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The Consequences of the Bank of Canada's Ballooned Balance Sheet

The Bank of Canada's balance sheet, which ballooned during the pandemic, faces pressures that will keep it over-sized for the foreseeable future. The near-term problem is that with interest rates rising, the interest the Bank owes is set to exceed the interest it earns on its Government of Canada bonds. A change to the Bank of Canada Act is needed to allow the Bank to deal with these losses effectively, thereby helping it to maintain its independence from political interference.

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THE STUDY IN BRIEF

The Bank of Canada's balance sheet has undergone a radical transformation since the beginning of the pandemic. The Bank's total assets more than quadrupled at their peak and still remain 3.5 times higher. The most radical change on the liabilities side has been the increase in settlement balances held by financial institutions at the Bank as part of its large-value payment system. The reason: more bonds on the Bank's balance sheet have been matched with increases to the settlement balances of the banks who sold them.

In this *Commentary*, we explore the consequences for the Bank of Canada of an enlarged balance sheet. Structural changes such as the introduction of new payments systems and new means of payments – Lynx, the new large-value system, the real time rail (RTR) on the retail side, and the possible introduction of a central bank digital currency – all have the potential to increase the demand for the use of settlement balances. Further, the Bank's decision to hold its large holdings of federal debt, accumulated through asset purchases, until they mature will perpetuate excess settlement balances for the foreseeable future.

As a consequence, the Bank of Canada announced that it will not return for now to its traditional corridor system around the policy rate, or target overnight rate, but will instead continue to run a floor system to implement monetary policy. With excess settlement balances in their Bank of Canada accounts, financial institutions have little need to lend to each other in the course of business each day, driving the overnight rate down to the Deposit Rate the Bank pays on settlement balances, which forms the floor.

The upside of an elevated balance sheet is that it will facilitate real time settlement under the modernized payment systems since financial institutions have ample liquidity. The downside is that the Bank of Canada will necessarily hold a larger share of Government of Canada bonds on the asset side of its balance sheet. While the Bank can employ repos and security lending to limit its impact on market functioning, by following its current strategy of quantitative tightening while also holding bonds to maturity and acting as a large holder of Government of Canada debt, it will still affect equilibrium interest rates in the economy.

This may raise concerns about the independence of the Bank of Canada from the government. We argue that the indemnity agreement signed by the Bank and government in early 2020 protects the Bank from a negative equity position due to valuation losses on the bonds. It is not, however, applicable to the Bank's operational losses as a result of the sharp rise in the policy interest rate that by now means that the interest the Bank is paying on settlement balances exceeds the interest earned on the Government of Canada debt it owns. These losses are likely to leave the Bank in a negative equity position.

Such a scenario could undermine the independence of the Bank of Canada in the eyes of the public. We therefore suggest amending the *Bank of Canada Act* in order to allow the Bank of Canada to create a deferred asset to cover the operational losses. That way the Bank formally has no negative equity arising from operational losses and must use future profits to pay down the entire deferred asset before remitting profits to the government, thereby compensating for current losses. This will enable the Bank to credibly communicate its current strategy of quantitative tightening, in particular making clear that it is in line with its aggressive tightening of the overnight rate to achieve the 2 percent inflation target in the near future.

Policy Area: Monetary Policy.

Related Topics: Banking, Credit and Payments.

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During the recent pandemic, the Bank of Canada intervened rapidly by cutting its overnight rate target to its effective lower bound in March 2020 and by introducing a number of asset purchasing programs to stabilize financial markets.

Over the next few months, its balance sheet ballooned quickly from a size of just over \$120 billion in early March 2020 to a peak of \$575 billion in March 2021. This increase was largely a consequence of the Bank's quantitative easing (QE) program, which bought up Government of Canada debt across the yield curve, to provide further stimulus to the economy.

On the liabilities side of the balance sheet, those assets were mostly paid for by increasing the settlement balances held by financial institutions at the Bank of Canada. (See Key Concept Explainer on next page.) Such settlement balances increased by three orders of magnitude, from \$250 million to approximately \$260 billion, implying a massive excess supply of short-term liquidity for Canada's financial system.¹

With settlement balances so high as a result of QE, there has been little to no demand for short-term funding in the overnight market. As a result, the Bank of Canada cannot operate its traditional corridor system any longer where – in the absence of large settlement balances – financial institutions allocate short-term funding close to the target for the overnight rate. Instead, the Bank now operates

what is called a floor system where interest rates in the overnight market are close to the Deposit Rate paid to banks for their balances at the Bank of Canada.

Against this background, this *Commentary* looks at the issues that will drive the size of the Bank of Canada's balance sheet in the short, medium and long runs. It also discusses the challenges Canada's central bank faces when operating with a large balance sheet.

The **short run** developments in the balance sheet are driven entirely by the Bank's current monetary policy tightening strategy to rein in high inflation. The Bank of Canada has begun to increase interest rates aggressively while employing quantitative tightening (QT). With respect to the latter measure, it has decided to simply let maturing government debt roll off its balance sheet rather than actively selling it to the market. Hence, its balance sheet will only gradually decline and settlement balances will remain fairly large for the foreseeable future.

In the **medium run**, developments in payments will place upward pressure on the Bank's balance sheet. In September 2021, the Lynx system

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- 1 Government of Canada deposits and securities sold under repurchase agreements made up the bulk of the rest of the liabilities increase. The former went from \$21 billion when the pandemic began to a peak of \$180 billion, while the latter started at \$0 and peaking at \$45 billion. Both are large increases, but are far outstripped by settlement balances. On the Government of Canada deposits, they have since halved from their peak, with the draw down occurring alongside Government of Canada treasury bills falling off the asset side of the Bank's balance sheet.

Key Concept Explainer

Settlement Balances:

Settlement balances can be defined as interest-bearing deposits that belong to participants of Canada's payment system (financial institutions), and are an integral part of the high-value payment system (HVPS), which, since 1999, consisted of the large value transfer system (LVTS), and was replaced by Lynx in 2021. These balances, akin to excess reserves in other jurisdictions, are held overnight at the Bank of Canada, remunerated at the Bank's Deposit Rate and are reflected as a liability on the Bank's balance sheet.

Adapted from Chu et al. (2022) at: <https://www.bankofcanada.ca/wp-content/uploads/2022/06/sdp2022-13.pdf>

How Bond Buying Expands the Central Bank's Balance Sheet:

When the Bank of Canada buys government bonds from a financial institution like a bank, the bonds go on the asset side of the central bank's balance sheet. The payment to the financial institution is added to the settlement balances on the liability side of the central bank's balance sheet. Hence, the Bank of Canada's balance sheet expands. The money supply increases as settlement balances increase.

Corridor System (before March 23, 2020):

In an interest rate corridor system, the Bank establishes an operating band – or corridor – around the policy interest rate, which is the target overnight rate used to influence other interest rates in the economy. The Bank then supplies limited settlement balances (close to zero) and actively manages the supply of these balances and its balance sheet more generally to maintain the overnight rate close to its target on a daily basis.

Adapted from: <https://www.bankofcanada.ca/markets/market-operations-liquidity-provision/framework-market-operations-liquidity-provision/>

Floor System (since March 23, 2020):

In a floor system, the Bank does not target a specific level of settlement balances but does ensure that the level is more than enough to meet demand from financial institutions. The higher liquidity created by an ample supply of settlement balances allows participants to lend settlement balances to each other at or near the Bank's Deposit Rate, which is the rate it pays to financial institutions on the balances. As a result, the Deposit Rate is set equal to the target rate, and the operating band is set at 25 basis points.

Adapted from: <https://www.bankofcanada.ca/markets/market-operations-liquidity-provision/framework-market-operations-liquidity-provision/>

replaced the Large Value Transfer System (LVTS) as the main electronic wire payments system for transferring funds between large financial institutions. Similarly, despite recent delays, real-time retail payments via the real time rail (RTR) are to be introduced in due time. Both will operate as a real-time gross settlement (RTGS) model, where transactions settle immediately, and as a result there are pressures for financial institutions to handle additional liquidity needs. While some features in these new payments system are designed to temper such needs, there will most likely be a moderate increase in the demand for settlement balances.

There is also the possible introduction of a central bank digital currency (CBDC).² At a minimum, there would be some substitution between traditional cash and CBDC (digital cash), leaving the size of the Bank's balance sheet unaffected. Similarly, people may move out of bank deposits and into CBDC: on the one hand increasing the Bank's balance sheet through increased demand for public money (which includes CBDCs), but on the other hand reducing financial institution balance sheets and, as a consequence, shrinking settlement balances at the Bank of Canada.

However, it is also plausible to expect that the overall demand for public money will increase, leading to an expansion of central bank liabilities. One reason is simply that access to public money for the general public may become easier in the form of digital cash. Another reason is that the Bank of Canada may issue a wholesale version of digital cash in the form of a stablecoin linked to the loonie that would directly support financial markets. In such a scenario, liabilities would increase with stablecoin issuance akin to settlement balances.

It is unlikely, however, that the demand for settlement balances due to these developments in

the payment system will outpace the supply. For these reasons, the Bank of Canada will operate in the **long run** with a significant amount of excess settlement balances. As a result, the floor system for implementing monetary policy will remain in place for the foreseeable future, which the Bank of Canada has officially – and rightly so – acknowledged.³

What are the benefits and the costs of running such a system? The upside of the floor system is that it improves payment system functionality. It eases the settling of transactions in real time given the ample liquidity in the overnight market arising from excess settlement balances. While the Bank should naturally limit itself to the purchase of Government of Canada debt from banks in exchange for these settlement balances, there are concerns associated with holding an increased amount of government securities.

First, as a large player in the market, the Bank of Canada has greater influence over market interest rates for government debt as liquidity in markets becomes thinner. Such concerns, however, can be alleviated by engaging in short term repo and securities lending as the Bank of Canada has done in the recent past. Second, and more importantly, holding a larger amount of government debt – as currently under its current strategy of QT – makes the Bank potentially vulnerable to political interference.

The Bank of Canada signed an indemnity agreement with the federal government at the start of its asset purchase program in the second quarter of 2020 to insulate its balance sheet from possible future valuation losses. If the Bank were to sell these assets before they mature, this indemnity agreement adds to the operating expenses on the Government of Canada's statement of operations, possibly

2 See Zelmer and Kronick (2021) for a detailed discussion.

3 <https://www.bankofcanada.ca/2022/04/bank-of-canada-provides-operational-details-for-quantitative-tightening-and-announces-that-it-will-continue-to-implement-monetary-policy-using-a-floor-system/>

triggering an extra need for the government to issue more debt.⁴ The government might have an incentive to prefer the Bank's hold-to-maturity strategy.

But the agreement helps to keep the Bank from falling into a negative equity position by adding an asset (a derivative position) to the balance sheet that compensates for the valuation losses from the Bank's Government of Canada debt holdings. Such a negative equity position – while not compromising the Bank's ability to perform monetary policy – could potentially lead to pressure to re-capitalize the Bank, again causing the government to issue more debt. Indeed, allowing the Bank to operate with negative equity for an extended period of time may undermine the Bank's credibility and set up expectations that it may be forced to increase seigniorage (profits from issuing currency) in order to build up its equity position.

The Bank therefore needs to explain clearly the details of how its indemnity agreement with the Government of Canada functions, and that it will not impact in any way its monetary policy decisions to achieve the 2 percent inflation target.

Similarly, the Bank and the Department of Finance should at a minimum explain how the Bank will deal with potential operational losses from the interest they are paying on settlement balances, which now exceeds the interest earned on the Government of Canada debt they own (See Appendix). If losses exceed the Bank's relatively small equity and reserve positions, future Bank profits need to be split between replenishing equity and reserves and making transfers to the government.

A better option and, indeed, our preferred one is to follow the practice of the US Federal Reserve, which books operational losses as deferred assets on its balance sheet. This deferred asset is paid off from

future profits before returning any surpluses to the Treasury. While such an arrangement would require a change to the *Bank of Canada Act*, it would be transparent enough for the Bank to convey to the public, signaling its continuing independence.

THE EVOLUTION OF THE BANK'S BALANCE SHEET DURING THE PANDEMIC

The Bank of Canada's response to the onset of the pandemic in 2020 was swift and decisive. Between March 4 and March 27, the Bank lowered the overnight rate target in three fifty-basis-point steps from 1.75 percent to 0.25 percent, its effective lower bound. Only the first cut on March 4 coincided with a fixed announcement date while the others were unconventional in the sense that they occurred at other dates.

Because the economic shutdowns imposed by the federal and most provincial governments threatened to turn into a full-blown financial crisis, the Bank also initiated several asset purchase programs to boost liquidity and to support critical financial markets. For the first time, it purchased large quantities of assets other than federal government debt, including provincial and private-sector debt. The Bank's policies were largely successful in calming financial markets.⁵ By the end of June 2020, the Bank's holdings of bankers' acceptances and commercial paper had fallen to zero, effectively ending the intervention to support financial markets.

On March 27, the Bank inaugurated its Government of Canada Bond Purchase Program. Its initial goal was to address strains in this market by purchasing federal government bonds of different maturities in primary and secondary

4 <https://www.bankofcanada.ca/wp-content/uploads/2022/07/amended-restated-indemnity-agreement-government-canada-secondary-market-support-program.pdf>

5 See Ambler and Kronick (2020), who discuss in detail these financial-market interventions and their effects on yields and spreads.

markets, as well as to “enhance the effectiveness of all other actions taken so far.”⁶ Over time, the yields on government bonds fell across the yield curve and the primary goal of the program became one of quantitative easing (QE), a means of keeping longer-term interest rates low in order to encourage borrowing and spending.⁷

During the time the overnight rate target was at its lower bound, the intended pace of these purchases became a prominent feature of the Bank’s regular fixed announcement dates, which take place at six-week intervals. Its pace of purchases continued at \$5 billion per week until the end of October 2020, and gradually reduced from then on until stopping altogether in October 2021. Table 1 gives the details of the Bank’s pace of bond purchases. As of the time of writing, the Bank has shifted to quantitative tightening (QT). For now, it will allow bonds that mature to roll off its balance sheet, shrinking it accordingly.

The Bank’s other asset purchasing programs have largely been wound down. By the end of 2021, it eliminated its holdings of provincial money market securities, commercial paper and bankers’ acceptances; by the end of 2022, it will have also eliminated all remaining term repos. It continues to hold a modest amount of corporate bonds, provincial bonds and Canada mortgage bonds. Most of the expansion of the Bank’s asset holdings (see Table 2) is due to its purchases of Government of Canada debt.

The Bank’s holdings of Government of Canada debt were just over \$437 billion at the end of 2021 compared to a little less than \$64 billion before the pandemic in December 2019 (captured as part of “Investments”). The total amount of Government of Canada debt outstanding at the end of 2021

Table 1: Pace of Government of Canada Bond Purchases

| Date | Rate of Bond Purchases |
|--------------------|----------------------------------|
| 27/03/2020 | \$5 billion |
| 15/04/2020 | \$5 billion |
| 03/06/2020 | \$5 billion |
| 15/07/2020 | \$5 billion |
| 09/09/2020 | \$5 billion |
| 28/10/2020 | \$4 billion |
| 09/12/2020 | \$4 billion |
| 20/01/2021 | \$4 billion |
| 10/03/2021 | \$4 billion |
| 21/04/2021 | \$3 billion |
| 09/06/2021 | \$3 billion |
| 14/07/2021 | \$2 billion |
| 08/09/2021 | \$2 billion |
| 27/10/2021 | replace maturing bonds |
| 08/12/2021 | replace maturing bonds |
| 26/01/2022 | replace maturing bonds |
| 02/03/2022 | replace maturing bonds |
| 13/04/2022 onwards | no longer replace maturing bonds |

Source: Various Bank of Canada interest rate announcements.

was approximately \$1.117 trillion.⁸ This means that as of the end of 2021, the Bank of Canada was holding just under 40 percent of the total outstanding stock. That is up from only 9 percent of the market at the end of 2019, when outstanding Government of Canada debt was \$697 billion. The

6 See the Bank’s press release from March 27, <https://www.bankofcanada.ca/2020/03/press-release-2020-03-27/>

7 See the Bank of Canada’s Backgrounder (Bank of Canada 2012) for details on its view of the transmission mechanism of QE.

8 From CANSIM Table: 10-10-0002-01. These are unaudited debt figures but allow us to compare December 2021 in both the instance of outstanding federal government debt and Bank of Canada holdings of federal government debt.

Box 1: Bank of Canada Asset Purchases – the Link between the Balance Sheet and Results of Operations

When the Bank of Canada buys up assets, it buys them (largely) at fixed rates for the lifetime of the asset. So, on the asset side of the balance sheet there is an increase in “Investments” at the corresponding value of the asset. The liability depends on what was used to purchase the asset.

Table 2: Bank of Canada Financial Statements, Balance Sheet (C\$ millions)

| Assets | September 2022 | December 2019 |
|--|----------------------|-----------------|
| Loans and receivables | 438 | 15,522 |
| Investments | 398,774 | 103,347 |
| Derivatives – Indemnity agreements with Government of Canada | 31,535 | - |
| All other assets | 1,116 | 774 |
| Total Assets | 431,863 | 119,643 |
| Liabilities | | |
| Bank notes in circulation | 116,652 | 93,094 |
| Deposits in Total (settlement balances) | 288,878 (199,707) | 25,243 (250) |
| Securities sold under repurchase agreements | 24,885 | - |
| Derivatives – Indemnity agreements with the Government of Canada | - | - |
| Other liabilities | 494 | 775 |
| Equity | 954 | 530 |
| Total Liabilities and Equity | 431,863 | 119,643 |

Source: From quarterly and annual reports. Any discrepancies in totaling come from rounding.

Table 2 (cont'd): Bank of Canada Financial Statements, Results of Operations (C\$ millions)

| Assets | June 2022 * | December 2019 |
|-----------------------------------|-------------|---------------|
| Interest revenue | 1,163 | 2,276 |
| Interest expense | (842) | (407) |
| Net Interest Revenue | 321 | 1,869 |
| Dividend Revenue | 4 | - |
| Other Revenue | 2 | 12 |
| Total Income | 327 | 1,881 |
| Expenses | (183) | (580) |
| Net Income | 144 | 1,302 |
| Other comprehensive income (loss) | 137 | (128) |
| Comprehensive Income | 281 | 1,173 |

Source: From quarterly and annual reports. Any discrepancies in totaling come from rounding. *Results of operations not available monthly so we use the most recent quarterly report.

In normal times, the Bank adjusts its purchases of assets to reflect money demand (or day-to-day Government of Canada needs), so the bulk of the liability increase is “Bank notes in circulation” (or, to a lesser extent, Government of Canada deposits).

(Continued on next page.)

Box 1: Continued

We say the composition of the balance sheet is liability driven. Here, assets are typically bought and held until maturity, so the asset value reflects the value at purchase.^a

In periods of stress, like the global pandemic, the purchases reflect a need to directly influence markets, and are paid for with an increase in “Deposits” (settlement balances) of Payments Canada members. In this case, the composition of the balance sheet is asset driven, reflecting where the Bank of Canada feels it needs to intervene. The assets are accounted for at market value as some might be sold as part of shrinking the balance sheet once the period of stress has ended.

During the lifetime of the asset, interest received at the fixed rate shows up as “Interest revenue” on the results of operations. If the liability increase is “Bank notes in circulation” there is no “Interest expense,” but there is a floating rate expense if the liability is an increase in Government of Canada deposits or settlement balances (interest on Government of Canada deposits has recently been suspended). This matters because if monetary policy tightens and the Deposit Rate goes up, it might rise to a higher level than the fixed rate earned on the assets. This appears set to be the case shortly, though not at the latest reading (Q2 2022).

As the Bank is a Crown Corporation of the Government of Canada, any comprehensive income (largely a result of interest income greater than interest expense) is transferred to the federal government. Under a comprehensive loss when expenses exceed income, the Bank could draw down its reserves, which are quite limited. Once losses exceed reserves, future profits will be split between the Bank of Canada rebuilding its equity and sending transfers to the federal government.

In the US, a comprehensive loss becomes a deferred asset on the Federal Reserve’s balance sheet, and must be paid down entirely with future year profits. We believe Canada should do the same, as we discuss later, which would help with transparency and clarity for the general public. Such a move would require a change to the *Bank of Canada Act*.

a Any difference between the purchase price and par value is amortized over the life of the bond, which leads to a small change in the value on the balance sheet over time.

Bank’s Government of Canada debt holdings, and total assets, have dropped since the end of 2021 (Table 2), but these numbers show how heavily the Bank’s market presence is felt today compared to before the pandemic, as well as how big the

balance sheet remains today. Box 1 gives a detailed description of how the Bank’s purchases of assets affects its balance sheet and results of operations – in both normal and exceptional periods.

There remain two questions relevant to our analysis:

1. What happens under QT if the Bank decides it needs to sell assets at a loss (as interest rates have increased)?
2. How does the indemnity agreement signed between the Government of Canada and Bank of Canada change this story?

First, if the Bank decides to sell an asset before it matures, the asset side of the balance sheet will shrink with a corresponding fall in settlement balances of the financial institution that purchased the bond.

In normal times, as mentioned in Box 1, most of the Bank's assets are held to maturity and are, therefore, accounted for as amortized cost (i.e., at the value when purchased). To deal with issues such as seasonal demand, the Bank will use repurchase agreements (repos), or acquire treasury bills and other short-term assets, "that mature when the seasonal demand for bank notes is expected to abate" (Johnson and Zelmer 2007).

Things are different in exceptional periods. If the Bank were to sell an asset for a loss as part of QT, the assets would shrink by a correspondingly smaller amount, as would the settlement balances from the financial institution that bought the bonds (the assets are at fair market value so the smaller amount is already baked in). However, with the indemnity agreement the Government of Canada signed with the Bank of Canada in the second quarter of 2020 – which shows up on the balance sheet as "Derivatives – Indemnity agreements with Government of Canada" – if the asset is in a

loss, the loss shows up as an asset. This is because when the sale occurs, the Government of Canada transfers the corresponding loss amount to the Bank of Canada. Therefore, overall, the balance sheet shrinks by the same amount it would if the Bank of Canada let the asset mature and the asset was priced at its amortized cost.

Without the indemnity agreement, when the value of the asset shrank there would have to be an offsetting liability as the Bank was holding the asset. This offsetting liability would be a shrinking of the equity position. The latter is fine unless the Bank were to go into a negative equity position. In theory, the Bank could operate with a negative equity position, but this could lead to a gradual loss of credibility. As a result, it is possible that political pressure would force the government to inject new capital to boost equity, which would entail simultaneously issuing debt that the Bank of Canada would buy to create an offsetting boost to the asset side of the balance sheet.

How does the indemnity agreement show up on the Government of Canada's financial statements?⁹ According to the public accounts: "Gains or losses under these indemnity agreements are recognized in the *Statement of Operations and Departmental Net Financial Position* when the Bank of Canada realizes gains or losses under the bond purchase programs."¹⁰ In other words, if the Bank sold at a loss, this would show up as an expense for the Government of Canada. If the increased expenses caused the Government of Canada to go further into deficit, it could also lead to the issuance of more debt.

9 <https://www.tpsgc-pwpsc.gc.ca/recgen/cpc-pac/2021/pdf/2021-vol1-eng.pdf>

10 <https://www.canada.ca/content/dam/fin/publications/fs-ef/fs-ef-21-eng.pdf> where it specifically says "The bond purchase program indemnity agreement derivatives are measured in the Statement of Financial Position at cost. Gains or losses under these indemnity agreements are recognized in the Statement of Operations and Departmental Net Financial Position when the Bank of Canada realizes gains or losses under the bond purchase programs." Statement of Financial Position refers to the balance sheet while Statement of Operations and Departmental Net Financial Position refers to an income statement.

Box 2: Quantitative Tightening – To Hold or To Sell

We briefly compare the two options for QT, selling off debt vs. letting it mature in the world of the indemnity agreement with the federal government.

The latter, a hold strategy, ensures that the Bank does not take losses on its bond portfolio, as a result of the fact that prices today are lower than when they purchased the debt (due to higher interest rates). However, holding on to debt until it matures, while raising the overnight rate, could lead to a larger inversion of the yield curve since short-term interest rates rise faster than longer-term ones (if the Bank sold, prices could go down and longer-term interest rates go up, negating the inversion). While often a sign of an impending recession, in the current scenario, it could cool off the lending market as intermediaries tend to finance themselves with short-term funds and profit from the higher long-term interest rates at which they lend.

The former, by selling off debt instead, the Bank of Canada directly influences market prices – including the lending rates borrowers incur – since it currently holds a large amount of the outstanding government debt. As mentioned, as prices decline due to the sales, yields on government bonds will increase (possibly sharply^a), and since the Bank bought debt at lower yields (i.e., higher prices), if they were to sell this would lead to capital losses.

However, under the indemnity agreement the losses would be covered for the Bank by the Government of Canada. But, the realization of these losses would increase the need of the government to fund the losses, and if this pushed the government into deficit, or further into debt, it would be forced to issue more debt. If this were disagreeable to the government, there could be independence concerns if the latter put pressure on the Bank not to sell.

^a See, for example, the evidence from US bond markets where announcements of the tapering of bond purchases by the Federal Reserve led to the so-called “Taper Tantrum.”

THE SHORT-TERM: UNWINDING MONETARY STIMULUS

As pointed out, once the overnight rate hits what the Bank of Canada considers its lower bound of 25 basis points, monetary policy can provide additional stimulus through purchases of federal government debt (and other assets). Known as QE, the additional stimulus this provides arises because by purchasing debt, the Bank of Canada is able to

lower yields across the yield curve. This is intended to make borrowing cheaper for households and firms as intermediaries and financial markets price their lending activities off the government yield curve.¹¹

In 2022, faced with high inflation, the Bank of Canada started removing monetary stimulus from the economy. It has started to sharply increase the overnight rate and has reversed its QE program – known as QT. At the extremes, for the latter, the

11 This was the intention. The actual effectiveness of QE has been the subject of some debate, notably in the American context after the financial crisis. See for example Thornton (2015).

Bank has two options available. It can either hold the bonds and let them roll off the balance sheet as they mature or actively sell its portfolio. The trade-off between the two options mainly revolves around the arguments of managing the yield curve and safe-guarding the independence of the Bank (see Box 2 for a brief discussion).

The Bank of Canada has chosen the hold strategy. Due to the composition of the Bank's portfolio,¹² this implies that the size of the balance sheet will remain large for the foreseeable future. About \$140 billion of debt will mature within the next two years (at the time of writing) with an additional amount of roughly \$200 billion by 2030. The bonds with the longest maturity will not mature until 2064, leaving roughly \$70 billion on the balance sheet in the coming decades.

The “hold-until-maturity” strategy is likely to cause little disruption in financial markets. Therefore, one can expect that the Bank of Canada will operate for some time with a significantly larger balance sheet than before the pandemic. Interestingly, a larger balance sheet than pre-pandemic may be necessary, regardless of QT strategy, as structural changes in the payment system take place that will require banks to hold additional liquidity; i.e., higher settlement balances. We turn to these structural changes next.

THE MEDIUM TERM: CHANGES IN THE PAYMENT SYSTEM

The payment system has undergone or will undergo two fundamental changes. First, Canada has embarked on a modernization of its payment infrastructure. The new large value payment system, Lynx, has just come online and, while the real-time retail payments system via the real time

rail (RTR) has been recently delayed, it is expected to launch soon.

Second, financial markets are undergoing a technological revolution that is based on the use of distributed ledgers and the use of digital currencies. These revolutions – often labelled as crypto economics and Decentralized Finance (DeFi), respectively – will possibly require infrastructure in the form of a digital currency provided by the central bank, or CBDC. We discuss next why both changes are likely to require that the Bank of Canada runs a larger balance sheet.

Payments System Reform – Lynx and RTR

In 1999, Canada launched the Large Value Transfer System (LVTS), an electronic-wire system allowing financial institutions to send large payments in a secure fashion in real time, with a guarantee of settlement. Payments processed under LVTS occurred in real time, while inter-bank settlement for the bulk of transactions only occurred at the end of the day.¹³ Each LVTS participant had a net position at the end of the business day, and if one institution was in a net debit position it would turn to the overnight market and look for a loan from other participants in a net credit position in order to eliminate this deficit. The finality of processing was “facilitated by use of collateral to secure participants’ intraday net debit (negative) positions and also by a residual guarantee provided by the Bank of Canada” (Arjani and McVanel 2006). When not under stress, the system worked quite well and the system required only a very small amount of settlement balances – typically much less than \$1 billion – to function properly.

In September 2021, the LVTS system was replaced by Lynx, owned and operated by Payments Canada with oversight by the Bank of Canada.

12 See <https://www.bankofcanada.ca/markets/government-securities-auctions/bank-of-canada-holdings/>

13 Part of the LVTS system operated as a “real-time gross settlement” system, but was far less used by participants.

In many respects, Lynx is a modernized version of LVTS, allowing for more data-rich payments, which helps support newer products and services for customers and digitizes outdated manual and paper-based invoicing and payments reconciliation. One of the primary differences between Lynx and LVTS is that the former is purely a real-time gross settlement system while in the latter settlement mainly occurred on a net basis end of day.

With Lynx, a participant – i.e., a financial institution with an account at the Bank of Canada – needs to have funds in the system to settle payments, making it essentially a pre-funded, large value payment system. In principle, this implies an increased demand for settlement balances by participants to fund their daily payments. The design of the system employs several mechanisms, however, to reduce the extra demand for liquidity. These liquidity saving mechanisms use the queuing of non-critical payments and participants can pledge eligible collateral against a “haircut” to obtain intraday credit.

Rivadeneira and Zhang (2022) have performed simulation exercises to arrive at the modest amount of additional settlement balances that are required in the system to have only short delays in payments execution. The delay in payments arises for two reasons. First, participants bear an opportunity cost when pledging collateral or holding settlement balances. Second, a lack of coordination among

participants – including the Bank of Canada – when scheduling payments can also lead to delays. Depending on the behaviour of participants and the use of different payment mechanisms in Lynx, Rivadeneira and Zhang (2022) peg the impact at roughly \$20 billion additional settlement balances at worst with average delays of less than one hour.

Such delays are, of course, less likely to occur whenever there are ample extra settlement balances in the system as is currently the case. Participants in Lynx hold an immense amount of settlement balances (\$192 billion at the time of writing), making funding payments a non-issue. It is still an open question how participants will change their behaviour as settlement balances fall over time and what payment delay – and, hence, the minimum required settlement balances – Lynx should accept in an optimal design of the system.¹⁴

On the retail side, the planned RTR payments system will provide 24/7/365 final and immediate settlement of retail payments. Such functionality requires funds to be available for all participants to settle their claims in this system. Since settlement ultimately occurs on the accounts of the Bank of Canada, funding needs to be ensured even when Lynx, which only operates during limited hours, is not available. This is also likely to increase the demand for settlement balances.¹⁵

Research by Chu et al. (2022) points out as well that “[t]he optimal level of required settlement

14 With ample extra reserves, large-value payments system essentially operate fully on a pre-funded basis. For example, the TARGET 2 system, the European Central Bank relies on reserves for about 3/4 of all large-value payments with collateralized intraday credit accounting for only 8 percent and offsetting payment making up the remainder (see https://www.ecb.europa.eu/pub/economic-bulletin/articles/2021/html/ecb.ebart202103_03~2e159cbd38.en.html).

15 This is consistent with recent Bank of Canada research from Chu et al. (2022) in which they state in reference to the RTR: “Although RTR is meant for small-value payments, it will be a 24/7 real-time gross settlement system with broad access, with funding and defunding occurring only during Lynx operating hours. Because of these factors, the need for higher settlement balances will increase, especially around weekends and holidays because participants will want to hold a precautionary buffer when Lynx is closed. A larger level of settlement balances will ensure that participants of both Lynx and RTR have sufficient liquidity to enable payment flows within and between both systems without needing to borrow from the Bank overnight.”

balances will depend on participants' behaviour as they determine payment flows through the new system. It will also depend on the addition of new participants, given RTR's broader access." The increase that these new payments rails will require is therefore hard to gauge. The current amount of settlement balances is likely many times the amount required in the long run to ensure the proper functioning of these new payment systems. However, it is also fair to say that the average settlement balances prior to the pandemic, a mere \$250 million during normal times, is likely insufficient to support Lynx and the planned RTR.

Central Bank Digital Currency

The second structural force that could keep the balance sheet elevated is the potential introduction of a central bank digital currency (CBDC) by the Bank of Canada. We note that at present, "The Bank currently has no plans to launch a CBDC. Rather, the Bank will build the capacity to issue a general purpose, cash-like CBDC should the need to implement one arise" (Bank of Canada 2020).

As the digital economy deepens, one area of innovation is around cryptocurrencies and the emergence of DeFi. Cryptos can be thought of as another form of private money, much like commercial bank deposits today, where transactions are verified and recorded using a decentralized system rather than the more standard centralized system involving financial institutions and the Bank of Canada. Such developments might force the Bank's hand, consistent with their stated position that "[t]he Bank will consider launching a CBDC if certain scenarios materialize or appear as if they are likely to. A CBDC could become beneficial or

even necessary, if...one or more alternative digital currencies – likely issued by private sector entities – were to become widely used as an alternative to the Canadian dollar as a method of payment, store of value and unit of account" (Bank of Canada 2020).

Similarly, DeFi¹⁶ could take financial transactions such as lending and trading out of the hands of intermediaries. The idea behind this development is that cutting out intermediaries reduces costs, speeds up transactions, increases competition and innovation, and improves access to financial services.

Central banks have been forced to ask themselves what the implications are for the financial system and for independent domestic monetary policy. If a cryptocurrency – especially one linked to a foreign currency – were to be used widely in Canada as a medium of exchange and to denominate contracts in Canada, monetary policy would be restricted as it may lose its ability to control the money supply. DeFi may need an infrastructure in order to reap its full benefits. Consequently, many central banks including the Bank of Canada have looked into issuing a digital currency either on the retail or wholesale level.

On the retail side,¹⁷ the effects on the balance sheet depend on the future demand for CBDC to conduct transactions. CBDC could lead to a shift in payments behavior if people started to use CBDC in lieu of other digital payments methods such as debit or credit cards. In this case, the liabilities of the balance sheet of the Bank of Canada would increase. Ultimately, the impact will depend – in addition to how the Bank manages and adjusts to any vulnerabilities in the system – on competition from private digital currencies, and the precise design features of CBDC such as limits for people

16 See Chiu, et al. (2022) for an introduction to the economic forces, value proposition, and limitations of DeFi.

17 For an overview of the benefits and potential costs of introducing a CBDC, see Kiff et al. (2020).

to hold it or whether it is token (like cash now) or account based (where everyone has an account at the Bank of Canada).¹⁸

The wholesale side presents a different dimension. DeFi relies on so-called stablecoins that use high quality assets as backing, possibly including reserves.¹⁹ One approach to take in response is for the central bank to issue its own digital currency that could be used as a stablecoin in DeFi applications.²⁰ This would facilitate interaction between different applications and, possibly, increase the value proposition of DeFi solutions. To the degree that DeFi crowds out traditional finance, a wholesale CBDC would replace so-called “inside money,” i.e., money created by the banking sector, with “outside money” in the form of reserves or settlement balances. This undoubtedly would lead to a significant increase in liabilities for the Bank of Canada – and, again, the ultimate outcome will depend in part on how the Bank manages the situation. It is impossible at this stage to precisely quantify the impact except for suggesting that it could be large.

Some of this increase to the balance sheet might be offset because of what a CBDC means for settlement balances. The increased demand by the public for Bank of Canada liabilities would show up in “Notes in Circulation” (see Table 2) or an equivalent category representing digital cash. But, to the extent financial institutions see lower deposits as people demand more public cash in the form of CBDC, they would either need to replace those liabilities on their balance sheet or shrink assets. Part of the decision will depend on liquidity

requirements, which require a certain amount of high-quality liquid assets (which settlement balances are) as a percentage of total assets and a certain amount of available stable funding (of which retail deposits are the most stable) as a percentage of required stable funding. To the extent shrinking settlement balances does not put banks into regulatory trouble, that might be a logical and less disruptive place to start. What this means is that while the Bank’s balance sheet will likely increase, there might be some offsetting effect from shrinking settlement balances.

In conclusion, medium-term trends are likely to increase the size of the balance sheet, with at least some of the increase coming in the form of a higher demand for settlement balances. Given its current QT strategy, however, the Bank of Canada will still operate with a large excess in settlement balances for the foreseeable future. Financial institutions in Canada will thus continue to be in a net credit position with the central bank. This will have ramifications for how the Bank of Canada implements its monetary policy, which we discuss next.

THE LONG-TERM: MONETARY POLICY IMPLEMENTATION

The Corridor vs. the Floor

Traditionally, the Bank of Canada has operated a corridor system when implementing monetary policy. In a corridor system, the Bank sets its overnight rate target at the midpoint of a band of 50 basis points.²¹ At the bottom end of the band is

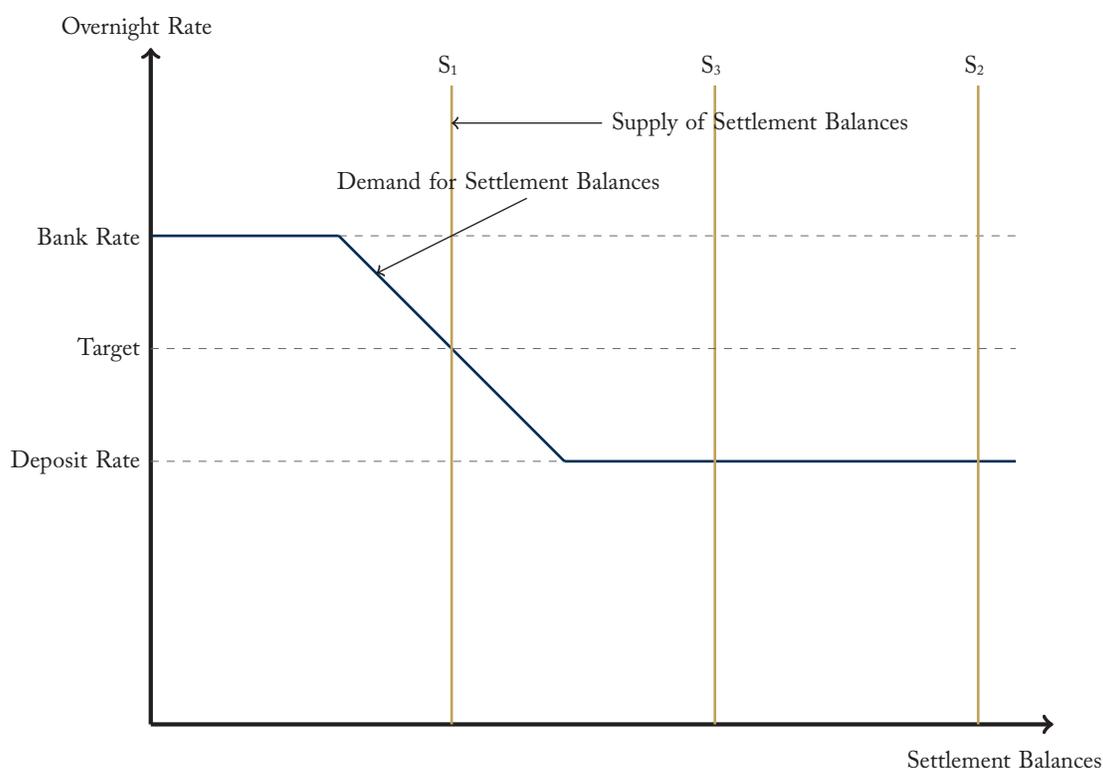
18 During times of economic stress, retail demand for CBDC is likely to increase. People would opt for safety whenever they perceived their bank deposits as less safe and earning too little interest on their deposits. Hence, we expect the Bank’s balance sheet to increase during such times.

19 They could instead over-collateralize their issuance using other assets as backing.

20 An alternative could be privately issued stablecoins that are backed by the Canadian dollar. This would also increase the demand for central-bank issued liabilities, albeit indirectly.

21 A basis point is 1/100th of a percent.

Figure 1: Corridor System



Source: Authors' compilation.

the Deposit Rate, which is the rate the Bank pays financial institutions who leave settlement balances on deposit at the Bank of Canada. At the top end is the Bank Rate, which is the rate the Bank charges financial institutions to borrow from it. Under the corridor system, monetary policy decisions simply shift the band up or down a specific amount, typically 25 basis points.

There is a clear link in this system between the overnight rate and the level of settlement balances

as shown in Figure 1.²² When the overnight rate is equal to the Bank Rate, demand for funds becomes completely elastic: banks can borrow funds overnight from the Bank of Canada at the same rate they can borrow from other banks, so they have no incentive to use the overnight market. When the overnight rate is equal to the Deposit Rate, demand is also perfectly elastic: banks have an equal incentive to borrow and lend funds in the overnight market as they do leave them on deposit with the

22 In other monetary systems, like the US (until March 2020) or the eurozone, banks are required to hold reserves. Canada does not have reserve requirements, but the Bank of Canada supplies reserves as settlement balances to LVTS members (now participants in Lynx).

Bank.²³ In between the Bank Rate and the Deposit Rate, there is a downward-sloping demand curve for settlement balances. By varying the total supply of settlement balances via asset purchases and sales, the Bank of Canada can keep the overnight rate in the overnight market close to its target. This is illustrated by the supply curve labeled S_1 in the figure. As the supply of settlement balances increases (decreases), the overnight rate in the market decreases (increases) as it is easier (harder) for banks that are short of balances to borrow from other banks that are in a credit position.

As settlement balances continue to increase, the overnight rate will drop towards the Deposit Rate at the bottom of the operating band. Eventually these increases become such that it is impossible to sustain an overnight rate above the Deposit Rate.

This is precisely what happened during the pandemic when the Bank of Canada bought Government of Canada bonds from financial institutions in secondary markets. In essence, an overnight rate target above the Deposit Rate became untenable, forcing the central bank to set the two equal to each other. This system of monetary policy is called a floor system.²⁴ Figure 1 illustrates this outcome: with a supply of settlement

balances equal to S_2 , the equilibrium outcome is far to the right of the zone where there is a downward-sloping demand curve for settlement balances.²⁵

But note that demand can change too, and what we argued in the medium-run section is there will be upward pressure on demand for settlement balances. The exact size of this increase in demand is unclear, but with the current size of the balance sheet, and the hold-to-maturity QT strategy, we believe supply will still be in the elastic zone, moving from a position like S_2 to a position like S_3 .

This will leave the Bank with little choice other than to run a floor system. Hence, we will next evaluate the benefits and costs of such a system.

Benefits of the Floor System

The immediate benefit of a floor system – and, indeed, more of a consequence – is that it gives the Bank of Canada an additional policy tool in the form of QE/QT.²⁶ The Bank can still use its traditional interest rate instrument by moving the floor (which moves the overnight rate and the Deposit Rate simultaneously) up and down. However, the Bank has an additional lever (its balance sheet) that comes into play if the Deposit

23 We note that this figure is standard for the unsecured overnight market. In Canada, it is a secured market, and since participants value the collateral that is pledged, the overnight rate might sit below the Deposit Rate in the floor system.

24 A thorough analysis of the two systems in the context of US monetary policy can be found in Keister et al. (2008).

25 We note that an overhang of excess reserves in the US after the financial crisis did not lead to a spike in inflation. In fact, the Fed (like many other central banks) had difficulty getting inflation up to target during the decade between the financial crisis and the pandemic. One view in the literature holds that because banks are receiving interest on their settlement balances (excess reserves in the US context), their portfolios have been skewed towards holding settlement balances and away from expanding loans and deposits. For theoretical and empirical evidence in the context of the Fed's QE policies, see Dutkovsky and Van Hoose (2017), Hendrickson (2017), Beckworth (2018), Hogan (2018), and Selgin (2018). Another way of thinking about why excess settlement balances don't necessarily lead to increased inflation is that for a bank, both settlement balances and Government of Canada debt are considered high quality liquid assets for regulatory purposes. So, the risk weighted assets of a bank does not change when that exchange occurs. Hence, there is no reason to expect an increase in the supply of loans as a result of that particular exchange.

26 As we noted above, there is some controversy about the effectiveness of QE in modifying the yield curve.

Rate reaches the lower bound on interest rates. It can increase or decrease the size of the balance sheet without necessarily moving the overnight rate.

The main benefit of a floor system, however, has to do with payments systems. As described above, modern real-time systems require participants to hold liquidity in the form of settlement balances or by pledging collateral. In a corridor system, liquidity is expensive, since the Deposit Rate institutions earn is below the overnight rate in the money market, meaning they would prefer to lend than to keep balances on deposit. Hence, participants have an incentive to delay payments or rely on pledging costly collateral for intraday liquidity, such as under the old LVTS system.

With the introduction of Lynx and the RTR, as mentioned, settlement has to be in real-time requiring participants to hold more liquidity. This is costly for participants, but a floor system eliminates these costs by making liquidity for payments purposes essentially free. As a consequence, operating a real-time gross settlement (RTGS) system becomes costless and, hence, efficient.

Another benefit of the floor system, which is more a challenge of running a corridor system using RTGS, is the varying demand for settlement balances across time under the modernized payments system. Such varying demand makes it hard for the Bank to set the supply of settlement balances under the corridor system that ensures the overnight rate is at target. Under the floor system, the Bank of Canada could simply supply large enough settlement balances to avoid excessive day-to-day management.

Potential Costs of the Floor System

In our view, the main concern with the floor system seems to be that it could interfere with the independence and credibility of the central bank.²⁷

There are two main arguments. First, the elevated balance sheet needed to run a floor system exposes the Bank of Canada to interest rate risk which is relevant in today's context.²⁸ The Bank issues settlement balances, which are a short-term liability, and invests into longer term assets. Initially, when the yield curve is increasing the Bank's profits increase, and are remitted to the government. As interest rates rise, however, the Bank is exposed to a) the risk of capital losses on their assets as the price falls and those assets purchased under QE are valued at market value, and b) operational losses if the Deposit Rate increases above the coupon rate on the bonds.

The capital loss is covered by the indemnification agreement the Bank signed with the government of Canada in 2020. According to the agreement, the government compensates the Bank for capital losses on its holdings of federal government bonds. That said, the independence concern arises because if the government has to compensate the Bank for losses upon sale, it will be an incurred expense for the government, which could force the issuance of more debt. As a result, the government might put pressure on the Bank to hold the assets to maturity, which may not be optimal for the conduct of monetary policy.

With respect to operational loss, the concern comes once the difference between interest income and interest expense becomes negative, meaning no

27 Running a floor system may also make the communication more difficult for the central bank. For example, when asset purchases are used to intervene in financial markets, settlement balances may also increase which has nothing to do with the implementation of monetary policy. An example at the time of writing are the asset purchases by the Bank of England as a market intervention that seem to contradict quantitative tightening.

28 For a detailed discussion in the context of the Fed's QE program, see Andolfatto (2017, 2017a) and the responses by White (2017, 2017a).

transfers to the government, and, more importantly, losses for the Bank. The Bank could first draw down its reserves, but this is unlikely to be sufficient given the potential magnitude of losses.²⁹ Further losses would put the Bank into a negative equity position, potentially requiring the government to issue more debt to recapitalize the Bank. One option, indeed our preferred one, would be for the government to allow the Bank to turn a comprehensive loss into a “deferred asset” as the Federal Reserve does. Under this setup, the Bank would not fall into a negative equity position, and would have to pay down the entire asset with profits before transfers to the government can resume. This requires changes to the *Bank of Canada Act* but will provide increased clarity and transparency for the Bank.

Second, if running a floor system requires large settlement balances, the Bank of Canada may be forced to consider a broader set of assets than federal government securities. This would put the Bank squarely in credit allocation territory, as it would look for debt from lower levels of government, as well as highly rated private sector debt.³⁰

This would not seem to be a big issue since, even with an increased demand for settlement balances

in the future, the current balance sheet is large enough so that we still have excess reserves. And, as we saw in Table 2, the assets supporting this excess are essentially all federal government debt.

A key question that remains, however, is whether a floor system and large holdings of government assets disrupt market signals.

Government debt plays an important role as collateral in financial markets, and is used as a reference point for pricing other debt instruments. This puts a limit on the percentage of federal debt the Bank of Canada should hold on its balance sheet in order not to distort the market. Here, should these limits be reached, the Bank will have to conduct reverse repo operations – temporarily selling back securities against settlement balances – and securities lending operations to reduce its impact.³¹ This gets to the operational trade-off in a corridor versus floor system in that the former required daily fine-tuning of the target, whereas the latter might require greater use of these kinds of facilities to address any kind of market disruption.

In a related context, under the floor system the overnight rate market largely disappears, as does to a certain extent the short-term repo market.

29 “Equity includes \$5 million of authorized share capital and a \$25 million statutory reserve. The Bank also holds a special reserve of \$100 million to offset potential unrealized valuation losses due to changes in the fair value of the Bank’s investments that are not covered by an indemnity agreement. Equity also includes an actuarial gains reserve of \$411 million as at June 30, 2022. This reserve accumulates the net actuarial gains and losses on the Bank’s post-employment defined Benefit plans that the Bank recognizes following the transition to International Financial Reporting Standards in 2010. The largest reserve held by the Bank is the investment revaluation reserve, which sits at \$424 million as at June 30, 2022. It represents the net gains in the Bank’s investment in the Bank for International Settlements” (Bank of Canada 2022e). It is unlikely that the Bank would draw on many of these resources beyond the \$125 million in statutory and special reserves (and the \$5 million in share capital) to cover losses as this may interfere with the general operation of the Bank and the Government.

30 During the initial phase of the pandemic, the Bank of Canada, indeed, purchased securities other than federal government bonds. However, these purchases were meant to keep financial markets functioning properly. The Bank has now shed most assets other than federal government debt. See Cochrane (2012) and Goodfriend (2014) who make a cogent case that central banks should not engage in credit allocation decisions.

31 The BIS Markets Committee (2018) also pointed out that permanently larger central bank balance sheets could reduce participation by investors and market makers, putting increased pressure on the Bank to play a larger role in financial markets in general.

Less activity in this market means less monitoring of financial institutions' activity in general, which might lead to a less sound banking system, one that is less robust to shocks. Whether this is critical in the Canadian context is unclear. After all, our financial institutions are well regulated and the market is fairly concentrated, so that market discipline seems to remain well maintained under the floor system.

CONCLUSION AND POLICY IMPLICATIONS

The Bank of Canada has made the decision to let the government bonds it accumulated during the pandemic slowly roll off its balance sheet as they mature. This approach, as opposed to actively selling the bonds, means the balance sheet will stay larger with excess settlement balances for the foreseeable future.

New structural changes in payments systems, and the potential introduction of a CBDC, imply that the demand for those settlement balances will increase as well. These changes to demand, however, are unlikely to fully reduce the excess supply of balances in the medium-run. Referring back to Figure 1, the downward-sloping part of the demand for settlement balances is gradually shifting to the right as the supply curve is shifting to the left. They will eventually meet, but not for some time. As a consequence, monetary policy will have to continue operating under a floor system. We do not see this as a big problem as there are benefits to doing so, and the costs can be mitigated.

The main challenge for the Bank is to figure out what the appropriate size of its balance sheet will be in the medium run given the implications of holding a large market share of Government of Canada debt. This involves two main research

questions. First, what will the demand for settlement balances be as a consequence of the introduction of Lynx and the RTR? Second, if a CBDC is introduced, how much will the net demand for the Bank's liabilities increase?

In the meantime, the key to moving forward will be to find ways to minimize the risks for the Bank of Canada of holding a large balance sheet. First, holding a larger balance sheet means playing a more significant role in the market for Government of Canada debt and potentially affecting rates of return that influence other market interest rates. Second, a hold-QT strategy invokes independence concerns if the reasons for its use are tied to the fact that selling bonds at a loss would increase expenses on the Government of Canada's statement of operations, which could trigger the need for more debt.

The Bank needs to explain clearly how its indemnity agreement with the Government of Canada works, and how this is likely to affect its monetary policy decisions.

The Bank and the Department of Finance should also clearly explain how the Bank will deal with operational losses not covered by the indemnity agreement. Our recommendation here would be for Finance to accept deferred transfers, and for the Bank to resume remitting profits to the government only after it has paid off the deferred asset. Formally, this would require a change to the *Bank of Canada Act*, which we believe is not a significant barrier.

Our recommendations are relatively easy to implement and will address concerns about the independence of the Bank of Canada. They will also enable the Bank to credibly communicate its current QT strategy, in that it is in line with its aggressive tightening of the overnight rate to achieve the 2 percent inflation target in the near future.

APPENDIX: HOW THE BANK OF CANADA LOSES OR GAINS ON ITS HOLDINGS OF GOVERNMENT OF CANADA BONDS

When the Bank of Canada buys Government of Canada bonds from commercial banks, it adds them to the asset side of its balance sheet and pays for them by adding to the banks' deposits (settlement balances) on the liability side of its balance sheet. Amid rising interest rates, the variable interest it pays banks on those deposits exceeds the average of the fixed rate it earns on the bonds from the Government of Canada. The Bank incurs a net income loss (Figure A). When the reverse is true, the Bank has a net income gain (Figure B).

Figure A: Bank of Canada Net Income Loss

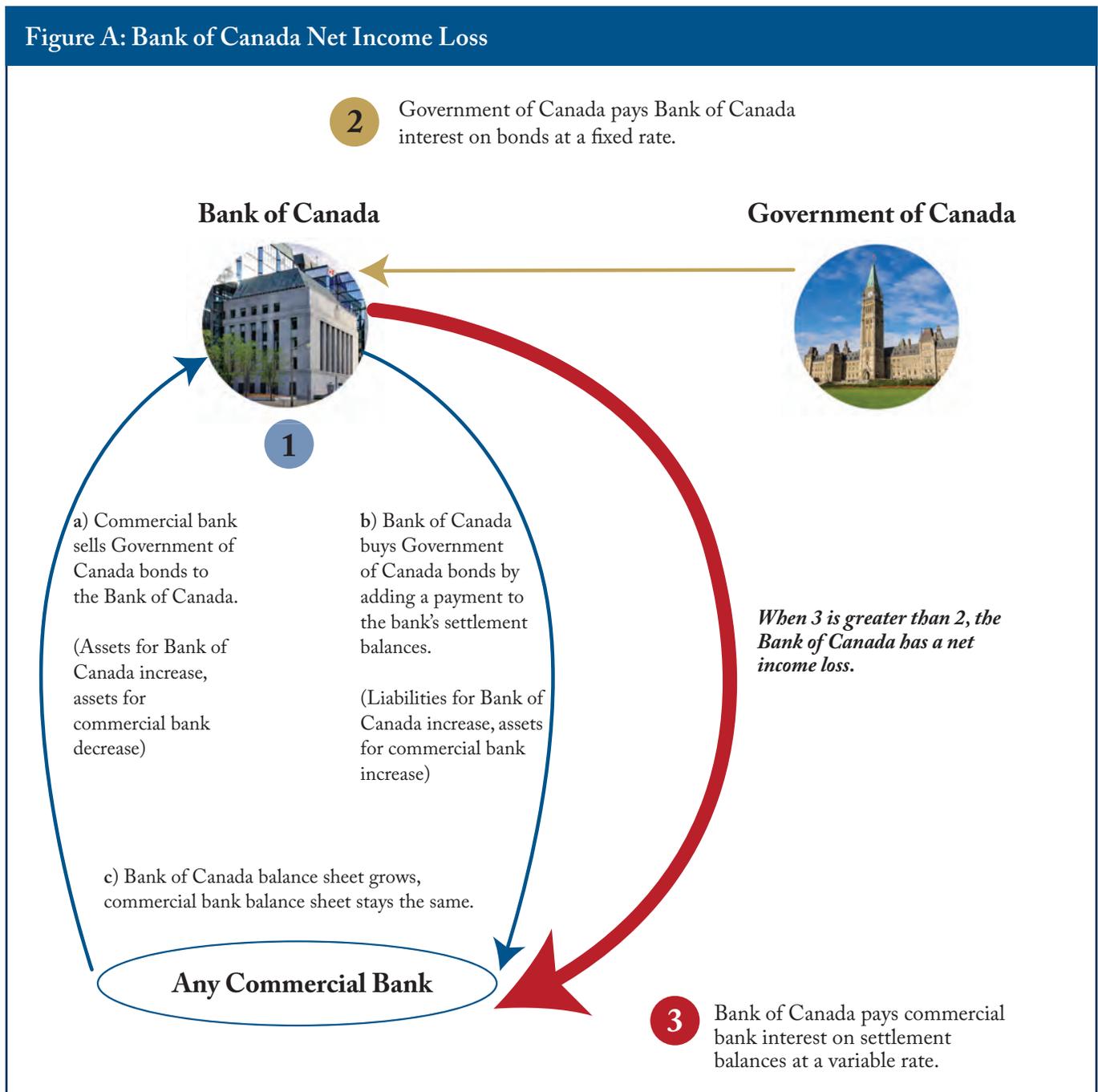
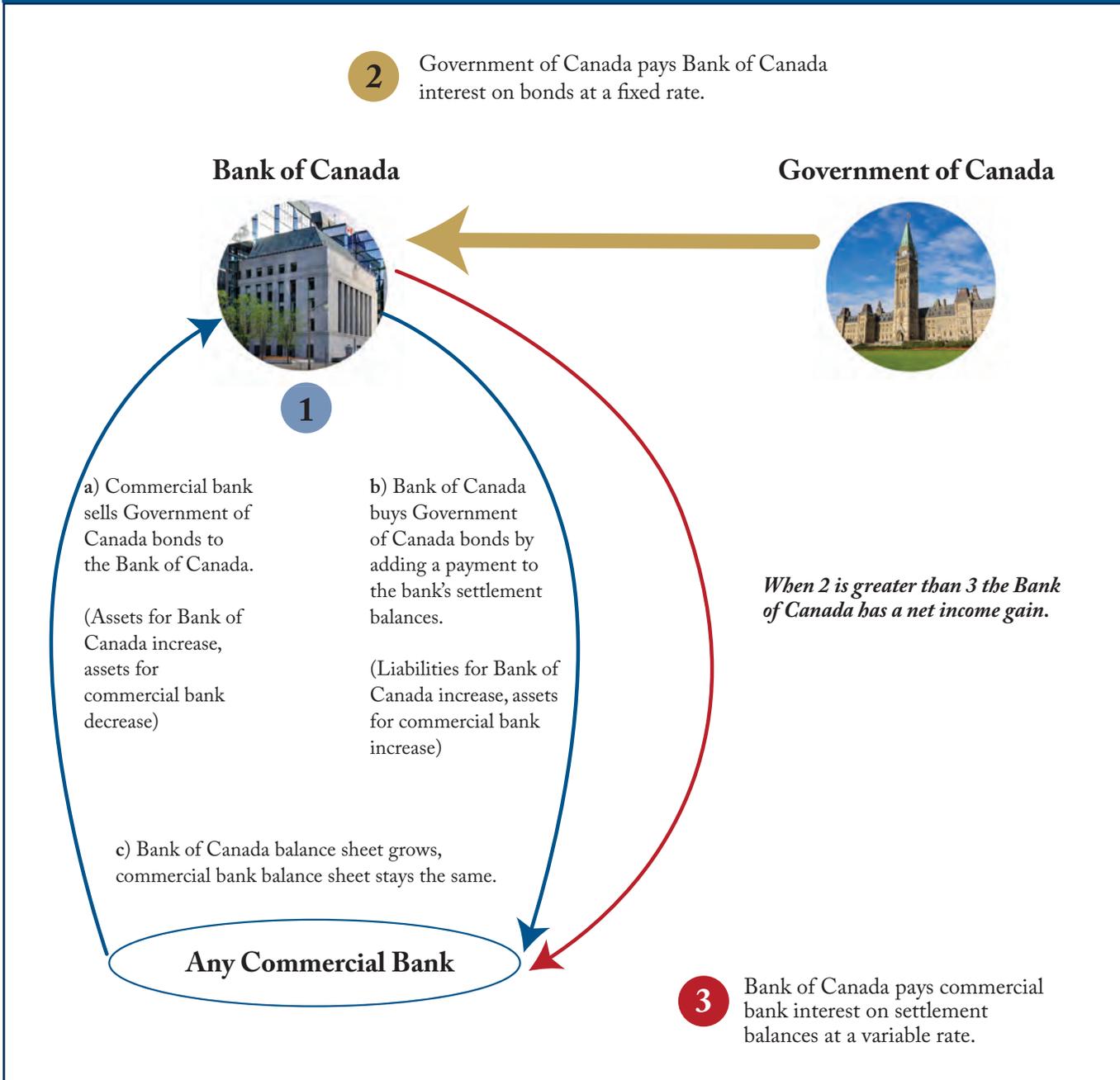


Figure B: Bank of Canada Net Income Gain



Source: Authors' compilation.

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