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**Buying Back Government Bonds:
Mechanics and Other Considerations**

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The analysis and conclusions offered in this working paper do not represent the official views of the Bank of Canada or the Department of Finance. Rather, they are meant to provide market participants and other interested parties with some background information on issues under discussion to stimulate debate on these issues. Feedback from interested parties is welcome.

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Abstract

With the elimination of the federal deficit, the Bank of Canada, the Department of Finance, and financial market participants are examining ways to manage the reduction in the stock of marketable debt. This paper summarizes three different methods — reverse auction, over-the-counter purchases, and conversions — that could be used to buy back Government of Canada bonds before they mature. The relation between the size of bond benchmark issues and the liquidity of the government securities market is examined. It is argued that the consolidation of bond issues, as well as the maintenance of large benchmarks, tends to enhance market liquidity. Thus, in an environment where the government's marketable debt is shrinking, purchasing off-the-run bonds ahead of maturity and the maintenance of large bond benchmarks helps maintain, and possibly enhances, the liquidity of a government securities market. In discussing the buy-back mechanics, reverse auctions are shown to be similar to conventional bond auctions except that tenders are made for the sale rather than the purchase of securities. Following this, the paper examines two over-the-counter repurchase methods. The first is similar to the coupon-pass approach used by the Federal Reserve. The second is simply direct over-the-counter purchases in the secondary market. Finally, the mechanics that underlie conversions (switches) are shown to be similar to reverse auctions or coupon passes except that the investors receive a liquid bond issue in return for tendering the less-liquid issue.

Résumé

Le déficit du gouvernement fédéral étant maintenant chose du passé, la Banque du Canada, le ministère des Finances et les participants aux marchés financiers ont commencé à étudier divers moyens de gérer la réduction de la dette constituée de titres négociables. L'auteur présente brièvement trois méthodes différentes : l'adjudication à l'envers, l'achat de titres hors bourse et la conversion de titres que le gouvernement canadien pourrait utiliser pour racheter ses obligations avant l'échéance. Dans un premier temps, il examine la relation entre la taille des émissions obligataires de référence et la liquidité du marché des titres d'État. Il fait valoir que le regroupement des émissions obligataires et l'existence d'importantes émissions de référence tendent à améliorer la liquidité du marché. Avec la diminution de la dette publique constituée de titres négociables, le rachat avant l'échéance d'obligations n'appartenant pas aux émissions de référence et le maintien sur le marché d'importantes émissions de référence aideraient à préserver et peut-être à accroître la liquidité du marché des titres d'État. Dans un second temps, l'auteur décrit les modalités techniques de chaque méthode de rachat. La première qu'il examine, soit l'adjudication à l'envers, est analogue à une adjudication ordinaire, sauf que les soumissions portent sur la vente plutôt que sur l'achat de titres. L'auteur passe ensuite en revue deux méthodes de rachat hors bourse. La première s'apparente à un *coupon pass*, opération par laquelle la Réserve fédérale invite les courtiers à présenter des soumissions pour la vente de titres dont l'échéance se trouve à l'intérieur d'une fourchette préétablie. La seconde méthode est simplement l'achat direct de titres sur le marché hors bourse. Enfin, l'auteur montre que les modalités techniques des conversions (ou substitutions de titres) ressemblent pour l'essentiel à celles des adjudications à l'envers et des *coupon pass*, sauf que l'investisseur reçoit des obligations plus liquides que celles dont il offre de se départir.

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1 Introduction

The Department of Finance and the Bank of Canada, as its fiscal agent, work closely with financial market participants in the management of the federal government's debt program. From the government's perspective, maintaining a liquid, well-functioning market in Government of Canada (GoC) securities is a key factor in ensuring that debt-service costs are minimized. It is also of general benefit to other participants in the domestic fixed-income market, since Government of Canada securities are a key benchmark for pricing other fixed-income securities.

With the elimination of the federal deficit, auctions of large amounts of Government of Canada benchmark bonds are difficult to justify solely on the basis of the federal government's financial requirements. Although reducing the amount of new debt issued in tandem with declining borrowing requirements seems reasonable strictly in terms of budgetary or accounting practices, it might not be desirable if the federal government is concerned with the liquidity and integrity of the GoC securities market. More to the point, despite the increase in size of benchmark bonds to \$7-\$10 billion, there have been concerns expressed that, at times, the demand for these securities has been outstripping the supply.¹ Some market participants believe the increasing scarcity (relative to demand) of various benchmark instruments might contribute to increased concentration of post-auction holdings (and the occurrence of squeezes) which, in turn, is assumed to have a detrimental effect on secondary-market liquidity. In order to maintain or enhance the liquidity of the secondary market for government securities, it might be necessary to increase or, at a minimum, maintain the size of the benchmark issues in order to satisfy the demand for these securities and to help ensure that they are widely distributed.

How can a reduction in the amount of marketable Government of Canada debt outstanding be effected without reducing the size of the benchmark issues? The outstanding debt could be reduced by either cutting the frequency of new issues while maintaining (or increasing) the issuance size,² and/or by repurchasing in advance of maturity some less-liquid (off-the-run) issues, while financing these bond purchases through larger (or maintained) new issues of benchmark bonds. This study examines some of the issues related to the latter approach.

The next section discusses the relationship between market liquidity and the size and timing of new bond issuance. This section also reviews the relationship between market liquidity and the level of fragmentation in the stock of outstanding marketable debt. Section 3,

1. The growing demand might be partly the result of the increasing internationalization of government securities trading, the growing use of GoC securities as hedging instruments and collateral (due, in part, to the Bank for International Settlements' zero-risk weighting), and/or to an increased placement of GoC securities with investors that prefer to hold them until maturity. The increased size of benchmark bond issues in recent years mainly occurred in tandem with larger deficits and the government's decision to establish a benchmark bond program, as well as its decision to increase the proportion of fixed-rate debt (bonds) to 2/3 of marketable debt outstanding.
2. Cutting the frequency of new issues would generally imply that there would be longer terms for the benchmark issues in order to allow for several reopenings (e.g., starting a 30-year benchmark at 32 years to increase the size of reopenings and, in the end, the size of the benchmark).

the main focus of the paper, describes two different approaches to repurchasing or buying back bonds before maturity. Section 4 focuses on some issues that are not directly related to the mechanics of either approach. A summary is presented in Section 5.

2 Some Features of Bond Market Liquidity

The management of sovereign debt has long been governed by the underlying principle that debt service costs are likely to be minimized by promoting the development of a liquid, well-functioning market for government securities. In turn, an efficient government securities market is an important element in the transmission of monetary policy to the domestic economy.³ In this section, the relationship between market liquidity and the number of bond issues outstanding/the size of benchmark (“on-the-run”) bond issues is examined.

A liquid market can be defined as one in which trading is immediate, where the immediacy of the trade has little impact on price, and where transaction costs and price fluctuation risks for large trades are small. In an over-the-counter (OTC) dealer market such as a government securities market, secondary market liquidity can be enhanced by minimizing the degree of security fragmentation and by issuing *new* bonds at a relatively low frequency.⁴

A feature of government securities markets is the fragmentation of outstanding issues, each with its unique maturity date. Though dealer markets are better suited to handle security fragmentation than other market structures (such as auction-agency market structures), a high degree of fragmentation does have a negative impact on the dealers’ market-making capacity, since it forces them to hold a larger number of instruments in their inventories. This increases their financing requirements, and adds to their (costly) risk management activities (hedging), which in turn tends to hinder their ability to make markets.⁵ Thus, fragmentation tends to disperse the liquidity or market-making services offered by the dealers over several issues rather than concentrating them on a limited number of securities. Thus, the consolidation of a larger number of outstanding government bond issues into fewer larger issues would improve market liquidity by focusing dealers’ market-making activities, and the market’s

3. As monetary authorities, central banks are interested in promoting efficient interest rate determination (efficient financial markets) because it enables, through price arbitrage, the effects of changes in monetary policy to permeate throughout the economy. Moreover, federal government securities play a key role in the pricing of other fixed-income securities, such as those issued by other levels of government and by private-sector entities. Thus, a well-functioning government debt market can help facilitate the development of active markets for other fixed-income securities.
4. Issuing new bonds at a low frequency implies that the “life cycle” of a bond should be relatively long. The life cycle of a new bond is defined as the period between the first time a bond is issued and the date it is replaced with a bond bearing a different coupon and/or maturity. For example, the life cycle of a 10-year bond in Canada is one year, while the life cycle of a 10-year bond in the United States is three months. Therefore, Canada is said to be issuing new bonds at a lower frequency.
5. There is greater pressure on the dealers’ financing requirements because, all things being equal, the dollar value of a dealer’s inventory of securities will tend to be greater when markets are more fragmented. This stems from the fact that a dealer will tend to hold a larger range of securities when markets are fragmented.

trading activity in general, on fewer instruments.⁶

In relation to government securities markets in other developed countries, the Canadian bond market displays a relatively high degree of fragmentation. Specifically, there are currently 79 different government bonds outstanding, which, in relation to the total amount of debt outstanding, is relatively high compared with other countries such as the United States, Australia, France, Sweden, and the United Kingdom. For example, although Canada's amount of fixed-rate federal government debt outstanding is approximately two-fifths the size of France's, Canada has approximately 60 per cent more bond issues outstanding than France.

The overall liquidity of a securities market depends not only on the microstructure of the market, but also on the tradability or liquidity of the instruments themselves. The latter is influenced by the underlying characteristics or features of the instruments. The liquidity of government securities tends to vary over time. They might initially be actively traded in the secondary market, but can subsequently become less liquid as their characteristics no longer correspond to what investors are looking for. Moreover, an instrument's liquidity depends on its *trading volume* and on its *distribution* among investors and dealers in the secondary market. In turn, its trading volume is positively related to the *amount outstanding* and negatively related to the *time since issuance*.⁷

To understand the relationship between the *amount outstanding* and the *time since issuance*, and trading volume, one must understand the life cycle of an on-the-run bond. Typically, the most recently issued bonds of a benchmark maturity will be the on-the-run issue. The new issue will remain on-the-run from the time of its first auction until it is replaced by the next new issue (and/or until the bond has aged to a point where its maturity no longer corresponds to the desires of the trading community). Conditional on its issue size and the distribution of the issue, the on-the-run bond issue will tend to be the most-liquid or actively traded issue (i.e., the benchmark issue) until it has been replaced.⁸ One should note that for the Government of Canada bond market, the on-the-run bond issue must be reopened on several occasions before it achieves benchmark status. However, the life cycle of the benchmark bond is generally identical in length to the life cycle of the on-the-run bond.

One of main reasons why the benchmark issue is the most liquid is that it is the bond issue that has the greatest *effective supply* (i.e., is in the greatest supply among "*trading market participants*") at that maturity.⁹ Therefore, the larger the size or amount outstanding of

6. See Dattels (1995) for more details on the effects of market fragmentation on market liquidity and on how the primary market might compete with the market makers in providing liquidity.

7. See Amihud and Mendelson (1991), for an empirical study of how liquidity affects the trading price of U.S. treasury securities.

8. Actually, if the time between new issues is long, it is possible that the bond's maturity no longer closely corresponds to that desired by the bond-trading community. In this situation, the bond may no longer be the most actively traded or benchmark bond, even though, technically, it is the on-the-run bond. It is also possible that an old (large) benchmark bond (that has rolled down the yield curve) would more closely correspond to the market's desired bond maturity and that this bond, if there is a sufficient effective supply, is now considered the benchmark.

the issue, the greater the *effective supply* of that issue, and the more actively traded or liquid the bond issue is. Over time, as the benchmark government security becomes seasoned and is placed with buy-and-hold investors, the supply of the benchmark security in the hands of the *trading market participants* diminishes. Thus, the liquidity of the benchmark tends to diminish as the time since its issuance increases. If the supply of the security in the hands of the “trading” market participants diminishes too quickly (e.g., when there is an abnormally large initial demand for the security from the community of buy-and-hold investors), the benchmark security could be *reopened* (i.e., *issued outside the regular quarterly issuance cycle*). This will tend to improve the liquidity of the security since there will be an increase in the supply of the benchmark bond issue in the hands of the traders (trading market participants).¹⁰ However, as touched upon in footnotes 8 and 10, demand for the issue is negatively correlated with its time since issuance. This places a limit on the effectiveness of reopening an issue in increasing its liquidity. As the issue’s maturity moves “too” far from certain “key” maturities, additional supply of the issue (via a reopening) would no longer necessarily increase the liquidity of the issue. Thus, there tends to be a minimum level of fragmentation desired by fixed-income market participants owing to the market participants’ desire to hold key maturities (e.g., in Canada: 2-, 5-, 10-, and 30-year bonds).

On occasion, either at the auction or in the secondary market, holdings of the benchmark bond become concentrated and are not widely held among the *trading market participants*. As mentioned above, the liquidity of the benchmark bond will depend on the distribution of the issue among trading market participants. When the issue is concentrated in the hands of a few market participants, the issue is no longer widely distributed and thus is likely to be less liquid. For example, at the auction, a trader (or a large number of buy-and-hold investors) might accumulate a large proportion of the security, leaving a smaller (than normal) amount of the security in the hands of other traders. In this situation, the bond’s liquidity, during the time it is a benchmark, is likely to be low relative to the just off-the-run or relative to past benchmark issues. Because demand for the security (from other buy-and-hold investors or from legitimate traders) has not had time to diminish, the price of the benchmark is likely to be distorted (i.e., above those of similar maturity), while the market participant holding the concentration of the security extracts monopoly rents from the rest of the investor community.

There are three ways to reduce the possibility of security concentration. First, increasing the size of the issue would make it difficult for any one bidder at an auction (and

9. “Trading market participants” are distinct from the market participant whose only interest is in purchasing a security and then holding it until maturity (buy-and-hold investors). “Trading market participants” are not only dealers, but are also investors who intend on trading the security before its maturity for arbitrage, hedging, speculative, or other reasons. Therefore, the *effective supply* of a bond is defined as the amount outstanding of the issue that is held outside of buy-and-hold portfolios.

10. This is conditional on the maturity of the security not straying “too” far from that desired by the trading market participants in general. Trading market participants will also demand certain securities for hedging. As these securities stray “too” far from key maturities, their usefulness as hedging vehicles diminishes, as does the demand for these instruments from trading market participants. What constitutes a maturity that is “too” far from the desired maturity is difficult to measure *ex ante*. It will depend on the available substitutes (old benchmarks that have rolled down the yield curve) and the investment needs (and views) of market participants.

through the when-issued market) to accumulate a large proportion of the issue. Second, limiting the total percentage winnings of any one bidder in an auction would tend to promote a wider distribution of the bond (although concentration could still occur through secondary market trading). Finally, more of the issue could be put in the hands of the *traders* (via larger issuance, reopenings outside the regular issuance cycle, conversions/switches, or central bank securities lending/selling from its portfolio), thereby lessening the monopoly power of a particular market participant. However, it should be emphasized that issuing government securities outside the regular schedule should be viewed as an extreme measure. This action introduces a moral-hazard problem whereby certain market participants will tend to disregard certain trading risks in anticipation of a reopening outside the regular schedule.

Of course, the tradability of the underlying instrument is also influenced by the overall liquidity of the market. There is a self-enforcing feedback mechanism influencing the liquidity of a security and the overall liquidity of the market. As individual securities traded in the market become more liquid, the liquidity of the market in general is improved. And if regulatory or market microstructure aspects of the market are changed to improve the trading incentives of individual market participants, there will be a positive influence on the trading activity of each security that in turn improves their liquidity.

This part of the paper has focused on ways liquidity in a government securities market can be improved through measures that enhance the tradability of securities such as reopenings, reductions in the level of fragmentation in the government debt stock, and changes in the size, frequency, and distributional characteristics of the primary auctions.¹¹ The conclusion that can be drawn from the discussion is that market liquidity can be promoted through the establishment of a limited number of large benchmark bond issues that are reopened in consecutive auctions over as long a period as possible. This minimizes the degree of security fragmentation in the market (over time, there will be a smaller number of issues outstanding) while the larger size of individual issues will tend to have a direct positive influence on the liquidity of these issues.

In times of large government-funding requirements, the issuance of larger benchmark bonds can be easily accommodated. However, in an environment where a government's borrowing needs are small or contracting, maintaining or increasing the size of the benchmark bond issues can only be accomplished if the extra funds raised via the benchmark bond issuance program (plus perhaps the funds arising from operating surpluses) are used to finance the repurchase in advance of maturity of some of the off-the-run issues. By doing so, the amount of marketable debt outstanding can be reduced while, at the same time, the size of the benchmark bond issues can be maintained or possibly even increased. The repurchase of off-the-run issues has the added advantage of possibly reducing the number of outstanding issues, thus reducing the degree of fragmentation in the government marketable debt stock. The rest of this paper reviews ways that some off-the-run government bonds can be repurchased in advance of maturity.

11. For example, matters dealing with the distribution of bonds at auction are examined in a recent discussion paper [see Bank of Canada (1998)] on the proposed revisions to the auction rules.

3 Retiring Bonds in Advance of Maturity: The Methods

In this section, three different repurchase methods are discussed. The first is the repurchase of outstanding bond issues by *reverse auction*. A reverse auction is conducted in the same manner as a regular (multiple sealed-bid) bond auction except that bidders submit offers to sell a security rather than offers to buy a security. The second method is the outright purchase of bonds in the over-the-counter (OTC) market. This method of debt repurchase can be accomplished in two ways. The first is similar to the outright purchase of Treasury coupon securities by the Federal Reserve, known as a “coupon pass.” The second is to trade directly in the OTC government securities market. The third method involves using what are known as switches or conversions, where one security is submitted as payment for the purchase of another. A more detailed description of each of these methods for repurchasing debt is provided in the following three subsections.

3.1 Reverse Auctions

As the name implies, a reverse auction is generally the symmetric inverse of a regular or conventional auction. In what follows, the discussion is restricted to “pure” or “straight” reverse auctions where payment for the repurchased securities is in the form of a cash outlay rather than in the form of a more-liquid benchmark security.

The description of the reverse auction process is broken into two parts. The first part describes how the reverse auction is conducted (i.e., the mechanics of the auction). The second describes how the structure of the auction affects the offers received by the auctioneer.

3.1.1 The mechanics

A reverse auction can essentially be conducted in the same manner as a regular government bond auction. It may therefore be useful to go over certain aspects of the regular auction’s format before discussing the reverse auction. As an example, some of the more relevant conventional auction procedures for Government of Canada bonds are¹²:

- A quarterly announcement is made indicating when the bond auctions will take place and which bond maturities will be issued.
- A week before each auction, there is a call for tender notice that gives the amount to be issued and maturity date of the issue.
- Upon release of the notice, the bonds to be issued begin to trade on the forward or when-issued market.
- Tenders by primary distributors are submitted on auction day. Tenders must be received no later than 12:30 p.m.
- Primary distributors can submit several tenders in terms of yield (each must be of minimum size equal to \$250,000) as long as they total less than 20 per cent of the total amount of bonds offered.
- One non-competitive bid may also be submitted by a primary distributor (minimum

12. For more details see Branion (1995).

\$25,000 and maximum \$3 million).¹³

- All non-competitive offers are accepted, and then competitive offers are accepted in ascending order (in terms of yield) until the issue is fully allotted.
- For new issues, the coupon rate is set at the average yield of the accepted competitive offers rounded to the nearest quarter of one per cent below the average yield of accepted offers.

Next, consider the mechanics of the reverse auction. The process would, in theory, be nearly identical to that for the conventional auction and can, for example, be described as follows:

- At some time before the reverse auction (e.g., a month in advance),¹⁴ a call for tender notice is issued giving the maturity date of the bond issue(s) of interest and the *maximum amount* the government wishes to repurchase.¹⁵
- Upon release of the notice, the issue trades, as it did before the notice, in the secondary market. In the case of the reverse auction, the secondary market serves as the forward or when-issued market for the security (to be repurchased).
- Tenders by primary distributors are submitted on auction day. Tenders must be received no later than 12:30 p.m.
- Dealers can submit several tender offers in terms of yield that total up to *the announced maximum repurchase amount*.
- Competitive offers are accepting in *descending* order until the full allotment of the issue is reached.

The mechanics of both auctions are virtually identical. However, some of the more subtle differences between the reverse and conventional auctions should be emphasized. As mentioned above, the reverse auction is generally the inverse of the conventional auction. This means that, offers are to sell the bond, the security already exists and trades in the secondary market rather than in the when-issued market before the auction; the competitive offers are accepted in descending order (in terms of yield) rather than in ascending order; and finally, primary dealers will tend to be long the issue of interest in the secondary market rather than tending to be short in the when-issued market as is the case for conventional auctions. However, a more important technical difference is that the announced size of the reverse auction should be up to a maximum, not a fixed amount.

13. A competitive tender consist of one or more bids that state the yield to maturity for which the bidder is willing to pay for the bonds and the amount the bidder is seeking to purchase at that yield. A non-competitive tender only states that amount that the bidder is seeking to purchase. Non-competitive tenders are allotted at the average yield of the auction.

14. In the United Kingdom and Australia, this announcement was made a month before the auction (see the appendix for details).

15. An announcement can be made a few months before the reverse auction indicating that an auction will take place some time during the coming quarter. This announcement would be rather vague, simply stipulating a range for the possible maturities to be purchased and a range for the size of the reverse auction.

3.1.2 *The reverse auction and its effects on bidding and secondary-market prices*

Several characteristics of the reverse auction's structure have important effects on the bidding behaviour and on the secondary market price of the securities to be repurchased. First, it is important to consider the effects of repurchasing up to a maximum auction amount (referred to, in what follows, as the *open-ended* size of the reverse auction). Because the security already exists and is trading in the government securities market, a second consideration is the possible *announcement effect* that a reverse auction has on the secondary market price. These issues are discussed in turn.

The open-endedness of the auction amount is one aspect of a reverse auction that differs from the conventional auction. Allowing the government to reject offers that are below some undisclosed cut-off yield or allowing the government to reduce the amount of the auction, will help prevent the government from locking itself into purchasing bonds at a price that is viewed as significantly above the "fair" market price. In essence, this flexibility mitigates the occurrence of poor coverage ratios as well as helping to limit the difference between the (average) repurchase price of the bond at the reverse auction and the quoted secondary market price of the bond. Also, the open-ended size of the auction has a positive effect on the aggressiveness of offers because it lowers the dealer's probability of successfully selling the bond at the auction. Since dealers will tend to be long in the secondary market after the call for tender announcement,¹⁶ the open-endedness of the auction size will have a similar effect on the aggressiveness of the bidding at the reverse auction that short positions in the when-issued market have on the bidding behaviour at conventional auctions. Moreover, the flexible auction size has no detrimental effects on the integrity of the secondary market. If anything, by implementing a reverse auction, the government plays the role of a large account (customer) entering the market to purchase bonds, which in turn tends to increase trading activity in that bond. With the potential arrival of a large buyer in the market, the secondary-market price of the announced bond issue to be repurchased will tend to rise.

One can refer to this increase in the price of the bond as an *announcement effect* on the secondary-market price.¹⁷ Specifically, the mere announcement of an intended repurchase (buyback) will tend to increase the price of the targeted bond in the secondary market between the announcement date and the auction date, thus reducing any (il)liquidity premium that the bond yield may have exhibited.

This reverse auction announcement effect can be mitigated in two ways. The first method is to keep the announced maximum size of the auction small relative to the amount outstanding of the bond that is available for trading in the secondary market.¹⁸ This makes the government's repurchase a relatively minor affair, thus limiting the size of potential price increases. However, in order to minimize the announcement effect, it is likely that the size of

16. Dealers might also hold client orders as their agent rather than directly purchasing the securities from clients.

17. These types of announcement effects are not restricted to a government bond market. Equity markets are frequently confronted by news (or rumours) that a large buyer has entered the market. One example is the announcement recently by IBM to buy back its shares. The subsequent increase in its share price was, in part, attributed to its buy back announcement.

the repurchase would have to be reduced to an amount that is equivalent to the average secondary market (OTC) trade size, which ranges between \$10 and \$50 million. On the other hand, in order for the reverse auction to attract sufficient interest from the investor community and thus be “well bid” (i.e., for the auction to attract a substantial amount of offers to sell), the reverse auction must be large enough.¹⁹ The problem of reducing the size of the reverse auction in order to mitigate the announcement effect is that the reverse auction, as is the case for a conventional auction, is specifically designed for the repurchase of a large amount of an outstanding bond issue (e.g., an amount greater than what is predicated by the depth of the secondary market) at any one time.²⁰

Since the reverse auction is designed for large-scale repurchase of government securities, one must look for another way of limiting the announcement effect. A reverse auction for several bond issues rather than for a single bond would mitigate the announcement effect by allowing, in theory, the repurchase amount of each bond issue to be relatively small while also having a large enough auction (the sum total of each series repurchased) to attract sufficient interest from the investor community. More importantly, participation at the auction is directly increased because there is a greater variety of investors holding the larger number of bonds to be repurchased. For example, one bond may be held by 10 investors while a second bond may be held by 10 other investors, 3 of which also hold the first bond. The repurchase of two issues of bonds would bring forward 17 different investors rather than just 10 if one bond was repurchased.

The repurchase of several bond issues also mitigates (in a less direct manner) the announcement effect by spreading the market participants’ trading activities (long positions) before the auction across issues, rather than concentrating their secondary-market trading activities (i.e., their accumulation of long positions) on a single bond. Specifically, upon announcement of the reverse auction, dealers will tend to canvass their customers for the bond in question. This increases the trading activity in that bond and, in turn, increases its price as dealers tend to take long positions in the specified bond in the hope of selling it at auction. If, on the other hand, there were several (2, 3, 4, or 5) bond issues to be repurchased rather than one bond, the trading activity will be distributed among the bonds slated for early retirement.

An additional advantage of repurchasing more than one bond issue at the reverse auction is the positive effect it has on the aggressiveness of the offers received since it adds another layer of indeterminacy to the success of the auction participants. Specifically, not only

18. Some proportion of the bond issue will be “parked” until maturity and thus is not necessarily available for trading purposes at any market price. Therefore, it is important to distinguish between amount outstanding and amount available for trading. Estimates of the proportion of any one issue that is parked are not readily available.

19. Dealers may have to expend some effort in acquiring the bond to be auctioned in the secondary market and might be willing to do so only if the benefits derived from bidding at the auction can be increased through economies of scale from bidding large amounts.

20. In general, the amount to be repurchased should be chosen after consultation with the major secondary market participants and should be set so that there is a high probability of achieving the full allotment of the repurchase.

are they uncertain if their offers will be deemed aggressive enough to be below (in terms of bond price) the undisclosed cut-off, as in the single-issue reverse auction, but they must also contend with the possibility that the majority of the buyback ends up being for bond issues other than the one for which they submitted offers.

In summary, the mechanics of the reverse auction are virtually identical to those of conventional bond auctions. The most important difference is that the auction size is open-ended (and there is an undisclosed cut-off price below which offers are rejected). This open-endedness tends to have a positive effect on the aggressiveness of the offers. A reverse auction for several bond issues tends to reduce the announcement effect inherent in a reverse auction, to increase the aggressiveness of offers received at auction, to increase the participation at the auction (and improve average coverage), and leaves room for larger reverse auctions. Interestingly enough, as more bond issues are added to the auction, the more the reverse auction takes on the characteristics of *coupon passes* implemented by the Federal Reserve. These similarities are discussed in Section 3.2 where it is argued that reverse auctions are essentially more formal or restricted versions of coupon passes.

3.2 Direct Repurchases of Government Bonds: Coupon Passes and OTC Trades

This section considers the repurchase of bonds in which the government or its fiscal agent contacts the participants in the over-the-counter bond market *directly* in order to solicit quotations or offers to sell various bond issues.

3.2.1 Coupon pass

What is a coupon pass? Simply put, it is the purchase of an unspecified amount of various bond issues that lie in a specific maturity range.²¹ More specifically, a typical coupon pass occurs when the Federal Reserve (Fed) contacts its primary dealers and asks them for offers to sell government securities to the central bank. The only restriction that the Fed puts on the process is that the dealers submit offers for securities that lie in a certain maturity range. The dealers respond within a few minutes with a series of offers on various securities (presumably out of their own inventories of security holdings). The Fed then chooses from among the offers using various criteria (one of them being the highest yield, while another is the rejection of offers for bonds trading on special) and then notifies the successful dealers. For the Federal Reserve, this whole process takes less than an hour (10 to 20 minutes).²² Although the Fed's goal is to inject reserves into the banking system and make permanent additions to its assets, the mechanics of a coupon pass are, in the end, a (re)purchase of bonds before maturity. Except that the Fed, in this case, has no intention of retiring the bonds after the repurchase, as

21. See Edwards (1997) for more details.

22. One should note that the longer the government or its fiscal agent takes to respond to the offers, the higher the price the dealers will quote. This is because there is an implicit options premium for an extended delay in getting back to dealers. The Fed recently reduced the width of the range of maturities that it seeks to purchase in any leg of a coupon pass in order to speed up its response time and in turn receive better prices.

would be the case for a government reducing its outstanding debt.

The coupon pass is, essentially, an informal reverse auction since dealers are in fact *submitting offers* to sell bonds just as dealers *submit offers* to sell bonds in a multiple-bond line reverse auction (described above). The total volume (amount) of bonds purchased in a coupon pass is never specified until after the pass is completed. Thus, at least in the sense of the amount repurchased, a coupon pass is more *open ended* than a reverse auction. Also, the total amount of a specific bond (re)purchase in a coupon pass is up to the discretion of the purchaser, as is the case for the reverse auction. The coupon pass is less formal than a reverse auction since there is no formal auction procedure. Rather, a simple announcement is made the day of the pass indicating an interest to purchase bonds that lie in a certain maturity range. However, a coupon pass does (indirectly) specify which bond issues are to be repurchased by indicating the maturity range. Thus it is, in this dimension, equivalent to a reverse auction. A reverse auction just specifies a much more restricted range of bond issues (usually 1, 2, 3, or 4 bond issues) while a coupon pass, in specifying a maturity range, indicates that a range of bond issues would be repurchased.

Aside from its more flexible structure, the other advantage of a coupon pass is that the *announcement effects* are likely much smaller than those for a reverse auction. The reason for this is that there is not a significant period of time between the announcement date of a repurchase and the actual repurchase/auction day. Since the time between the announcement and completion of the (re)purchase is quite short, the market does not have much time to move against the government. The announcement effects are also mitigated by the fact that there is no indication as to the possible size of the repurchase. Typically, the Fed's coupon pass program represented no more than approximately 10 per cent of the market value of trades for the day. This in turn implies that the total amount purchased will likely be smaller relative to the repurchase size of a typical reverse auction.²³

3.2.2 OTC reverse "tap" repurchases

The repurchase of government bonds by OTC trading is carried out by conducting direct purchases in the secondary market with bond market primary dealers or brokers. In this exercise, the government or its fiscal agent would contact individual dealers directly and ask them for their offering (selling) quote for \$x amount of a specific bond and, if the price is deemed sufficiently low, purchase the bond from that dealer. If the price is not deemed appropriate, calls to other dealers could be placed until an amount \$x of the security has been purchased. Alternatively, instead of going sequentially from dealer to dealer, the government or its fiscal agent could place offers to purchase the bond via the inter-dealer broking system, where the bid to purchase will be passed along simultaneously to the dealer community.

23. The reason for this is that dealers do not have the time to go out and canvass their customers in the hope of purchasing bonds (by perhaps prying away "parked" bonds) to be resold to the government or its fiscal agent at the repurchase. However, if the time between the repurchase and delivery date is sufficiently long, dealers could sell short the bonds at the repurchase knowing that they could find a source for the bonds some time before the delivery date. This issue is discussed in more detail in Section 4.

Dealers can then choose to contact the inter-dealer broker to sell the security at that posted bid.

The obvious difference between direct OTC trading and a coupon pass (and a reverse auction) is that a much larger dollar volume of securities can be purchased during the time it takes to carry out a coupon pass than during the same amount of time spent conducting direct open market “tap” purchases. In general, the average repurchase volume carried out with the OTC reverse tap method will be smaller than the coupon pass method, exactly for this reason. Therefore, one of the disadvantages of the reverse tap method is that repurchases are relatively small in size (when compared with other repurchase methods including coupon passes). When there is a large amount of funding available for the repurchase program waiting to be put to use (because there was a recent benchmark bond auction for example), the direct OTC purchase is not a suitable method. However, if there is a continuous flow of excess funding (small amounts), which the government wishes to dispose of on a continuous basis by conducting debt repurchases, then reverse tap repurchases might be worthwhile.

The effect of OTC reverse tap trades on secondary market prices depends on the amounts purchased and the way the direct purchases are carried out. Generally, the effect should be of a smaller order of magnitude than that of a coupon pass. Moreover, direct dealer purchases should in general incur no announcement effects, since the purchases are made at the dealer’s quoted offer price. In most circumstances, the dealer’s offer price is conditional on the size of the offer to sell as well as on its inventory of the bond in question. If the repurchase is conducted via the inter-dealer broker network, there is a greater probability of an announcement effect. In fact, if the inter-dealer brokers announced the fiscal agent’s presence in the government securities market (after the completion of its first brokered trade), then OTC purchases would in effect be nearly identical to a coupon pass. A larger volume of securities could be purchased but must be broken up into smaller bits in order for the trades to go through at the average lot size predicated by the depth of the secondary market.

3.3 Conversions (switches or exchanges)

Conversions, as the name implies, offer market participants the opportunity to convert their holdings of less-liquid government securities into larger, more liquid benchmark bond issues. Conversions can be carried out in two distinct ways. The first is a competitive offer format, where market participants submit various competitive rates of conversion as well as the amount they wish to convert to the fiscal agent (acting on behalf of the government). The second is a fixed rate format, where market participants simply decide how much of the bonds they are willing to exchange (if any) at a conversion rate that has been pre-set by the government. The competitive offer format for conversion is essentially an auction.

Before moving on to a more detailed discussion of the three bond conversion methods, a few general points are presented. First, a conversion can be viewed as a repurchase of government securities in advance of maturity where payment for these repurchases is in terms of newly issued more-liquid benchmark securities. Thus, it is often easier to view a bond conversion as simply a reopening of a bond issue or, alternatively, simply as a repurchase in advance of maturity, where other government securities are supplied as payment. The conversion rate or ratio will depend on the secondary market prices at the time of the

announcement of a conversion. Though not a necessary precondition, the less-liquid off-the-run bonds are usually paired with liquid benchmarks that are of similar maturity and coupon rate. In the case of fixed-rate conversions, this similarity will minimize the spread risk that may occur between the announcement date and the end of the conversion period.²⁴ Also, by allowing investors to exchange like for like, market participants concerned about the duration (or the maturity structure) of their portfolios are more likely to consider taking advantage of the conversion, thus increasing investor participation levels in the conversion. Both of these issues help ensure the success of the conversion. The success of the conversion may also depend on the demand for the benchmark bond as well as on the proportion of the less-liquid bond that can be pried away from buy-and-hold investors. The conversion of less-liquid for liquid bonds of similar maturity also helps maintain the average term to maturity of the government's debt structure (further comment is made in Section 4 on the choice of which less-liquid, off-the-run bonds to pair with the benchmark).

3.3.1 Reverse auction/coupon pass conversions

As briefly mentioned above, the exchange of less-liquid bonds for more-liquid, on-the-run or benchmark bonds *on a competitive bid basis* can be carried out in two ways, via the reverse auction or the coupon pass methods. One should note that the discussion on *reverse auction conversions* will focus on the exchange of the less-liquid bonds for additional (reopened) benchmark bond issues, even though the method could, in theory, be used for the exchange of off-the-run and newly issued (first tranche) bonds.

To understand the mechanics that underlie the reverse auction conversion, one must understand that they are generally the same as for a standard conventional auction, where dealers are bidding to purchase a government security at auction. However, in contrast to a conventional auction, bidders are offering less-liquid government bonds as payment for their purchase in lieu of cash. In this case, their offers for the reopened benchmark security are in terms of units of the off-the-run bonds per unit of the bond being issued. That is to say, the offers are simply price ratios (or, alternatively, the offers can be in terms of bond yield spreads). For example, if the off-the-run bond has a secondary market price of \$105 and the dealer is *willing to bid* a price of \$99 for the bond being issued, then the dealer would submit a price ratio of $105/99 = 1.0606$. This would imply that for every \$100 worth of the off-the-run that the dealer submits as payment, the dealer is bidding to receive in return \$106.06 worth of the bond being issued. By taking the secondary-market price of the less-liquid off-the-run bond as given (fixed for all market participants), which is somewhat of an oversimplification, it then becomes clear that the dealer is in fact submitting offers for the purchase of the new issue since the price ratio submitted by the various dealers will vary only because their valuation of the new bond being issued varies among them. Thus, the reverse conversion can be viewed as a conventional auction where offers will vary in terms of the bidders, valuation of the security being auctioned.

24. Spread risk is the risk the government or investor incur from changes in the yield spread that arise between the announcement and close of the conversion period. Under a constant liquidity premium assumption, the yield between bonds of similar maturity and coupon will tend to move in parallel and thus yield spreads (and relative price ratios) tend to be constant even as interest rates shift between the announcement and the close of the conversion period.

This implies that the reverse auction conversion will be very similar to a conventional auction (detailed in Section 3.1), except that the offers will be in terms of a price ratio (or yield spread) with the competitive (price ratio) offers accepted in *descending* order.

Since the reverse auction conversions are essentially conventional auctions with payment in the form of another security, auction theory that applies to the conventional auction also applies to the reverse auction conversion.²⁵ Another consideration is that rather than simply having the when-issued and secondary market price of the reopened bond issue influencing offers received at auction, as is the case for conventional auctions, the secondary-market price of the off-the-run bonds being exchanged for the new issue will also influence the offers received at the reverse auction conversion. In a reverse auction conversion, the government will want to maximize the price received (minimize the yields received) for the new issue while, at the same time, minimizing the price paid for the off-the-run issues received in the exchange.

Another competitive-offer conversion format, where market participants submit various competitive rates of conversion, is a *coupon-pass conversion*. The structure is very similar to that of the coupon pass methodology discussed previously except that offers are in terms of price ratios. However, this method does not allow the authorities to set a fixed amount of the (reopened) on-the-run bond to be issued. The amount of the liquid bond issued will depend on the authorities' undisclosed cut-off conversion rate, the amount of the repurchase bonds that the dealers hold in their inventories at the time of the pass, and the primary dealers' demand for the benchmark bond. For example, if the authorities chose to carry out a coupon-pass conversion in which the liquid bond being issued as payment (for the less-liquid bonds being surrendered) is trading on "special," the dealers will likely seek to convert a larger amount than if the conversion was for a benchmark issue that was not on special.²⁶

It should also be noted that the amount of the less-liquid, off-the-run issue converted will, in general, be less than what may be converted using a reverse auction conversion or fixed-rate conversion simply because the dealers are restricted to converting what they have on hand in their inventories (and from a few other sources that they can easily gain access to). This is due to the fact that the pass is completed in less than an hour, with little notice, giving dealers little time to canvass their customers and accumulate the less-liquid bonds.

25. See Sundaresan (1994) for further details on the effects of the different auction formats on revenue. See also Das and Sundaram (1997) for recent research on auction theory in relation to government securities markets.

26. "Special" is a term used in the repo market and implies that the specific collateral repo rate for the particular bond is below the "general collateral" rate observed in the market. A bond trading at a special rate is an indication that, for a given total supply of the instrument in question, the demand exceeds the available supply. Thus, holders of the instrument are able to extract "above-market" lending rates on the instrument. See Duffie (1996) for details.

3.3.2 Fixed-rate conversions

A fixed-rate conversion, is simply the conversion of less-liquid bonds for more liquid on-the-run bonds at a predetermined rate of conversion. The rate of conversion is set according to the prices prevailing at the time of the announcement. Upon announcement of the conversion, which usually matches one or two less-liquid bond issues with a similar but more liquid bond, the market participants holding the conversion bonds have a limited amount of time before the conversion offer closes. Therefore, as was the case for the coupon pass conversions, the market endogenously sets the amount of bonds supplied for conversion. The amount actually converted is, of course, also conditioned by the rate of conversion set by the authorities and the time between the announcement and the offer closing. If the market views the conversion rate as unfavourable (relative to secondary-market prices and net demand conditions) then little conversion is likely to take place. Also, because there is some time between the announcement and the closing date, the market may, over time, move against a conversion rate that may have been viewed favourably (generous) at the time of the announcement. However, the length of time between announcement and closing will have a positive correlation with the amount actually converted since the more time dealers are given time to canvass their customers the more they can accumulate for conversion.

As was the case for the coupon pass conversion, a possible disadvantage of the fixed-rate conversion is that the conversion amounts are open-ended. There is no assurance that a target amount of the new issue will be created or that a minimum proportion of the outstanding off-the-run will be repurchased in the conversion.

3.4 Relative Ranking

In this subsection the advantages and disadvantages of each approach are discussed. All of the repurchase methods put forward allow the authorities to maintain or increase the size of the benchmark issue while reducing the total amount of marketable debt outstanding. However, when considering other dimensions of a repurchase operation, such as repurchasing bonds at what the authorities consider “fair” market value, one is able to distinguish further advantages and disadvantages to each approach.

The following table summarizes the relative ability of each type of repurchase operation to satisfy various supplemental debt-repurchase objectives.

Table 1: Relative Ranking of Repurchase Operations

Repurchase Program	Other Objectives of the Repurchase		
	Purchase Price	Acquiring Large Amounts	Consolidation/ Elimination
Reverse Auction	*	***	**
Coupon Pass	***	**	**
Conversion	**	*** (or ****)	***
Reverse Tap	****	*	**

The relative ability of each repurchase approach is indicated by the * symbol, where the larger number of * indicates that it is better suited to achieving the goal.

Before discussing the relative rankings, it is first necessary to expand on what each column heading means. The first column ranks each method according to which will cost less for the government (i.e., repurchasing bonds at what the authorities consider “fair” market value). Since it is generally announcement effects that tend to cause the secondary-market price of a targeted bond issue to move against the government, repurchase operations that tend to mitigate these adverse price movements will achieve a higher ranking. The second column provides an indication as to the average repurchase amount that can be achieved. Repurchase methods that give the market more time to gather (round up) the less-liquid issue will, in general, allow the government to repurchase a larger amount per operation. The third column ranks the ability of each method to remove less-liquid bond issues and thus reduce the amount of fragmentation in the stock of marketable debt.

As alluded to in the previous discussion, OTC reverse tap repurchases are most likely to allow for the acquisition of bonds at or near prevailing secondary-market prices. This is largely due to the fact that there are little or no announcement effects engendered when undertaking this type of repurchase operation and the fact that repurchases can be conducted at the dealers’ quoted offer prices (with the repurchase size predicated on the depth of the market). Although the coupon pass approach also engenders few announcement effects, there are two reasons why it receives a lower ranking. First, the government is implicitly seeking to acquire a larger amount of each bond. This will tend to move the price against it. Second, as mentioned above, dealers will tend to incorporate an option premium into the prices they offer to offset the price-risk they bear. On average, conversions will tend to elicit better prices than a reverse auction because the dealers are not only submitting offers to sell a less-liquid bond issue but are submitting offers to purchase a liquid benchmark security that may be on special in the repo market.

Because both reverse auctions and reverse auction conversions are announced before the date of the repurchase, dealers are able to canvass their customers before the

repurchase in order to accumulate a (large) stock of the targeted security. This is not the case for OTC repurchases, coupon passes, and coupon pass conversions. This implies that, on average, repurchases carried out using a reverse auction or conversion will be for larger amounts than the other approaches. One should note that if a specific conversion operation is carried out in which the liquid bond is on special, it is possible that a high demand for this benchmark security could lead to a large amount of the less-liquid bond(s) being tendered (thus explaining the parentheses in the conversion box). It is important to keep in mind that poor conversion and reverse auction results are possible. This is likely to occur when the undisclosed cut-off price is set such that few offers (in terms of price) are tendered below the cut-off. In this circumstance, the amounts repurchased are likely to be small (or zero). Furthermore, it is also important to note that it is possible to accumulate, *over time*, a large amount of the targeted repurchase issue using an OTC reverse-tap approach.

In order to concentrate liquidity in a few key benchmark issues while at the same time reducing the outstanding amount of government debt, it is necessary to remove selected issues from the total stock of outstanding bonds. In a conversion repurchase operation, when the less-liquid bond is paired with a liquid bond that has a similar maturity and coupon rate, the amount of the less-liquid bond tendered is likely to be greater than would otherwise be the case. In this circumstance, it is possible that the majority of the less-liquid issue be tendered. The other repurchase methods have, on average, similar probabilities of success at eliminating selected bond issues. This arises because it is more than likely that a large number of the less-liquid bond issues have a significant proportion of their outstanding stock in the hands of buy-and-hold investors (see footnotes 18 and 23), thus making it unavailable for the repurchase operation.

4 Other Considerations

It is important to compare the offers (in terms of yield or price) received at the auction or OTC repurchase with the yields (prices) calculated from a theoretical yield curve, not with the current price of the nearest benchmark bond.²⁷ Using a theoretical yield-curve model allows one to gain some insight into which bonds are trading “cheap” or “rich” before and during the repurchase operation and thus can guide the selection of the bonds to be repurchased in a reverse auction and the selection of the accepted offers received in a coupon pass. More to the point, this is the only way for the government to know if it is (re)purchasing a less-liquid bond — that has had little or no trading activity — at a price that is above (below) the secondary market price.²⁸ This is one way that investment banks decide on which part of the curve they intend to carry out their proprietary trades.

27. This is especially the case if the current benchmark is on special in the repo market. In this situation, the bond’s price will be above that indicated by the theoretical yield curve (and thus above what would be the price under normal circumstances).

28. Less-liquid bonds that may be tendered for repurchase will in many circumstance have been quoted at notional prices rather than at trading prices.

As a hypothetical example, consider the government’s decision to carry out a reverse auction for a maximum amount of \$1 billion. In comparing market yields with those calculated with a theoretical yield-curve model, the authorities notice that there are three bonds in the 2- to 5-year part of the yield curve with quoted yields that are 10 basis points or greater above the theoretical zero curve. The government would be able to mitigate the effects of any price movement against it by selecting these bond issues for the reverse auction. If the market yields on these bonds decreases by 5 basis points on average, owing to the *announcement effect*, the government would still be able to repurchase at auction bonds that are at or near “fair” market value.²⁹

Generally speaking, the undisclosed *cut-off* prices of each bond being repurchased should in general be chosen to lie below or equal to the prices indicated by the theoretical yield curve used by the authorities. Any offers received, via a reverse auction or coupon pass, should not be accepted if they are above these predetermined (and undisclosed) cut-off prices. The theoretical yield curve would be calculated just prior to the repurchase operation in order to determine the cut-off price of each bond being repurchased. One should note that there is a positive relationship between the cut-off price and the amount of the bond that will be repurchased. That is, all things being equal, lower cut-off prices will tend to be associated with fewer offers that lie below the cut-off price, the amount of offers that are accepted are likely to fall, and the amount of bonds that can be repurchased declines.³⁰ Also, *some judgment* should be used in setting the cut-off prices. Yield-curve models are not precise; thus, this will be an important consideration if there is a concern that the yield-curve model used in setting the cut-off prices does not provide an accurate representation of fair value for certain segments of the yield curve.

It is worth emphasizing that some care should be taken when divulging the details of how the cut-off prices are set and/or how the theoretical yield curve is calculated. If the cut-off prices (based on the estimated theoretical yield curve) are public knowledge, why would reverse auction participants submit offers different than these cut-off prices? Moreover, if the authorities used a mechanical rule in setting these cut-off prices (off the theoretical yield curve), then public knowledge of the authority’s theoretical yield-curve model would, in principal, allow market participants to estimate the undisclosed cut-off prices. This public knowledge would eliminate the possibility that the government might capitalize on realizing the difference in price between the estimated fair value, derived from the theoretical yield curve, and the tenders received at the repurchase. Therefore, it is important that the cut-off prices and (perhaps to a lesser extent) the theoretical yield-curve model remain “proprietary” knowledge.³¹

29. Note, that these bonds will be “cheap” based on estimates of the theoretical curve made on the day of the *announcement*. It may be the case that the theoretical yield curve estimated on the day of the repurchase indicates that these bonds are no longer trading cheap.

30. Because of the existence of an upward-sloping supply curve for each bond, an increase (decrease) in the amount of the issue repurchased can be achieved by increasing (decreasing) the *cut-off* price (over which all offers are rejected).

Of course, there may be considerations other than the price of the repurchase bond driving the selection of bonds. For example, if the government’s goal is to repurchase a specific proportion of the amount outstanding of specific bond issues (or simply to invest a set amount of funds), then the price paid might have to be higher than would “normally” be set by the government (e.g., the bond may not need to be trading “cheap” in order to be repurchased). Alternatively, it could be the case that the government is restricted to investing surplus funds on a repurchase operation at a time when few bonds are trading “cheap.” The following subsection discusses other bond selection considerations.

4.1 Selection of Bonds to be Repurchased in Advance of Maturity

Aside from the secondary-market price considerations discussed above, there are other factors affecting the selection of which bonds to repurchase. These include stripping activity, which affects the amount outstanding and the effective supply of the bond, and the government’s desired maturity structure for its outstanding debt.

Obviously, as discussed in Section 2, one should exclude liquid benchmark bonds from the set of potential repurchase bonds, since this would frustrate efforts to improve or maintain bond market liquidity. There could also be reasons to exclude certain off-the-run bonds from the repurchase. For example, if the authorities plan to use some of the larger past benchmark bonds—that are now off-the-run bonds—as future benchmark bonds (as these roll down the curve into key maturity areas), then it would be wise to reject any offers to repurchase these bonds as well.³²

The maturity structure of government debt is an important consideration when selecting the bonds to be repurchased. Therefore, selecting the repurchase bonds might be conditional on the maturity and coupon of the bonds being issued to finance the repurchase. For example, if a reverse auction for three bond issues is being contemplated, which uses the proceeds of a recent 5-year issue to finance this repurchase, the bonds selected may need to have maturities near the 5-year maturity area in order to hold the duration (or average maturity) of the portfolio constant.³³

31. However, the need for transparency does force the authorities to make explicit the procedure concerning how the offers will be evaluated (i.e., the mechanics of the repurchase procedure), so that the market participants understand how their tenders will be handled which allows them to evaluate their positions quickly, thus enabling them to make several reasonable tenders.

32. For example, in a relatively flat yield-curve environment (as we have now, with approximately 10 basis points separating 2- and 5-year benchmark yields), the government could reopen an old (and large) 5-year issue when it has rolled down the yield curve to the 2-year area, rather than issuing a new 2-year bond. In this instance, if the government’s funding requirements are low, it would not need to issue the full amount of a new 2-year bond. The government would only issue (reopen) enough of the old 5-year to “freshen it up.” Liquidity of the old 5-year would increase since the reopening would increase the *effective supply* of the issue. Also, the effective supply would, in general, increase on its own, as the maturity of the 5-year approached the 2-year area (especially if the old 5-year had a large amount outstanding).

The amount that can be repurchased will be influenced by the proportion of the bond that has been “stripped.” The greater the proportion of the bond that has been stripped, the lower the amount of the bond (in its original form) that can be tendered for repurchase.³⁴ The amount of stripping activity is an important consideration when selecting which bond issues to repurchase in a reverse auction (less so for coupon pass repurchases).³⁵ If the issues chosen are heavily stripped, then the reverse auction will tend to be poorly offered (i.e., have a low coverage ratio) because there will be few bonds available to repurchase. Thus, the amount of stripping has a negative affect on the probability of repurchasing the *maximum* amount at the reverse auction.³⁶ The negative consequences of stripping on auction coverage can be mitigated by lengthening the period between the announcement of the selected bond issues eligible for buy-back and the auction date. This would allow dealers, if they deemed it profitable, to reconstitute the stripped bonds into their original form before the auction, thus increasing the amount of the bond that can be put up for tender. Alternatively, in order to ensure a successful repurchase operation, the bond issues selected for repurchase should exclude issues that have been heavily stripped.

Finally, the selection of bonds to be repurchased should take into consideration whether or not a bond is considered to be “cheapest-to-deliver” for the 10-year and 5-year Montreal Exchange bond futures contracts. Similarly, some bonds may form the “underlying” asset in certain swap contracts. By repurchasing a bond that plays such a role, the authorities may inadvertently end up causing distortions in other markets.

5 Summary

This paper summarizes three different methods—reverse auction, over-the-counter purchases and conversions—that could be used to buy back Government of Canada bonds before they mature. Reverse auctions are similar to conventional bond auctions except that tenders are made for the *sale* rather than the *purchase* of securities. There are two over-the-counter repurchase methods. The first is similar to the coupon-pass approach used by the Federal Reserve to augment its portfolio of assets. The second is simply direct over-the-counter purchases in the secondary market. Conversions (switches) are similar to reverse auctions or coupon passes except that the investors receive a liquid bond issue in return for tendering the

33. However, if the goal is to keep duration constant, the government is not restricted to exactly matching maturities of the repurchase and newly issued bonds. Because a high coupon reduces the duration of bonds of a given maturity, it is possible to repurchase a bond with greater than 5 years to maturity when a 5-year maturity bond was issued to finance the repurchase.

34. See Whittingham (1996-97) and Bolder and Boisvert (1998) for details on the Government of Canada strip bond market.

35. This point differs from the point made in Section 3.4 in which the “parked” proportion of the targeted repurchase issue plays a role in the amount acquired in the operation. The difference is that the amount of the bond issue that is stripped is ex ante observable, while the amount of the issue that is “parked” is not directly observable ex ante.

36. This is an important consideration when there is a fixed amount of funds set aside for the repurchase.

less-liquid issue.

Before discussing the mechanics of each repurchase approach, Section 2 examined the relation between the size of benchmark bond issues and the liquidity of the government securities market. The consolidation of bond issues as well as maintaining large benchmarks tends to enhance market liquidity. Thus, in an environment where the government's marketable debt is shrinking, purchasing off-the-run bonds ahead of maturity and the maintenance of large bond benchmarks helps maintain, and possibly enhances, the liquidity of the government securities market.

Section 3 examined the mechanics of the three buy-back methods. It indicated that the conversion or reverse auction approach should be used if the government is primarily interested in acquiring large amount bonds, although the purchase price of these bonds is likely to move against the government. On the other hand, if acquiring bonds at "fair" market value is of greater concern, then the OTC reverse-tap approach should be used.

During each repurchase, the computation of undisclosed cut-off prices, above which offers to sell back bonds to the government should be rejected, is of utmost importance. This requires the estimation of a yield curve in the secondary market in order to obtain an indication of the fair market value of each repurchase bond candidate. A theoretical yield-curve model *might* be the best tool for determining the undisclosed cut-off prices. However, in order to minimize the costs associated with the repurchase, it would be important to disclose a few details of the estimates derived from whatever theoretical yield curve is used in setting these cut-off prices. The attached appendix gives a broad indication of the bond prices that repurchase programs in other developed countries have succeeded in eliciting. However, since other countries tend to have diverse goals for their bond repurchase programs, it is not clear that repurchasing bonds at "fair" market value is always a priority.

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Appendix

Repurchases in Advance of Maturity in Other Developed Government Securities Markets: A Few Examples

In this appendix, some data on the experiences that other countries have had with bond repurchase operations are presented. Table A gives a summary of significant reverse auction programs.

Table A: Reverse Auctions in Other Countries

Country	Number of Reverse Auctions	Number of Issues Eligible	Average Value of Offers ^a	Total Amount Repurchased ^a	Proportion of the Issue Repurchased	Goal
Australia	1	5	702 M	159 M	≈ 10 %	To remove less-liquid stocks and consolidate bond issues.
UK ^b	4	3	1500 M	2 B	N.A.	Repayment of debt (using excess funds due to surplus).
France	4	1 ^c	NA	17 B ^d	7% to 20%	To smooth out the size of bonds maturing in the near future.

a. Local currency.

b. Also carried out 9 conversions (switches). Conversions were used to consolidate the number of bond issues.

c. One of the reverse auction operations was for 3 bond issues; one for FrF2.5 billion and two smaller ones that accumulated a total of FrF 1 billion.

d. Total amount purchased in each repurchase operation ranged from FrF2.7 billion to FrF7.5 billion.

In 1989, both the United Kingdom and Australia carried out reverse auctions, while France had four reverse auctions between 1991 and 1993, of which only one was for a range of bond issues.¹ The four United Kingdom reverse auctions accumulated bonds totalling £2 billion and succeeded in getting accepted offers that were at, or slightly above, the *prices* prevailing *immediately before* the auctions.² Specifically, the average accepted price was 1/8 of a percent higher than prevailing market prices. In Australia, the lowest accepted *yields* on each bond issue averaged 7-8 basis points below prevailing secondary-market yields at the time

1. Until 1992, Belgium had a reverse auction program in order to eliminate “old physical certificates.” New Zealand also has a reverse auction program that was used to repurchase bonds in the months prior to their maturity in order to smooth redemptions (i.e., used as a cash-management tool). (Note that what is called a reverse auction in New Zealand seems to be more akin to an OTC coupon pass operation.) Italy recently introduced a framework for repurchasing bonds via a reverse auction. However, it is not clear if they have implemented it yet. Data on these programs were not available.

2. See Bank of England (1991) for details on their reverse auction and conversion repurchase operations.

of the auction. The weighted average yield on the accepted offers was five basis points below secondary-market yields. Both in Australia and the United Kingdom, the details of the reverse auction were announced a month in advance. Unfortunately, data was not available on the price change that occurred between the announcement date and the auction for these repurchases.

Notably, the Australian Treasury has announced that it will be repurchasing AU\$8 billion in their current fiscal year.³ The Treasury also indicated that it has, to date, repurchased AU\$3.6 billion in “the market” (i.e., reverse tap repurchases).⁴ The Treasury’s stated goal in repurchasing bonds is “... to repurchase near maturity bonds for cash management reasons and to remove selected benchmark lines from the yield curve with the view to concentrating liquidity in key stocks along the curve (Australian Treasury, January 1998).”

Information on the Fed coupon-pass approach is found in Edwards (1997). However, since the Fed’s goal in conducting coupon passes is to add permanent reserves to the U.S. economy, it is not directly concerned with the price at which the bonds were purchased. Therefore, details on the Fed’s success at purchasing Treasury securities at near “fair” market prices are not presented.

Several countries have also performed switches or conversions, under which investors are given the opportunity to exchange one or two less-liquid bond issues for a benchmark bond. The United Kingdom, France, The Netherlands, and Sweden have the most experience with this method. The United Kingdom set the price ratio for the exchange at (or near) market prices that prevailed at the time of the announcement (i.e., they used fixed rate conversions), while the Netherlands entertained market offers. In 1991 and 1992, France carried out switches via an underwriting syndicate and set the exchange price near prevailing market rates. Their primary goal in 1991 was to issue a new ECU bond. The goal of the second conversion was to consolidate 45 old bond issues (that were issued before the reform of their debt program) and to refinance the repurchases by issuing three liquid benchmark bonds. The United Kingdom used this technique in 1989-90 to increase the size of their benchmarks (since they had no intention of issuing new debt while running a funding surplus) and thus maintain liquidity in the Gilt market.⁵ Sweden has in the past allowed investors the possibility of exchanging bonds with less than one year to maturity for T-bills in order to improve the liquidity of their shorter-dated instruments. In 1994 the Netherlands used an OTC switch technique (on one day a week, for seven weeks) where the price ratio of the conversion was set by the market participants on an offer basis. The debt agency had the choice of accepting or rejecting the conversion offers.⁶

Several countries have used the OTC “reverse-tap” approach to repurchase bonds.

3. The Australian government is currently running a budget surplus.
4. The average yields achieved in their 1989 reverse auction likely explains why the Australian Treasury has chosen to conduct reverse tap repurchases rather than undertake reverse auction operations.
5. The United Kingdom carried out 9 conversions to consolidate the number of bond issues.
6. Until 1995, Spain had an exchange program. But it met with little success (it is not clear what they mean by success). They have since initiated a reverse OTC tap program.

France, Ireland, Spain, and Italy seem to be the leaders in this method of repurchasing bonds at market prices. Of the four countries, France and Ireland have the more significant programs. France and Ireland have carried out these reverse taps on an ongoing basis in order to buy back bonds that they viewed as “cheap,” thus producing debt management cost savings. However, Ireland’s tap repurchases have also been aimed at increasing liquidity by consolidating the number of bond issues outstanding and increasing or establishing a liquid benchmark issue.

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