

Markets for Government of Canada Securities in the 1990s: Liquidity and Cross-Country Comparisons

Toni Gravelle, Financial Markets Department

- *During the 1990s, liquidity in the market for Government of Canada securities has been supported by changes in market structure. These include the introduction of benchmark bond issues, the increasing use of inter-dealer brokers, and a slight rise in the level of dealer competition.*
- *Liquidity in the bond market has generally benefited from a shift in the Canadian government's debt-management strategy, but liquidity in the treasury bill market has decreased since 1995, largely because of the declining supply of these securities.*
- *While below that of the large U.S. Treasury market, liquidity in the market for Canadian government securities appears to compare favourably with that in the government securities markets of other industrialized countries.*

In most industrialized countries, the market for government securities is viewed as a key financial market that performs several important functions. This market is of particular interest to central banks. It is here that they usually perform their domestic monetary operations and from here that they extract information on expectations of future movements in interest rates. It is also the market in which governments raise funds and is thus of particular interest to central banks with fiscal agency responsibilities, such as the Bank of Canada. Furthermore, because of their virtually riskless nature, government securities function as the pricing benchmark and hedging vehicle for other fixed-income securities. They also serve as collateral (or as part of regulatory liquidity requirements) for various financial intermediaries, enabling them to finance their operations. Finally, since other fixed-income markets possess many of the structural and institutional characteristics of government securities markets, a greater understanding of how the government securities market functions provides central banks with a better understanding of broader fixed-income markets.

Liquidity is an important dimension of all financial markets, and the liquidity of government securities markets is important to central banks interested in maintaining or enhancing the functioning of these markets.

This article reviews some of the factors that underlie liquidity in the market for Government of Canada (GoC) securities. It also compares the degree of liquidity with that of government debt markets in other industrialized countries.

This article is an abbreviated version of Gravelle (1999a). The data used for the international comparisons are taken from a recent study by the Bank for International Settlements (1999). A more thorough cross-country examination of government securities market liquidity issues is presented in that study.

Defining Market Liquidity

Because of its multi-dimensional nature, market liquidity is a concept that eludes simple definition or easy measurement. While most market participants would agree whether or not a specific market is liquid, few would be able to precisely identify all the factors contributing to that market's liquidity. Nevertheless, there is a fairly wide consensus that *a liquid market is one where large transactions can be completed quickly with little impact on prices.*

In the academic literature, *market liquidity* is typically defined over four dimensions: *immediacy*, *depth*, *width* (bid-ask spread), and *resiliency*. *Immediacy* refers to the speed with which a trade of a given size at a given width is completed. *Depth* refers to the maximum size of a trade for any given bid-ask spread. *Width* refers to the costs of providing liquidity (with narrower spreads implying greater liquidity). *Resiliency* refers to how quickly prices and price movements revert to "normal" levels after a large transaction or how quickly imbalances in transaction flows dissipate. The various dimensions of liquidity tend to interact. For example, for a given (immediate) trade, width will generally increase with size or, for a given bid-ask spread, all transactions under a given size can be executed (immediately) with no movement in the price or the spread.

In the context of government securities markets, liquidity may best be thought of in terms of the cost of supplying immediacy.

In the context of government securities markets, liquidity may best be thought of in terms of the cost of supplying immediacy. In these markets, the cost of an immediate trade will vary depending on the size and direction of the trade and on variations in the market-makers' costs of providing this immediacy.

Market liquidity is influenced by the way the market is structured.¹ Most government securities markets

1. See O'Hara (1995) for a useful introduction to the academic literature dealing with market microstructure issues.

are quote-driven, multi-dealer markets rather than order-driven, auction-agency markets, and the actions of the dealers provide much of the market liquidity.² Therefore, one means of assessing the level of liquidity in a government securities market involves studying the factors that influence dealer incentives and costs when making markets and supplying liquidity.³ Also contributing to a market's liquidity is the security's inherent liquidity. The security's inherent liquidity is, in turn, related to several factors including the amount of the security outstanding and its *effective supply*.⁴ Other structural factors that influence the level of liquidity in the government securities market include transparency, transaction taxes, interest rate volatility, and derivatives market activity.

Readily available data on all four dimensions of liquidity are not easy to come by. Thus, other measures are often used as proxies for market liquidity. These include trading volume, turnover ratios, and quoted bid-ask spreads.

Readily available data on . . . liquidity are not easy to come by.

Trading volume is the most commonly used measure of liquidity in government securities markets. However, trading intensity and, in turn, liquidity is more specifically measured by the turnover ratio, defined as total trading volume divided by the stock of securities outstanding.⁵ The level of trading intensity is also

2. Markets with auction-agency structures (often called order-driven markets) are characterized by the existence of limit-order books and/or non-discretionary matching systems. Specifically, standing (limit) orders to buy or sell some quantity of an asset at some pre-specified price are arranged in an order book. As new limit orders or market orders (defined as orders to buy or sell at the best price in the book) come into the auction agency, they are matched up (using standard rules) with the existing orders in the book. The "books" in nearly all auction-agency markets, like the "downstairs market" at the Toronto Stock Exchange, are now electronic as are most of the matching systems.

3. In reality, not all government securities dealers can be considered market-makers. But in this article, the term dealers, unless specified otherwise, refers to market-makers.

4. Effective supply is defined as the outstanding amount of the security less the portion held by buy-and-hold investors.

5. Trading intensity refers to the number of transactions that take place over a set period, while trading volume refers to the currency value of trading activity over a set period.

reflected in the bid-ask spreads quoted by dealers. As trading intensity increases, dealers find it easier (less costly) to rebalance their inventory to their desired level, and they can quote narrower spreads since their inventory-control costs decline. In many ways, the spread is a broader indicator of the level of liquidity than turnover data, since it also reflects many of the other factors influencing the dealers' costs of providing liquidity.⁶ These include: adverse selection concerns (a dealer's concern that the agent with whom he/she is trading is better informed about an asset's value), order-processing costs, dealer competition, search costs, and the costs of inventory-risk management.

Recent Trends

Indicators of liquidity in the GoC securities market

Charts 1 through 4 present the readily available indicators of liquidity. The top panel of Chart 1 shows that until 1997, weekly trading volumes in the market for Government of Canada bonds rose along with the increase in outstanding stock. The bottom panel indicates that turnover ratios in the bond market increased steeply from 1990 to the end of 1996, and then remained relatively flat until the autumn of 1998. What are the factors behind these trends in trading activity? As discussed in Gravelle (1999a and b), trading activity for government securities is positively related to the *effective supply* of the traded securities. This implies that trading volumes tend to increase (decrease) more quickly than the rise (fall) in their stock outstanding, which, in turn, leads to a rise (fall) in the turnover ratio. In the case of GoC bonds, the introduction of benchmark bond issues in 1992 and the increase in the target size of these issues since that time, as well as the government's strategy of increasing the proportion of domestic marketable debt in the form of bonds from 56 per cent in March 1995 to 73 per cent in June 1999, have all increased the effective supply and, in turn, the liquidity of this market.⁷ Increases in effective supply will also generally be reflected in narrower bid-ask spreads, since a market-

maker's cost of providing immediacy is influenced by the trading intensity of the security. Thus, outside of the spikes in late 1994 and in the autumn of 1998, it is not surprising to find that bid-ask spreads for bonds displayed a slight downward trend until the end of 1996 (Chart 2) as the outstanding stock of bonds was rising, and, since then, have remained relatively flat as the stock of bonds plateaued.

Trading activity for government securities is positively related to the effective supply of the traded securities.

In the case of the treasury bill market, the data indicate that after a sharp rise from 1991 to 1995, the turnover ratio declined markedly. Here too, the effective supply of treasury bills played a role in determining the turnover ratio. The government's strategy of increasing the proportion of fixed debt, together with lower financing requirements, led to a significant decline in the stock of treasury bills and, in turn, to a corresponding decline in trading activity after 1995 (Chart 3).⁸ Bid-ask spreads in the treasury bill market, after having trended down slightly in the early 1990s, when the stock of bills was rising, have trended up with the decline of their effective supply (Chart 4).

In the case of the treasury bill market, the data indicate that after a sharp rise from 1991 to 1995, the turnover ratio declined markedly.

In summary, the liquidity of the Canadian treasury bill market has deteriorated since 1996, while the GoC bond market has generally held on to the gains

6. There is no consensus in the academic literature about the superiority of quoted bid-ask spreads over transaction data. For example, Datar et al. (1998) suggest that a measure similar to the turnover ratio has several advantages as a proxy for liquidity over quoted bid-ask spreads.

7. Gravelle (1999a) provides further details on how the government changed its issuance practices to allow for the buildup of large benchmark bonds.

8. See Boisvert and Harvey (1998) and Harvey (1999) for more details on how the declining supply has affected the treasury bill market.

Chart 1
Government of Canada Bonds: Trading Activity

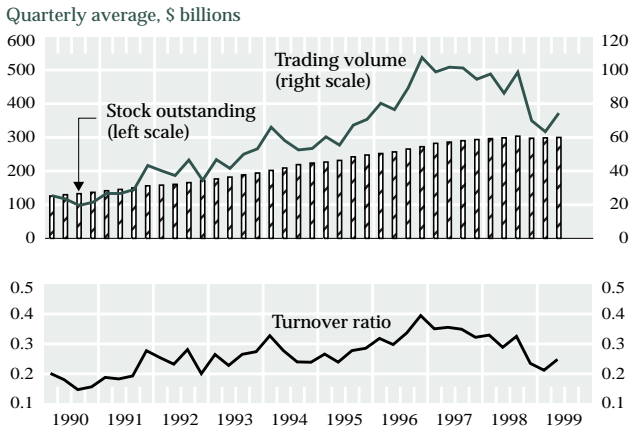


Chart 2
Government of Canada Bonds: Bid-Ask Spreads, Monthly Average

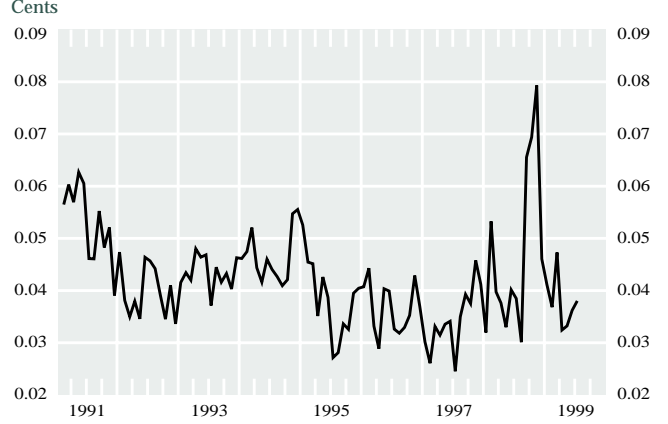


Chart 3
Treasury Bills: Trading Activity

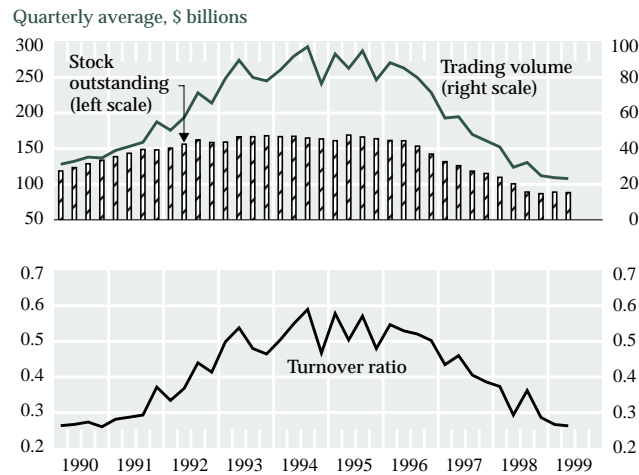
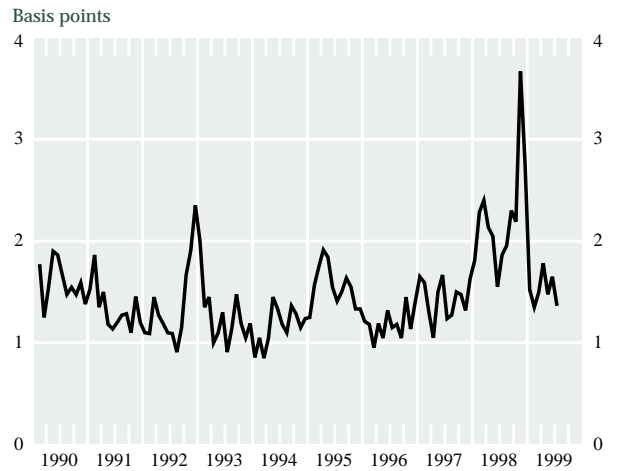


Chart 4
Treasury Bills: Bid-Ask Spreads, Monthly Average

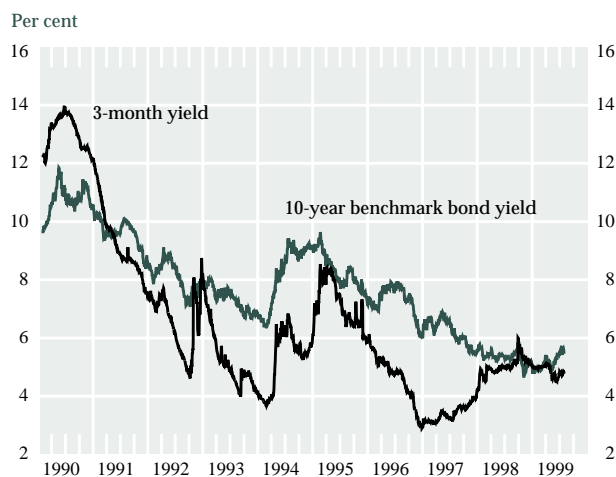


achieved over the first part of the 1990s. These liquidity indicators show a link between the effective supply of government securities and the liquidity of the market.⁹

Because market-makers will widen their quoted spreads with an increase in interest rate volatility (or risk), which increases their inventory-risk-management costs, it is not surprising to see that the large transitory spikes in the spreads for treasury bills and bonds in Charts 2 and 4 coincide with sudden increases in short- and long-term interest rates, respectively (Chart 5).¹⁰ Thus, the jumps in treasury bill spreads that occurred in late 1992, early 1995, and in the autumn of 1998, correspond to sudden increases in 3-month interest rates during those periods, while the increase in bond spreads that occurred in late 1994 and in the autumn of 1998 coincide with sudden increases in long-term rates. Although the largest jump (autumn 1998) coincided with the smallest rise in interest rates, it also occurred at the height of the financial market turbulence that followed the Asian crisis.

Chart 5

Ten-Year and Three-Month Yields



9. Gravelle (1999a) presents statistical evidence of the link between effective supply and liquidity in the GoC securities market.

10. Fleming and Remolona (1999) find empirical evidence that bid-ask spreads for U.S. Treasury securities increase during periods of (intra-day) interest rate volatility. This supports the hypothesis that the bid-ask spreads of risk-averse dealers reflect their inventory-control costs. Statistical evidence showing the positive correlation of bid-ask spreads for GoC securities with interest rate volatility is presented in Gravelle (1999a).

Broad factors affecting the evolution of liquidity in the GoC securities market

As mentioned, bid-ask spreads and liquidity more generally are also influenced by factors related to the structure of the market which, in turn, tend to be the factors that influence the dealers' costs associated with providing liquidity to the market. It is important to emphasize, however, that these structural factors work by shaping the environment, making it conducive to greater or lesser levels of liquidity in the securities market, rather than by directly affecting the state of market liquidity.

Because of the multiple-dealer structure of the GoC securities market, it is important to understand how dealers manage their (security) inventory risks, since this affects their ability or capacity to supply liquidity to the market. Dealers prefer to manage these risks by rebalancing their inventory levels with offsetting customer orders. Since the timing of offsetting customer orders rarely coincides with a dealer's rebalancing needs, dealers will often go to the inter-dealer market for such rebalancing. They can also hedge their exposure with an offsetting position in the futures or repo markets.¹¹

When rebalancing their inventory positions, dealers often find it quicker to sell off (acquire) their unwanted (wanted) inventory positions via inter-dealer brokers (IDBs).¹² The use of IDBs lowers the search cost associated with finding the best available price in the inter-dealer market and, at the same time, allows dealers to trade anonymously with each other. These factors, theoretically, reduce the costs associated with providing liquidity.¹³ Table 1 presents data

11. For example, dealers' inventory positions can be hedged by taking offsetting short positions in the futures market or by borrowing the security they do not hold in inventory and then selling it short. The borrowing of government securities is carried out in the repo market.

12. Inter-dealer brokers provide communications networks that link dealers. The "broker screens" that they provide allow dealers both to post their bid-ask quotes and volumes at which they are prepared to trade a particular government security and to act on other dealers' quotations on the same system. A dealer initiates a trade by contacting the broker, indicating its intention to trade against a posted offer. The initiator and the dealer who posted the offer then trade via the broker, rather than bilaterally. Thus, inter-dealer brokers offer anonymity by placing themselves between the two counterparties and also reduce search costs because dealers can visually (on the screens) seek out the best quote available rather than sequentially contacting individual dealers.

13. There is empirical evidence indicating that an increase in the level of anonymity in the inter-dealer market increases liquidity (Scalia and Vacca 1999). Support for the hypothesis that an increase in IDB trading narrows bid-ask spreads and thus improves GoC securities market liquidity can be found in studies that show that IDBs reduce the amount of searching dealers do (Garbade 1978) and that the search-cost component of the bid-ask spread is economically significant (Flood et al. 1999).

Table 1
Government Securities Dealers' Trading
by Counterparty
(per cent)

	Counterparty			IDB/Total inter-dealer
	Inter-dealer brokers (IDBs)	Other dealers (directly)	Customers	
1991-93	30.6	15.8	53.7	65.8
1994-96	37.2	10.2	52.6	78.5
1997-98	39.3	7.1	53.6	84.7

illustrating the evolution of this inventory-rebalancing activity in the GoC securities market. It is clear from the table that government securities dealers are conducting an increasing proportion of their inter-dealer trading via IDBs (see last column). Although dealers suggest that this stems from the decline in broker fees over the years, it nonetheless implies an increasing level of anonymous inter-dealer trading and lower search costs, making it easier and/or less costly for dealers to rebalance their inventories. This makes them more willing to trade and quote markets to customers, thus contributing to enhanced market liquidity.

Government securities dealers are conducting an increasing proportion of their inter-dealer trading via IDBs.

Quoted bid-ask spreads and, in turn, the cost of liquidity that customers (as opposed to dealers) face are influenced by the level of competition among dealers. Because dealers compete for market share through the bid-ask spreads they quote, any increase in dealer competition puts downward pressure on bid-ask spreads. Table 2 presents annual statistics on market concentration for both the bond and treasury bill markets: the Herfindahl index and the 10-firm concentration ratio.¹⁴ In the bond market, both indica-

14. The concentration ratio measures the sum of the market share for the top 10 dealers in terms of their secondary market turnover. The Herfindahl index is defined as the sum of the squared individual market shares of all reporting dealers.

Table 2
Measures of Concentration in Secondary
Market Turnover

	Bond market		Treasury bill market	
	10-firm concentration ratio	Herfindahl index	10-firm concentration ratio	Herfindahl index
1993	0.90	0.091	0.96	0.15
1994*	0.89	0.090	0.96	0.14
1995	0.84	0.082	0.96	0.14
1996*	0.81	0.082	0.96	0.14
1997	0.84	0.082	0.95	0.13
1998	0.86	0.088	0.95	0.15

* Represents the weighted average of pre- and post-merger concentration statistics. See Gravelle (1999a) for details concerning the timing of these domestic-dealer mergers.

tors displayed a generally downward trend until 1998, indicating a decrease in concentration that coincided broadly with the slight narrowing of bid-ask spreads observed in the bond market until 1998 (Chart 2). In the treasury bill market, the concentration statistics tended to be relatively flat over the sample period.

Quoted bid-ask spreads . . . are influenced by the level of competition among dealers.

Broadly speaking, there is a general consensus among market participants and academics that the dissemination of prevailing prices in the market to customers as well as to dealers enhances market liquidity.¹⁵ Thus, the arrival in the spring of 1999 of the CanPX system (which displays inter-dealer bid-ask quotations and volumes for a limited number of GoC securities on one screen via the Internet and through information vendors such as Reuters) should increase the level of transparency in the GoC securities market. Judging from the importance of the GovPX system in the United States (on which CanPX is modelled) to U.S. Treasury market participants, this innovation offers the *potential* to improve the liquidity of the market.

15. See Scalia and Vacca (1999) as well as Gravelle (1999b) for a summary of some of the issues related to market transparency.

The arrival in the spring of 1999 of the CanPX system . . . should increase the level of transparency in the GoC securities market.

Some Stylized Cross-Country Comparisons

Given the importance of liquidity in government securities markets for the functioning of financial markets generally, it is surprising that the determinants and mechanics of liquidity in government securities markets have received scant attention from the academic community. Most research into the mechanics of market liquidity has concentrated on equity markets (and, more recently, foreign exchange markets), leaving fixed-income markets as relatively virgin territory. Recent work at the Bank for International Settlements (BIS) has provided data that allow some international comparisons of liquidity in government securities markets. Here, these data are used to make comparisons that span both readily available liquidity indicators, such as turnover and bid-ask spreads, and factors of a more structural nature. It should be emphasized, however, that the level of detail is insufficient for more than a stylized analysis.

Most research into the mechanics of market liquidity has concentrated on equity markets (and, more recently, foreign exchange markets).

Indicators of market liquidity

The BIS data were compiled from 11 industrialized countries and provide a “snapshot” of overall market liquidity in each country in 1997. Although the degree of market liquidity varies across several dimensions, let alone across individual securities within each

market, it is still useful to examine the existing liquidity conditions in each market by comparing both the turnover ratios and bid-ask spreads. The turnover data presented in Table 3 provide a rough overview of the aggregate liquidity conditions across the markets.¹⁶ This indicates that turnover ratios, defined as yearly trading volume divided by the outstanding stock of government securities, were relatively high in the Canadian, French, Swedish, and U.S. markets.¹⁷

The data for quoted bid-ask spread are of special interest, since the spread reflects many of liquidity’s underlying components and is, therefore, ideal for comparison across a spectrum of different market structures. Because actual market data are not available in several of the countries, some of the spreads were estimated by central banks. Also, some of the spread data represent average levels over an extended period, which likely include spells of spread widening due to temporary periods of market turbulence. The spreads presented in Table 3 indicate that the greatest amount of liquidity can be found in the U.S. market, which was also one of the countries with a higher turnover ratio. Historically, the data have shown that, over time, countries with higher turnover ratios tend to be those with lower bid-ask spreads.

Comparison of market structural factors

Before outlining the structural differences that exist between the various markets, it is useful to outline their broad common characteristics. Government securities markets are usually decentralized multiple-dealer markets. Most of these markets function alongside affiliated markets, such as repo and futures markets, that use the government security as the underlying asset or as collateral. Most governments in the sample (with the exception of the Netherlands) issue their securities by auction. Most countries have set up primary dealer systems¹⁸ to facilitate the issuance process (Japan, Germany, and Switzerland are

16. The figures in Tables 3, 4, and 5 combine data on turnover and stock outstanding for both fixed-coupon and discount government debt instruments commonly referred to as bonds and treasury bills.

17. Turnover ratios are not perfectly comparable across countries since they ignore the fact that, in certain countries, the governments and central banks hold, until maturity, sizable portions of the government securities outstanding. For example, in Japan in 1997, 46 per cent of the securities were held by the government and the central bank, implying, in effect, a higher turnover ratio than indicated.

18. This is a group of selected dealers with responsibilities to support the functioning of the government market.

Table 3
Cross-Country Comparison of
Liquidity Indicators
 (US\$ billions)

	Bid-ask spreads	Stock outstanding	Yearly trading volume	Turnover ratio
Canada	10	285	6,243	21.9
Belgium	n.a.	232	947	4.1
France	24	551	18,634 ¹	33.8
Germany	10	563	n.a.	n.a.
Italy	4	1,100	8,419	7.7
Japan	16 ²	1,919	13,282	6.9
Netherlands	n.a.	176	450 ¹	2.6
United Kingdom	8	458	3,222	7.0
United States	3.1	3,457	75,901	22.0
Sweden	27 ³	111	3,626	32.7
Switzerland	25	35	125 ¹	3.6

Note: Trading volumes are for the 1997 calendar year, while the figures for the stock of debt outstanding are for the end of 1997. In this and the data that follow, the figures were converted to U.S. dollars at the rate prevailing at the end of 1997. (US\$1 = Can\$1.43 = ITL1,770 = ¥130 = BEF37.1 = FFr6.02 = DM1.80 = Dfl2.03 = SKr7.93 = SFr1.46, £1 = US\$1.65). The bid-ask spreads are given in one-hundredths of the currency unit for the face amount of 100 currency units. Unless indicated otherwise the spreads are for on-the-run or benchmark, 30-year, fixed-coupon issues. Source: BIS (1999)

1. Figures may include trading other than outright transactions, such as repos or buy/sell backs.
2. For 20-year bonds
3. For 22-year bonds

the exceptions). And the policy of reopening existing issues to create large liquid benchmark issues is common to all the countries studied, except Japan.¹⁹

As noted above, instead of rebalancing their inventory positions, dealers can hedge their positions using interest rate futures. The existence of a market for interest rate futures, or an increase in the level of that market's liquidity, improves the dealer's ability to carry out inventory-risk management in the cash market, which, in turn, promotes greater liquidity in that market. Trading activity in the futures market (due to speculative activity) may also increase activity in the cash market through arbitrage.²⁰ The futures/cash ratios shown in Table 4 provide a rough indication of the relative importance of the futures markets for government securities relative to the cash markets.

19. Unlike the United States, which has no explicit policy for reopening coupon securities, other countries do so in order to increase the issue size in light of the dealers' limited subscription capacity.

20. There may instead be an inverse relation between trading activity in the cash and futures market. Because both instruments reflect the same underlying interest rate risks, investors may choose to speculate about these risks in one instrument rather than in both. In this case, cash issues (particularly benchmark issues) and futures contracts may act as substitutes rather than complements.

Table 4
Relationship between Cash and
Futures Markets
 (US\$ billions)

	Yearly trading volume (cash)	Yearly trading volume (futures)	Futures/Cash ratio
Canada	6,243	185	0.030
Belgium	947	28	0.029
Italy	8,419	2,036	0.244
Japan	13,282	18,453	1.429
United Kingdom	3,222	3,294	1.022
United States	75,901	27,928	0.370
Sweden	3,626	1,137	0.313
Switzerland	125	90	0.714

Note: Figures for trading volume are for the 1997 calendar year. Futures data are for contracts that have a government security as the underlying asset. For some countries, annual futures figures were estimated using average daily trading volumes. Data were not available for France, Germany, or the Netherlands. Source: BIS (1999)

Canada and Belgium have the smallest futures markets both in absolute terms and/or in relation to their cash markets.²¹ In principle, countries with a well-developed and liquid futures market should experience greater trading activity in the cash market.

Although government securities are relatively fungible instruments in comparison with other fixed-income instruments, because there is only one issuer per country, there is still a high degree of fragmentation in the existing stock of outstanding debt, since each issue differs in its coupon rate and maturity. While dealer markets are better suited than auction-agency markets to handle market-making for multiple securities, a relatively high degree of fragmentation makes it more difficult for dealers to supply liquidity. One rough measure of fragmentation in the stock of debt is given by the average issue size (stock outstanding divided by number of issues) of each market, presented in Table 5. While the U.S. Treasury market has the largest stock of outstanding debt, markets in Canada, Belgium, and Switzerland have proportionally larger numbers of issues outstanding (in relation to their stock outstanding), indicating a higher degree of fragmentation.

The fragmentation profile of the stock of outstanding securities has fallen in recent years as countries lowered the frequency of new issues, reduced the number of maturity classes for each issue, and increased the average issue size. For example, the United States and

21. Comparisons of futures markets across countries are not precise, since the spectrum of maturities covered by futures contracts differs from country to country.

Table 5
Fragmentation of Debt Stock
 (US\$ billions)

	Average issue size	Benchmark size
Canada	2.3	6.7
Belgium	1.7	8.9*
France	n.a.	2.8
Germany	4.8	8.3
Italy	5.5	12.3
Japan	8.2	7.7
Netherlands	3.5	6.2*
United Kingdom	5.6	18.2*
United States	13.9	17.5
Sweden	4.0	3.8*
Switzerland	0.8	2.5*

Note: Benchmark sizes are those for a typical (recent set of) 10-year benchmark issues.
 *The following issues were used in these countries: U.K. 7.25% due 12/2007; Bel. 6.25% due 3/2007; Neth. 5.27% due 2/2007; Swe. 6.5% due 5/2008; Switz. 4.25% due 1/2008.
 Source: BIS (1999)

Canada stopped issuing 3-year bonds to concentrate issuance in other areas, and most countries have moved towards the creation of larger benchmark issues by periodically reopening these issues. Driving these changes are the declining debt levels in many countries and, probably, the realization by debt-management authorities that larger issues contribute to the market's liquidity. The move towards a more concentrated profile of debt stock is reflected in the generally larger size of current benchmark issues compared with the average issue size in each market (Table 5). Over time, as the more fragmented debt stock matures, the average issue size should increase.

In general, market liquidity is negatively influenced by the imposition of exogenous trading costs such as transaction taxes. Transaction taxes reduce the incentives to trade, lowering the level of turnover, and in the end, reducing liquidity. With Japan abolishing its transaction tax levy on government securities trading in March 1999, there are now only two countries in the sample with this type of tax regime still in place—Belgium and Switzerland.²² However, more than half of the countries in the sample continue to levy withholding taxes,²³ which indirectly increase transaction

22. Note, however, that the transaction tax applied in these countries is, in fact, applied rather narrowly and does not affect a large proportion of market participants.

23. Italy, Belgium, France, and Sweden impose withholding taxes only on individual investors, not on institutions. Japan dropped its withholding tax on non-residents in September 1999.

costs. Canada, the Netherlands, the United Kingdom, and the United States form the minority of countries that do not impose withholding taxes.

The fragmentation profile of the stock of outstanding securities has fallen in recent years as countries lowered the frequency of new issues, reduced the number of maturity classes for each issue, and increased the average issue size.

Conclusion

Broadly speaking, liquidity in the market for Government of Canada securities has improved over the 1990s. During this period, an important factor has been the change in the Canadian government's issuance practices. This has included a commitment to creating large benchmark issues that has helped bond market liquidity. It has also included a marked reduction in the issuance of treasury bills and, given that liquidity appears to be strongly correlated with a security's effective supply, it is not surprising that trading activity in the treasury bill market has suffered. Over the 1990s, liquidity in the government securities market has also been supported by changes in the structure of the market such as the increasing use of IDBs by dealers and a slight rise in dealer competition. The rise in the level of transparency offered by the CanPX display system also offers the potential of increased liquidity in the future. Liquidity in the government securities market has also, occasionally, been adversely affected by transitory periods of above-normal interest rate volatility.

In terms of the readily available liquidity indicators, the Canadian market seems to compare favourably with a sample of 11 industrialized countries. Nevertheless, in terms of structural factors, which set the scene rather than bearing directly on liquidity, the degree of fragmentation in the debt stock and the relatively underdeveloped domestic futures markets could hamper the further enhancement of market liquidity in Canada.

Literature Cited

- Bank for International Settlements. Committee on the Global Financial System. 1999. *Market Liquidity: Research Findings and Selected Policy Implications*. BIS-CGFS Study No. 11, May.
- Boisvert, S. and N. Harvey. 1998. "The declining supply of treasury bills and the Canadian money market." *Bank of Canada Review* (Summer): 53–69.
- Datar, V., N. Y. Naik, and R. Radcliffe. 1998. "Liquidity and Stock Returns: An Alternative Test." *Journal of Financial Markets* 1: 203–19.
- Fleming, M. and E. Remolona. 1999. "Price Formation and Liquidity in the U.S. Treasury Market: The Response to Public Information." *Journal of Finance* 54 (October).
- Flood, M., R. Huisman, K. Koedijk, and R. Lyons. 1999. "Search Costs: The Neglected Spread Component." Monograph.
- Garbade, K. 1978. "The Effect of Interdealer Brokerage on the Transactional Characteristics of Dealer Markets." *Journal of Business* 51: 477–98.
- Gravelle, T. 1999a. "Liquidity of the Government of Canada Securities Market: Stylized Facts and Some Market Microstructure Comparisons to the United States Treasury Market." Bank of Canada Working Paper No. 99-11.
- . 1999b. "The Market Microstructure of Dealership Equity and Government Securities Markets: How They Differ." In *Market Liquidity: Research Findings and Selected Policy Implications*. BIS-CGFS Study No. 11, May.
- Harvey, N. 1999. "Recent Initiatives in the Canadian Market for Government of Canada Securities." *Bank of Canada Review* (Summer): 27–35.
- O'Hara, M. 1995. *Market Microstructure Theory*. Cambridge MA: Blackwell Publishers.
- Scalia, A. and V. Vacca. 1999. "Does Market Transparency Matter? A Case Study." In *Market Liquidity: Research Findings and Selected Policy Implications*. BIS-CGFS Study No. 11, May.