

COVID-19 Crisis: Lessons Learned for Future Policy Research

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Abstract

Fixed-income markets were disrupted at the beginning of the COVID-19 crisis. As whole industries temporarily shut down, businesses and households ran down their savings or needed credit to survive income losses. As volatility increased, portfolio managers sold securities to manage their leveraged exposures or meet actual and anticipated margin calls and redemption requests. In financial markets, a substantial part of the demand for money came from asset managers. When the dealer arms of commercial banks approached their internal risk limits, the demand for money outpaced their willingness to deal or lend against securities, and trading costs rose in core and peripheral funding markets. The unprecedented scale of interventions by the Bank of Canada and other central banks raises questions that we pose for future policy research. Can central banks' policies and crisis interventions in financial markets better reflect the growing role that asset managers play in the financial system? And can the structure of financial markets be made less reliant on the capacity of banks to supply money?

Bank topics: Coronavirus disease (COVID-19), Financial markets, Financial System

JEL codes: D47, E41, E5, G01, G14, G20, G21, G23

Overview

In March 2020, the COVID-19 pandemic and physical distancing rules halted work in a range of industries. Many businesses and households worried that they could lose their income for months and would need to take out loans, sell assets or apply for government support to make their payments on rent, wages, materials and debt. Anticipating or facing large demands for money from their investors or counterparties, asset managers needed to sell securities to raise the funds. The widespread nature of the disruption meant that demand for new loans and for asset sales would soar (Bank of Canada 2020a).

Banks are the natural institutions to meet such demands. They lend to businesses and households, and they deal in asset markets—buying and selling securities for investors. However, bank dealers became more prudent and less willing to lend against or buy securities as uncertainty and market volatility rose. Furthermore, in recent decades, the asset management industry had grown relative to the stock of liquid assets held by Canadian banks, and their demand for money during the COVID-19 crisis was considerable. At the height of the crisis, it became costly and difficult for investors and asset managers to sell the securities they were holding to meet the demand for money. This could prevent savings from being channelled into investments. The Bank of Canada stepped in and injected into the financial system the largest amount of money that it ever has in its history.

Over the past two centuries, central banks have evolved to regulate the supply of money in response to changes in demand. The Bank's actions are therefore built into the design of the financial system, like those of other central banks around the world. Nevertheless, many observers—the authors included—were surprised by the speed, scope and size of central bank interventions that were needed in the early months of the COVID-19 crisis. In this document, we examine the events that took place in financial markets around these interventions and ask how the need for intervention could be reduced in future crises.

Specifically, we review the disruptions observed in Canadian fixed-income markets during March and April 2020 because these markets play a key role in the financial system (Fontaine, Selody and Wilkins 2009). First, we examine the impact of the COVID-19 pandemic on investors' need for money. Then, we look at the signs of stress coming from fixed-income markets. Finally, we examine some of the constraints bank dealers face when intermediating fixed-income markets. We summarize our findings in a conceptual framework of the demand for and supply of money. In short, we find that demand from investors and asset managers to sell fixed-income securities outpaced the ability or willingness of bank dealers to grow their balance sheet and supply the money to buy them.

Based on our analysis, we identify two main questions about potentially reducing the scope and size of central bank interventions in a crisis and the associated moral hazard. These questions may form the basis of themes of future policy research:

- Can central banks' policies and crisis interventions in financial markets better reflect the growing role that asset managers play in the financial system?
- Can the structure of financial markets be made less reliant on the capacity of banks to supply money?

The pandemic led to a dash for cash

Businesses and households needed loans to weather loss of income

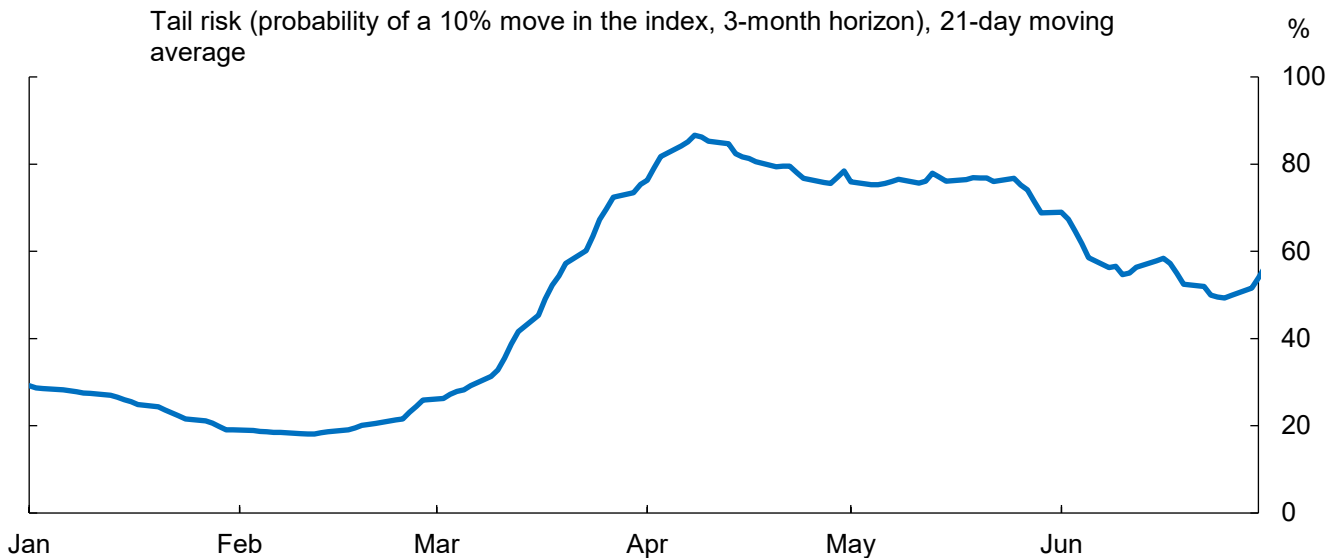
Containment measures such as stay-at-home orders disrupted economic activity. For the week of March 15 to 21, 2020, the Statistics Canada Labour Force Survey found that the employment level had already declined by one million jobs. In the first quarter of 2020, the Canadian Survey on Business Conditions found that nearly one-third of businesses reported revenue declines of 40 percent or more compared with the same quarter a year earlier. Businesses and households worried that the closures would create a gap between their income and expenses, which they would need to reconcile by selling their assets or by borrowing. The disruption led to the sharpest fall on record in consumer and business confidence (Bank of Canada 2020b), and many households and businesses sought money to weather the storm for both immediate payment needs and precautionary savings.

The financial sector prepared to make short-term loans but faced a great deal of uncertainty. Since the duration and extent of the lockdown was unknown, it was unclear who would need to borrow and what amount would be required. Because the long-term impacts on the economy were unknown, it was difficult for lenders to judge which businesses would survive the pandemic to repay the loans.

Chart 1 illustrates the growing sense of uncertainty at the beginning of the pandemic. It shows the tail risk for stock prices based on Fontaine, Ouellet Leblanc and Shotlander (2020). The tail risk is the probability of a 10 percent price change of the S&P/TSX 60 Index, based on the prices of options on the index. This measure is a sort of fear index that captures the market's perceived probability of large negative returns.

Chart 1: Markets became uncertain about what businesses were worth

Tail risk (probability of a 10% move in the index, 3-month horizon), 21-day moving average



Sources: Bloomberg and Bank of Canada calculations

Last observation: June 30, 2020

The tail risk quadrupled from 20 percent in February to a peak of nearly 90 percent in March: some options traders believed that there could be large swings in stock prices in the second quarter of 2020. The uncertainty of COVID-19 was compounded by the oil price war between Russia and Saudi Arabia in March, which lowered the valuations of Canadian oil companies.

Asset managers needed to sell assets to weather outflows and manage leverage exposure

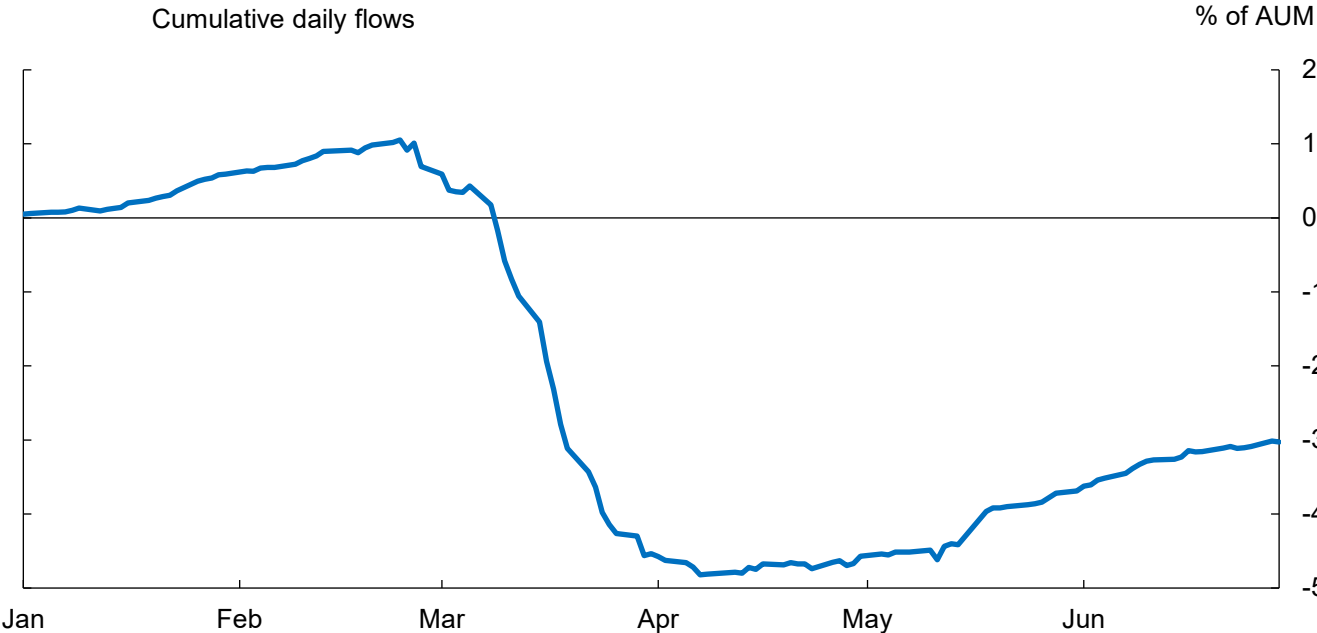
Mutual funds faced investor redemptions

Anticipating a loss of income and the need for money, and facing uncertainty, businesses and households became more likely to withdraw from their financial investments, including their mutual fund investments.

Clients of mutual funds are entitled to withdraw or “redeem” their money on demand. To ensure the mutual funds can meet fluctuating demand for redemptions, regulatory guidance and their own liquidity management rules require mutual funds to set aside a buffer of cash and easily sold assets (Ouellet Leblanc and Arora 2018). However, if too many clients redeem simultaneously, this buffer could be depleted, forcing the mutual fund to quickly sell its less liquid assets and further decreasing the liquidity of those assets (Ouellet Leblanc and Shotlander 2020).

Chart 2 illustrates the magnitude of redemptions at fixed-income mutual funds (bond funds) in Canada during the crisis.

Chart 2: Bond funds saw large redemptions in March 2020



Note: AUM stands for assets under management.

Sources: Morningstar and Bank of Canada calculations

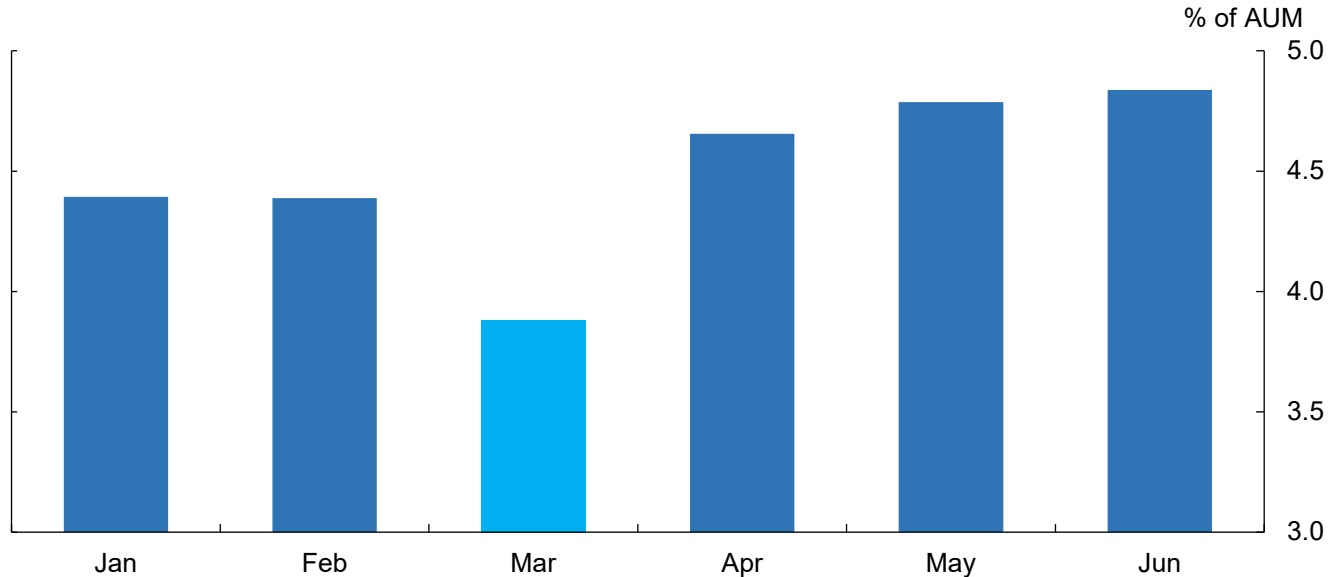
Last observation: June 30, 2020

Bond funds saw cumulative redemptions of about 5 percent of their 2020 assets under management in March, the highest outflow on record (Ouellet Leblanc and Shotlander 2020). This mirrors the international experience. Bond funds in many advanced economies saw their assets under management drop by up to 5 percent in mid-March, with weekly outflows of US\$109 billion (FSB 2020).

Chart 3 shows the buffer of cash and easily sold assets held by bond funds in Canada.

Chart 3: Liquidity buffers of bond funds fell in March 2020

Buffer of cash and easily sold assets, monthly data



Note: Panel data are unbalanced due to missing values (maximum sample size: 175 funds; minimum sample size: 167 funds). The liquidity ratio is calculated as the fund's holding of cash, certificates of deposits and Government of Canada securities with less than one year to maturity as a percentage of total fund size.

Sources: Morningstar Direct and Bank of Canada calculations

Last observation: June 2020

In March, elevated redemption rates caused the average buffer of cash and easily sold assets of bond funds to substantially decline as a proportion of total assets. The average masks important differences across funds; about 9 percent of bond funds had entirely depleted their buffers by the end of March (Ouellet Leblanc and Shotlander 2020). Though many bond fund buffers were able to withstand the unprecedentedly high redemption levels, the dash for cash caused some funds to sell less liquid assets.¹

Other asset managers needed to manage leverage exposures

Other asset managers do not face the risk of redemption runs because their clients may only withdraw their investments under specific conditions. Instead, these asset managers may have been exposed to the rising uncertainty through their use of leverage (Bédard-Pagé et al. 2016).

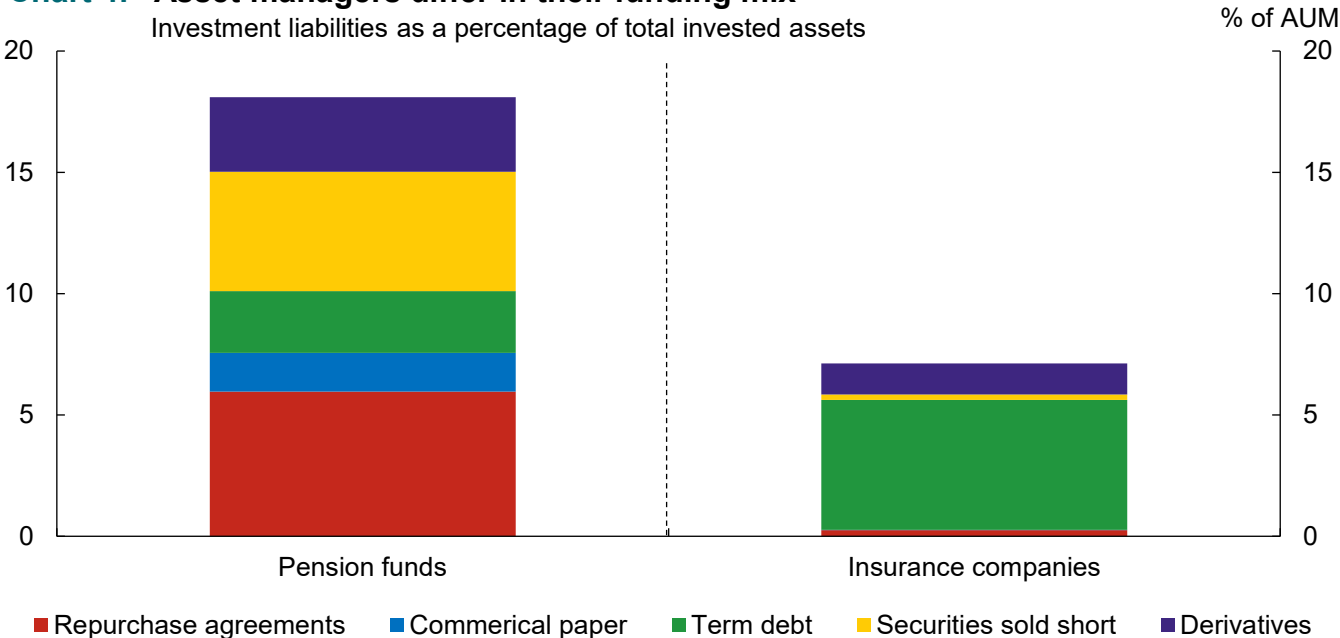
For instance, pension funds and insurance companies take on leverage by investing borrowed funds or entering derivative contracts. Some of these positions may reduce the risk of their portfolio holdings,

¹ Ouellet Leblanc and Arora (2018) find that the liquidity-management decisions of corporate bond funds depend on market conditions. When volatility is low, corporate bond funds tend to use liquid holdings, but when volatility is high they also tend to sell less liquid assets.

such as the use of a swap contract to hedge their exchange rate risk. But leverage is a double-edged sword. If the price of a security exhibits increased volatility, any investor who has pledged the security as collateral or who is exposed to its price through a derivative contract is typically required to post additional cash or other collateral to their counterparty as margin. Therefore, as uncertainty and volatility grew, so too did the risk of incurring a margin call, even if the derivatives contract provided a hedge against other risks in the portfolio. Pension funds and insurance companies may have been forced to sell some of their holdings to meet their margin calls.

Leveraged funds or those that held riskier assets may also have needed to sell assets to rebalance their portfolios. **Chart 4** provides a proxy of the average leverage positions of the eight largest pension funds and three largest insurance companies using public data about their sources of borrowed funds.

Chart 4: Asset managers differ in their funding mix
Investment liabilities as a percentage of total invested assets



Note: Figure shows the average for each liability from a sample of insurance companies and pension funds.
Source: Annual financial statements and Bank of Canada calculations Last observation: December 31, 2020

Pension plans and insurance companies use a different mix of debts and derivatives. These differences are also apparent when we look within pension plans or insurance companies, and they likely reflect variations in risk exposures across asset managers. However, the different mix of debts and derivatives that asset managers use implies that they experience different demand for money, for instance due to roll-over short-term debts or meet margin calls.

Asset managers generally sold assets during the crisis

Asset managers were, on the whole, net sellers of bonds during the crisis. They sold their assets for cash for various reasons, including:

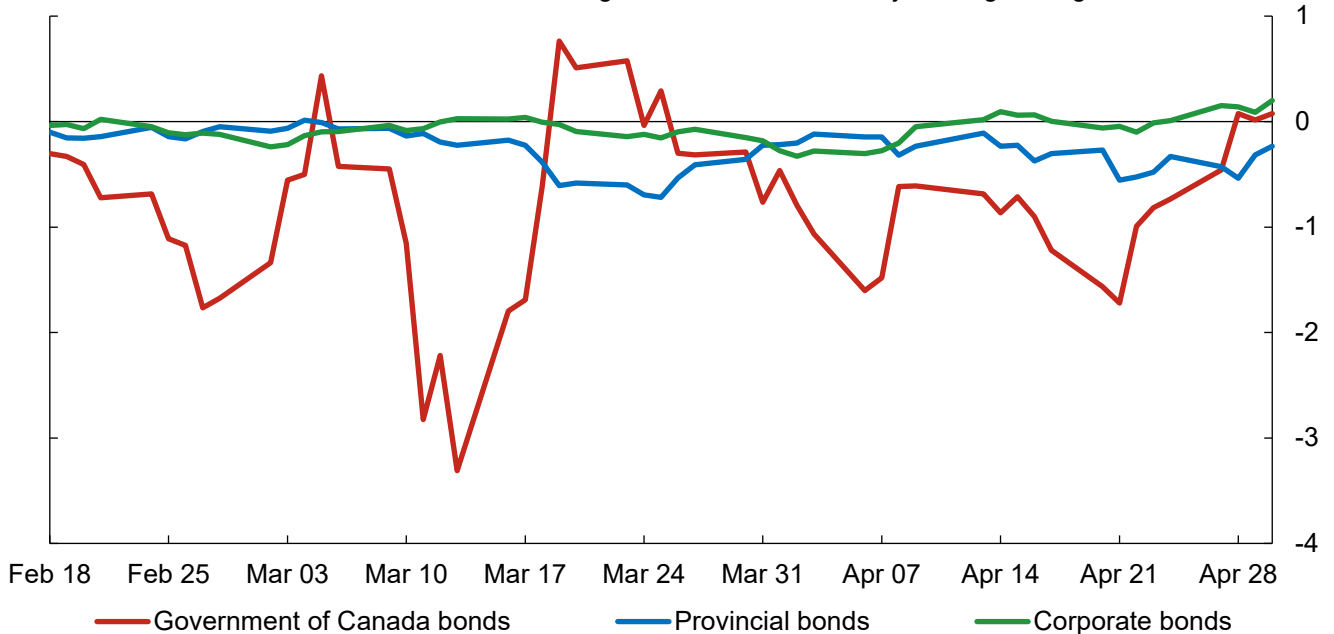
- as a precaution, to maintain prudent levels of the highest liquidity,
- to meet the demand for money from their investors and counterparties, or
- to satisfy margin calls related to their leveraged exposures.

Chart 5 shows the net volume of bond transactions between asset managers and bank dealers at the height of the crisis, where a negative number indicates that asset managers sold bonds, in aggregate.

Chart 5: Asset managers were selling bonds to dealers

Net transactions between asset managers and dealers, five-day moving average

Can\$ billions



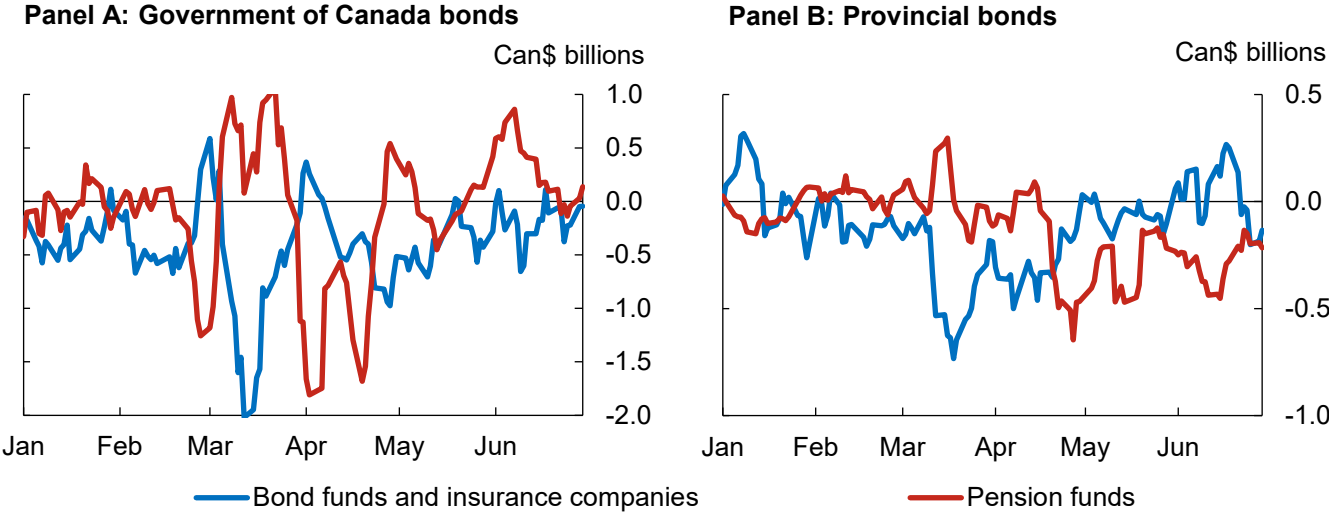
Sources: Market Trade Reporting System 2.0 and Bank of Canada calculations

Last observation: April 30, 2020

Breaking down the transactions by asset manager type, however, reveals some nuance. Chart 6 distinguishes between the net trading flows of pension funds and other asset managers for Government of Canada (GoC) and provincial bonds with bank dealers.

Chart 6: Bond sales to dealers differ across asset manager types

Daily data, five-day moving average



Sources: Market Trade Reporting System 2.0 and Bank of Canada calculations

Last observation: June 30, 2020

Bond funds and insurance companies are grouped together in this chart because they both tended to sell bonds at the height of the crisis, while pension funds demonstrated different behaviours. Pension plans with larger buffers, lower leverage or safer assets might have played a stabilizing role in some markets by acting as a counterparty and buying assets. See Bédard-Pagé and Berger-Soucy (forthcoming) for further examination of the interactions between the liquidity management of the eight largest Canadian public pension funds and financial markets during the pandemic.

Fixed-income markets were stressed

As large investors sold their assets, the cost of selling securities rose sharply. Yields increased and spreads widened. Signs of stress appeared in core money markets and bled into other fixed-income markets. This section documents the symptoms of the dash for cash in both money and bond markets.

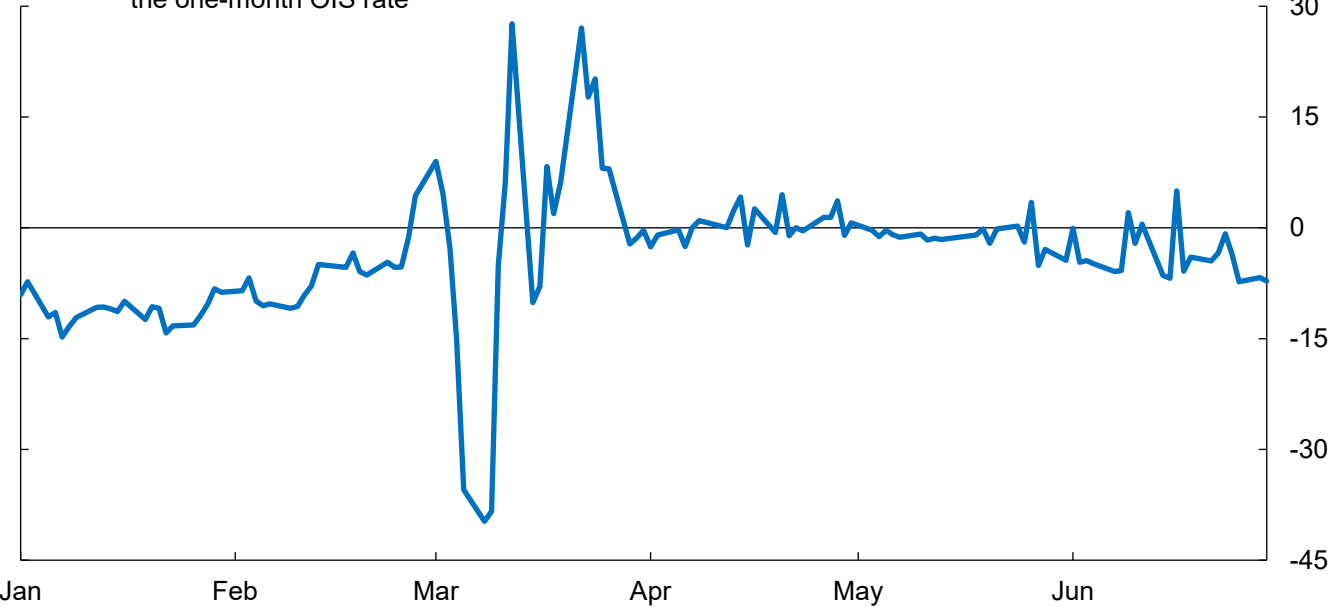
High yields on Government of Canada treasury bills indicated a desperation for money

Signs of strain became evident in the yields of Government of Canada money market instruments. Government of Canada treasury bills are typically easy to trade. The short term of these loans and the superior credit quality of the federal government that issues the debt make treasury bills a virtually risk-

free investment. In fact, short-term treasury bills typically yield slightly less than other risk-free rates (such as the overnight index swap [OIS] rate) because of their limited supply and because of the ease with which investors expect they can be sold. However, **Chart 7** shows that the yield on treasury bills with a remaining term to maturity of one month or less was sometimes much higher than the one-month OIS rate in March 2020.

Chart 7: Treasury bills yielded more than the risk-free rate at the height of the COVID-19 crisis

Daily spread between the yield of treasury bills maturing in one month or less and the one-month OIS rate Basis points



Note: OIS stands for overnight index swap.

Sources: Market Trade Reporting System 2.0, Bloomberg and Bank of Canada calculations

Last observation: June 30, 2020

The yield on treasury bills initially dropped drastically to 40 basis points below the OIS rate early in March, suggesting that investors bid down yields in their flight to the safety and quality of treasury bills. Such a negative spread between treasury bill and OIS yields was also typical in 2007–08, when the global financial crisis drove people to seek treasury bills as a safe and liquid store of value.

But after an initial scramble for treasury bills, their yields soared well above the risk-free rate. The unusually high yield on such a safe asset indicated that some financial market participants had become so eager to hold money that they sold their treasury bills at a discount. The high yields revealed that dealers turned down these apparently risk-free profits, indicating that internal constraints may have prevented dealers from satisfying this demand for money and absorbing the large flow of discounted treasury bills. The positive yield spread on treasury bills distinguishes the COVID-19 crisis from the global

financial crisis. Whereas the global financial crisis was a crisis of the banking system, the COVID-19 crisis was an acute need for money by households and businesses.

Commercial bank money market instruments also became hard to sell

Other money market instruments were affected by the dash for cash. While the treasury bills market provides short-term loans to the federal government, the bankers' acceptance (BA) market provides short-term loans to businesses. In Canada, some businesses can access bank loans by drawing on pre-established, committed BA facilities. When this facility is accessed, the bank advances the funds to the borrower and issues a BA security to sell to investors on the BA market to fund the loan. For many businesses, this arrangement is more cost-effective than issuing their own debt. Investors are attracted to the BA market because:

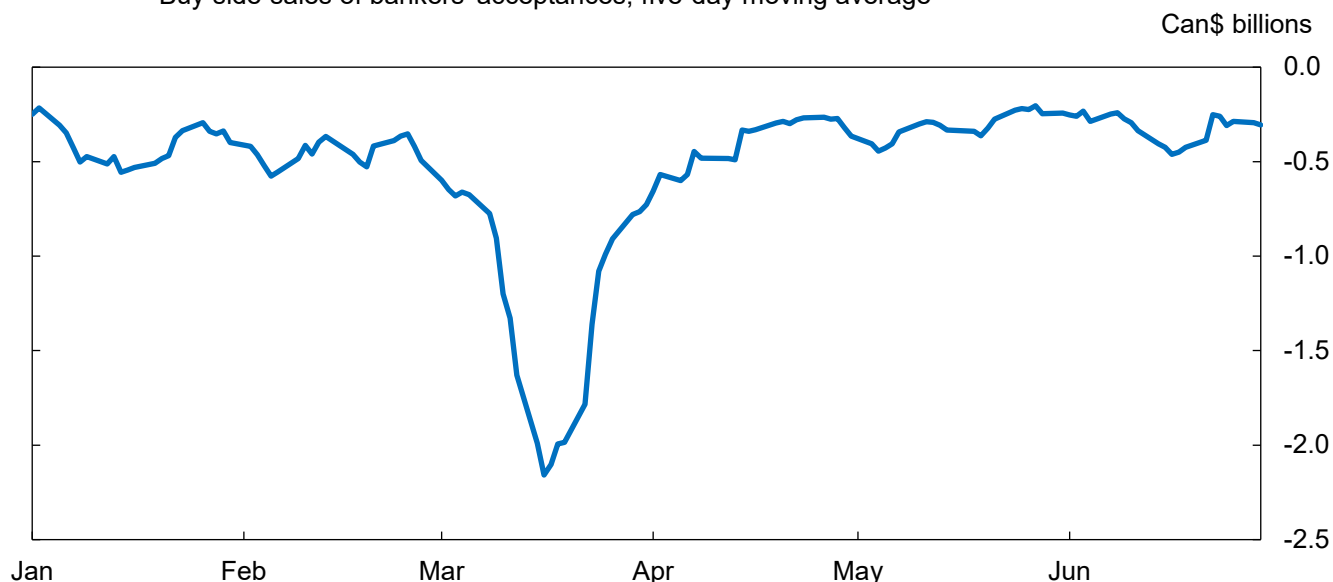
- the banks that issue the BAs have higher credit ratings than the firms that draw on BA facilities, and
- the BA market is well-established, so BA securities are easier to trade.

The BA market is an important source of funds for small and medium-sized businesses and accounts for the largest portion of money market instruments issued by the private sector in Canada (McRae and Auger 2018).

However, asset managers were generally in need of money in March 2020. They reduced their holdings and even sold BAs back to bank dealers. **Chart 8** illustrates the quantity of BAs that investors sold back to bank dealers.

Chart 8: Investors were selling bankers' acceptances to dealers in March 2020

Buy-side sales of bankers' acceptances, five-day moving average



Sources: Market Trade Reporting System 2.0 and Bank of Canada calculations

Last observation: June 30, 2020

Investors typically sell around \$500 million BAs back to bank dealers each day, usually selling those nearing maturity to buy BAs with longer maturities. **Chart 8** shows that the amount sold back to bank dealers reached \$2 billion a day at the height of the crisis. This meant that bank dealers were accumulating inventories of older BAs as well as some newly issued but unsold BAs. A market that banks normally turned to as a source of funding had instead becoming a drain.²

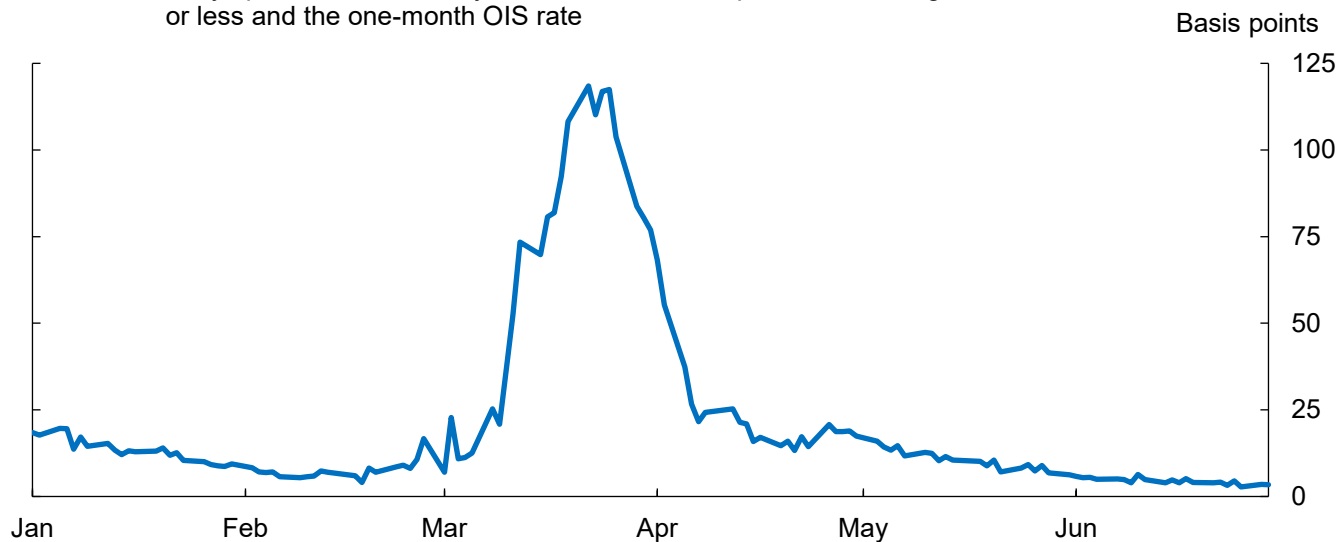
By selling BAs back to banks, investors essentially converted their investment in the banking sector from BAs to deposits, contributing to the \$227 billion (11 percent) increase in overall bank deposits during that period. However, the conversion made their investment a less stable source of funding for banks, because deposits can be withdrawn more quickly. Banks therefore needed to prepare for potential outflows by reserving a larger amount of cash and easily sold assets at a high opportunity cost.

Accordingly, bank dealers asked for steep price discounts to buy the BAs back from investors. This discount, shown in **Chart 9**, is measured by the spread between the yield on BAs with a remaining time to maturity of less than one month and the one-month OIS rate.

² A similar trend of withdrawal from short-term non-government money markets was seen in other countries. In March, investors in the United States withdrew US\$125 billion (11 percent of assets under management) from non-government money market mutual funds that invest in short-term commercial paper and deposit notes, which are instruments that are comparable to BAs (FSB 2020). At the same time, US government money market funds saw an inflow of US\$800 billion. In Europe, sterling money market mutual funds saw outflows of £25 billion (10 percent of assets under management) between March 12 and 20 (Hauser 2020).

Chart 9: The yield on bankers' acceptances soared in March 2020

Daily spread between the yield on bankers' acceptances maturing in one month or less and the one-month OIS rate



Note: OIS is overnight index swap.

Sources: Market Trade Reporting System 2.0, Bloomberg and Bank of Canada calculations

Last observation: June 30, 2020

The BA-OIS spread is a good proxy for the additional yield a bank would require tying up their funds. It shows how much more they would earn by holding a one-month BA to maturity instead of earning the expected overnight rate over one month, say by rolling over an overnight loan in the repo market or depositing the funds at the central bank, while entering into a one-month OIS contract. Therefore, the BA-OIS spread quantifies how much banks value the convenience of having access to its funds every day. The spike in the spread in **Chart 9** shows that this convenience had become highly valued in March 2020.³

Higher markups, rates of agency trading in core and peripheral bond markets point to dealer constraints

Chart 5 revealed that bank dealers were generally purchasing bonds from asset managers in March, especially Government of Canada bonds. Fontaine, Ford and Walton (2020) describe some of the events in the bond market around March 2020.

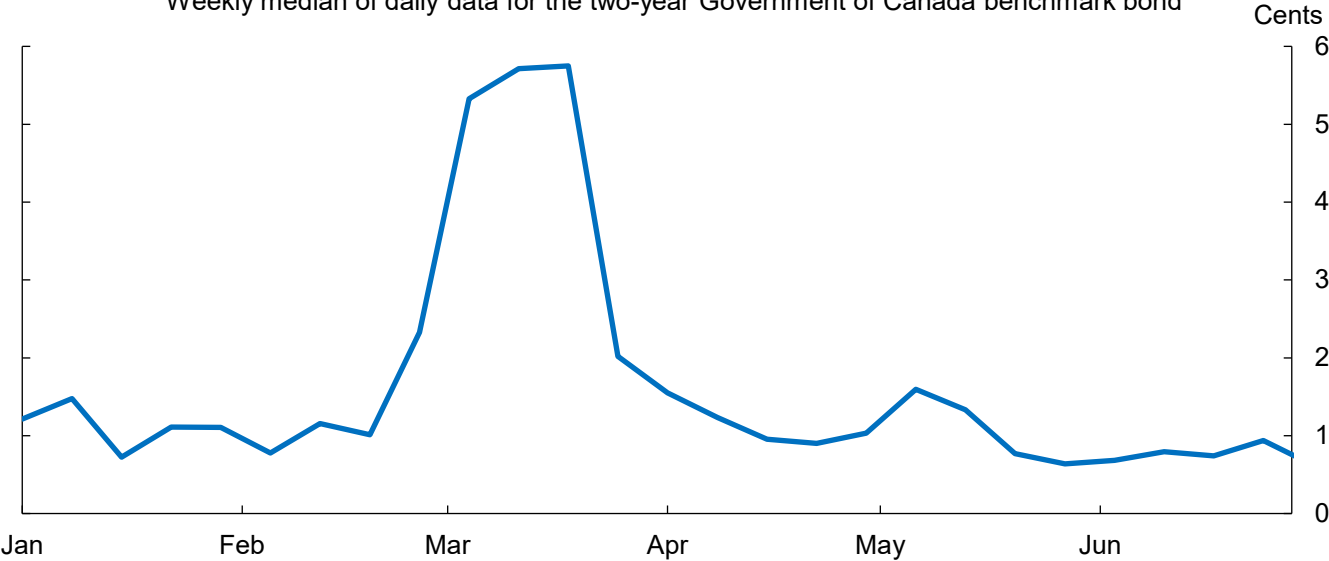
In their role as dealer, banks can provide the crucial service of buying fixed-income securities from investors when there are no other willing counterparties. For providing this service, they make a profit by holding securities on their balance sheet until they can find another investor to sell them to. There are

³ The change in the BA spread is consistent with changes in the treasury bill spread. This confirms that the large spreads observed in the BA market were not driven by concerns about banks' credit quality. Instead, this supports the idea that, during the COVID-19 crisis, investors were attempting to keep their funds liquid—in cash or convertible into cash on short notice.

practical parallels between the business models of bond and car dealers; a car dealership buys and stores vehicles on its lot until it finds a buyer, incurring the cost of maintaining the lot, the opportunity cost of storing another vehicle in that spot and the risk that it will not fetch a good price on the car for its trouble. One of many differences is that bond trades are typically denominated in millions of dollars, so bank dealers are among the few actors in the financial sector with the sizable capital needed to deal bonds.

In March, as dealers bought bond and money market securities from asset managers with increasingly precious money and parked them in their increasingly full “lots,” they would only do so for higher markups. **Chart 10** depicts the cost of trading GoC bonds and **Chart 11** highlights the cost of trading GoC bills and provincial and corporate bonds as proxied by the Roll measure—a proxy of the markup a dealer charges to trade securities.⁴

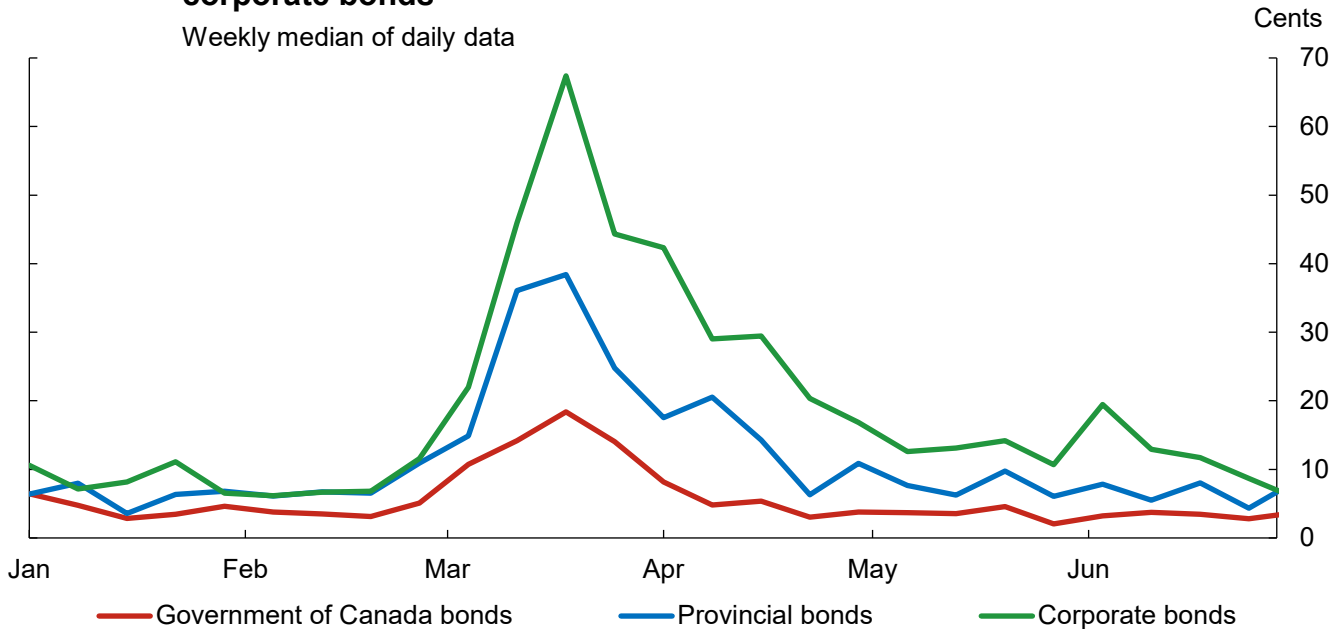
Chart 10: The cost of trading Canadian government bonds rose during March 2020
 Weekly median of daily data for the two-year Government of Canada benchmark bond



Sources: Canadian Depository for Securities and Bank of Canada calculations Last observation: June 30, 2020

⁴ The Roll measure (Roll 1984) is computed as twice the square root of the negative covariance between adjacent price changes (which tend to be negatively correlated). See Gungor and Yang (2017) for further definitions and equations.

Chart 11: The cost of trading rose for Government of Canada, provincial, and corporate bonds



Sources: Canadian Depository for Securities and Bank of Canada calculations

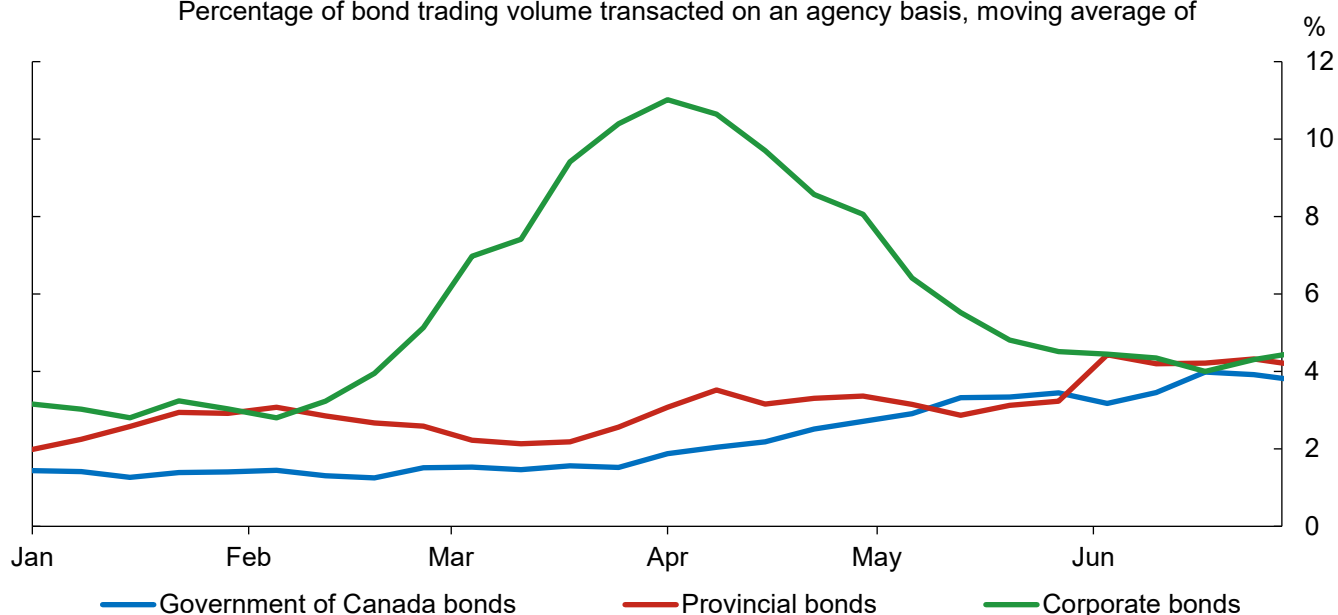
Last observation: June 30, 2020

The markups on all fixed-income securities rose substantially at the height of the crisis. The proxy of the transaction cost of two-year GoC bonds quintupled. Dealers were charging much higher service fees for buying a bond, an indication that their ability to purchase bonds was stressed.

For corporate bonds, the proxy increase was tenfold, rising from a markup of around 20 cents to a peak of 250 cents. Corporate bonds are harder to trade than government securities in normal times due to their credit risk and the large number of distinct outstanding bonds (Fan et al. 2018); as a result, dealers are particularly uninterested in owning them during a crisis.

Another sign of dysfunction was a move to agency trading. In normal times, dealers often trade on a principal basis, purchasing securities without lining up an immediate buyer and shouldering the cost and risk of the security until it is sold. Bearing this risk can be central to the value they provide in a transaction. However, in an environment where money is scarce and their balance sheets are full, dealers tend to purchase risky assets only if they have a ready buyer lined up to take it off their hands quickly (Cimon and Garriott 2019). This practice is known as agency trading. We identify trades that occur on an agency basis using a similar method to that in Hyun, Johal and Garriott (2017). Agency trades occur when the dealer buys and sells the exact same quantity of a particular security with another counterparty within 15 minutes. This strict definition of agency trading may tend to underestimate actual agency trading activity, but it illustrates the general trend. **Chart 12** shows the percentage of bond trading volume that was transacted on an agency basis.

Chart 12: A greater percentage of bonds traded on an agency basis
 Percentage of bond trading volume transacted on an agency basis, moving average of



Sources: Market Trade Reporting System 2.0 and Bank of Canada calculations

Last observation: June 30, 2020

Agency trading for GoC bonds, provincial bonds and corporate bonds generally increased in 2020. The increase is particularly pronounced for corporate bonds trades, for which agency trading nearly quadrupled in late April before falling back in line with the other classes of bonds. This illustrates the growing reluctance of dealers to bear the risk of holding bonds, especially riskier corporate bonds. Instead, dealers seemed to prioritize their use of balance sheet space and became more likely to only provide the function of matching investors and effecting the transactions (Kargar et al. 2020).

Banks were under pressure in their dual role of lender and securities dealer

The dash for cash at the beginning of the pandemic highlighted the centrality of commercial banks in the financial sector and stressed the importance of their dual role as money lenders and fixed-income security dealers. However, the high cost of selling fixed-income securities—especially the deep discount observed for treasury bills and BAs—indicates that the scale of the demand for loans and security intermediation due to the pandemic may have approached the limits of the banks' willingness or ability to provide both services.

How banks supply money

Commercial banks often play the dual role of lender on main street and securities dealer in financial markets.

But where do banks get the money to lend money and purchase securities? When a bank issues a loan or purchases securities, it creates money by adding the amount of the loan or purchase to the client's account in the bank's ledger.⁵ This "inside money" is an asset backed by credit from inside the private sector. Conversely, when a bank sells securities or when a loan is repaid, inside money is eliminated (Lagos 2006).

Inside money is used as a medium of exchange and can easily be transferred among clients within the same bank; the bank simply debits one client's account and credits the other. However, if a client wants to withdraw its deposits or pay someone with an account at a different bank, a common currency or "outside" money must be used to transfer the net balances between the banks. In most cases, commercial banks hold outside money in the form of settlement balances in their accounts at the central bank.

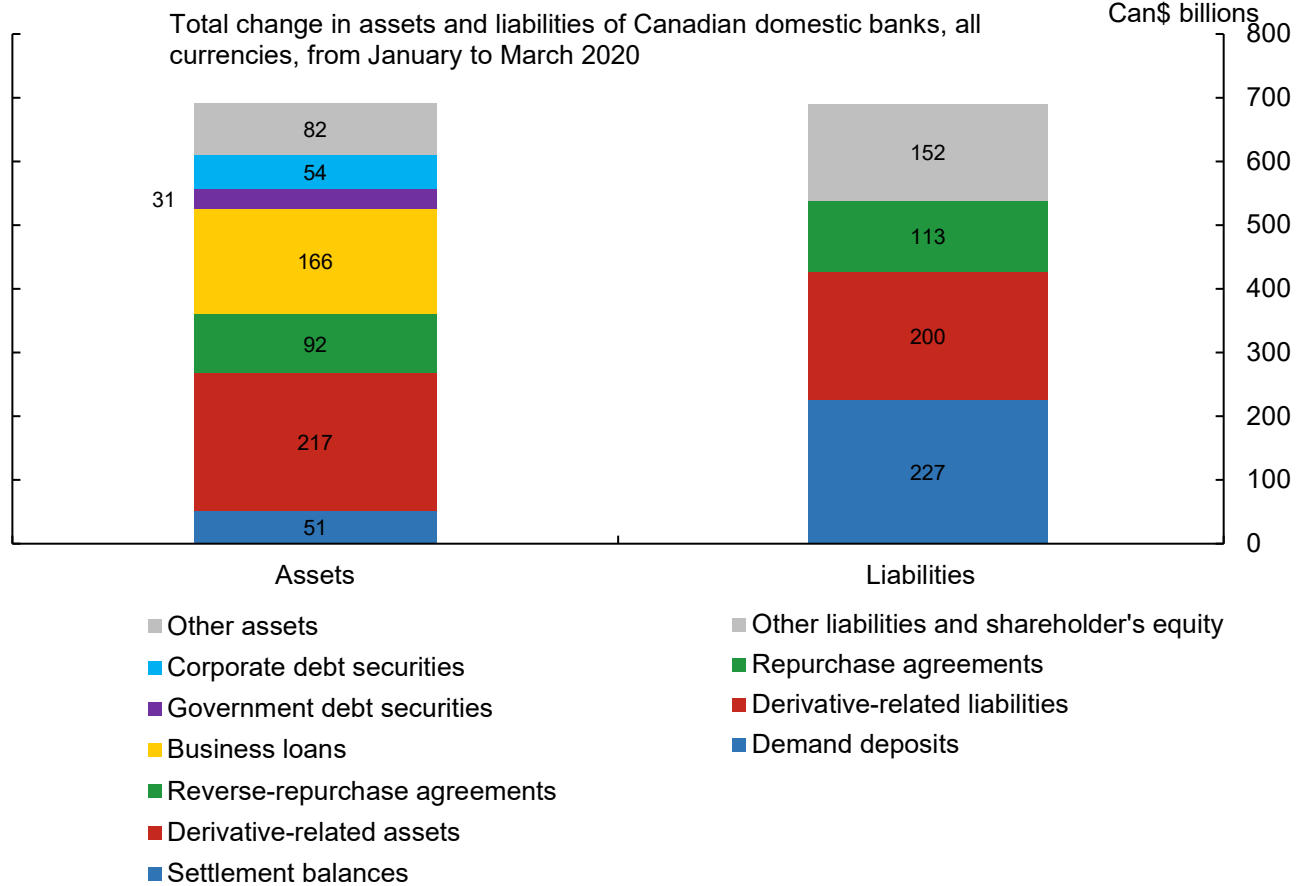
To ensure they are always able to effect timely withdrawal or payment on behalf of their clients, banks hold a certain amount of outside money, including government securities and other securities that can be easily converted into money at the central bank, relative to its deposits and liabilities, in proportions set by their internal risk standards and consistent with banking regulations. This protects the bank and its depositors from bank runs, but it constrains banks' ability to create money (Holmström and Tirole 1998). When the demand for loans and asset purchases increases, as it did during the COVID-19 crisis, banks can only create the inside money to satisfy the demand if it has sufficient outside money or government securities to support the resulting liabilities.

Bank balance sheets expanded, but signs of constraints existed

Due to the inflows of deposits and the rise in new loans and asset purchases between January to April, banks' balance sheets expanded by \$692 billion (+11 percent). **Chart 13** provides a breakdown of the increase in the assets and liabilities of Canadian banks during this period.

⁵ As Graham Towers, the first Governor of the Bank of Canada, said in 1939, "Each and every time a bank makes a loan, new bank credit is created—new deposits—brand new money. [...] The manufacturing process consists of making a pen-and-ink or typewriter entry on a card in a book." Today, of course, it would be done using a computer database. The quote is from the Standing Committee on Banking and Commerce, Minutes of Proceedings and Evidence Respecting the Bank of Canada, March–June 1939.

Chart 13: Bank balance sheet expansion was driven by increases in value of derivatives, deposits and business loans



Source: Office of the Superintendent of Financial Institutions (OSFI)

Last observation: March 2020

From the end of January to the end of March, Canadian banks saw net inflows of \$227 billion (+11 percent) in demand deposits from businesses and households. During the same period, Canadian banks lent an additional \$166 billion (+20 percent) to businesses and expanded their holdings of debt securities by \$82 billion (+9 percent).⁶

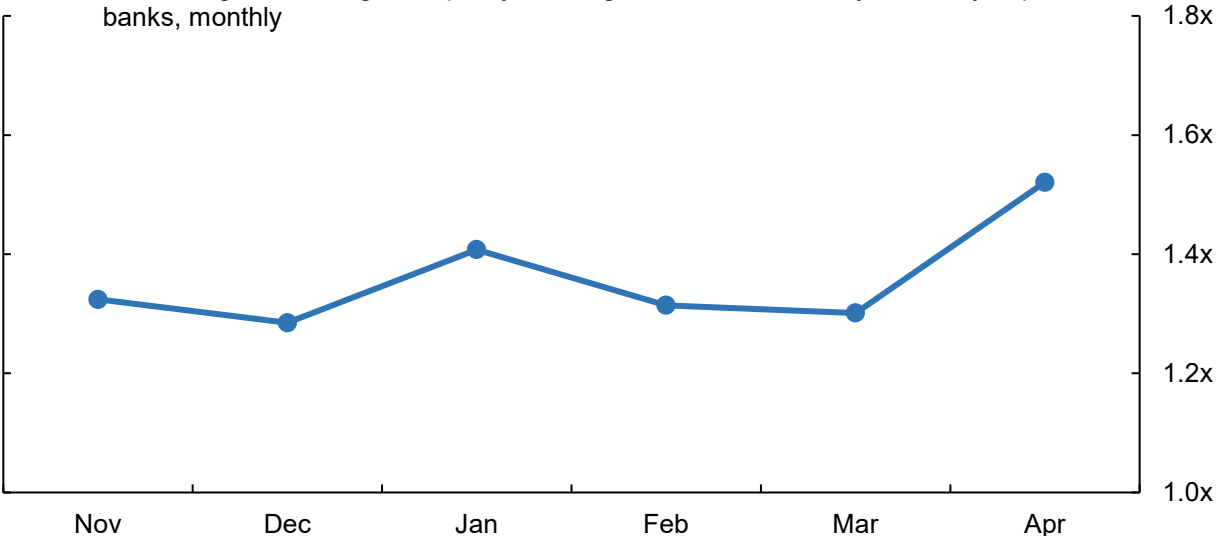
Despite selling pressure and high markups, the increase in fixed-income securities represents only a small portion of the growth in banks' balance sheets (\$82 billion or 12 percent), compared with the large amounts of business loans (\$166 billion or 24 percent) and derivatives-related assets (\$217 billion or

⁶ For comparison, over the month of March, US banks saw an inflow of US\$1 trillion worth of new deposits and made an additional US\$482 billion in business loans (Li, Strahan and Zhang 2020).

31 percent).⁷ To a large extent, banks’ business lending and derivatives activity consists of pre-existing commitments to their client businesses and to their counterparties in derivatives markets. The proportions of balance sheet expansion suggest banks faced a trade-off between lending to the real economy and purchases of securities (or lending against bond collateral) in fixed-income markets. If banks face any binding constraints to expanding their balance sheet, it would be easier for them to limit the resources they allocated to purchases of new securities than to other areas of their business. The increased volatility of asset prices during that time meant that the limited resources allocated to securities purchases could support even less dealing activity than before.

Chart 14 reports the quantity of outside money and easily sold assets of large Canadian banks as a ratio of the minimum required by the Office of the Superintendent of Financial Institutions (OSFI) regulation.

Chart 14: Banks' liquidity coverage ratio remained elevated
 Asset-weighted average of liquidity coverage ratio of domestic systemically important banks, monthly



Source: Office of the Superintendent of Financial Institutions and Bank of Canada calculations Last observation: April 2020

The average ratio remains above one throughout the crisis, indicating that this regulatory requirement was not binding. Instead, banks’ internal risk limits may have tempered banks’ asset purchases and inside money creation. Prudent risk management typically results in banks keeping a wide distance from regulatory requirements, and the increased volatility of asset prices during the crisis reduced the lending and securities dealing activity the banks could support with their resources. Banks’ internal risk limits tend to further tighten in the face of increased price volatility and margin calls, as is often the environment in times of crisis.

⁷ Some growth in the derivatives-related assets may likely be attributed to their marked-to-market prices (which would have been affected by the increased volatility).

Overall, constraints to banks' money creation caused problems in the fixed-income market because of the essential role bank dealers play in intermediating the trade of bonds and money market instruments (either directly by holding them in inventory or indirectly by lending to other buyers). When the constraints to bank money creation becomes binding, the reliance on banks made them a bottleneck that impeded the flow of securities among investors in financial markets.

Regulators intervened to support financial markets

The way the financial system is designed enabled the Bank to intervene in March and April 2020. One of the primary goals of central banking is to regulate the stock of money in response to demand; the preamble to the *Bank of Canada Act* states that the Bank exists "to regulate credit and currency" and "to control and protect the external value of the national monetary unit", and it stipulates that the Bank has the authority to provide extraordinary liquidity. Yet, the speed, scope and size of the interventions that were necessary to restore market functioning surprised many observers.

Finance, the Bank of Canada and the Office of the Superintendent of Financial Institutions intervened

Through Canada's COVID-19 Economic Response Plan, the government has supported the real economy by committing over \$212 billion in direct support and \$85 billion in tax deferrals to households and businesses (Government of Canada 2021).

Meanwhile, in the financial sector, the Bank of Canada responded to the increased cost of borrowing or selling in various markets by:

- cutting its policy interest rate,⁸
- lending more money against an expanded set of collaterals, and
- purchasing more securities from a broader set of counterparties in a larger number of markets.

OSFI intervened by temporarily relaxing the regulatory risk limits it imposes on banks. Much of this flexibility was built into the design of the regulation as a pressure-release valve in times of stress. **Table 1** lists the major monetary and macrofinancial actions Canadian authorities took in response to the COVID-19 crisis.

⁸ The three policy rate cuts in March—two of which were unscheduled—lowered the target rate from 1.75 percent to 0.25 percent. While this made it less costly for banks to borrow, substantial uncertainty remained about the timing of future decisions and about the likelihood that the Bank might cut to 0 percent or even negative rates. The Bank communicated it was at its effective lower bound, removing the risk of further rate changes. See the Bank's April 15, 2020, [press release](#), "Bank of Canada Maintains Overnight Rate Target and Unveils New Market Operations."

Table 1: Major policy responses to the COVID-19 crisis

Action	Description	Date
Policy rate cut by 0.5 percentage points	The Bank of Canada lowered its rate target to 1.25 percent.	March 4, 2020
Additional bond purchases and lending	The Bank expanded the frequency and scope of term repurchase operations and (as fiscal agent of the Government of Canada) of bond repurchase operations.	March 12, 2020
Domestic stability buffer lowered by 1.25 percent	Office of the Superintendent of Financial Institutions (OSFI) lowered the common equity Tier 1 required of domestic systemically important banks from 10.25 percent to 9 percent of risk-weighted assets.	March 13, 2020
Policy rate cut by 0.5 percentage points	The Bank lowered its rate target to 0.75 percent.	March 16, 2020
Canada Mortgage Bond Purchase Program (CMBP)	The Bank began purchasing Canada Mortgage Bonds in the secondary market (with primary dealers).	March 17, 2020
Bankers' Acceptance Purchase Facility (BAPF)	The Bank began purchasing bankers' acceptance securities in the secondary market (with primary dealers).	March 23, 2020
Provincial Money Market Purchases (PMMP)	The Bank began purchasing provincial securities through the primary issuance market.	March 25, 2020
Policy rate cut by 0.5 percentage points	The Bank lowered its rate target to 0.25 percent.	March 27, 2020
Regulatory flexibility for liquidity coverage ratio (LCR) announced	OSFI announced its expectation that banks use their unencumbered high-quality liquid assets during periods of liquidity stress, even if they go below the 100 percent of the liquidity coverage ratio requirement.	March 27, 2020

(continued...)

Table 1: (continued)

Action	Description	Date
Government Bond Purchase Program (GBPP)	The Bank began purchasing Government of Canada bonds on the secondary market (with government securities distributors ⁹ and customers).	April 1, 2020
Reserves and sovereign securities exempted from leverage ratio	OSFI temporarily exempts central bank reserves and sovereign-issued securities from leverage regulation	April 9, 2020
Corporate Bond Purchase Program (CBPP)	The Bank began purchasing corporate bonds on the secondary market (with primary dealers or registered portfolio managers or pension plans).	May 26, 2020

Many of the policy actions listed in **Table 1** were asset purchase programs by the Bank of Canada, such as the Canada Mortgage Bond Purchase Program, Bankers' Acceptance Purchase Facility, Provincial Money Market Purchase Program, Government of Canada Bond Purchase Program and the Corporate Bond Purchase Program. In these programs, the Bank purchased assets from commercial banks (and later, directly from investors) with central bank settlement balances. These interventions were novel because the Bank had never before conducted large-scale outright purchases of private debt. The Bank's outright purchases of bonds had previously been limited to federal government debt.

At the same time, OSFI gave banks regulatory relief to allow them to lend more on a set amount of capital.¹⁰ Most major central banks and macroprudential regulators undertook similar actions in March and early April (FSB 2020).¹¹ Starting March 13, OSFI temporarily excluded settlement balances and sovereign securities from the calculation of the leverage ratio requirement and lowered the domestic stability buffer from 2.25 percent to 1 percent, enabling banks to lend more and more create inside money relative to their capital. OSFI also issued a statement permitting the minimum standard for the liquidity coverage ratio to fall below 100 percent, thereby relaxing how much cash and easily sold assets banks required to hold to cover net cash outflows for a 30-day period of stress. As we saw in **Chart 14**, banks

⁹ The Bank of Canada Government Securities Auctions [web page](#) provides a full list of government securities distributors.

¹⁰ A comprehensive list of measures announced by OSFI is available on its COVID-19: Updates web page.

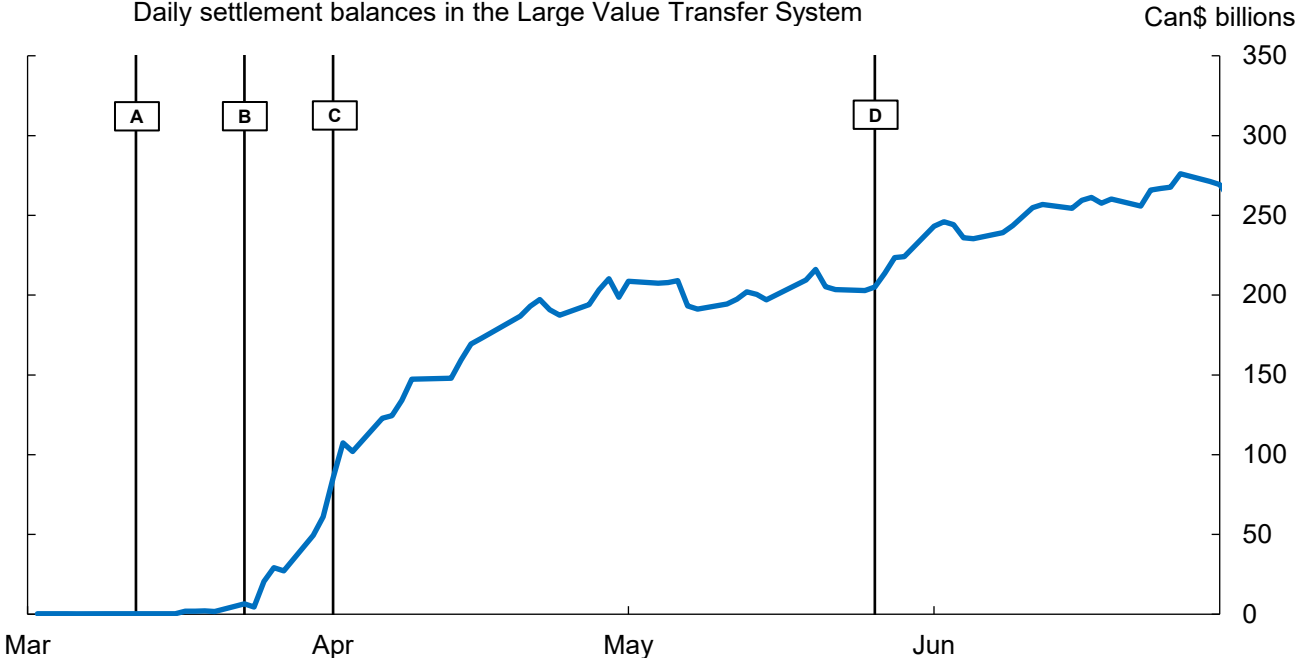
¹¹ The Federal Reserve's crisis interventions likely had positive spillover effects on non-US markets, including Canadian financial markets.

did not take advantage of this flexibility and kept their liquidity coverage ratio substantially above the regulatory minimum.

Interventions expanded money supply and restored market conditions

The cumulative effect of these programs was the largest monthly injection of money into the Canadian financial system in history. The Bank’s balance sheet expanded from \$120 billion to \$215 billion in March 2020, and the amount of settlement balances grew by more than \$200 billion. The change in settlement balances held by the banks can be seen in **Chart 15**.¹²

Chart 15: Settlement balances grew rapidly
Daily settlement balances in the Large Value Transfer System



Note: A is expanded purchasing and lending (March 12); B is the Bankers' Acceptance Purchase Facility (March 23); C is secondary market purchases of Government of Canada bonds (April 1); D is the Corporate Bond Purchase Program (May 26).

Source: Bank of Canada

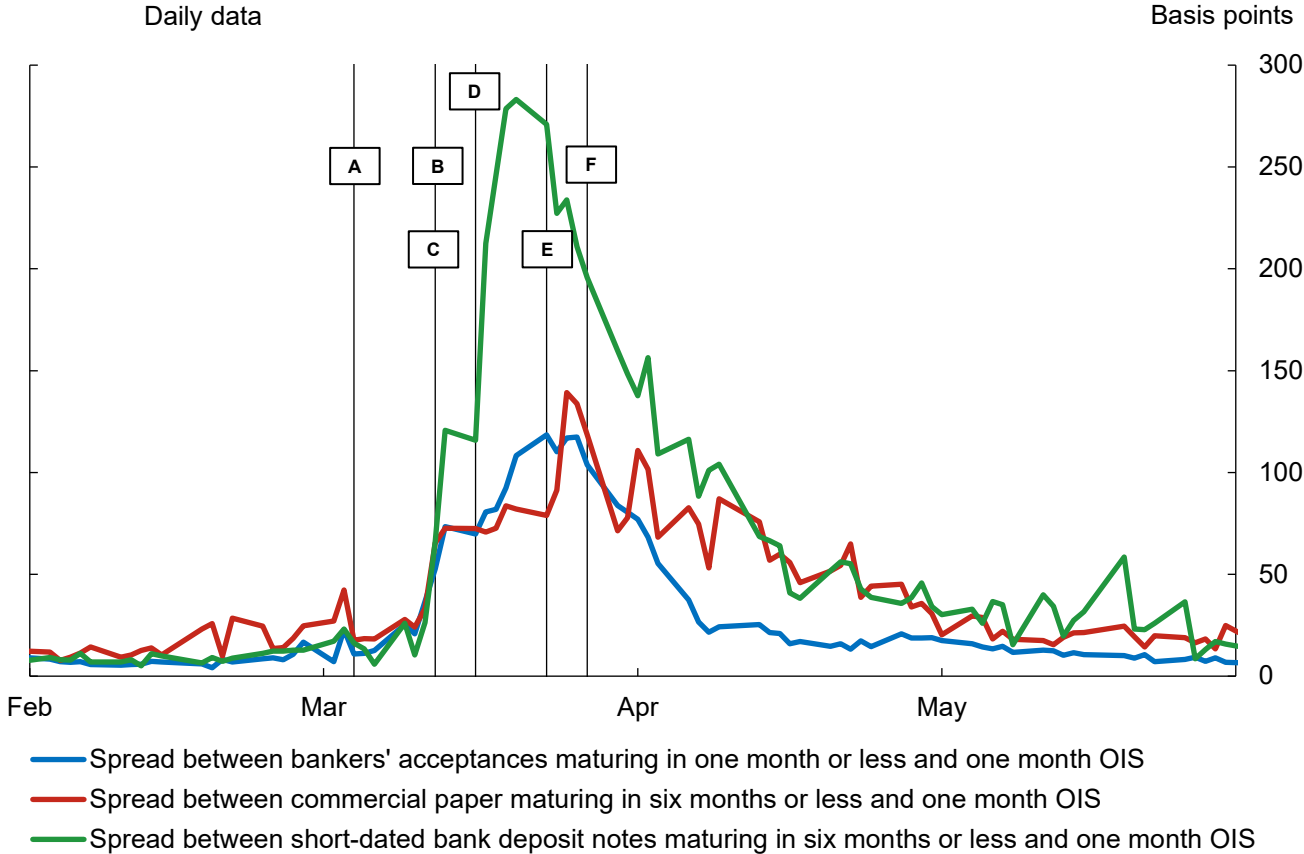
Last observation: November 30, 2020

By purchasing BAs, GoC securities, provincial and corporate bonds from banks and investors, the Bank replaced the assets that were difficult or costly to sell with central bank money. These purchases increased the liquidity of the commercial banks’ assets. This freed up bank balance sheet space and likely helped alleviate scarcity in money markets and restore trading conditions in broader bond markets. The impact in various money markets is visible in **Chart 16**, which shows the yields for BAs, for loans made directly to

¹² Settlement balances are a form of digital money that banks use to make payments to one another. They do this electronically using the Large Value Transfer System. See Arjani and McVanel (2006) for a primer. When the Bank of Canada purchases assets from a commercial bank, it pays for it by crediting the bank’s account of settlement balances. For readers familiar with the United States, settlement balances at the Federal Reserve are called reserves. Settlement balances can be turned into physical cash (with a lag).

corporations (commercial paper) and for other loans made to banks (short-dated bank deposit notes¹³). Vertical bars mark the dates of selected interventions.

Chart 16: Policy actions brought down yields in the money market



Note: A is a rate cut (March 4); B is the lower capital buffer (March 12); C is expanded purchasing and lending (March 12); D is a second rate cut (March 16); E is the Bankers' Acceptance Purchase Facility (March 23); F is a third rate cut (March 27); OIS is overnight index swap.

Sources: Market Trade Reporting System 2.0, Bloomberg and Bank of Canada calculations

Last observation: June 30, 2020

Money market yields peaked between March 11 to 27. This encompasses the dates of the expanded bond purchases, the term repo operations, the lowered capital buffers, the second rate cut, the Bankers' Acceptance Purchase Facility and the third rate cut (see Table 1 for details). After this period, the yields fell. By early May, BA rates fell below the Bank's reserve rate, indicating that the BA market had recovered sufficiently to be ineligible for central bank support. Arora et al. (2020) provide a deeper analysis of the BA intervention.

¹³ Sometimes referred to as bearer deposit notes.

Looking back to **Chart 10** and **Chart 11**, we see that the costs of trading on fixed-income markets also recovered over the same time frame.

Lessons learned

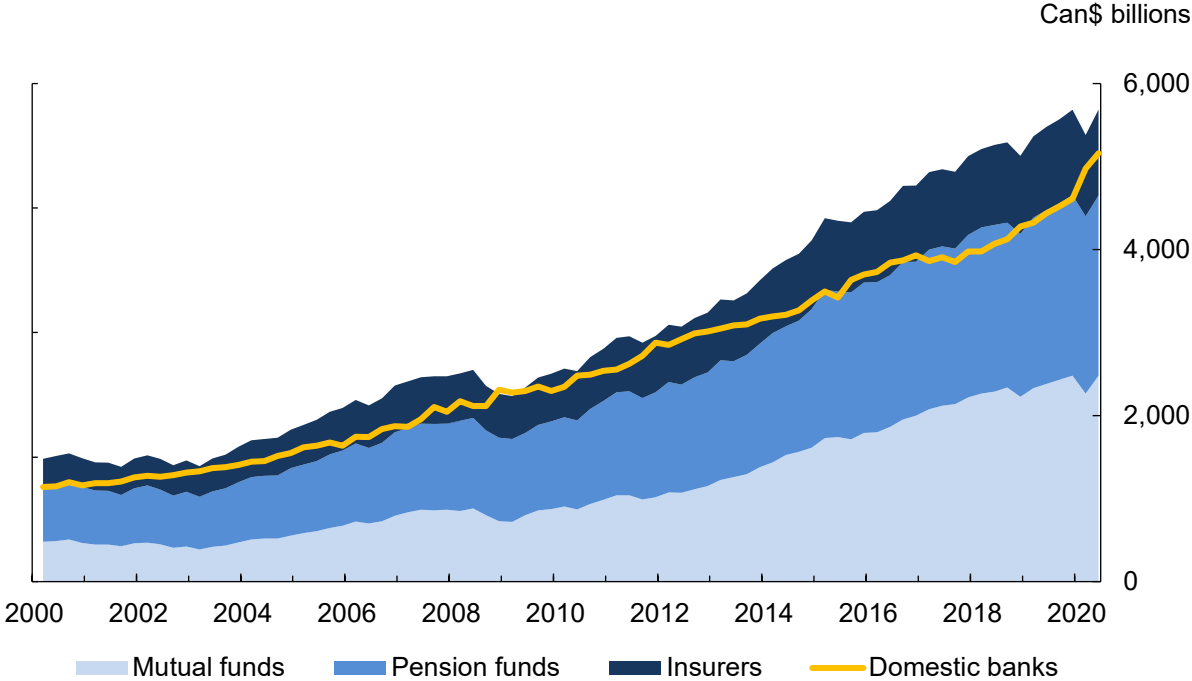
The COVID-19 crisis highlighted the crucial role central banks and prudential regulators play in supporting financial system functioning. While central bank interventions were expected in the face of such an extreme and rare event, the speed, scope and size of the interventions that were necessary was unprecedented; the Bank had never before needed to conduct large-scale direct purchases in the secondary market or purchase private-sector debt. Beyond the severity of the crisis, we believe this change also reflects longer-term structural shifts in the financial system.

The asset management industry is growing faster than the base of assets banks use to create inside money

The growing role of asset managers in the financial system could be one of the reasons underlying these unprecedented interventions. During the COVID-19 crisis, an important source of money demand in financial markets came from mutual funds, pension funds and insurance companies. **Chart 17** shows the growth of assets held by three groups of asset managers since 2000, compared with the value of assets held by banks. The size of this group has grown considerably, at the same pace as the Canadian banking sector, driven in part by demographic changes, financial innovations and declining interest rates. Asset management is growing by offering significant benefits to their clients, for instance in the form of broader investment opportunities.

Chart 17: The value of financial assets has tripled since 2000

Quarterly total financial assets by investor type



Sources: Statistics Canada and Bank of Canada calculations

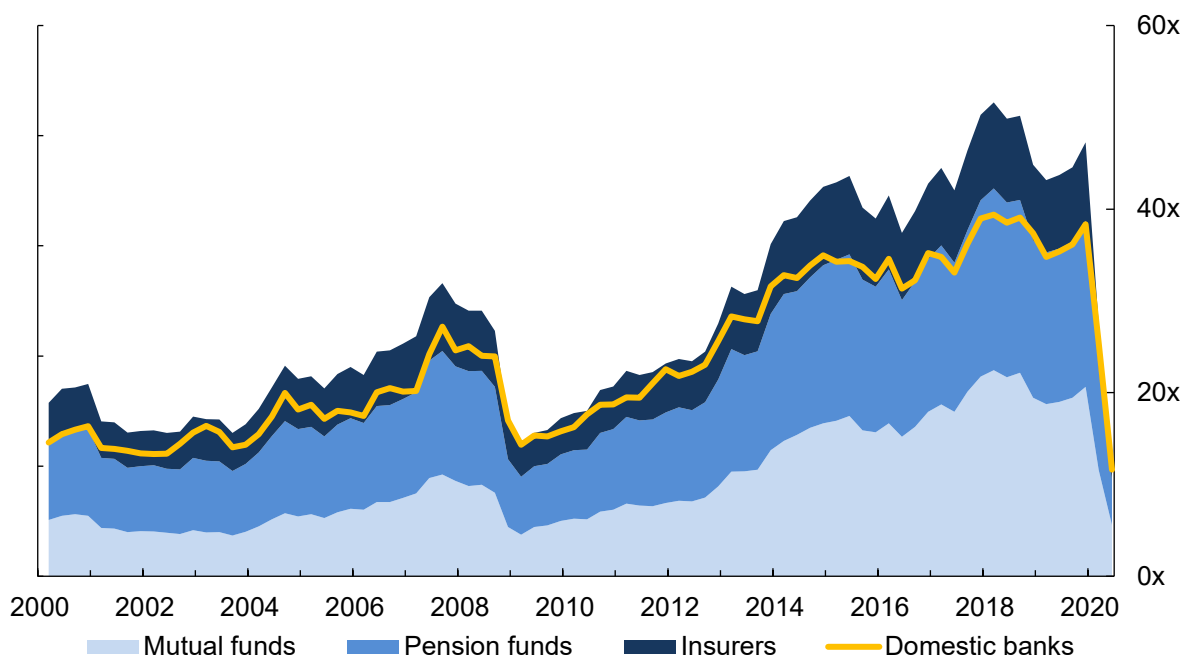
Last observation: 2020Q2

However, banks can supply inside money, whereas asset managers cannot. Unlike the deposit liabilities of banks, the liabilities that asset managers issue cannot be used as money by their holders to settle payment obligations. Instead, faced with claims from investors or counterparties, asset managers must obtain money to meet the claims, either by withdrawing from bank deposits or selling securities in their portfolio to bank dealers. Therefore, asset managers rely on the special ability of commercial banks to supply inside money. The faster growth of asset managers could mean that a spike in their demand for money could outpace the banks' supply capacity.

Chart 18 shows the value of the financial assets held by three groups of asset managers expressed as a ratio to Canadian banks' most liquid assets. Here, financial assets under management includes stocks, bonds, shares in mutual funds, loans, derivatives, structured products and deposits. Bank liquid assets include outside money: settlement balances and GoC securities held by banks. As we discussed above (see Chart 14), individual banks hold these assets in certain proportions to their deposits and liabilities, as set by their internal risk standards and consistent with banking regulations. These requirements can prevent rapid changes to the size of banks' balance sheet.

Chart 18: The financial sector is growing relative to banks' most liquid assets

Total financial assets divided by domestic bank reserves and Government of Canada holdings



Note: Liquid assets include currency, deposits and Government of Canada debt securities.

Sources: Statistics Canada and Bank of Canada calculations

Last observation: 2020Q2

Chart 18 shows that, over the past two decades, the value of Canadian investments has become large relative to the liquid assets held by Canadian banks. The ratio declined after the global financial crisis, but its growth resumed unabated after 2009 until early in 2020. The elevated ratio, which is due to the growth in asset management, may help explain why commercial banks (as a group) could not create enough inside money to meet the demand during the COVID-19 shock.

The large drop in the ratio in 2020 occurred after the Bank of Canada's interventions dramatically increased the stock of settlement balances that banks held (increasing the denominator of the ratio). The traditional role of the central bank is to intervene in such crises because it is more efficient for them to provide money to cover the most extreme and rare events than to require commercial banks to hold at all times the substantially larger stock of liquid but low-yield assets they would need to cover such events themselves. However, the growth of asset management suggests that demand for central bank interventions may have become larger and more frequent.

Constrained dealer balance sheets could create a bottleneck between central banks and asset managers

Asset managers rely on bank dealers to purchase fixed-income securities when they need additional money. And central banks rely on bank dealers to distribute the money it provides to support market functioning. But commercial banks have internal risk limits that may constrain their growth in both their role on main street as lender to businesses and households and their role in fixed-income markets as dealer, and their single balance sheet may require them to prioritize lending to the real economy over their dealing activity. During the COVID-19 crisis, only a fraction of commercial banks' growing balance sheets was due to purchases of securities (as we saw in **Chart 13**) when asset managers were selling assets to prepare for redemptions or to respond to margin calls. This meant that many of the money market instruments or the bonds that asset managers held to weather sudden cash needs could not be sold easily, if at all.

Increasing the central bank's footprint in the financial system to circumvent the bottleneck may create moral hazard

Over the past two centuries, central banks have evolved to regulate the supply of money in response to changes in demand. Like those of other central banks around the world, the Bank's actions are therefore built into the design of the financial system. The global pandemic that spread early in 2020 had economic consequences that were extreme by any standard. The central banks' actions to support the financial system reflected the objectives underlying their design.

Nevertheless, many observers—the authors included—were surprised by the speed, scope and size of central bank interventions that were needed in the early months of the COVID-19 crisis. The direct purchases of BAs, provincial bonds, Canada Mortgage Bonds and certain corporate bonds on secondary markets circumvented the limits of commercial banks to directly meet the large demand for money, in contrast with the traditional way central banks have regulated the supply of money in the past (by extending loans exclusively to commercial banks against high quality collateral). The COVID-19 crisis suggests that secular growth in asset management together with the risk limits of commercial banks contributed to central banks' growing footprint in the financial system worldwide.

However, the growth of the central bank's footprint may introduce new risks. A well-known risk created by central bank intervention is moral hazard (Engert, Selody and Wilkins 2008; BIS 2014). Investors, asset managers and banks may discount the difficulty of selling their assets in a crisis if they come to expect the central bank to buy them when a crisis arises. As a result, they may invest more heavily in riskier or less-easily sold assets, or they may increase leverage more than they otherwise would have. The resulting misallocation of risk and capital makes the financial system riskier overall, increasing the likelihood and impact of a crisis and creating an even greater need for future central bank interventions.

What comes next?

Three approaches to reduce moral hazard

If the continued growth in asset management creates an increasing need for intervention in a crisis, there are three broad methods of modifying the financial system to mitigate the moral hazard that it introduces. One way is to regulate the liquidity management of asset managers. Securities regulation already require mutual funds to hold certain amounts of liquid assets in case of stress events; such rules could be further refined (IOSCO 2018) and their scope broadened to encompass other types of asset managers. The Financial Stability Board (FSB) has set out a work programme to review the specific issues that fall under this topic (see FSB 2020 holistic review for a discussion).

In the following, we focus our discussion on the other two approaches to reduce the central footprint in a crisis: changing the way central banks interact with asset managers and refining the infrastructure of financial markets.

How should the central bank interact with asset managers?

Future research could examine whether existing central bank strategies and policy tools—those used both before and during a crisis—could better control moral hazard by better reflecting the larger role asset management plays in the intermediation of savings and investments.

- 1. Should asset managers be able to hold settlement balances?** To manage fund outflows or margin calls, asset managers depend on the ability to sell certain fixed-income securities that they hold in markets that bank dealers intermediate. This works well in good times or “fair weather” but not during a crisis, regardless of the quality of the asset, because of the bank dealers’ risk limits. If asset managers were given deposit accounts of their own at the central bank, they would have the option to hold a safe asset that can be used as money in all weather, irrespective of bank dealers’ risk limits. Asset managers could accumulate these “all-weather” liquid assets in normal times, for use in times of crisis. A natural question this would raise is whether the use of asset manager settlement accounts could also increase the effectiveness of central bank asset purchases and loans in a crisis. Research should also ask whether the broader availability of settlement accounts would offer synergies with the broader transition to more digital forms of currency. However, such a change would require careful deliberation because it moves away from the traditional view that banks play a special role in the financial system.
- 2. Could the Bank of Canada act as a predictable market-maker of last resort for certain assets?** The Bank’s crisis interventions to support financial market functioning have taken the form of fixed-income instrument purchases to support the financial system. The timing of the Bank’s exit from these positions was not specified and it was eventually linked to the improvement of general economic conditions. Research could ask how the timing and conditions under which the Bank

would buy and subsequently resell those assets could be made more predictable, to more clearly align the interventions with objective to support the financial system and control moral hazard. For instance, a central bank could act as market-maker of last resort, quoting two-way prices and standing ready to buy and sell certain securities. This would clarify upfront which assets the central bank is prepared to exchange for money (e.g., treasury bills) and how the timing of entry and exit is related to the specific asset's market conditions. The Bank of England's Corporate Bond Secondary Market Scheme, introduced in 2009 to aid secondary market liquidity, provides an example of how entry and exit conditions can be specified.¹⁴ However, determining in advance the precise conditions that would be appropriate to trigger purchases and sales could remove the flexibility with which the tool could be used to adapt to unique crises.

3. **Could the Bank of Canada extend its operations to permanently include large investors?** The Bank typically restricts its lending and purchasing operations to banks because the intermediary role of these financial institutions should, in theory, position them ideally to distribute funds throughout the system. The Bank therefore relies on dealers to acquire the securities that the Bank is willing to buy or lend against and to pass the money to the end investor. During the COVID-19 crisis, however, banks approached their risk limits, which hindered the pass-through and thus the effectiveness of the Bank's operations. As a result, the Bank took the novel step of purchasing and lending directly to large investors in certain markets. Research could ask whether the Bank could normalize access to its operations to the large investors that hold the targeted securities. But there is a trade-off: the price of permanent access to central bank operations is usually greater oversight or regulation. The central bank, wishing to limit its intervention and prevent moral hazard, typically asks its counterparties to satisfy certain risk standards. For example, NBFIs might be asked to hold more of their investments in bank deposits or GoC securities.
4. **Would announcing a crisis collateral policy help coordinate market participants' investments on safer assets?** Central banks typically accept government securities for purchase or as collateral for the loans they extend. However, during crises, central banks sometimes expand the range of acceptable collateral. As we have discussed, this raises moral hazard. Research could examine whether central banks could clarify in advance which collaterals it will accept in a crisis, the terms (for example, the asset-specific haircut) and the sequence with which the acceptable collateral list will be expanded (for example, from highest to lowest quality)—a "crisis collateral waterfall." Banks and large investors might coordinate on the securities the central bank says it will support, increasing their liquidity and reducing the likelihood that the central bank would need to intervene

¹⁴From 2010, the scheme offered daily two-way prices on a wide range of high-quality corporate bonds. These prices, determined as a spread around the market price, were set at levels that incentivized market participants to sell to the Bank of England when market functioning was poor and to buy when market functioning returned to normal (Hauser 2021).

with other securities. However, this would limit the flexibility central banks have in responding to a crisis because it could hurt the central bank's credibility to deviate from the established order.

Could the central bank foster improvements to the market structure?

Central banks could also reduce their footprint during a crisis by improving the structure of fixed-income markets.

Central banks have often fostered the market structure changes. A historical example is given in the 1933 MacMillan report studying the desirability of a central bank in Canada. The report recommended that the eventual central bank of Canada would need a money market for safe and short-term securities such as treasury bills. In the early 1950s, Governor Towers and staff of the Bank of Canada created the inter-dealer market for treasury bills. By 1954, the Bank had approved 14 investment dealers, granting them special financing arrangements (Fullerton 1986). More recently, the Bank continues to advance important market structure changes, playing an instrumental role in fostering payments systems in Canada and in the design and launch of Canada's clearing house for repurchase agreements.

5. **Could membership in clearing and settlement infrastructure be expanded to reduce dealers' exposures?** More widespread membership in clearing and settlement infrastructure, particularly for GoC securities, would reduce the amount of reserves and easily sold assets that banks require to maintain liquid markets and could increase the additional supply of inside money when needed (Duffie 2020; Liang and Parkinson 2020). Researchers could ask whether more central clearing would materially reduce the size of a bank's counterparty exposures relative to bilateral clearing. In addition, improved trade processing and shorter settlement cycles could further reduce exposure between the parties and margin requirements, tying up fewer funds in transactions that have yet to settle. This expansion could nevertheless have drawbacks, particularly with central clearing: the concentration of risk, and the uniformity of clearing-house margins, could increase systemic risk
6. **Could fixed-income markets be further digitalized to diversify the investor base and reduce risk?** Many treasury bills and bonds still trade over the counter, meaning that the transactions are negotiated by humans over chat or telephone. Listing fixed-income assets on electronic platforms would enable banks and asset managers to accept trades with a larger pool of investors or enable them to trade with each other directly. Researchers could ask whether a wider, more diversified investor base could stabilize fixed-income markets during times of crisis. It is also possible that greater competition could destabilize markets or that fixed-income securities are still insufficiently standardized to be listed.

- 7. Could further digitalization enhance exchange-based trading?** In March 2020, exchange-traded funds (ETFs) that were holding bonds traded continuously on exchanges. ETFs combine large numbers of a variety of fixed-income securities but issue a single type of exchange-traded shares. Trading on exchanges broadens the pool of investors, and issuing a single share concentrates the liquidity in a single instrument. Digitalization could help keep the secondary market for bonds more closely related to the secondary exchange-based market for bond-owning ETF shares. ETFs are redeemed in kind, meaning that the fund manager does not face redemption risk and does not require cash reserves to handle redemptions—making them a resilient investment vehicle during crises. However, research should ask whether these new investors might be more pro-cyclical than current funding sources.

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