

Staff Discussion Paper/Document d'analyse du personnel 2018-15

Alternative Futures for Government of Canada Debt Management



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December 2018

Alternative Futures for Government of Canada Debt Management

by

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Acknowledgements

The views expressed are those of the authors and do not represent the views of the Bank of Canada. We are grateful to Joanna Roberts, who helped us launch this project; to Chen Fan and Joshua Fernandes for research assistance; and to Jason Allen, Alison Arnot, Donald Bélanger, Narayan Bulusu, Wendy Chan, John Cochrane, Jean-Sébastien Fontaine, Toni Gravelle, Carole Hubbard, Darcey McVanel, Mervin Merkowsky, Maksym Padalko, Ryan Riordan, Matthieu Truno, James Wu and Jun Yang for useful discussions and editorial advice.

Abstract

This paper presents four blue-sky ideas for lowering the cost of the Government of Canada's debt without increasing the debt's risk profile. We argue that each idea would improve the secondary-market liquidity of government debt, thereby increasing the demand for government bonds and thus lowering their cost at issuance. The first two ideas would improve liquidity by enhancing the active management of the government's debt through market operations used to support the liquidity of outstanding bonds. The second two ideas would simplify the set of securities issued by the government, concentrating issuance in a smaller set of bonds that would each be more highly traded. We discuss the ideas and give an account of the political, legal and operational impediments.

Bank topics: Debt management; Financial markets; Market structure and pricing

JEL codes: H63, G12, G24

Résumé

Cette étude présente quatre idées imaginatives visant à réduire le coût de la dette du gouvernement du Canada sans accroître le profil de risque de la dette. Nous soutenons que chacune d'entre elles permettrait d'améliorer la liquidité des titres d'emprunt du gouvernement sur le marché secondaire, et par le fait même de hausser la demande d'obligations d'État et de diminuer leur coût à l'émission. Les deux premières idées amélioreraient la liquidité en favorisant la gestion active de la dette publique au moyen des opérations de marché servant à assurer la liquidité des obligations en cours. Les deux autres idées simplifieraient l'ensemble de titres émis par le gouvernement en concentrant l'émission d'obligations dans un groupe restreint de titres qui seraient négociés en plus grands volumes. Nous analysons ces solutions et donnons un aperçu des contraintes présentes sur le plan politique, juridique et opérationnel.

Sujets : Gestion de la dette; Marchés financiers; Structure de marché et fixation des prix

Codes JEL : H63, G12, G24

Non-technical summary

In this paper, we present four blue-sky ideas for lowering the cost of funding the Government of Canada's debt without increasing its risk profile. Our ideas are to implement changes to increase the liquidity of the government's debt securities on the secondary market. The ideas work on the principle that improved liquidity in the secondary market would also improve the cost of issuing debt in the primary market without affecting risk.

Investors value liquidity, the ability to trade an asset in the secondary market in large amounts at a low cost and with minimal impact on the price of the asset. Indeed, investors will pay more in the primary market for assets they believe will be more liquid. Thus, issuing assets that are more liquid would decrease the issuer's costs. Given the amount of Government of Canada (GoC) debt securities outstanding (\$678 billion as of December 2017), even a marginal improvement in cost could be economically significant. Assuming the amount of GoC securities remains constant, a decrease in the total cost of funding of just *one basis point* would save the government \$68 million annually.

Our first two ideas aim to enhance the active management of GoC securities using existing market operations conducted by the Bank of Canada. Specifically, the first idea is to reopen the issuance of scarce bonds, and the second is to conduct more switch operations (exchanges of less liquid GoC securities for new, more liquid bonds). Both these operations would address the tendency of GoC securities to be less liquid later in their life. The operations would *tactically* shift debt outstanding in and out of the various existing securities. Older, less liquid GoC securities would have greater value, since investors who hold them could more easily acquire recent and more liquid bonds.

Our last two ideas are *strategic* rather than tactical, involving redesigns of the type of securities issued by the Government of Canada. The government's outstanding debt is currently fragmented among more than 70 slightly different securities. Our redesigns would concentrate debt outstanding in a smaller number of securities, thereby concentrating trading activity and increasing fungibility, thus enhancing liquidity. Specifically, the third idea is to eliminate coupon payments from government debt and issue debt on a simpler and fixed maturity schedule. Issuing zero-coupon debt would eliminate a key difference between GoC securities and increase their fungibility. Combined with a fixed maturity schedule, it would simplify the issuance of GoC securities throughout their life cycles and increase their liquidity.

Our fourth and most radical idea is to push defragmentation to its logical end. We describe a government debt program centred around three perpetuities—one to replace bonds, one to replace bills and one to replace Real Return Bonds. The perpetuities would be standardized, streamlined and issued in greater size than the most liquid bonds available anywhere today. These features would make them extremely liquid on the secondary market, which would in turn decrease their cost at issuance.

Introduction

The objective of debt management is to procure funding for the government at the lowest cost possible for some acceptable level of risk. To pursue this objective, governments have historically focused on the cost and risk outcomes in the primary market, the market where debt securities are issued. This is a reasonable focus, given that the cost of funding is ultimately realized in the primary market. However, since the global financial crisis, debt managers have begun to monitor secondary markets, where securities trade after issuance, because they recognize that secondary-market liquidity can improve outcomes in the primary market.

For example, Canada's Debt Management Strategy describes its objectives as follows: ¹

The fundamental objectives of debt management are to raise stable and low-cost funding to meet the financial needs of the Government of Canada and to maintain a well-functioning market for Government of Canada securities. Achieving stable, low-cost funding involves *striking a balance between the cost and the risk* associated with the debt structure as funding needs change and market conditions vary. *Having access to a well-functioning government securities market ensures that funds can be raised efficiently over time to meet the Government's needs.* (emphasis added)

The first objective relates to the primary market. The government seeks to minimize the cost of its debt at issuance while also limiting risk in issuance. The risk is of a bad outcome at auction: the yield is much higher than expected, or, worse, the government finds itself unable to raise the desired amount of funds at an auction.² This may happen when the government increases its debt or raises funds to replace maturing debt (rollover risk).

In contrast, the second objective relates primarily to the secondary market. As stated in the most recent Debt Management Report, "a well-functioning market attracts investors and contributes to keeping funding costs low and stable over time."³ The government expects that participants will pay more for government securities at issuance if the securities are less costly to trade throughout their life. The literature on asset pricing has confirmed this relationship empirically in multiple markets. Liquidity raises asset prices in equities, corporate bonds and US Treasury bonds (Goldreich, Hanke and Nath 2005; Li et al. 2009; Lin, Wang and Wu 2011; Pastor and Stambaugh 2003).

¹ See "[Debt Management Strategy for 2018–19](#)" in Budget 2018 (Annex 3). In Canada, the functions of debt management are divided between [the Department of Finance Canada and the Bank of Canada in its role as the fiscal agent](#) of the Government of Canada. Missale (1999) has an overview of public debt management. See OECD (2018) for a discussion of the practices in the developed economies.

² For a complete discussion of the concepts of cost and risk in the Canadian context, see Bolder and Deeley (2011).

³ See the Department of Finance Canada's "[Debt Management Report 2016–2017 - Part 1.](#)"

Government of Canada bonds could be more liquid

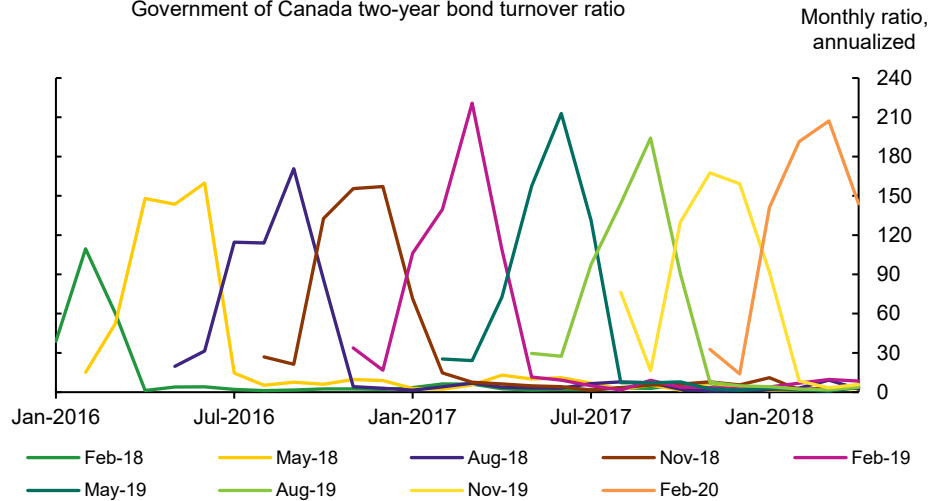
Although Government of Canada (GoC) bonds are already quite liquid, it is our opinion that their liquidity could be even higher. There are potential gains because the liquidity of GoC bonds declines rapidly and materially after issuance (Bulusu and Gungor 2017). A GoC bond is most liquid early in its life cycle when it attains benchmark status, which is the status of having its price serve as a reference price on the GoC yield curve. While on benchmark, the bond is traded much more heavily on the secondary market and is much more liquid than otherwise similar GoC bonds. However, when a GoC bond is succeeded by newer vintages, it loses benchmark status (going “off-benchmark”) and becomes significantly less liquid.

Benchmarking is a useful response to the need for coordination in the GoC bond market. It is good to concentrate trading in one bond near popular durations because it makes risk sharing easier (Vayanos and Weill 2008). All else being equal, benchmarking makes GoC bonds more liquid than they would be in its absence. Nevertheless, while benchmarking does facilitate coordination, someone must still hold the less-liquid, off-benchmark bonds, and almost all debt outstanding is in this category. GoC bonds that lose benchmark status go on to spend the rest their life off-benchmark. If they were more liquid throughout their life, they would be worth far more at issuance because the liquidity premium on a bond depends primarily on how long it is expected to be liquid (Goldreich, Hanke and Nath 2005). Much of this premium for expected future liquidity is foregone.

The illiquidity of off-benchmark bonds relative to benchmarks can be illustrated in many ways. **Chart 1** plots the turnover ratio of two-year GoC bonds. *Turnover* is the total value of trades divided by the outstanding amount of each bond. A bond’s turnover ratio is highest when the bond is a benchmark; then, after the benchmark period, turnover vanishes. In general, off-benchmark bonds are traded less, are traded in smaller sizes, exhibit wider bid-ask spreads and exhibit shallower market depth than benchmarks (Gungor and Yang 2017).

Chart 1: Turnover ratio for issues of two-year bonds, 2016–18

Government of Canada two-year bond turnover ratio



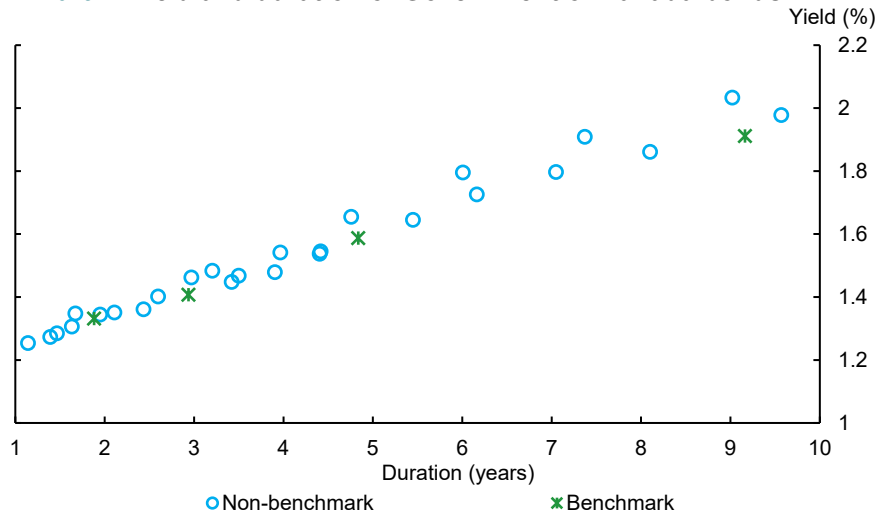
Sources: Investment Industry Regulatory Organization of Canada's Market Trade Reporting System and Bank of Canada calculations

Last observation: April 2018

These differences in the liquidity of GoC bonds create material distortions in pricing. For example, off-benchmark bonds have lower prices than bills of similar maturity and risk. Similarly, benchmark bonds have higher prices, often exceeding 0.5 per cent of par value, than off-benchmark bonds of similar maturity and risk. **Chart 2** shows end-of-day yields for GoC bonds. Marked by a green asterisk, benchmark bonds typically have a lower yield (thus, a higher price) than off-benchmark bonds of similar interest rate risk, as measured by duration. This phenomenon is well documented.⁴

⁴ See Clark, Cameron and Mann (2016); Fontaine and Nolin (2017); Hu, Pan and Wang (2013); Krishnamurthy (2002); and Warga (1992).

Chart 2: Yield and duration of Government of Canada bonds



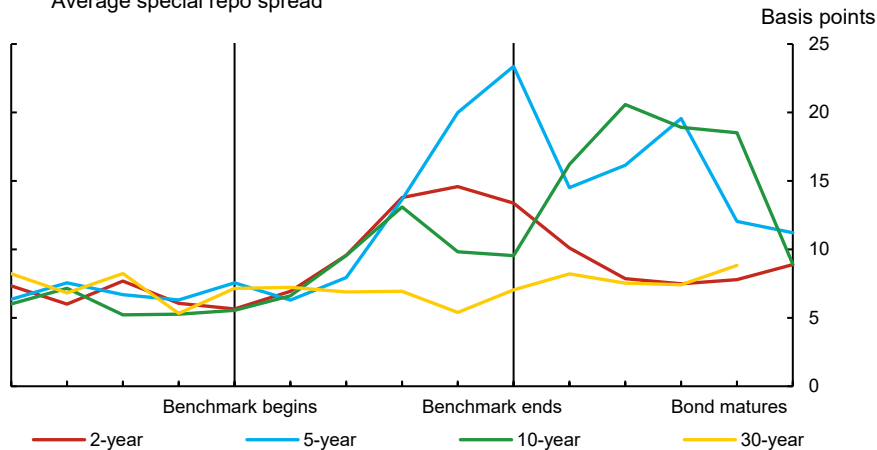
Source: FTSE TMX

Last observation: September 1, 2017

As a last illustration, a bond becomes costlier to borrow in the repo market as it loses benchmark status. **Chart 3** shows that the special repo spread—the cost of borrowing the bond—rises as a bond approaches the end of its benchmark period. This phenomenon is also well documented.⁵

Chart 3: Specialness of Government of Canada bonds during the benchmark cycle

Average special repo spread



Sources: Reproduced from Bulusu and Gungor (2017), Canadian Depository for Securities, Canadian Derivative Clearing Corporation and Bank of Canada calculations

Last observation: July 31, 2015

Four ideas to increase Government of Canada bond liquidity

Given the size of the Government of Canada’s debt portfolio, a cost improvement at issuance could be economically significant. As of the end of December 2017, there was \$678 billion in GoC

⁵ See Amihud and Mendelson (1991), Boudoukh and Whitelaw (1993) and Warga (1992).

securities outstanding, divided among 21 treasury bills (T-bills), 45 nominal bonds and 8 Real Return Bonds, with amounts outstanding of \$120 billion, \$512 billion and \$46 billion, respectively.⁶ Assuming the amount of GoC debt remains constant, a decrease in the total cost of funding of just *one basis point* would save the government \$68 million annually.

In this paper, we present four ideas to increase GoC bond liquidity through the bond life cycle, thus increasing demand for GoC securities and lowering the cost of issuance. We present our ideas as blue-sky alternatives to current practice to stimulate discussion on debt management among the academic, regulatory and industry communities. A reader who disagrees with our ideas might nevertheless be inspired to examine the proposals theoretically or empirically or to propose alternatives.

The first two ideas aim to enhance the active management of the government's debt using existing market operations conducted by the Bank of Canada. Specifically, the first idea is to reopen the issuance of scarce bonds, and the second idea is to conduct more switch operations (exchanges of illiquid off-benchmark bonds for new quantities of benchmark bonds). The government would use these two operations to optimize the allocation of its debt among existing bonds in a way that improves market liquidity. These operations would address the illiquidity of off-benchmark GoC bonds *tactically*, through targeted operations that would shift debt outstanding in and out of the various existing securities. As the government is the sole issuer of its debt, it is the only institution that can reallocate the supply of GoC bonds, and thus it is the only one that may conduct these operations.

The last two ideas are *strategic* rather than tactical. They are streamlined redesigns of the GoC securities portfolio as a whole. The government's outstanding debt is currently fragmented among more than 70 slightly different securities. Our redesigns would concentrate debt outstanding in a smaller number of securities, defragmenting trade and increasing fungibility, thus enhancing liquidity. The third idea is to eliminate coupon payments from government debt and issue debt on a sparser schedule. Issuing zero-coupon debt would get rid of a key difference that fragments GoC securities, which is that each bond has its own coupon rate. In contrast, zero-coupon bonds would be distinguished only by their maturity dates. This simplification would make bonds fungible across maturities, enabling the government to reopen an old security at a desired maturity instead of issuing an entirely new security. In addition, the old security would re-enter a new benchmark period of high liquidity.

Last, in our fourth and admittedly most radical idea, we take the idea of defragmentation to its logical end. We present an issuance portfolio inspired by Cochrane (2015). This portfolio would be centred on three perpetuities—one to replace bonds, one to replace bills and one to replace

⁶ See "[Government of Canada Treasury Bills and Bonds Outstanding](#)" on the Bank of Canada website.

Real Return Bonds. It would then greatly limit the issuance of other securities. The perpetuities would be more standardized, streamlined and fungible than the most liquid bonds available anywhere today, and thus they would command the highest-possible premium at issuance.

Government debt management is complicated, and financial markets are also complicated. It is impossible to anticipate the full spectrum of changes in participant behaviour that would follow the implementation of our ideas. In the section on each idea, we address common concerns deriving both from the literature and from informal discussions, but we make no attempt to address every possible concern. At the outset, we address two frequent objections to changes such as the ones we propose.

Clienteles

A common objection to reallocating or simplifying the debt structure is that the current structure exists for a reason—to satisfy clienteles. Clienteles are groups of investors who have a strong or narrow preference to hold bonds with specific maturity dates or coupon structures, sometimes called their “preferred habitat” (Greenwood and Vayanos 2014; Vayanos and Vila 2009). For example, because of the five-year refinancing of mortgage contracts in Canada, many Canadian lending institutions have an interest in terms of five years. Clienteles are an important determinant of the pricing of debt (Greenwood and Vayanos 2010; Guibaud, Nosbusch and Vayanos 2013; Jin, Rivadeneyra and Sierra 2018; Krishnamurthy and Vissing-Jorgensen 2012). Under a clientele-based debt strategy, managers issue bonds catered to a clientele that has proven to be a reliable buyer of a type of security. Therefore, to shift quantities of debt out of catered securities, or to remove attributes desirable to a clientele, such as particular coupons or maturity dates, is to ignore one of the most important sources of demand for government debt (Duffie 2015).

In our opinion, a government’s comparative advantage in debt issuance is its ability to issue safe assets and not its ability to serve clienteles. The government’s advantage in issuing safe assets derives from its ability to tax, which is a more reliable means to obtain revenue than that of most issuers. But the government has no special advantage in client service compared with private intermediaries, who are better positioned to work with clients because intermediaries are paid for these services. In our view, a better way to serve clienteles is to create a portfolio of fixed payments that can be flexibly assigned to clienteles on an agency basis. Counterparty risk could be removed by manufacturing cash flows through the settlement authority. The more standardized the securities in the debt portfolio, the easier it is for private intermediaries to assign payments flexibly to the clientele who currently prefers it. In contrast, securities designed to satisfy one clientele are forever less desirable to the others. In time, such securities may even become undesirable to their original targets.

The role of broker-dealers

Our proposals would likely change the role of broker-dealers in the GoC securities market. Currently, these intermediaries supply liquidity to the GoC securities market by conducting several operations: they purchase GoC securities at auction, distribute them, act as market makers (meaning they stand ready to buy or sell GoC securities on demand), and lend and borrow GoC securities on the repo market. All these services are supplied for profit (Hortaçsu and Kastl 2012) and are beneficial to the wider market.

Our proposals, particularly the tactical proposals, are partial substitutes for some of the operations of dealers. Offering a substitute for an operation would reduce broker-dealers' incentives to continue to perform the operation. Still, in our view, it is economically natural that the issuer of debt securities would conduct certain liquidity-supplying operations since it can do so more efficiently than non-issuers. This is because only the issuer can increase or decrease its debt outstanding or reallocate it among existing securities. In this respect, the government is no different than any other issuer.

Any design choice for the government debt program has consequences for the incentives of financial intermediaries. Any action the government takes in its debt market, including issuing a security, raises (or lowers) broker-dealers' profits and affects the liquidity of outstanding securities (Gao, Jin and Thompson 2018). Ultimately, we believe the government should design its debt portfolio to meet its primary debt management objectives: to raise funds at the lowest cost possible for some level of acceptable risk.

Alternative futures for Government of Canada debt management

1. Reopen persistently special issues

Our first tactical proposal is to reissue a GoC bond when the cost of borrowing this bond is persistently high in the repo market. The government could reissue these bonds in reopening operations such as competitive auctions. A bond would be selected for an operation if its repo rate was predictably and persistently significantly below that of other GoC bonds, a condition called "specialness."

When investors borrow cash on GoC bond collateral, the cash lender is typically indifferent as to which specific bond is used to collateralize the loan. However, when investors borrow bonds on cash collateral, the securities borrower is often seeking a specific bond.⁷ If this specific bond is in high demand relative to supply, the repo rate will decline to motivate the bond's holders to lend it for cash. This bond is said to be trading "on special," meaning its repo rate is significantly lower

⁷ For more on Canadian repo markets, see Garriott and Gray 2016.

than the general collateral (GC) repo rate, the rate at which most other GoC bonds will be lent on the repo market.⁸ In **Chart 4**, we graph the average daily number of bonds on special, distinguished by maturity. At any time, at least a few bonds are on special, and there are periods of pervasive, persistent specialness.

Bonds that are predictably on special in the repo market are more valuable than equivalent bonds that are not, since special bonds can be used as collateral to borrow at cheaper rates (Duffie 1996). Specialness thus presents an opportunity for the government to increase the supply of scarce bonds, improving their liquidity while capturing an advantageous funding rate. Moreover, increasing the supply of scarce bonds would have knock-on benefits for other securities. For example, a benchmark that is persistently on special could create distortions in the relative pricing of other products, such as derivatives, provincial bonds, or corporate bonds, which are typically issued with prices that reference the benchmark bond.

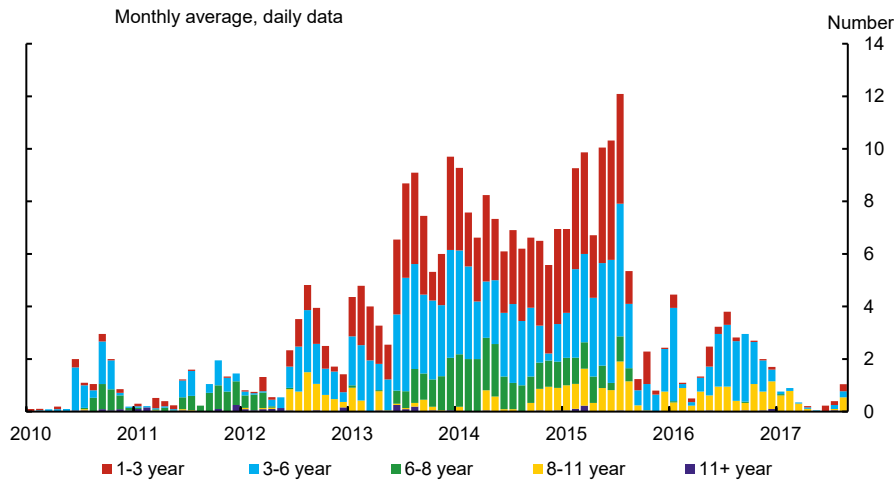
To temporarily support the liquidity of GoC bonds and reduce the distortions created by specialness, the Bank of Canada implemented a securities-lending program in 2002.⁹ The Bank intervenes in the overnight repo market by lending some of the GoC bonds on its balance sheet when the special repo rate falls below certain thresholds. Bulusu (2018) finds that these operations are generally effective in reducing the special repo rate of these bonds. However, Bulusu (2018) also shows that, given the design of the operations, the securities-lending program does not prevent GoC bonds from being persistently on special. Indeed, several GoC bonds were persistently on special between 2013 and 2015, despite regular securities-lending operations conducted by the Bank of Canada (**Chart 4**).

Therefore, we propose to permanently increase the supply of bonds that are on special—this could be called a “special reopening.” The operation would decrease the cost of issuance in two ways. First, since a special rate is cheaper than the market rate of interest, whenever the government succeeds in issuing debt at the special rate, it is obtaining a lower cost of funding. Second, by reopening issues, the government ensures that its issues are consistently liquid throughout their lifetime, which increases the value of the bonds and makes them more valuable at auction.

⁸ For a more comprehensive discussion of specialness, see Duffie (1996).

⁹ See [“The Bank of Canada Securities-Lending Program”](#) and the [current terms of the auction](#).

Chart 4: Daily number of Government of Canada bonds on special*



* Bonds on special traded at a repo rate 25 basis points below the Bank of Canada policy rate.
Sources: Bulusu and Gungor (2017), Canadian Depository for Securities, IIROC MTRS and Bank of Canada calculations.

Last observation: August 2017

The proposed operation would assess the specialness of bonds and reopen weekly

The special reopening would work as follows. The Bank of Canada trading desk, on behalf of the Government of Canada, could conduct regular assessments of bond specialness to identify target bonds to reissue. To some degree, the specialness of bonds is predictable.¹⁰ When persistent specialness is anticipated, special reopenings could be planned. When specialness arises unexpectedly, the trading desk would monitor conditions and decide whether a bond's specialness is sufficiently exacerbated and expected to persist. Based on these estimates, a decision could be made whether to use securities-lending operations for temporary specialness or a special reopening for persistent specialness.

A transparent policy would determine the level of specialness that a bond should exhibit to be eligible for this operation. For example, the operation could be conducted for a bond if the Bank has already lent the bond through the Bank's existing lending programs for several consecutive days or if all the bond has been lent already.¹¹ Once a week, using the existing auction procedures, the Bank of Canada, in its role as fiscal agent, would reissue additional quantities of the eligible bonds to the special reopening.

This could be done in two ways. First, the Bank of Canada could issue the bond through a regular auction, meaning that interested eligible participants could bid to purchase the newly reissued

¹⁰ Bulusu and Gungor (2017) show that two- and five-year bonds are most likely to become special when these bonds are close to the end of their benchmark period.

¹¹ Note that only two bonds in the entire history of the Bank of Canada securities-lending operations have reached the limit of 50 per cent of the bonds held on the Bank of Canada's balance sheet.

bonds. The limit to the size of the operations would be the willingness of the government to temporarily increase the total size of its debt program. The increase would be temporary since future issuance could be reduced at the following auctions.¹² Alternatively, the Bank of Canada could conduct a switch operation, covered in detail in the next idea, whereby interested eligible parties would offer off-the-run bonds to the Bank in exchange for the bond on special.

The size of special reopenings would likely be small relative to the overall size of the GoC debt program. As a comparison, the maximum amount of bonds lent by the Bank of Canada securities-lending program was \$1.862 billion in July 2015, less than 0.3 per cent of the total amount of GoC debt outstanding at the time. Further, securities-lending auctions have rarely reached their maximum size.

Questions and answers

Would the operation cause participants to underbid at auction?

Investors might bid less aggressively at ordinary auctions if they anticipate that a special reopening will soon offer more of the bond. This is the law of supply: if a good becomes more plentiful (or is expected to become more plentiful), its price tends to fall. In the case of scarce bonds, this is not an unintended consequence but the intended consequence. The government should be expanding the supply of bonds that are scarce and reducing the supply of bonds that are plentiful. Even if the price of scarce bonds decreases somewhat, the government will still be issuing more debt at a better yield and less debt at a worse yield. In this respect, its strategy is no different from that of the producer of an ordinary good.

Would the operation cause participants to consider gaming behaviour?

Large investors might consider gaming the repo market to induce a special reopening. A large investor could strategically restrict its lending of a new issue to make the issue's lending rate more special, inducing the special reopening desk to issue more. While this could occur, we find it unlikely that an investor would take such a costly action to induce an auction when it has a more direct means, such as the telephone, to communicate a desire for another auction. If a large investor would like to pay a temporarily higher price for additional quantities of an issue it finds scarce, this is what the special reopening is designed to facilitate.

Would the duration of the debt portfolio change substantially?

One impediment to this operation would arise if the operation caused the duration of the debt portfolio to shift substantially from its desired duration. We do not expect special reopenings to be large enough in size to significantly change the government's debt duration. In any case, the government can control the duration of its debt by changing the composition of the bonds it

¹² The exact impact would be a function of the government's debt management strategy (e.g., portfolio duration and benchmark sizes).

issues. If necessary, the government could introduce a provision to reduce the scale or suspend the operation entirely if a special reopening had the effect of moving the duration of the portfolio away from the government's target. This provision would be stated in the special reopenings policy and be based on public data, so that portfolio duration and use of the special reopenings would be predictable for market participants. In addition to managing duration, the government could adjust the gross issuance amounts in subsequent regular bond auctions to maintain a yearly target of borrowing.

How will bonds be identified as persistently on special?

The ability to identify a bond as sufficiently and persistently on special could be a challenge because specials can be temporary and self-correcting. Intervening by changing the amount outstanding might generate additional uncertainty for bondholders. The government would reduce this uncertainty by publishing criteria for a bond's eligibility for a special reopening.

Would settlement conventions have to be changed?

The trade date plus two days ("t+2") is the settlement convention adopted by market participants in Canada for bonds with more than one year until maturity. Since the special reopenings would be for bonds with two or more years until maturity, the operation would require either that the convention be changed or that special instructions be used to handle the same-day settlement of the reopened bonds. Without the same-day settlement, the impact on the special spread would be smaller, thus reducing the value of the operation. Technically, same-day settlement is feasible for any type of security. For example, overnight GC repo settles on the same day regardless of the securities being used to collateralize the loans.

2. Operate an active switch desk

A second tactical approach to improve secondary market liquidity would be for the government to enhance its existing switch program. In a switch operation, an issuer (in this case the government) issues new quantities of an already-issued bond in exchange for old quantities of other outstanding bonds. The government then retires the quantities of old bonds received. The switch operations would be designed to be duration neutral. In recent years, switch operations have been performed once or twice a year on GoC bonds in the 30-year sector.¹³ Essentially, we propose to greatly extend the frequency and scope of these switch operations.

Specifically, we propose the creation of an active switch desk authorized to conduct regular and frequent switch operations (e.g., once a week) and for all the benchmark sectors, not just the 30-year sector. The switch desk would purchase quantities of off-benchmark bonds, retire the purchased quantities and issue the benchmark (or building benchmark) bond in the targeted sector. The switch desk could operate via open auctions announced in advance. As with current

¹³ Government securities distributors and customers are eligible to participate in these operations. See "[Standard Terms for Switch Operations of Government of Canada Marketable Bonds](#)" for more details.

switch operations, the desk would trade only on terms favourable to the Government of Canada and its debt management objectives, and thus it could collect fees on a cost-recovery basis (to cover technology and labour) or to adjust for the balance-sheet impact of the switch.

The switch desk would substantially improve liquidity

The objective of a switch desk is to ensure an easy exit from off-benchmark issues, enhancing liquidity for these bonds, and to concentrate debt outstanding in benchmark issues, which are the most liquid. These operations would improve liquidity by enabling market participants holding off-benchmark government bonds to transform them into benchmark government bonds with a similar duration. This would create a valuable flexibility and attract investors. It would concentrate debt outstanding in liquid securities, rendering the same debt outstanding more tradable. And it would improve the liquidity of the less-liquid bonds, since it would create a “standing buyer” always willing to take less-liquid bonds in exchange for a better issue. The standing buyer would assure any market maker that it can exit a position after accepting a client’s offer to sell a security, because it could exchange the bond directly at the switch operation for a different bond that is easier to trade, rather than searching for a counterparty. It is likely the gains would be substantial. Switch operations at the Bank of Canada are consistently oversubscribed.

The switch desk is not a new idea and is an extension of existing operations

Many jurisdictions do periodic bond switches. The UK Debt Management Office, the Australian Office of Financial Management, the Dutch State Treasury Agency and the US Department of the Treasury tender switches on an infrequent basis. Similarly, the Bank of Canada performs bond buyback and bond switch operations, acting as the government’s fiscal agent, authorized by the Minister of Finance.¹⁴

In the case of the Bank of Canada, the switch operation is known as the bond buyback on a switch basis. The program transacts around twice a year with specific terms on the eligible bonds, the size and the pricing. A typical operation of the program is to open an auction to switch any bond on a list of four or five off-benchmark bonds for a long-term benchmark bond. Recently, the program has confined itself to accepting one of several GoC bonds at terms from 11 to 23 years for some new quantity of the on-the-run 30-year GoC bond. It does not offer to reissue more than one bond at a time, and it is required to be duration neutral. Finally, the program does not charge a fee, whereas we propose the switch desk collect fees to pay for its more frequent operations.

The Bank of Canada also conducts a weekly Cash Management Bond Buyback operation with the objective of helping the government manage its cash balances by reducing the size of principal

¹⁴ More information on Bank of Canada bond operations can be found on the [Bank of Canada website](#).

payments at the maturity of the bonds. Though this is a different sort of program, it is worth noting that the operation improves the liquidity of bonds as they approach maturity. In addition, until 2012, the Bank also conducted a bond buyback on a cash basis as part of the Regular Bond Buyback Program. These operations targeted illiquid high-coupon bonds and off-the-run issues, and the main objective was to increase liquidity.

The desk would be governed by multiple stakeholders

The desk would be active, so it would require a chain of governance to design and modify its mandate, including senior management at the Department of Finance Canada and at the Bank of Canada, the government's fiscal agent. The governance framework should balance the oversight of the program with the need to maintain its flexibility and responsiveness. The mandate should include details such as the permissible size and frequency of purchases, the bonds or areas of the yield curve to target and the fee structure.

The desk could conduct only switches that are roughly duration neutral

The switch desk would implement the switch operations in line with the government's debt strategy and the specific terms of the operation. This could restrict the desk to switches that have a small or no impact on the duration of the debt portfolio. Under a "tight" version, the government would never engage in switches that significantly alter the duration of the bond portfolio. Under a "looser" version, the desk could engage in switches that alter the duration of the debt portfolio if the alteration is deemed favourable to the government.

One way to operationalize a switch desk is to restrict the switches to term buckets. The desk could switch a bond only to the benchmark of the nearest term. For example, in exchange for a novel issue of the five-year benchmark, the desk could require receipt of a bond with a term to maturity between four and seven years. This mandate follows the tradition of the mandate used in the Bank of Canada's existing switch operations.

Questions and answers

Could this desk dry up liquidity for unpopular off-benchmark bonds?

It is possible that participants would exchange so much of an unpopular bond that its outstanding stock would become small.¹⁵ Such a bond would become scarce and difficult to purchase on the secondary market. (This failure is limited to purchases, as potential sellers will always find a standing buyer in the switch desk.) An investor with a narrow desire to receive a large payment on the unpopular bond's maturity date might fail to find the corresponding bond for purchase. Although this outcome would be bad for an investor with this specific hypothetical need, it is clearly better for the whole market, since the bond was unpopular, and, accordingly, most of its

¹⁵ Indeed, one hypothetical outcome of the switch desk is that most of the debt outstanding "rolls over" into the next benchmark bond after the benchmark is declared.

outstanding stock was switched for the benchmark. The future liquidity of any quantity of GoC debt is expected to be much higher under the switch desk.

If the risk of isolating a small investor clientele were unacceptable, the mandate of the switch desk could disallow switching of any bond that is on special in the repo market. Or, our second idea could be combined with our first idea, the reopening of special bonds, which would increase quantities of scarce bonds at rates favourable to the government. Finally, if the switch desk were successful, another way to address this outcome would be to allow switching *out* of benchmarks (on a basis favourable to the government) rather than simply *in* to benchmarks.

Don't bond repurchases appear as losses in the government's financial statements?

Yes. Under current accounting practice, the repurchase of debt appears as an accounting "loss" because debt is repurchased at its market value, whereas, at issuance, the value was recorded at its par value. The market value of a bond rises over time, so certain repurchases could occur at prices that are greater than par, thus appearing as losses.¹⁶ While the accounting loss is merely an appearance, since the market value of the benchmark bond is higher (and would be a necessary condition for the desk to trade), the economic gain appears in the accounting only slowly over time as the price of the purchased bond amortizes. To adequately implement a more frequent switch desk would require the government to tolerate the temporary accounting implications of this more active management of its debt portfolio or to develop another way to implement the switch than an outright purchase and sale.

Doesn't the market already alleviate the problem of illiquidity in off-the-run bonds?

Yes, but the solution carries its own costs. The market alleviates the illiquidity of bonds through securities-financing transactions. Securities financing provides a substitute for selling bonds that are trading at poor prices due to illiquidity. Instead of selling the bonds, a financial participant can pledge those bonds as collateral to obtain a loan of cash and then use the cash for transactions. However, this expands the participant's balance sheet and requires interest payments, so it is not economically equivalent to selling the bond.

There are efficiency gains to using switches to alleviate illiquidity rather than securities financing. Financing transactions require interest payments, the economic value of which is paid to intermediaries. Financing also creates counterparty risk and hence requires capital and margining, which are also costly. In addition, there are transaction costs in the bid-ask spread in

¹⁶ The government accounts for debt at par value to express its intention of holding its debt to maturity. If instead it were to account for its debt at market value, changes in interest rates would make the size of the national debt fluctuate significantly. The government will record an expense (gain) for bonds purchased at a premium (discount) on the secondary market. If interest rates are increasing over time, bonds will tend to trade at a discount to their par value, and the government will record a net gain. However, in a declining interest rate environment, bond prices will trade at a premium, and the government will record an expense.

the securities-financing market. The government would collect the economic equivalent of these payments by fixing the problem of its illiquid issues directly.

Could this desk be perceived as conducting monetary policy?

The operations of the desk could potentially be perceived to be associated with monetary policy. As with the Bank of Canada's other operations, it would need to be clear to market participants that the desk's operations are performed under the Bank's mandate to be the government's fiscal agent and not under its mandate to conduct monetary policy. To keep the switch operations at arm's length from monetary policy, direct management of the desk should be exercised by the Bank's Funds Management and Banking Department and not by a department with a monetary policy mandate.

3. Streamline the payments in the debt portfolio

The third idea is strategic as opposed to tactical, since it involves a redesign of the debt portfolio as a whole, rather than a policy of modifying its allocations on the margin. The third idea is to streamline the portfolio of GoC securities by eliminating coupon-bearing bonds and by committing to a simpler and fixed maturity schedule. These two changes would improve the liquidity of GoC bonds because they would concentrate the debt outstanding in a smaller group of securities that are also fungible, which would enable old bonds with the same payoffs as benchmark bonds to share the liquidity benefit of benchmarks.

The Government of Canada relies mostly on two types of securities to obtain funding: T-bills and fixed-rate coupon bonds. T-bills are short-term funding instruments that promise a single maturity payment. Two bills with the same maturity date are typically (though not always) fungible, so when the government desires increased funding at the term of some existing bill, it often reopens the bill. In contrast to bills, GoC bonds promise not only a maturity payment but also a series of coupons paid semi-annually, so GoC bonds maturing on the same date are typically not fungible, and the government does not typically reopen bonds after the building benchmark period. Our third proposal, essentially, is to make bonds more like bills.

Each GoC bond is issued with a distinct coupon rate. In practice, the coupon rate is set to the nearest 0.25-percentage-point increment below the average yield at the first auction for the bond (with a lower bound of 0.25 per cent), resulting in a variety of coupon rates. The presence of different coupon rates often creates large differences in price and interest rate risk between bonds maturing at similar dates, making otherwise similar bonds difficult to compare and use as substitutes. We argue that these differences are unnecessary and cause fragmentation, which contributes to illiquidity.

Moreover, the low interest rate environment has reduced the importance of coupon payments. When GoC bonds yielded 10 per cent (more than 20 years ago), the coupon payments on a

10-year bond constituted over 61 per cent of its present discounted value. If many economists are correct that economic growth will average 2 per cent a year and inflation expectations remain anchored at the current 2 per cent target for monetary policy, then interest rates are unlikely to be as high as 10 per cent. Today, for a 10-year 1 per cent coupon bond with a yield of 1 per cent, coupons account for less than 10 per cent of the value of the bond, with the remainder of the value being the principal payment at maturity. For example, as at May 31, 2017, the present value of nominal GoC bonds was \$543 billion, while coupon payments were worth \$100 billion.¹⁷ This means that investors who desire only a regular stream of payments are not well-served by coupon bonds because most of the purchase price of a bond derives from the principal repayment.

Streamlining the issuance of Government of Canada bonds and bills

To streamline the issuance of GoC bonds and bills, we propose to replace the current bond portfolio with a regular issuance series of zero-coupon bonds that have maturity dates strictly at fixed intervals. This set of bonds would allow investors to tailor their investments in government bonds to their investment needs. For example, investors who prefer annual payments to the biannual payments paid by coupon-bearing bonds could purchase quantities of one bond per year; investors who seek one large payment at a specific time could buy only that bond; investors seeking a steady stream of payments could buy all the bonds in the series maturing during the desired period.

Under the proposed zero-coupon bond structure, issuance would occur on a regular, predetermined schedule designed so that maturity dates coincide. The outcome of this strategy would be that different bonds with the same maturity date would no longer be distinct securities and would therefore trade at the same price. In time, an old 10-year bond would become equivalent to a freshly issued five-year bond. Operationally, the 10-year GoC bond could be issued to mature in June, and five-year bonds could be issued to mature in June and December. Five years after the issuance of the 10-year bond, it would have five years remaining to maturity, and therefore its maturity date would equal the maturity date of any five-year bonds being issued. Instead of issuing a new five-year bond, the government would reopen the existing 10-year bond.

Older bonds would therefore trade at equivalent prices to newer bonds, rather than trading at a discount due to their lower liquidity. The increased fungibility would improve liquidity and would make bonds more valuable at issuance because they would repeatedly enter periods of benchmark status rather than being neglected after one benchmarking. This is already how the issuance of T-bills is structured; again, the idea is to make bonds like bills in this respect.

¹⁷ These values are obtained by discounting the coupon and principal payments using a fitted Svensson (1994) curve.

Our idea would potentially reduce the absolute number of GoC securities outstanding and increase their size. Fleming (2002), looking at the US Treasury bill market, finds that fungibility increases securities prices, and most of the literature finds a small but positive effect of issue size in bond markets (Houweling, Mentink and Vorst 2005).

Here is a hypothetical issuance schedule. Long bonds (30-year) could mature every three years, 10-year bonds every year, 5-year bonds twice a year, and 2-year bonds four times a year. Then, the number of nominal GoC bonds outstanding would decrease from the current 44 to 26 (excluding the 50-year ultra-long bond).¹⁸ This maturity structure would also reduce the number of distinct T-bills by four (from 21 to 16), given that the maturity dates of these four would coincide with those of longer-term bonds.¹⁹ This idea would thus halve the number of GoC securities outstanding.

As of November 1, 2017, there were 37 distinct payment dates for coupon or principal payments of outstanding bonds between November 1, 2018, and November 1, 2027 (**Chart 5**). Under the proposed schedule, these payments would be consolidated to only 15 payment dates (**Chart 6**).²⁰ This new structure would distribute the same amount of payments (roughly \$410 billion) in the same period, but in much larger increments.

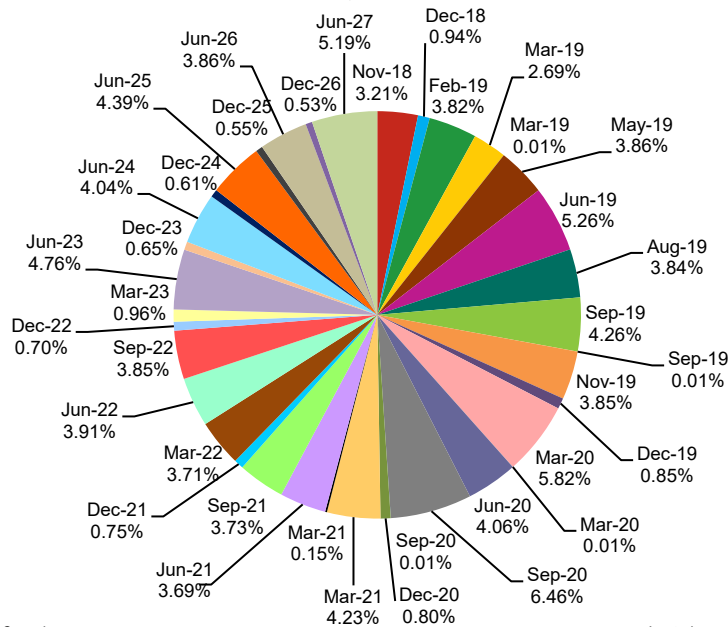
¹⁸ Assuming the current issuance schedule, the number of GoC nominal bonds outstanding will decrease to 39 over time. The number of T-bills outstanding would not change.

¹⁹ The issuance schedule for T-bills would have to be adjusted marginally. In recent years, T-bills have been issued with maturity dates every 14 days out to six months and every 28 days between six months and one year from the current date.

²⁰ For the purpose of this chart, payments under the existing structure were consolidated to the nearest payment date under the proposed schedule.

Chart 5: The current Government of Canada bonds payment schedule is complex

Share of nominal coupon and principal payments between November 1, 2018, and November 1, 2027

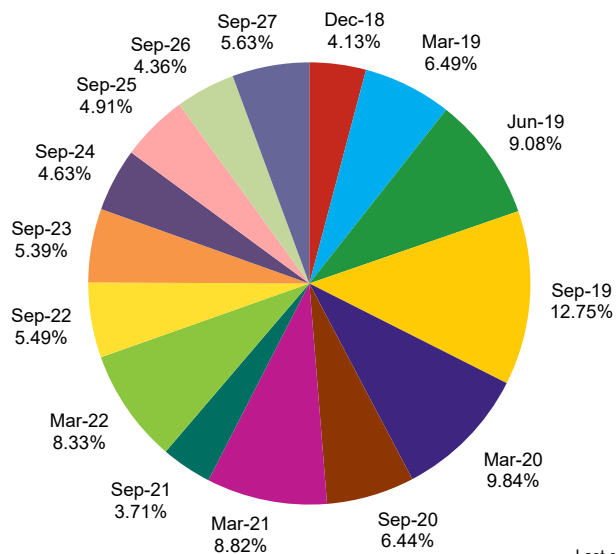


Source: Bank of Canada

Last observation: October 31, 2017

Chart 6: Streamlined Government of Canada bond payments

Share of payments between November 1, 2018, and November 1, 2027



Source: Bank of Canada

Last observation: October 31, 2017

Depending on the preferences or fiscal situation of the Government of Canada, this structure could be made “sparser” or “denser” (with fewer or more maturity dates for bonds). A cautious approach to implementation would be to begin with shorter-maturity bonds, starting with two-year bonds. This could be done by gradually extending the tenor of the T-bill program. A less cautious and more accelerated approach to implementation could be accomplished by treating

GoC strip bonds as equivalent and fungible with new issues. For example, a “new” 10-year bond could be issued as a “reopening” of a 30-year bond’s coupon strip.

Questions and answers

If this idea is so great, why are investors not trading more strips?

To obtain access to certain fixed payments in a bond, investors can “strip” apart a bond’s payments to create a series of new, separated securities out of each coupon payment and the principal. Bonds can be easily stripped (and reconstituted) at the settlement facility. The resulting “strip bonds” are bonds like the ones we propose. They have zero coupons and are fungible with other strip bonds that have the same payment date. Yet, so far, strip bonds using GoC payments have struggled for liquidity. They are infrequently traded, and, except for certain 30-year strips, they have low amounts outstanding.

It is a subject of debate why strips are not more popular in Canada. We argue that, at the very least, they lack three advantages possessed by traditional bonds. First, in Canada, strips are issued in quantities too small to attract much liquidity; second, the dates of issuance are unplanned and continuous rather than concentrated in a large auction, so strips do not receive much attention from securities distributors; and third, strips are never the locus of a coordination mechanism such as benchmarking, which is a kick-starter for liquidity. In contrast, the zero-coupon bonds we propose would be issued in large quantities, concentrated in periodic and planned auctions and designated as benchmarks (and not only after issuance but repeatedly throughout their lifetimes).

Wouldn’t this idea increase rollover risk?

Assuming a constant fiscal position for the Government of Canada, concentrating the existing debt into fewer securities would lead to larger payments at the maturity dates of the fewer bonds. This could increase the difficulties associated with large principal payments because they require the government to engage in cash management through securities auctions in advance of these payments. It is conceivable these large temporary cash balances may have distortionary effects on Canadian money markets. However, the government already manages large payments, and their size has grown in recent years without significant difficulties.

If concentrating issuance in 26 bonds and 16 T-bills made payments too large, the trouble could be alleviated by distributing issuance over more GoC bonds and adopting a “denser” schedule for bond maturities. This would decrease some of the liquidity benefits of concentrating issuance in fewer bonds. However, in our opinion, the potential liquidity benefits from increased fungibility are substantial. Even if the number of bonds outstanding were to remain unchanged from what it is now, fungibility would allow old bonds to regain benchmark status, substantially increasing the amount of time during a bond’s life that it is liquid.

Wouldn't this idea have large tax implications?

Zero-coupon bonds are essentially the same as coupon bonds with respect to taxes. Interest is earned as it is accrued and not as it is paid. However, because interest income would be taxed without a matching cash flow, the new structure may be unattractive to liquidity-constrained taxable investors (low-wealth retail). These could be forced to sell bonds to pay taxes. Tax issues such as this would be confined to a small group of investors. The lion's share of the holdings is with non-taxable institutional investors, and for retail investors, many tax-free investment vehicles are available.

Would accounting rules cause the debt to look larger than it is?

Currently, the figures for Government of Canada debt outstanding are reported at par value. However, under this new approach, bonds would be issued at a discount to their par value (assuming a positive interest rate); this would lead par values to overstate the debt outstanding. This is the case even if the current and proposed frameworks are economically equivalent. The discount at which bonds are issued would be more important for longer-term bonds or in a higher interest rate environment. This could pose a communications challenge for the government during the transition, when the par value of debt could appear higher than its market value. To alleviate this challenge, we propose that the government could report the market value of its debt alongside its par value during the transition. If it implemented this idea, it should also extensively explain to the public the implication of this new design for reported debt levels.

Would streamlining change the role of intermediaries?

Streamlining would not fundamentally change the nature of intermediation in the market for GoC bonds. Bonds would continue to be issued at auction, only at a discount to par value. They would also become more fungible. This is in all respects like the functioning of the GoC T-bill market, which is perhaps even more liquid than the market for bonds.

Market makers would maintain their role in the secondary market. Given the projected increase in the liquidity of bonds after losing benchmark status, bond prices might become slightly less volatile; this could modestly reduce the risk of holding these bonds on their balance sheet. Finally, it is possible that some investors might desire a custom set of payments from the government rather than a single bond; as well, they might adjust these positions over time. This might contribute a slight increase in the number of bonds traded, although the cost of trading might decrease.

4. Centre the debt portfolio around perpetuities

So far, we have focused on the disadvantages of fragmentation, which leaves most of the outstanding debt sequestered in the less-liquid and lower-priced off-benchmark bonds. While our focus has been on the disadvantages for liquidity and therefore the cost of issuance, another disadvantage of the current system is the substantial rollover risk present whenever bonds of

considerable size mature and need to be replaced. Before a bond matures, the government must issue new debt to finance the payment of the old. Rollover risk is the risk that the cost of financing these replacements is unexpectedly high or that the government fails to raise sufficient amounts to cover payments.

Our fourth idea, which is our second strategic idea, addresses the issues of fragmentation, illiquidity and rollover risk simultaneously. Drawing on a proposal by Cochrane (2015), this idea is to replace most of the government's bonds and bills with three perpetuities: fixed-income securities that never mature and pay coupons perpetually. We argue that the small number of remaining securities would be much more liquid than current GoC bonds. Further, perpetuities would reduce rollover risk because they never mature and hence do not need to be rolled over.

As in Cochrane's (2015) proposal, the Government of Canada would issue three perpetuities:

1. A **floating-rate perpetuity**, which would have a floating rate but a fixed value.

The rate would be set at the central bank's monetary policy target rate and paid frequently, such as monthly (or even daily). Since the rate is floating, the perpetuity would have a very short duration, like a bill, and could therefore serve to replace the government's bill portfolio. The fixed value would be maintained at an arbitrary level, say, \$1,000 (this is discussed in greater detail below).

2. A **fixed-rate perpetuity**, which would have a fixed rate but a floating value.

The fixed-rate perpetuity would pay a fixed coupon, say \$1,000 per month, forever. Because this perpetuity has a fixed rate, it would have a long duration. (For example, at a flat yield curve at 2 per cent interest, the duration of the perpetuity would be around 50 years; even at 5 per cent, it would be around 20 years.) It could therefore serve as a replacement for most of the government's bond portfolio. Since the rate is fixed, market forces would determine the price of the fixed-rate perpetuity.

3. An **inflation-linked perpetuity**.

Last, the inflation-linked perpetuity can be envisioned as a replacement for the government's inflation-linked bonds (the Real Return Bonds). It would pay coupons of an inflation measure multiplied by an arbitrary amount, say \$1,000, forever. As with the fixed-rate security, market forces would determine the value of the security. Since the security would track inflation, this perpetuity would provide holders with a direct hedge against inflation.

Under a perpetuity system, the process to change the quantity of debt outstanding would be simple. To borrow, the government would reopen an existing perpetuity by auctioning it, in the same way it currently conducts auctions on bonds after they are initially issued. To reduce its

debt, the government would buy back the perpetuities on the open the market or conduct reverse auctions like those currently used for bond buyback operations.

Perpetuities would increase liquidity

At the end of 2017, Canadian government debt was fragmented across 74 distinct securities. If the government instead consolidated its debt into a small number of securities, it would promote overall liquidity in its market due to the liquidity externality (Pagano 1989). Highly liquid securities are more valuable to their holders, so consolidation of debt into a small number of securities would reduce funding costs for the Government of Canada.

For example, were the government to issue only three perpetuities, they would be some of the largest securities globally by amount outstanding. If the government made this switch without altering the distribution of debt, the outstanding amounts of floating-rate, fixed-rate and inflation-linked perpetuities would be \$120 billion, \$512 billion and \$46 billion, respectively, and their duration would easily be more than 17 years (assuming long-term interest rates in a range of 0 to 5 per cent). As a comparison, the largest publicly traded company in Canada, Royal Bank of Canada, had a total market capitalization of \$149 billion at the end of 2017; the largest outstanding US Treasury bond had an issue size of \$45 billion. GoC perpetuities would therefore rank as some of the world's largest debt securities. Because of their size, these perpetuities would likely trade on electronic platforms, where they would be priced continuously and transparently, which is not currently the case for GoC bonds. Electronic trading would make them even more liquid, which would further decrease the cost of issuance.

Perpetuity cash flows would be like those of the existing debt portfolio

Perpetuities are unconventional, but a switch to perpetuities would not change much about the cash flows coming out of the government. The payments the Government of Canada makes on its bonds already look like the payment flow on a fixed-rate perpetuity, as the amounts of the payments are close to a constant proportion of debt held in bonds.

Chart 7: Payments on bonds compared to debt held in GoC nominal bonds, 2000–16

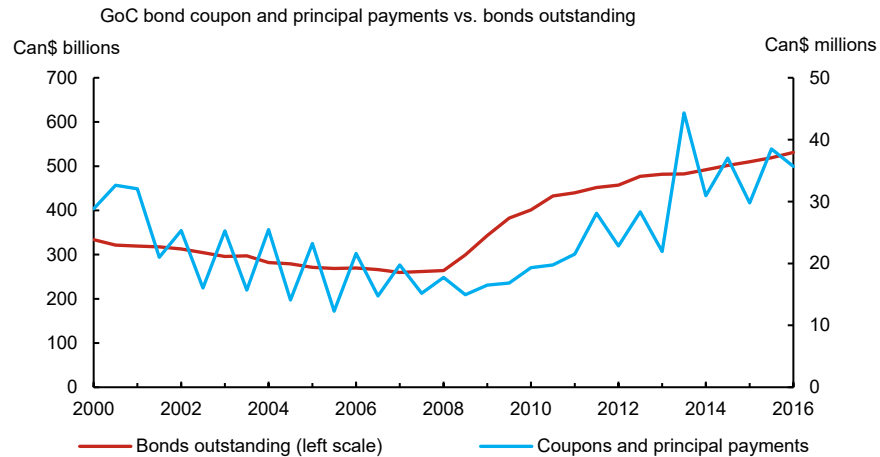


Chart 7 shows the Government of Canada’s interest and principal payments on its bonds compared with the amount of GoC nominal bonds outstanding. The payments in the chart are aggregated semi-annually to compare them with the twice-yearly payments that would be made by a perpetuity. In the chart, cash outflows track the GoC debt in nominal bonds almost exactly, except in 2008, when five-year bonds of large size were issued in response to the global financial crisis; those bonds expired in 2013. Even if the bond portfolio were built entirely on perpetuities, little would change in terms of semi-annual cash flows.

Perpetuities could be issued alongside traditional debt securities

It is not necessary to replace the debt portfolio completely with perpetuities. The government could concentrate much of the debt outstanding in ultra-liquid securities (particularly in the floating-rate perpetuity, as there is high demand for money-like securities), while continuing to issue a limited number of term securities that are streamlined, as in Section 3.3. If there were strong clientele effects that simply must be addressed by the issuer, as argued by Duffie (2015), this would be a flexible and preferable system.

For example, the government could start a trial program by issuing some quantity of fixed-rate and floating-rate perpetuities in place of future bill and bond issuance. The perpetuities could be made callable (with a strike well out of the money) in case the government decides to withdraw from the trial but certain investors refuse to sell back the perpetuities. The switch desk idea, described in Section 3.2, could be used to support the perpetuity by allowing movement to and from the perpetuity and the benchmark bond of closest duration. This would allow the government to gauge demand for the program and allow market participants to give counsel and advice on its development. After a trial period, the government could work toward an end-state target portfolio. The target could be, for example, a portfolio of 23 securities: the three

perpetuities and a series of 10-year zero-coupon bonds maturing semi-annually (thus, 20 more bonds), issued for the sake of term clienteles.

Questions and answers

Would just three perpetuities leave most clienteles unserved?

In our opinion, no, although the government would cease to serve them directly. Intermediaries would have a new role serving investors who desire payments with some maturity, duration or timing. Intermediaries can replicate any cash-flow structure desired by holding an appropriate portfolio of perpetuities or perpetuity derivatives and rebalancing it occasionally. As some clients are unable to do this or would find it too costly, intermediaries could repackage the fixed payments of perpetuities to meet the demand of clienteles. We see a competitive system of intermediaries who are paid to serve clients as a better way to address clienteles.

Intermediaries already do this today when, for example, they sell derivatives to clients and simultaneously hedge in the underlying market—in effect, transmuting cash flows. It is unlikely that this process would be costly since the replicating strategies would involve trading in the ultra-liquid markets for the underlying perpetuities. Further, since the size of the outstanding quantity of a perpetuity would be substantially larger than a bond, it would be more difficult for intermediaries to exercise market power by owning a large share of the security. Counterparty risk could be mitigated by manufacturing cash flows through the settlement authority, just as strips are manufactured today.

Still, this may not be enough if clienteles are as strong as some suspect. Duffie (2015, 1) argues that there are sizable clienteles who simply have narrow and inelastic demand for specific terms due to “hedging, speculation, cash management and collateral applications.” The question is therefore empirical. How many clienteles are there, and are they so narrow and inelastic? So far, the literature has identified short- and long-duration clienteles (Greenwood, Hanson and Stein 2010; Krishnamurthy and Vissing-Jorgensen 2012), which Duffie (2015) concedes would be well served by a three-perpetuity system. But there could be many more, and with more narrow preferences (e.g., specifically for a five-year bond).

Under a perpetuity system, such inelastic clienteles would have no choice but to synthesize “term” securities out of perpetuities. (One way to do this would be to strip the perpetuity into a finite series of coupon payments and a forward claim on a perpetuity beginning after the first series of payments completes.) If there truly are many large clienteles with such narrow demands, they would synthesize many term securities. In such a case, the government might as well issue the requisite term securities so that it can easily address any scarcities that arise. The portfolio of 23 securities, discussed above, could be issued for the sake of term clienteles at 0 to 10 years.

How would the government manage its interest rate risk?

Any government debt portfolio carries risks associated with changing interest rates. For example, for a portfolio of perpetuities, increasing interest rates will increase the payments of the floating-rate coupons, as happens currently with T-bills. The way to manage this risk using perpetuities is to adjust the duration of the portfolio by repurchasing the floating-rate securities using funds obtained by the issuance of new fixed-rate securities (and vice versa). This is similar to the way duration is managed currently by shifting debt between T-bills and bonds of various maturities.

The duration of the fixed-rate perpetuities is more dependent on the level and slope of the yield curve than shorter-term bonds are. In this respect, fixed-rate perpetuities are much like long-term bonds, particularly those with terms to maturity of 10 years and greater. In a volatile interest rate environment, the government would have to more frequently issue and withdraw perpetuities than it would have to adjust quantities in the current bond portfolio.

The government could also adjust its duration by entering swaps. At first glance, a drawback of using swaps to manage duration is that it exposes the government to counterparty risk, since these swaps would be contracts with private financial institutions. While the government would be exposed to counterparty risk, there are many widely used and well-understood tools to mitigate the risk, such as variation margin and central clearing. But more to the point, it should be recognized that the government is already exposed to counterparty risk since its debt-issuance strategy has rollover risk. When debt rolls over, the government relies on private financial institutions to buy its securities and to distribute them to market participants. If any of these counterparties defaults from one issuance to the next, or otherwise becomes much less able to bid in primary auctions, the terms on which the government can issue debt become less favourable. This is the same risk that is present with issuing perpetuities.

How would the value of the floating-rate security be maintained?

To fix the value of the floating-rate perpetuity at some arbitrary unit value, say, \$1,000, the government would need a mechanism to determine the coupon rate at which the market values the security at \$1,000. A simple way is to fix the coupon to the monetary policy target. Then, just as the Bank of Canada borrows and lends securities overnight using the corridor system to enforce the overnight rate, it could borrow and lend floating-rate perpetuities for prices in some corridor around \$1,000. The central bank could hold a reserve of floating-rate perpetuities in its lending facility to conduct operations.

Another possibility would be to create or redeem floating-rate perpetuities at a price of \$1,000 in exchange for fixed-rate perpetuities. This would require a form of a switch desk like that discussed in Section 2, and it represents a synergy among the ideas in this document. It could also be combined with the first solution of making the floating rate equal to the monetary policy target.

How would we compute the yield curve?

The yield curve is currently derived using prices across the spectrum of maturities issued by the government. It serves as the reference for the fixed-income market in Canada by providing a curve against which other fixed-income securities are priced. The yield curve is also a key market indicator of the future path of interest rates.

A yield curve is still computable if the government issues perpetuities. Market participants would be able to derive points on the yield curve from overnight indexed swaps, interest rate swaps and other derivatives. In Europe and other jurisdictions, the swap curve is already the benchmark curve against which other fixed-income instruments are compared (Remolona and Wooldridge 2003). Swaps can be created at any duration and can therefore span the maturity spectrum needed to construct a yield curve.

How would an issuer of perpetuities deal with a credit event?

A government that had issued perpetuities and then fell in distress would be in a better position than one using a traditional funding portfolio because perpetuities have lower rollover risk. Low rollover risk is one of the selling points of the perpetuity. However, it is unlikely a distressed issuer would issue more of the floating-rate perpetuity, as it would be heavily discounted due to its long duration. In a sense, an issuer should issue perpetuities when it can, since after a credit event, it will no longer be economical to issue securities with such low rollover risk. Instead, it will have to shift its issuance toward shorter-term traditional bonds.

How would perpetuities be accounted if they have no face value?

Since perpetuities do not mature, their book value cannot be accounted like a typical debt security. The book value of a debt security is typically the face value, which is the amount returned at maturity. There is no face value per se for a perpetuity since it does not mature. The solution is to use the amount borrowed at issuance as the book value of the perpetuity, which is the same as the face value of a bond.

Conclusion

In this paper, we have outlined four alternative ways for the Government of Canada to improve the secondary market liquidity of its bonds through changes in its debt management. In our view, increasing liquidity will have benefits throughout the financial system, both for private investors and for the government itself. Given the potential benefits, we hope that our ideas will generate discussions among researchers, policy-makers and market participants in Canada and in other jurisdictions. Our four ideas will not be implementable without further research and careful consideration of the operational implications, but we believe that in each case the hurdles can be overcome.

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