main measure of inflation. Several countries in the European Union have refrained from incorporating OA into their CPI, although Eurostat is currently conducting a pilot study for the euro area based on the net acquisition approach. Australia and New Zealand use a net acquisition approach, while Sweden and Finland—like Canada—are using a partial user-cost approach. No country has adopted a full-fledged user-cost approach.

- 14 More importantly, the user cost can become negative in such circumstances. To avoid this problem, Diewert, Nakamura and Nakamura (2009) propose that the opportunity cost of home ownership be the higher of the user cost and the rent that the premises could command; this would have to be estimated at the micro level.
- 15 In Statistics Canada's methodology, "mortgage interest costs" is the product of two indexes: an index (H) that captures the effects of changes in dwelling prices on the outstanding mortgage balance, assuming a fixed stock of dwellings and fixed financing conditions, and an index (I) that estimates the effect of changes in interest rates on the amount of mortgage interest owed, assuming a given amount of principal outstanding. For more details, see Statistics Canada (2009).
- 16 However, there is a consensus about using the rental-equivalence approach to measure consumption in the national accounts.
- 17 The decision to adopt a rental-equivalence approach in some European countries, such as Germany, likely has to do with the depth of their rental markets.

	Simplified user-cost approach	Rental- equivalence approach	Net acquisition approach	Excludes OA
Australia	-	-	х	-
Belgium	-	-	-	х
Canada	х	-	-	-
Denmark	-	х	-	-
Euro area (HICP)	-	-	Pilot study	х
Finland	x (until 2005)	-	х	-
France	-	-	-	х
Germany	-	х	-	-
Italy	-	-	-	х
Japan	-	х	-	-
Netherlands	-	х	-	-
New Zealand	-	-	х	-
Norway	-	х	-	-
Spain	-	-	-	х
Sweden	х	-	-	-
Switzerland	-	-	-	х
United Kingdom	x (RPI)	X CPIH	-	-
United States	-	х	-	-

Table 1: Treatment of owned accommodation in the CPI: International practices

Note: HICP = Harmonised Index of Consumer Prices; RPI = Retail Prices Index; CPIH = consumer price index including costs of owner-occupied housing

Source: Bank of Canada

The remainder of this article presents specific suggestions to make the CPI more like a COLI with respect to its treatment of housing and automobiles. Our empirical estimations are only approximate, however, since they are calculated from Canadawide aggregates rather than from the geographically disaggregated data used in the construction of the official CPI.

Improving the CPI as an Approximation of a Cost-of-Living Index: The Case of Owned Accommodation

To obtain a more comprehensive measure of user costs, the mortgage interest cost (MIC) has to be replaced with the financial opportunity cost (FINOC) of living in one's own dwelling.

The overall user cost combines the measure of the FINOC (**Box 1**) with other operating expenses related to OA costs embedded in the CPI. These include replacement-cost depreciation (*rc*), property taxes (*pt*), maintenance and repairs (*mrp*), property insurance (*ins*), and other housing services such as condominium fees (*oth*). Their relative weights in OA correspond to those in the current CPI, adjusted for the fact that the specific dollar amount of the FINOC is different from, and often lower than, the dollar value of the MIC component that it replaces.¹⁸ Consequently, the size of the total basket diminishes, and the relative weights of

¹⁸ This is because, in those cases, the negative contribution of the house appreciation term to the cost of owning a house exceeds the contribution of the average return on household financial assets.

the other operating-cost components in both OA and total CPI increase. A chainweighted user-cost index is constructed using the Survey of Household Spending (SHS) for 2001, 2005, 2009 and 2011. For illustrative purposes, using the 2005 and 2009 weights, the user-cost index for OA is, respectively defined as

 $uc_t^{oa2005} = 0.22 * IFINOC_t + 0.24 * rc_t + 0.24 * pt_t + 0.11 * mrp_t + 0.08 * ins_t + 0.11 * oth_t$

and

 $uc_t^{oa2009} = 0.24 * IFINOC_t + 0.28 * rc_t + 0.22 * pt_t + 0.09 * mrp_t + 0.08 * ins_t + 0.09 * oth_t.$

Box 1

Measuring Financial Opportunity Cost

Financial opportunity cost (*FINOC*) has three elements: the interest rate paid on the mortgaged portion of the house (r_t^d) , the average return on household financial assets (r_t^a) as the opportunity cost of the equity portion of the house, and the expected future appreciation of the dwelling $(E[H_{t+1}] - H_t) / H_t$:

$$FINOC_{t} = r_{t}^{d}D_{t} + r_{t}^{a}(1 - D_{t}) - \frac{(E[H_{t+1}] - H_{t})}{H_{t}},$$

where D_t , the mortgaged portion of the house, is approximated by the ratio of residential mortgages to the value at current prices of residential dwellings and land held by the personal sector, taken from the national accounts. This ratio has been relatively stable at about 30 per cent, which is consistent with the Canadian Association of Accredited Mortgage Professionals' estimate of 26 per cent (CAAMP 2014).

The financial opportunity cost in current dollars $(FINOC\$_t)$ associated with a fixed (base-period) stock of residential owner-occupied properties is calculated as

$$FINOC$$
^{*}_t = $Res_{base} * P_t^{res} * FINOC_t$

where P_t^{res} is measured by the index of resale housing prices from the Royal LePage House Price Survey, and Res_{base} is the base-period volume of residential stock for owner-occupied housing.¹ The index (base = 100) of the financial opportunity cost component of the CPI (*IFINOC*) is calculated as

$$IFINOC_t = \frac{FINOC\$_t}{FINOC\$_{base}} * 100,$$

where FINOC^{\$} base is the base-period value of FINOC^{\$}.

One challenge in building a user-cost measure of owned accommodation is to come up with appropriate measures for the three elements of the financial opportunity cost: the average mortgage interest rate (r_t^d) , the average return on household financial assets (r_t^a) and the expected future appreciation of the dwelling $(E[H_{t+1}] - H_t)/H_t$.

(continued...)

¹ Not all residential dwellings are owner-occupied. Data on paid and imputed rents from the national accounts suggest that owner-occupied dwellings account for about 75 per cent of the value of residential dwellings.

Box 1 (continued)

The average mortgage interest rate (r_t^d) is approximated by a 20-quarter weighted moving average of the posted 5-year mortgage rate less a discount rate,² with the weights corresponding to the value of the net change in the number of mortgages in each quarter. For simplicity, the implicit assumption is that all mortgages are renewed at or within five-year intervals. We estimate that r_t^d averaged 3.4 per cent over the second half of 2014, much lower than the average of 6.5 per cent in 2001.

For the average return on household financial assets (r_t^a) , we used the ratio of the investment income of the personal and unincorporated business sector to the market value of that sector's financial assets at quarter-end, as provided by the National Balance Sheet Accounts. Investment income includes interest, dividends, miscellaneous investment income of the personal and unincorporated business sector, and capital gains.³

The nominal return on household financial assets has averaged about 4.5 per cent since 2000, ranging from a peak of 5.0 per cent in the first quarter of 2000 to a trough of about 4.0 per cent in the fourth quarter of 2014 and displaying a distinct downward trend.

The advantage of this macro measure of return on equity r_t^a is its comprehensive coverage. The list of assets covered includes various types of deposits, short-term paper, bonds, Canada Savings Bonds, mortgages, life insurance and pension funds, shares in mutual funds and companies, and foreign investment. By construction, the evolution of r_t^a reflects changes in both the returns on individual assets and the composition of the asset portfolio of households.⁴

The expected rate of housing appreciation can exhibit extreme volatility from one period to the next. However, given the costs involved in moving, finding and selling property, households do not reassess their decision to own or to rent every period. Based on the view that households take a long-run perspective on the prospects for future appreciation, housing price expectations are assumed to be constant over time⁵ at the average annual rate of change of house prices over the period of the inflation-targeting regime (1992–2014) (i.e., at about 4.0 per cent).⁶

- 2 The discount rate, measured as the difference between the actual and the posted rate for a 5-year term, has risen significantly over time, reaching about 1.9 percentage points in the fourth quarter of 2014.
- 3 Capital gains are measured as the difference between the market value and the book value of the financial assets at quarter-end. To avoid excessive volatility, capital gains are assumed to be constant over time, at the average since 1992 (i.e., about 1.0 per cent).
- 4 To obtain a pure price effect, it would have been preferable to measure the return of an invariant portfolio in terms of risks, but this is not possible, owing to a lack of data. Our measure of the average return on household financial assets would also not be available on a timely basis. It could be used to measure the weight of FINOC, but for computation of the monthly CPI, a risk-free rate of return, which, by arbitrage, should be a reasonable approximation of risk-adjusted returns on household portfolios, could be used as a price index.
- 5 The housing price expectations measured with a 5- or 10-year moving average significantly increase the volatility of the FINOC index and do not adequately represent expected future house price movements.
- 6 The rate of appreciation is measured from the Royal LePage House Price Survey of existing houses, the only index available over a sufficiently long time period. Over the past 15 years, its trend growth has closely tracked that of other measures of existing house prices, such as the Teranet-National Bank House Price Index.

Pricing Owned Accommodation: An Empirical Comparison of the Approaches

Synthetic measures of OA based on the net acquisition and rental-equivalence approaches were also constructed using simple assumptions and procedures. They are calculated as chain-weighted averages of the components in each index (**Table 2** and **Table 3**). The weights for the net acquisition measure are based on the SHS and correspond to the total value of houses bought by the household sector minus the value sold in a given survey period.¹⁹ The key price component, net home purchases, is captured by Statistics Canada's New Housing Price Index. As observed in footnote 8, above, the weight of OA in the net acquisition approach varies considerably from one basket to the next. For the rental-equivalence measure, the weights are taken from the national accounts and correspond to the personal expenditure values for imputed rent.²⁰ As well, the key price component, equivalent rent, is proxied by the index of paid rent in the CPI. All the other price components of these two measures are taken directly from the CPI.

	Weights for each Index ^a					
	Official index	Net acquisition index	Rental- equivalence index	User-cost index		
Maintenance and repairs	9.8	11.2	3.2	10.9		
Property taxes	21.0	24.0	-	23.8		
Insurance premiums	6.9	6.3	1.7	8.3		
Mortgage interest cost	33.2	-	-	_		
Replacement depreciation cost	19.5	-	-	23.6		
Other owned- accommodation expenses	9.6	11.0	-	11.4		
Equivalent rent	-	-	95.1	-		
Home purchase cost	-	47.5	-	-		
Financial opportunity cost	-	-	-	22.0		

Table 2: Weights for the components of indexes of owned accommodation

a. All weights are based on the 2005 Survey of Household Spending except for equivalent rent, home purchase cost and financial opportunity cost.

Source: Bank of Canada

19 The total value is for new or existing houses and includes both structure and land.

²⁰ The weights may be upwardly biased since most rented homes include appliances. Therefore, the estimated rental values for OA also likely include the rental of some appliances provided with the houses.

		2001	2005		2009		2011	
Approaches	Rented housing	Owned accommodation	Rented housing	Owned accommodation	Rented housing	Owned accommodation	Rented housing	Owned accommodation
Official	6.3	15.5	5.5	15.6	6.2	16.8	5.9	15.5
Net acquisition	6.5	13.1	5.6	13.9	6.3	15.8	5.5	20.8
Rental- equivalence	6.1	18.7	5.3	18.4	6.0	19.4	5.7	19.2
User-cost	6.1	17.1	5.6	13.9	6.2	16.0	6.0	14.7

Table 3: Weights of rented housing and owned accommodation in the CPI using various approaches

Source: Bank of Canada

The levels and year-over-year growth rates of the indexes of OA from 2000 to 2014 are plotted in charts 1 to 3. In level terms, the very gradual profile of the rental-equivalence index stands in sharp contrast to the rapid escalation of the net acquisition index. The user-cost measure, however, follows a path broadly similar to the official measure, although they diverge in recent years because of falling returns on financial assets and the use of a moving average of mortgage interest costs in the official measure. In both the user-cost and the official indexes, the effect of the rise in house prices on OA (and the cost of living) is tempered by the decline in financing costs, but the user-cost index is more sensitive to fluctuations in interest rates (**Chart 1**). This greater sensitivity adds volatility to the measure of user-cost inflation (**Chart 2**). In terms of yearly growth rates, the rental-equivalence measure shows exceptional stability around 1.5 per cent (a rate slightly below the average overall inflation rate),²¹ whereas both the official and the net acquisition measures track the changes in house prices (**Chart 3**).²²

In both the user-cost and the official indexes, the effect of the rise in house prices on owned accommodation (and the cost of living) is tempered by the decline in financing costs, but the user-cost index is more sensitive to fluctuations in interest rates





Note: Both indexes are buffered from house price increases by declining financing costs. Sources: Statistics Canada and Bank of Canada calculations Index 160 ר

21 The use of paid rent for tenants as a proxy for imputed rent could account for such smoothness and the large divergence from the user-cost approach. This might not be the case if rents were appropriately imputed at a micro level, based on a composite of owner-occupied dwellings.

22 In the official measure, however, the link with house prices is lagged. This is because, by construction, the new house price index (excluding the land) used to measure the depreciation costs in the official CPI is entered with a one-month lag.

Last observation: 2014Q4



Chart 3: The official inflation rate of owned accommodation reflects house price movements with a lag



As shown in **Chart 4**, despite the slower progression of the rental-equivalence index, the imputed value of rents has constantly exceeded the value of the user cost.²³ The potential upward bias in the weights for the rental-equivalence measure mentioned in footnote 20 may partly explain this result. Alternatively, this finding may suggest that rents are elevated relative to the cost of home ownership and could explain why, in Canada, home ownership grew from about 64 per cent in 2000 to 69 per cent in 2011, while the rent component of shelter fell in real terms (i.e., relative to the overall CPI).

23 This is also expressed by the higher weights of OA in total CPI for rental equivalence compared with the user cost for each basket update.



Chart 4: The value of owned accommodation in the rental-equivalence index has been higher than its value in the user-cost index

For each synthetic index of OA, the corresponding measure of total CPI is based on the weights of each OA measure in the overall basket (**Table 3** and charts 5 to 7).²⁴ The acquisition-based CPI would have registered the fastest inflation rate since the early 2000s (**Chart 5**), particularly during the period of peak yearly growth in housing prices, from the first quarter of 2006 to the second quarter of 2007, when total inflation would have been 0.4 percentage points above the inflation target instead of being on target, as officially recorded. Conversely, the inflation rate of a rental-equivalence-based CPI would have been significantly lower than the official one, particularly during the same period of rapid increases in house prices (**Chart 6**). For total CPI, the user-cost index is broadly in line with the official measure, albeit exhibiting less inflationary pressure since 2012 as a result of declining financial opportunity costs (**Chart 7**).





2007

2009

2011

2013

Last observation: 2014Q4

Official CPI index
 Net-acquisition CPI index

2005

Sources: Statistics Canada and Bank of Canada calculations

2003

2001



Chart 7: The user-cost version of the CPI follows a broadly similar path to the official measure but is weaker in recent years



Volatility in the alternative measures of the cost of ownedaccommodation and implications for the CPI

Volatility is defined as the standard deviation of the year-over-year growth rates in the OA indexes and the associated total CPI over the 2001–14 period (**Table 4**). The rental-equivalence index is by far the smoothest, while both the net acquisition and the user-cost indexes generate more volatility than the official measure. The greater volatility of the user-cost index relative to the official measure of OA comes from the higher standard deviation of the year-over-year growth in the measure of financial opportunity cost relative to the mortgage interest cost in the CPI. In terms of the implied volatility in CPI inflation, the net acquisition and user-cost indexes show slightly more volatility than the official measure, while the rental-equivalence index produces an overall CPI inflation that is somewhat smoother. The net acquisition and user-cost indexes show slightly more volatility than the official measure

Table 4: Volatility in indexes of owned accommodation and total CPI

Standard deviation of year-over-year growth rates, 2001–14

	Official	Net acquisition	Rental-equivalence	User-cost
Owned-accommodation indexes	1.48	1.52	0.35	2.86
Total CPI	0.90	0.96	0.84	0.97

Source: Bank of Canada

Improving the CPI as a Cost-of-Living Index: The Case of Motor Vehicles

As mentioned above, information from car leasing could readily be used to assess the cost of car services, given the virtual absence of market segmentation between car purchases and car leasing.²⁵ An alternative way to help the CPI approximate a COLI could be to replace the purchase price of motor vehicles and the remaining private transportation components with the costs of owning, maintaining and using cars. Cost information is divided between operating and fixed costs. Operating costs include gasoline and other fuel (*gas*) and maintenance (e.g., changing tires) (*mrp*_t). Fixed costs include driver's licences, car registration and parking fees (*fee*), and insurance premiums (*ins*), as well as depreciation (*rc*) and financial opportunity costs (*IFINOC*_t).²⁶ Using the SHS for 2005, the user-cost index for private transportation is defined as²⁷

 $uc_t^{pt2005} = 0.06 * IFINOC_t + 0.37 * rc_t + 0.28 * gas_t + 0.10 * mrp_t + 0.16$ $* ins_t + 0.03 * fee_t.$

The index for private transportation using this very rough proxy for the user-cost approach is similar to the official CPI index (**Chart 8** and **Chart 9**).²⁸ This is not surprising, given that the weights for the price of new motor vehicles are very similar in the two approaches and the weight for the financing costs is relatively small. These costs are nonetheless driving the divergence between the two indexes, with the user-cost measure showing less inflationary pressure in early 2000, but more in 2006–08, a period characterized by higher financial costs. After 2012, the inflation rate suggested by the user-cost measure is lower than the official measure (0.6 per cent versus 0.9 per cent, on average) because of declining interest rates on personal loans, including for automobiles.

- 25 We did not calculate a rental-equivalence measure for automobiles because we did not have access to leasing data.
- 26 The CPI weights for the depreciation of motor vehicles and for the FINOC were derived from Ray Barton, VPP and Mohammadian's (2006) estimates of the average depreciation over a fiveyear period and the average finance charges relative to automobile insurance premiums and other fixed costs, multiplied by the weight of these fixed costs (including insurance premiums) in the CPI. The resulting estimated CPI weight for depreciation is about 6.5 per cent (based on the 2011 SHS), slightly lower than the weight for the purchase and leasing of motor vehicles (7.6 per cent), and the weight of the FINOC is estimated at 0.9 per cent. The CPI price for the purchase of new motor vehicles is used as the price index of the replacement depreciation cost and, multiplied by an index of the interest rate on personal consumer loans, as the price index of the financial opportunity cost (IFINOC). The expected future rate of change of car prices is assumed to be zero.
- 27 Given the lack of access to data, the user-cost index for private transportation is computed using a fixed-weight approach, based on the 2005 SHS.
- 28 The two indexes show similar volatility over the historical period (2000–14).

An alternative way to help the CPI approximate a COLI could be to replace the purchase price of motor vehicles and the remaining private transportation components with the costs of owning, maintaining and using cars



Chart 9: The recent inflation rate for user-cost private transportation is somewhat weaker than in the official CPI index



Conclusion

We have argued that making the CPI more like a cost-of-living index can be accomplished by pricing the service flows from durable goods and housing rather than the acquisition cost. This type of index can be implemented through either a rental-equivalence approach (where a comparable rental market exists) or an enhanced user-cost approach. Both approaches pose considerable conceptual and practical difficulties, however, particularly for owner-occupied housing.

The rental-equivalence approach could be usefully considered for automobiles, given the prevalence of the car-leasing market and the virtual absence of segmentation between the markets for car purchases and car leasing. But, for housing, the high degree of segmentation between the rental and home-ownership markets raises important questions about the adequacy and cost of the information needed to support a high-quality rental-equivalence measure of owned accommodation in a Canadian context. The user-cost approach requires assumptions about the financial opportunity cost, particularly the expected future appreciation of housing. It can also produce excessive volatility.

Our rough attempt to produce rental-equivalence and user-cost measures of owner-occupied housing for the Canadian CPI shows that there is a lack of sensitivity to housing prices in our synthetic rental-equivalence index compared with the user-cost and official indexes. This could be problematic for monetary policy and could mean that, if a rental-equivalence measure were to be adopted for the official CPI, serious consideration might have to be given to a subsidiary indicator of inflation based on a net acquisition approach to owner-occupied housing.

For housing, our enhanced user-cost index of owned accommodation (based on extensive smoothing of the expected housing appreciation term) yields results that are relatively close to (though still somewhat more volatile than) the official measure throughout most of the past 15 years. For automobiles, this user-cost approach again yields results that are very close to the official (net acquisition) approach. One conclusion that could be drawn is that the actual practice thus represents an acceptable compromise in the current environment of low and stable inflation.²⁹ Another is that it would be worthwhile to pursue the work of trying to treat housing and durables in the same way and to bring the actual CPI closer to a COLI. Finally, it is reassuring to find that the contemplated changes would not alter the broad CPI story over history.

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²⁹ This would not be true in a higher inflation environment with a larger and more variable difference between nominal and real interest rates.

The Effect of Regulatory Changes on Monetary Policy Implementation Frameworks

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- The emerging regulatory environment's increased focus on liquidity and maturity transformation risks is expected to affect monetary policy implementation frameworks.
- Although the effects of individual regulations on monetary policy implementation frameworks can be anticipated in most cases, the combined regulatory effects are ambiguous.
- Central banks should be able to accommodate the effects of the emerging regulatory environment within their existing policy implementation frameworks.

The financial regulations introduced by supervisory authorities following the 2007–09 financial crisis are designed to improve the resilience of the global financial system. They will, among other things, result in stronger capital and liquidity requirements for regulated financial intermediaries, which have the potential to affect their behaviour.¹ Because financial intermediaries play important roles in the intermediation of credit and in financial markets, this could have implications for the implementation of monetary policy.² Central banks have therefore been examining whether they will need to adjust their monetary policy implementation frameworks.³

Individual central banks approach the implementation of monetary policy decisions differently. The common ground is that financial intermediaries are inevitably involved in transmitting policy decisions to the broader economy. It follows, then, that regulations influencing the structure or behaviour of financial intermediaries will also influence how monetary policy is implemented and, possibly, transmitted.

This article offers analysis of three updated banking regulatory initiatives: the Leverage Ratio (LR), the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR).⁴ Although this list is not exhaustive, these regulatory changes are likely to have the most

- 1 Macroeconomic Assessment Group (2010). See also Brei and Gambacorta (2014).
- 2 The term financial intermediaries is used throughout this article to refer to prudentially supervised institutions that are subject to the regulations discussed here.
- 3 Monetary policy implementation frameworks reflect a central bank's approach to implementing its monetary policy decisions. They are the link between a central bank's monetary policy decisions and their transmission to the real economy. See Murray (2013) for further details on the monetary policy transmission mechanism in Canada.
- 4 Basel Committee on Banking Supervision (2013, 2014a, 2014b, 2014c).

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influence on the activities of financial intermediaries and, in turn, the effectiveness of central bank monetary policy implementation frameworks. 5

The article begins by summarizing monetary policy implementation frameworks, which include central bank facilities and the tiered structure of financial intermediaries through which central bank policy is transmitted.⁶ It then describes how the regulatory changes may affect monetary policy implementation frameworks. Lastly, it assesses how these regulations could affect both the ability of central banks to control the target policy variable and the money markets, a key channel for the transmission of monetary policy.

Monetary Policy Implementation Frameworks

Central banks generally operate within one of three main monetary policy frameworks based on their policy objectives: (i) interest rate targeting regimes—a rate is targeted to express the bank's stance on monetary policy, (ii) quantitative target regimes—a monetary aggregate is targeted, and (iii) exchange rate regimes—a measure of the exchange rate is targeted. Of these three, most central banks today operate within interest rate targeting regimes.⁷

Central banks operating within an interest rate regime usually target the overnight rate, which determines the rates at which financial intermediaries are able to borrow and lend funds for one day. Changes in that rate and expectations about its future path influence the interest rates further out the yield curve, as well as rates on and prices for various securities and loans with different risk and liquidity characteristics, such as long-term government bonds, corporate bonds and mortgages. These changes also influence the exchange rate. The resulting movements in asset prices, in turn, affect total demand in the economy by influencing spending and investment decisions.

Monetary policy implementation for overnight interest rate targeting frameworks usually relies on an operating band, which is characterized by two key standing facilities—a lending facility and a deposit facility—that create an interest rate corridor around the target for the overnight rate. The corridor provides incentives to market participants to lend or borrow money in the overnight market near the target rate. Central banks commit to lending money at some spread above the target rate and to taking deposits at the target rate minus a spread.

Central banks using this system can also manage the amount of overnight settlement balances, or bank reserves, determining how much excess or deficit deposits must be supplied to payment system participants daily to reinforce the target rate.⁸ Lastly central banks can use open market operations to inject or withdraw overnight liquidity during the day and reinforce the target for the overnight rate.

- 5 Other relevant regulations include central clearing and margining of over-the-counter derivatives and changes to the treatment of bank capital.
- 6 This article draws on the work of the Committee on the Global Financial System (2014) and the Committee on the Global Financial System and the Markets Committee (2015a, 2015b). The authors represented the Bank of Canada on these committees.
- 7 The Bank of Canada uses an overnight interest rate targeting regime without a reserves requirement. Its implementation framework relies primarily on the Large Value Transfer System (LVTS) along with an interest rate corridor system to achieve that target rate (Engert, Gravelle and Howard 2008).
- 8 Increasing settlement balances provides more liquidity, resulting in a strong incentive for market participants to lend their cash during the day. This puts downward pressure on the overnight rate, as financial intermediaries seek to lend out their excess liquidity that results, and vice versa.

Central Bank Facilities for Monetary Policy Implementation

Regardless of the established implementation framework, most central bank facilities or operations have a similar structure and design because of their objectives of either providing liquidity to, or withdrawing liquidity from, the system. Central banks seeking to provide liquidity typically use a combination of repo operations, collateralized lending facilities and outright purchases of securities. Central banks withdrawing liquidity use reverse repo operations, central bank deposit facilities and outright sales of securities.⁹

A tiered market structure provides a link between changes in a central bank's target rate and changes in liquidity offered or withdrawn through its facilities and the general economy. The central bank aims to provide overnight liquidity to the system as a whole, generally relying on a limited set of financial intermediaries as counterparties to its facilities or operations. These financial intermediaries then redistribute liquidity through other regulated and non-regulated financial intermediaries to common for most monetary policy implementation frameworks, regardless of the regime being followed.

Different central bank facilities can be distinguished according to the following characteristics: (i) counterparty eligibility—major counterparties for central bank facilities or operations are often financial intermediaries subject to the regulations discussed in this article; (ii) secured versus unsecured transactions—using repos to inject liquidity into and reverse repos to withdraw liquidity from the financial system; (iii) type of collateral—usually a large proportion of the eligible collateral is of high quality; and (iv) the tenor of the facility's transactions (e.g., 1 or 30 days, 6 months, longer than a year). How a central bank's operations are aligned with the above characteristics determines how the banking regulations discussed in this article interact with the implementation of monetary policy.

A central bank's ability to implement its desired monetary policy stance is influenced by the use and effectiveness of its facilities and how the facilities affect the various intermediaries in the tiered market structure, which essentially constitutes the overnight money market. The banking regulations can influence the use of and the price paid by counterparties for the central banks' liquidity operations as well as the impact of the target rate and changes in its level on the broader fixed-income markets that involve transactions among various combinations of financial intermediaries.

The Regulations

The LR and LCR came into effect in January 2015, while the NSFR will come into force in 2018. These regulations strive to improve the resilience of financial intermediaries to financial shocks by ensuring an adequate level of capital (LR) and by maintaining prudent liquidity over the short and medium terms (LCR and NSFR).

Because the implementation of these regulations is recent and ongoing, this analysis is directional rather than quantitative and is premised, to some degree, on whether the regulatory constraints are binding. And, while concepts are introduced as required for the exposition, technical analysis is left for a more indepth study. A central bank's ability to implement its desired monetary policy is influenced by how its facilities affect the various intermediaries in money markets

Leverage Ratio (LR)

According to the LR, the ratio of a financial intermediary's capital to its exposures must be equal to at least 3 per cent (Basel Committee on Banking Supervision 2014a).¹⁰ It is intended to be a non-risk-based capital measure to complement the Basel III risk-based capital measures. Whereas most of the Basel III regulatory capital framework is aimed at assessing capital adequacy against risk-weighted assets using standardized and model-based methodologies, the LR aims to be a backstop by using absolute levels of asset values rather than risk-weighted values.

The LR influences monetary policy implementation frameworks largely through its treatment of securities financing transactions, which are often used in many central bank facilities (**Box 1**). For example, a central bank engaged in a repo transaction to provide liquidity enters into an agreement to purchase securities from the financial intermediary for an agreed price and to resell these securities back to the financial intermediary at a later date (which can be overnight or for longer terms). The difference between the purchase price and the resale price includes an interest rate component. This is essentially a secured lending transaction where the central bank is lending money to financial intermediaries and is generally conducted at or near the policy rate.

Box 1

The Leverage Ratio (LR)

 $\frac{\text{Tier 1 capital}}{\text{Exposure measure}} \ge 3\%$

- The accounting rules for securities financing transactions have an asymmetric impact on the LR, depending on whether it is a repo transaction used in a liquidity-providing facility or a reverse repo used in a liquidity-withdrawing facility.
- Liquidity-providing transactions between a central bank and a financial intermediary (e.g., unsecured or secured through repos) will increase a financial intermediary's balance-sheet-exposure measure, which will decrease the LR.
- Liquidity-withdrawing transactions between a central bank and a financial intermediary (e.g., reverse repos) do not change the balance-sheet-exposure measure and therefore do not affect the LR.

The financial intermediary adds the cash received to its assets and also retains the repo security on its balance sheet, resulting in a net increase in its assets and a decrease in the LR because the level of capital remains the same; the net effect is an expansion of the bank's balance sheet.¹¹ Conversely, a reverse repo transacted between a central bank and a bank to withdraw liquidity would not

- 10 Tier 1 capital is defined as set out in the Basel rules. Exposure is defined to include on-balancesheet exposures, derivatives exposures, securities financing transactions and off-balance-sheet items. The Basel Committee on Banking Supervision continues to monitor the leverage ratio implementations and may recalibrate its definition. The final calibration is expected by 2017 with a view to implementing it as part of the Pillar 1 minimum capital treatment by 2018.
- 11 The balance sheet expands because the cash received by the regulated financial intermediary from the central bank increases its assets and is balanced on the liability side by the obligation to repurchase. The security sold to the central bank, however, remains on its balance sheet.

The leverage ratio influences monetary policy implementation frameworks largely through its treatment of securities financing transactions, which are often used in many central bank facilities expand the bank's balance sheet and would not affect the LR. ¹² The result for central bank operations involving outright sales or purchases would be similar in treatment as reverse repos.

With respect to central banks' liquidity-provisioning facilities, if the LR is a binding or near-binding constraint, it could potentially discourage repos—or any other liquidity-provision facilities—that would expand a financial intermediary's balance sheet and, thus, decrease the LR. In money markets, transactions between financial intermediaries or between financial intermediaries and nonregulated financial intermediaries will have a similar impact for the same reason. With respect to liquidity-withdrawing facilities, the effect on the LR from reverse repos should be minimal because they do not expand the bank's balance sheet.

For the reasons discussed above, the LR could have similar impacts in the money markets, potentially providing an incentive for financial intermediaries to decrease their repo activities.

Liquidity coverage ratio (LCR)

The LCR requires financial intermediaries to maintain unencumbered, highquality liquid assets (HQLAs) equal to 100 per cent of total net cash outflows over a period of 30 calendar days.¹³ These HQLAs are intended to be assets that a bank can readily convert into cash in the event that it faces liquidity stress. The LCR also defines the characteristics of HQLAs and sets guidelines for how different levels of HQLA are classified.¹⁴ Deposits at central banks that can be withdrawn are treated as HQLAs.

The LCR will exert an influence in a number of ways (**Box 2**). Net cash outflow (the denominator in the LCR) is calculated according to the tenor of the transactions, the type of counterparty and whether the transaction is secured or unsecured, along with the quality of the collateral used. Overall, a higher LCR is achieved when financial intermediaries lower their net cash outflow over 30 days. Also, the requirement to hold HQLAs will affect the collateral market for HQLAs and markets for other collateral that are eligible for central bank transactions.

For transactions up to 30 days, borrowing or lending cash collateralized with HQLAs would generally not affect the LCR because it is simply an exchange of one type of HQLA for another.¹⁵ As well, HQLA-secured transactions between central banks and financial intermediaries would not affect the LCR. It is possible that lending secured by a central bank with a non-HQLA (e.g., repos) could be encouraged, depending on the relative haircuts for the central bank operations compared with the regulatory haircuts. When a central bank haircut for the non-HQLA collateral is lower than that imposed by the LCR, the transaction could improve a financial intermediary's LCR.

As intended by the LCR regulations, for unsecured transactions, the LCR would encourage both borrowing at terms longer than 30 days (because it is excluded

15 This is for level 1 HQLA as defined in the LCR regulations.

 The liquidity coverage ratio requires financial intermediaries to maintain liquid assets that can be readily converted into cash in the event of liquidity stress

¹² In the case of the reverse repo, there would be an accounting offset on the asset side between the cash loaned to and the securities received from the central bank. A similar treatment would hold for outright purchases and sales.

¹³ Basel Committee on Banking Supervision (2013). The 100 per cent is a floor, not a target, during normal business conditions; the LCR rules accommodate a lower ratio in times of stress. The structure of the formula for this ratio requires an HQLA level of not less than 25 per cent of the cash outflows over the 30-day period, regardless of the level of inflows.

¹⁴ Basel Committee on Banking Supervision (2014c).

from the cash outflow calculation) and lending at terms less than 30 days (because it is treated as 100 per cent inflows for LCR calculations).

Box 2								
The Liquidity Coverage Ratio (LCR)								
		← Decreasing cash outflows (improves LCR)						
Increasing inflows (improves LCR) \rightarrow		Borrow Bo longer than (se 30 days lev or fun ce	orrow ecured) with vel 1 HQLA secured nding from entral bank	Borrow (unsecured) from central bank or non- financial corporates	Borrow unsecured wholesale from another bank or non-regulated financial institution			
	Lend less than 30 days	 The LCR: High-quality liquid assets (HQLAS) Net cash outflows over the next 30 calendar days ≥ 100% Liquidity-providing transactions by a central bank to a financial intermediary The effect of unsecured borrowing on the LCR depends on the tenor: borrowing less than 30 days will decrease the LCR and vice versa. Secured borrowing (repos) has a minimal impact regardless of tenor because posted collateral must be Level 1 HQLA. No significant LCR improvement can take place through a collateral upgrade since Level 1 HQLA (collateral) is exchanged for Level 1 HQLA (cash); however, if the central bank collateral haircut is lower than the LCR haircut, this would marginally benefit the financial intermediary's LCR. Central banks have a lower cash outflow factor for outstanding maturing secured funding than other counterparties. Liquidity-withdrawing transactions by a central bank from a financial intermediary Mirrors the relationships above. 						
	Non- HQLA reverse repos							
	HQLA reverse repos							

HQLA-secured transactions with central banks should not affect a financial intermediary's LCR; with respect to money markets, the LCR is expected to move financial intermediaries toward more secured lending and a potentially steeper yield curve at the short end because, typically, it would increase supply and reduce demand for tenors shorter than 30 days and vice versa for tenors longer than 30 days. The effect of the LCR on volumes is unclear.

Net stable funding ratio (NSFR)

The NSFR, which is a companion measure to the LCR, requires financial intermediaries to maintain a stable funding profile in relation to the composition of their assets and off-balance-sheet activities. It requires a financial intermediary's available amount of stable funding (ASF) to be at least 100 per cent of its required amount of stable funding (RSF).¹⁶ The intent is to limit overreliance on short-term wholesale funding, encourage better assessment of funding risk across all on- and off-balance-sheet items, and promote funding from stable sources on a structural basis. Note that the ASF is a statement about a financial intermediary's liabilities structure, and the RSF is a statement about its asset structure. Most important for this ratio are the various classifications that determine how much of the asset class is designated for the RSF and the funding sources classifications that determine how much can be included in the ASF. The net stable funding ratio is intended to limit overreliance on short-term wholesale funding, encourage better assessment of funding risk and promote funding from stable sources The ASF and RSF calculations, which determine the NSFR, depend on tenor, the counterparty, whether it is a secured or unsecured transaction and the quality of the collateral (**Box 3**). As with the LCR, these characteristics include aspects of central bank facilities.

Generally, secured or unsecured funding of more than one year receives 100 per cent ASF treatment, which improves the numerator of the NSFR. Secured or unsecured funding from another financial intermediary or a central bank for between six months and one year receives 50 per cent ASF treatment.

Box 3

The Net Stable Funding Ratio (NSFR)									
	← Increasing available stable funding (improves NSFR)								
Decreasing required stable funding (improves NSFR) $ ightarrow$		Borrow longer than one year from a central bank or financial institution	Borrow between six months and one year from a central bank or financial institution	Borrow less than six months from a central bank or financial institution					
	Central bank deposits/claims less than six months	The NSFR: $\frac{Available stable funding}{Required stable funding} \ge 100\%$ Liquidity-providing transactions by a central bank to a financial intermediary							
	Loans to financial institutions for less than six months secured by HQLA	 The effect of secured and unsecured borrowing from a central bank by a financial intermediary depends on collateral and tenor. Liquidity-withdrawing transactions between a central bank and financial intermediaries Unsecured or secured lending by a financial intermediary reduces its NSFR. Generally, longer-term liabilities (> six months) receive higher ASF treatment than shorter-term liabilities (< six months), thereby increasing the NSFR. 							
	Unsecured loans to central bank and financial institutions between six months and one year	 Longer-term assets generally receive higher RSF treatment than shorter-term assets, thereby lowering the NSFR. Generally, unencumbered HQLAs receive more favourable treatment by lowering the RSF. Central bank and financial intermediary transactions that are assets o liabilities for the financial intermediary (that affect the RSF and ASF, respectively) will be excluded for tenors shorter than six months. 							
	Loans for one year or longer								

Regarding the RSF weighting, central bank reserves and deposits for less than six months receive 0 per cent; HQLA-secured loans to financial institutions with maturities of less than six months receive 10 per cent if the financial institution can freely rehypothecate the received collateral over the life of the loan; loans to financial institutions and deposits at central banks with maturities of six months to a year receive 50 per cent.

The NSFR will therefore not have a material effect on central bank operations that are shorter than six months but could potentially make central bank transactions of longer tenors more attractive for financial intermediaries because longer-term borrowing from a central bank gets a higher ASF than short-term borrowing from a central bank.

With respect to the money markets, the effects of the NSFR on unsecured transactions will depend on tenor and counterparty. The effect on the supply of

unsecured financing is expected to be lower (particularly at longer tenors), whereas the effect on the demand for unsecured financing is expected to be higher, exerting upward pressure on rates. The NSFR may also encourage financial intermediaries to borrow from non-financial corporations because these transactions are treated more favourably.¹⁷

Potential Impacts on Monetary Policy Implementation Frameworks

It is difficult at this time to fully foresee the combined effect of these regulations on central bank operations and money markets for a number of reasons.¹⁸ First, the implementation deadline for the various regulations is a few years away. Second, financial intermediaries will also take some time to adapt to the new regulatory environment. In particular, it appears that financial intermediaries are still developing their internal transfer-pricing models to be able to efficiently allocate capital (for example, the LR). Uniform practices have not yet been adopted in the marketplace. Moreover, financial intermediaries are also expected to adjust their business models according to the new regulations, and this may shift their portfolio compositions and the structure of their liabilities, especially since the impact of the various regulations will depend on the constraints facing the financial intermediaries, which may vary.¹⁹

Possible implications for central bank facilities

For liquidity-provisioning facilities, there may be a potential decrease in the demand for repos secured by HQLA, driven largely by the LR. The LR would make it more capital intensive for financial intermediaries to borrow from central banks through repos. This may be more prevalent for repos using HQLAs because the LR results in an increased capital cost with no improvement in the LCR. Central banks that provide non-HQLA liquidity-providing facilities may see an increase in demand that offsets the effects of the LR, as a result of the beneficial impact on the LCR for financial intermediaries. Overall, this would imply that central banks could offset this decrease in the relative desire of financial intermediaries to source liquidity from central bank repo operations, by adjusting the tenor, collateral requirements, quantity or price on offer to financial intermediaries.

For liquidity-withdrawing facilities, reverse repos are generally expected to be unaffected because the LR is largely unaffected by this structure. As well, central bank deposit facilities for less than six months should be neutral to these regulations, although the NSFR may create a slight decline in their use for tenors of greater than six months.

Possible implications for money market activity

Financial intermediaries play a central role in money markets through the issuance of money market instruments, through their demand for these instruments for their treasury or liquidity risk management and, more generally, through their lending activities. Overall, the effects on the level of activity and interest rates of money market instruments are likely to differ, depending on the tenor of transactions and whether they are secured or unsecured.

19 See, for example, Banerjee and Mio (2014); Duijm and Wierts (2014).

¹⁷ The ASF for funding from non-financial corporations gets favourable treatment compared with financial intermediaries.

¹⁸ For some initial model-based assessments, see Bech and Keister (2013); Bonner and Eijffinger (2012).

The LCR provides incentives for financial intermediaries to shift toward greater amounts of unsecured lending for terms less than 30 days, while decreasing the incentives for financial intermediaries to do unsecured lending that is greater than 30 days. The incentives for unsecured bank borrowing are in the opposite direction: reduced incentive to borrow for less than 30 days, while increasing demand for unsecured funding for terms more than 30 days. As such, at the shorter tenors (less than 30 days), there should be, all other things being equal, downward influence on rates from the LCR (resulting from increased supply but lower demand), and vice versa, for terms of more than 30 days. The impact on volumes will depend on whether the supply or demand effects dominate.²⁰

The LR may lead to a decrease in repo activity among regulated financial intermediaries primarily because borrowing using repos increases leverage and thus tends to be more expensive for financial intermediaries from an LR perspective.

Given these offsetting effects, it is difficult to assess the overall effects of the various regulations on money market volumes and rates, in particular, because of the complex interactions across the regulations and their effects on the activities of financial intermediaries in these markets.

Possible implications for the market-making activity of financial intermediaries

A related implication of these regulations is that they may reduce incentives for market-making activities of financial intermediaries. For example, the LCR could encourage market-makers (i.e., financial intermediaries) to reallocate securities inventory in favour of greater amounts of eligible HQLAs relative to before the regulations came into effect, while the LR could result in an offsetting shift from highly rated sovereign bonds and repos (using these bonds as collateral) toward loans that bear a higher risk-weighted capital charge and lower repo volumes. Together, the requirements provide incentives for market-making activities to be reduced for these fixed-income instruments, especially when the LR and LCR are viewed as binding, and, as such, the balance sheet costs of holding these are higher as a result of these regulatory changes. However, other non-regulatory drivers have also been identified as affecting the provision of market-making services by financial intermediaries and thus any potential reduction in market-making cannot be attributed solely to new regulations (see CGFS 2014).²¹

The potential reduction in the provision of market-making by financial intermediaries (that assumes no other financial intermediaries fill in the gap left by financial intermediaries), could reduce market liquidity in fixed-income securities, especially if repo market activity declines. However, should a lower level of market liquidity arise, it would imply a greater cost to trading in markets, one that market participants would want to take into account. This would result in a level of market liquidity that reflects the fundamental costs and market-making capacity of financial intermediaries across fixed-income markets and require investors to adjust their risk-management frameworks to adequately reflect the lower levels (or higher costs) of market liquidity. Any potential reduction in market-making cannot be attributed solely to new regulations

²⁰ The LCR may encourage the shorter funding markets to move from unsecured to secured funding activity with non-HQLAs. A shift of secured market activity toward longer-term tenors is also likely because of the LCR and NSFR benefits at maturities greater than 30 days and 6 months, respectively.

²¹ Some of these drivers are structural and relate to innovations and trading technology, while others are conjectural and are closely tied with post-crisis deleveraging and reduced marketmakers' risk appetite.

While there are other regulations affecting the provision of market-making (e.g., prohibiting proprietary trading), those discussed here were intended to drive adjustments in the business models and risk-management practices of financial intermediaries. In hindsight, market liquidity and the funding liquidity that underpinned it were underpriced in many markets before the financial crisis. Capital requirements were insufficient to absorb losses and funding models were vulnerable to changing funding and market liquidity conditions. That is, regulations are intended to make it more costly for financial intermediaries to take liquidity and solvency risks. These market-making effects must be set against the regulations' targeted benefits, including strengthening financial intermediaries' balance sheets and funding models, as well as enhanced stability of the financial system more generally, which reduce the risk of significant bank-lending contractions and their spillovers to the real economy.

Conclusion

The LR, the LCR and the NSFR are expected to have a meaningful impact on monetary policy operations.

These regulations have the potential to affect the relationships between financial asset prices and central bank policy rates, likely decreasing arbitrage activity across markets and opening up the possibility for a larger role for central bank operations.

In general, central banks should be able to accommodate the effects of the emerging regulatory environment within their existing policy frameworks. The main levers available to central banks to make any adjustment are their parameters for counterparty eligibility, collateral eligibility and the tenor of the transactions.

However, factors such as changing market practices will also affect markets and the transmission mechanism. Any changes to existing implementation frameworks should be carefully made because operational choices by central banks can affect the propagation of liquidity in markets in a variety of ways, both intentionally and unintentionally (CGFS 2015a). The nature and degree of these adjustments need to appropriately take into account local market structures and the adjustments made by the central bank's main counterparties in reaction to these regulatory changes.

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Recent Enhancements to the Management of Canada's Foreign Exchange Reserves

Mervin Merkowsky and Eric Wolfe, Funds Management and Banking

- Canada's foreign exchange reserves have grown steadily since the 2007–09 global financial crisis.
- This growth has been accompanied by enhancements to the way in which the reserves are managed that aim to improve the governance structure, portfolio management, risk measurement and risk management.
- This article briefly describes these enhancements, the motivation for implementing them and some of the lessons learned along the way.

Over recent years, Canada's foreign exchange reserves have grown steadily. This growth was accompanied by enhancements to the reserves-management framework. Even though the list of eligible fixed-income assets and credit quality requirements is conservative compared with most other foreign reserves portfolios, having a well-defined decision-making framework in place is important.

Canada's reserves are managed within a well-defined and transparent risktolerance framework. However, that framework was silent on the issue of investment and risk preferences. That is, there was no risk-balanced benchmark. Thus, while the portfolio composition was steered by discussions about "what not to invest in," there was little information available to actively guide portfolio managers with respect to "what to invest in." The result was a portfolio that was based largely on the governance committees' revealed preferences. This meant that, while the foreign exchange reserves portfolio was regularly reviewed ex post by the governance committees, ex ante investment direction was limited.

In 2011, both an internal and an external review confirmed that improvements could, and *should*, be made to governance, portfolio management, risk measurement and risk management. Over the past four years, Finance Canada and the Bank of Canada have undertaken an extensive work plan to close the identified gaps (Finance Canada 2012a).

After reviewing the fundamental principles behind managing foreign exchange reserves in Canada, we describe the experience of the 2007–09 global financial crisis and how it informed the review of portfolio-management practices. The enhancements that resulted from that exercise are then discussed. We conclude

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with some lessons learned that may prove useful for other managers of foreign exchange reserves portfolios.

Fundamentals of Reserves Management in Canada

The Bank acts as the fiscal agent for the federal government and works with Finance Canada to provide advice to the Minister of Finance on the funding and investment of Canada's foreign exchange reserves. Canada's liquid foreign exchange reserves are held in the Exchange Fund Account (EFA). The purpose of the EFA, as specified in the *Currency Act*, is to provide foreign currency liquidity to the government and to promote orderly conditions for the Canadian dollar in the foreign exchange markets, if required. The EFA's purpose is achieved through operational measures specified in the Statement of Investment Policy. There, the EFA's three objectives are established:

- (i) To maintain a high standard of liquidity—hold reserves in assets that mature or can be sold on very short notice with minimal market impact and therefore loss of value.
- (ii) To preserve capital value—minimize risk of loss of market value by holding a diversified portfolio of high-quality assets (in terms of credit rating and type of issuer), managing liquid assets and liabilities on a matched basis (in terms of currency and duration) and using appropriate practices to mitigate risks.
- (iii) To optimize return—achieve the highest possible level of return, while respecting the objectives of liquidity and capital preservation.

Within this context, the aspects of the EFA listed below are fundamental to the reserves-management approach taken in Canada.

- Foreign exchange reserves assets (and the associated liabilities that fund them) are owned by the federal government and therefore do not appear on the Bank's balance sheet.
- No external managers are employed in the funding and investment of the foreign exchange reserves.
- All reserves are managed in a strict asset-liability-matching (ALM) framework (Finance Canada 2014) that serves to effectively mitigate risk to the interest rate and the foreign exchange. Some credit spread risk is accepted.
- While many reserves managers prefer to hold short-dated assets, the ALM framework allows the federal government to fund and purchase assets with maturities of up to 10.5 years.
- The list of eligible reserves currencies is restricted to U.S. dollars, euros, Japanese yen and U.K. pounds sterling.
- The list of eligible asset classes is similarly narrow and is restricted to fixedincome securities. Structured assets are not eligible.

Recent Developments in Reserves Management

Globally, foreign exchange reserves have been marked by a steady increase in holdings (**Chart 1**). This growth appears to have been driven by several broad policy objectives that, when combined, have led to an increase in the stock of global reserves held for both precautionary and liquidity purposes.



Although these broad policy objectives vary across sovereigns, the buildup in foreign exchange reserves traditionally reflected a desire to maintain market confidence in the value and liquidity of the domestic currency. When such confidence is compromised, reserves can be deployed for possible intervention in foreign exchange markets. This type of intervention can be used to target the level of a currency or to manage the volatility and speed of currency adjustments. Market intervention can also be concerted, meaning several sovereigns agree to transact in a coordinated manner. Over the years, the broad policy objectives have come to include a range of issues, such as current account (balance of payments), balance sheet (loss of market access) and the broader domestic economy (the central government and domestic financial institutions). Finally, there is a growing body of evidence showing that reserves accumulation has been the residual outcome of the pursuit of mercantilist policy objectives by some sovereigns: reserves accumulated as a consequence of export-driven growth agendas and the resultant current account surpluses (IMF 2013).

The last time Canada intervened in support of its domestic currency was in 1998. In the case of Canadian reserves being used for concerted intervention, there have only been two recent episodes. The first was to signal support for the euro by purchasing US\$97 million of that currency in September 2000, and the second was to help stabilize the Japanese currency market by selling yen equalling US\$124 million in March 2011, as agreed by the G7 ministers of finance.

Canada's foreign exchange reserves have also grown since the global financial crisis (**Chart 2**). The Minister of Finance requires that foreign exchange reserves be maintained at 3 per cent, at least, relative to nominal GDP (Finance Canada 2013). The rationale for tying reserves to GDP was to recognize that reserves should grow in relation to the size of the economy. This strategy also has the benefit of being relatively simple to implement and monitor.



This reserves growth has been implemented within the context of a prudential liquidity plan, and the EFA is a key component of that plan. The purpose of the plan is to provide the government with liquidity in the event of a temporary market disruption in which the government is unable to raise funds to pay off maturing liabilities (Finance Canada 2012b).

Another feature of the post-crisis period has been the increasing rigour of leading global practices in the governance and management of reserves portfolios (IMF 2013; Borio et al. 2008). The enhancements to the management of Canada's foreign exchange reserves were largely based on these practices.

Increasingly, the governance of foreign exchange reserves portfolios has come into focus. Transparency, accountability and regular reporting are key features of good governance of foreign exchange reserves.

Clear statements of investment objectives and beliefs are also important. This includes a statement of the purpose for holding foreign exchange reserves as well as a statement of the principles around the funding and investment of the reserves.

Finally, there has been a broad-based global response by supervisory and regulatory authorities to the financial crisis. Financial stability concerns have emphasized the importance of systemic resilience in the face of adverse market conditions. Two key consequences of this have been the increased importance placed on internal creditrisk assessments and the collateralization of counterparty exposures.

Aspects of the Management of Canada's Foreign Exchange Reserves That Have Been Enhanced

The Bank and Finance Canada recently conducted a comprehensive and wideranging review of how foreign exchange reserves are managed. This review sought to evaluate the management framework of the EFA, identifying gaps between leading global practices and recommending enhancements. These enhancements can be broadly categorized into the following themes: governance, portfolio management, risk measurement and risk management. Management of foreign exchange reserves has been enhanced in the areas of governance, portfolio management, risk measurement and risk management

Governance

Senior managers from the Bank and Finance Canada participated in an exercise to assess investment beliefs. This exercise served to identify investment and risk preferences that had previously been revealed only in the structure of the resulting asset and liability portfolios.

The investment beliefs exercise identified ways to better specify investment preferences ex ante, including defining a strategic allocation of assets by broad issuer type, term and currency, as well as defining an investment horizon. The objective function of the reserves portfolio was made explicit by assessing the relative importance of each of the three EFA objectives.

This exercise also helped shed light on the concepts of risk tolerance and risk preference. Risk tolerance is both a qualitative and quantitative expression of the maximum amount of financial risk that the government will accept while still being able to achieve the EFA objectives. The concept of risk preference is, however, defined as the amount of risk chosen to balance ("optimize") the three EFA objectives. At no time should risk preferences exceed risk tolerances.

Portfolio management

The strategic investment preferences are operationalized by investing according to a detailed asset allocation that specifies the preferred amount of holdings for each eligible investment by currency and term. The detailed asset allocation is expressed in terms of risk tolerance (maximum and minimum levels) and risk preference (a point within that range). This permits some discretion to portfolio managers. Risk attribution and performance measures are calculated regularly with respect to the actual portfolio relative to the detailed asset allocation.

Consistent with best practices in global asset management, the EFA now formally considers the risk-return trade-off preferences in its investments. The pound sterling was added as an investable currency to diversify the asset portfolio, thus reducing risk related to concentration of investment in a limited number of currencies (Finance Canada 2014).

The funding of the EFA has also responded to the evolution in market conditions. In 2013, the government introduced a medium-term note program as a regular funding instrument (Finance Canada 2014). This program provides another vehicle through which the foreign exchange reserves can be funded and also serves to diversify the funding sources and investor base.

Risk measurement

The ALM framework employed by the EFA has proven to be a very effective means of mitigating interest rate and foreign exchange risk to the government's fiscal position. However, there is still residual market risk that is derived from the credit spread exposures inherent in the assets and the liabilities—and the lack of correlation between the two. Since the EFA is predominately funded with crosscurrency swaps, there are non-zero levels of net credit spread risk. It is largely due to this residual risk that the EFA is able to achieve a positive net carrying return.

A more comprehensive measure of market risk has been introduced. This measure—total market value at risk—takes into account all of the risk factors the EFA is exposed to: interest rates, foreign exchange rates and credit spreads. It therefore provides a more comprehensive picture of the risk borne by the EFA, which permits a more thorough assessment of the risk-return trade-off in the portfolio.

In the aftermath of the global financial crisis, the Financial Stability Board raised concerns about the mechanistic reliance market participants had placed on ratings from credit agencies. Best practices have evolved for internal credit opinions in the investment decision process. The Bank has made significant progress in developing and implementing internal credit-assessment abilities, in collaboration with Finance Canada (Wolfe 2014). In the same way that the establishment of investment preferences is through-the-cycle, the internal credit-assessment framework relies on fundamental credit analysis that produces a forward-looking (through-the-cycle) assessment of an entity's capacity and willingness to pay its financial obligations, resulting in an opinion on the relative credit standing or likelihood of default.

Risk management

Implementing two-way Credit Support Annexes as part of the International Swaps and Derivatives Association agreements between the government and private sector counterparties for derivatives transactions has improved credit-risk management for funding the EFA. Like many sovereigns, Canada has established agreements with its counterparties that oblige them to pledge collateral in response to adverse mark-to-market movements. These agreements were called one-way agreements because counterparties had to pledge collateral if they owed the government money on a derivatives contract, while Canada did not have a similar obligation.

The recent evolution in the regulatory environment for banks has seen an increasing emphasis on the accurate pricing of counterparty risk and the management of residual risk through collateralization. As a result of changes in pricing, the government is moving toward two-way agreements with symmetrical treatment of collateral—collateral flows back and forth between the government and the counterparty, depending on the market valuation of the derivatives contract (Rivadeneyra and Dissou 2011).

These agreements will reduce the cost of funding the reserves through cross-currency swaps. They also bring broader benefits. Banks can now reuse the collateral received under these revised agreements for their own needs. This rehypothecation helps to further financial stability and market functioning by supporting continued liquidity in the market for high-quality assets. These objectives, while typically beyond the scope of reserve managers, are nonetheless worthwhile and important.

Conclusion

The recent comprehensive review of the EFA portfolio-management framework by the Bank and Finance Canada has yielded several insights. The key riskmanagement lesson that was relearned is that risk management is a shared responsibility—from the front office through to the middle and back offices. Equally important, it should be recognized that risks cannot be completely eliminated: they can merely be transformed and mitigated.

From a governance perspective, transparency and decision-making accountability are critical. Establishing clear investment preferences has enabled greater clarity around decision-making authority and fostered a more granular approach to risk management and performance attribution.

At the same time, governance structures need to retain a degree of flexibility. In an environment where market conditions evolve and are interconnected in sometimes unexpected ways, portfolio and risk managers need to have a degree of discretion.

 The Bank has made significant progress in developing and implementing internal creditassessment abilities, in collaboration with Finance Canada

 Canada has established agreements with its counterparties that will further financial stability and market functioning by supporting continued liquidity in the market for high-quality assets

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