

LGB™

30-Year Government of Canada Bond Futures



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A Broader Range of Risk Management Tools for the Bond Market

The Montréal Exchange broadens its range of bond futures with the introduction of the 30-Year Government of Canada Bond Futures (LGB™).

Futures	Symbol	Nominal Value	Remaining Maturity	Coupon
2-year Government of Canada bonds	CGZ	C\$200,000	1½ years to 2½ years	4%
10-year Government of Canada bonds	CGB	C\$100,000	8 years to 10½ years	6%
30-year Government of Canada bonds	LGB	C\$100,000	21 years to 33 years	4%

The LGB will facilitate yield curve trading strategies by using it in parallel with the other bond futures contracts—the CGZ™ and the CGB™.

Why LGB?

There is a worldwide trend to issue longer-term government bonds and futures. For example, the U.S. Department of Treasury resumed issuing 30-year bonds at the February 2006 refunding for the first time since 2001. In addition, Eurex introduced the Euro-Buxl® Futures in 2005 for which the underlying debt instrument is a German government bond having a maturity of 24 to 35 years.

In Canada, the need for a 30-Year Government of Canada Bond Futures (LGB) has been expressed by a well-defined niche of market participants. More specifically, pension funds and insurance companies would be in a better position to hedge their long-term obligations by using the LGB.

Canadian Long-Term Bond Market

- The over 10-year Government of Canada (GoC) bond market accounts for 9% of the total GoC bond trading activity with an average daily turnover of C\$2.2 billion in 2006.¹
- Daily trading activity has been growing at an annual rate of 4.7% since 2001, increasing from an average daily turnover of C\$1.7 billion in 2001 to C\$2.2 billion in 2006.²
- The over 10-year GoC bond market has a high notional amount outstanding (C\$81.1 billion as at July 10, 2007). The 30-year GoC bonds eligible to the basket of deliverables for the LGB account for C\$36.9 billion in the last quarter 2007, with approximately C\$2.7 billion worth of new issuances annually.³

¹ Investment Dealers Association of Canada, "Bond Market Secondary Trading", http://www.ida.ca/Files/Compliance/BondMarketSecTrading_en.pdf.

² Ibid.

³ Bloomberg.

Contract Design

Physical delivery

Physical delivery is the preferred method for settling futures contracts on government bonds. It imposes more discipline on participants than cash settlement does. As there is a sufficient number and dollar amount outstanding of deliverable GoC bonds in the underlying cash market to support a long-term bond futures contract, the physical delivery settlement method has been selected.

The following additional reasons can also be invoked for choosing physical delivery:

- **Rollover:** The roll from the nearest expiring contract to the next listed contract will be more orderly if the contract calls for physical delivery. A physical delivery contract will better facilitate "fair value" rollover as users will find it easier to price the next contract month.
- **Trading opportunities:** Deliverable bond futures contracts create several trading opportunities due to short-term fluctuations in the cash/futures basis. The ability to profit from such fluctuations creates many arbitrage trading strategies.
- **Greater impact on the cash bond market volume:** Hedging, portfolio rebalancing and cash-and-carry strategies can create greater trading activity in the underlying cash bond market.
- **Harmonization between MX's bond futures contracts and those of international exchanges:** Harmonizing the delivery settlement method with the one that prevails for government bond futures contracts traded on other exchanges will contribute creating interproduct spread opportunities to take advantage of yield curve shifts. Such opportunities will also benefit arbitrage traders who use spreading techniques against similar futures contracts such as the 30-Year U.S Treasury Bonds Futures and the Euro-Buxl[®] Futures.
- **Liquidity:** In Canada, it is easier to get a 30-year government bond on the repo market than a 2-year bond as liquidity is higher in the 30-year cash market.
- **Canadian yield curve:** The Canadian yield curve is obtained from the government bonds, not from futures prices such as it is the case, for example, in Australia.

4% notional coupon

Harmonization with the 4% notional coupon of the Euro-Buxl[®] Futures listed on Eurex.

- **Better reflection of current yields:** A 4% notional coupon will better reflect the actual 30-year GoC bond market yield of 4.45% (as of October 2007).
- **Implications on the cheapest-to-deliver bond:** A 4% notional coupon will favour longer duration bonds and position the on-the-run (that is, the most recently issued) bond as the cheapest-to-deliver bond.

Users

- **Bond traders:** to manage book exposure, duration, basis trading, optionality.
- **Proprietary traders and hedge funds:** for yield curve trading (2-, 5-, 10- and 30-year), or to manage spreads between the LGB futures price and the prices of the Euro-Buxl[®] or the 30-Year U.S. Treasury Bonds Futures contracts.
- **Asset and liability managers:** to manage recorded assets and liabilities.
- **Bond portfolio managers:** to manage asset allocation and duration.
- **Insurance and trust companies** needing to hedge their very long-term liabilities.
- **Swap traders:** to manage the risk exposure of their book of positions and to use anticipatory hedge techniques such as locking-in interest rates in anticipation of future swap volume.
- **Speculators:** to manage directional trading, curve trading and optionality.

The launch of the LGB will be supported with continuous and competitive market making with size and spread commitments designed to ensure an attractive market.

LGB Contract Specifications

Trading Unit	C\$100,000 nominal value Government of Canada Bond with 4% notional coupon.
Contract Months	March, June, September and December.
Price Quotation	Quoted on a 100 points basis where 1 point equals C\$1,000.
Last Trading Day	Trading ceases at 1:00 p.m. (Montréal time) on the 7 th business day preceding the last business day of the contract month.
Contract Type	Physical delivery of eligible Government of Canada bonds.
Delivery Notices	Delivery notices must be submitted before 5:30 p.m. or before such time set by the clearing corporation on any business day, between the 3 rd business day preceding the 1 st business day of the delivery month and the 3 rd business day preceding the last business day of the delivery month inclusively.
Delivery Date	Delivery must be made on the 3 rd business day following the submission of the delivery notice by the member holding a seller's position or on any other day as determined by the clearing corporation. Delivery shall be completed no later than the last business day of the delivery month.
Minimum Price Fluctuation	0.01 = C\$10 per contract.
Reporting Level	250 contracts.
Position Limits	Information on position limits can be obtained from the Exchange as they are subject to periodic changes.
Minimum Margin Requirements	Information on minimum margin requirements can be obtained from the Exchange as they are subject to periodic changes.
Delivery Standards	Government of Canada bonds which: <ul style="list-style-type: none"> i) have a remaining time to maturity of between 21 years and 33 years as of the 1st day of the delivery month, calculated by rounding down to the nearest entire three-month period; ii) have an outstanding amount of at least C\$3.5 billion nominal value; iii) are originally issued at 30-year Government of Canada bond auctions; and iv) are issued and delivered on or before the 15th day preceding the 1st delivery notice day of the contract month.
Daily Price Limit	Three points (C\$3,000) per contract above or below the previous trading day settlement price.
Trading Hours (Montréal time)	Early session: 6:00 a.m. to 8:05 a.m. Regular session: 8:20 a.m. to 3:00 p.m. Curb trading session: the curb session begins once settlement prices have been determined and ends at 4:00 p.m.
Clearing Corporation	Canadian Derivatives Clearing Corporation (CDCC).

Detail specifications of MX's bond futures contracts are listed on MX Web site:

www.m-x.ca > MX Products > Interest rate derivatives.

Reducing the Duration of a Bond Portfolio

A pension fund manager forecasting a rise in interest rates intends to decrease the duration of his bond portfolio.

By using the 30-Year Government of Canada Bond Futures (LGB), the manager can quickly decrease the duration of the bond portfolio.

SETTING:

Value of bond portfolio	\$20,000,000
Total modified duration of the portfolio	13.72
Yield of the portfolio	4.73%
Targeted modified duration of the portfolio	10
Price of the LGB	93.74
Cheapest-to-deliver bond	Can 5% June 1 st , 2037
Conversion factor	1.16
DV01 of the cheapest-to-deliver bond (per \$100,000 notional amount)	\$176.20
DV01 of the LGB (per \$100,000 notional amount)	\$151.90

DV01 refers to the dollar value of a basis point.

Step 1

The pension fund manager must determine the dollar value of a basis point.

For the current portfolio: $\$20,000,000 \times 13.72 \times 0.0001 = \$27,440$

For the targeted portfolio: $\$20,000,000 \times 10 \times 0.0001 = \$20,000$

Difference between the targeted and the actual DV01 of the portfolio: $\$20,000 - \$27,440 = -\$7,440$

Step 2

The manager applies the following hedge ratio to determine how many LGB contracts must be sold to obtain the desired duration.

$$\frac{\text{Targeted portfolio DV01} - \text{Current portfolio DV01}}{\text{LGB DV01}} = \text{Number of LGBs}$$

$$\frac{-\$7,440}{\$151.90} = -48.9 \text{ contracts}$$

$$\Rightarrow \text{Number of LGBs to sell} = 49$$

Adjusting the total modified duration of a portfolio to investor's specifications is simple with the help of futures contracts. By selling (or buying) futures contracts, it is possible to decrease (or increase) the total modified duration of the portfolio.

Yield Curve Spread Canada–U.S.

An investor expects the Canadian economic activity to weaken compared to the U.S. economy. In addition, the investor believes that increasing signs of U.S. job growth and treasury issuance, combined with a weakening U.S. dollar and high current account deficit to gross domestic product ratio, will drive U.S. yields higher in the 30-year yield curve sector. The outlook is expected to result in U.S. 30-year Treasury yields to rise relative to 30-year Government of Canada bond yields.

The investor can act on this view by buying 30-Year Government of Canada Bond Futures (LGB) and selling 30-Year U.S. Treasury Note Futures (U.S. Futures) with the goal to structure a trade that will only respond to changes in the Canada-U.S. 30-year yield spread.

To implement the trade, the investor needs to determine the hedge ratio that will render the two legs of the spread essentially duration neutral. This allows both legs of the futures contract to respond equally to parallel yield shifts, with the spread trade producing results only when one yield changes relative to the other. However, because the U.S. Futures is denominated in U.S. dollars, the hedge ratio must also take the currency exchange rate into account.

SETTING:

DV01 of the LGB (per \$100,000 notional amount)	C\$151.90*
DV01 of the U.S. Futures (per \$100,000 notional amount)	US\$124.80
CAN-U.S. dollar exchange rate	1.0005 CAD = 1.00 USD

DV01 refers to the dollar value of a basis point.

* One basis point (bp) decrease in yields will increase the value of one LGB by \$151.90.

The hedge ratio, expressed in terms of LGB per U.S. Futures, is determined as follows:

$$\frac{\text{U.S. Futures DV01} \times \text{CAD per USD ratio}}{\text{LGB DV01}} = \frac{\$124.80 \times 1.0005}{\$151.90} = 0.822 \text{ contract}$$

To establish a duration neutral spread trade, the investor buys 0.822 LGB for every 1 U.S. Futures sold. To demonstrate that this spread position is essentially duration neutral, one simply multiplies the currency-adjusted U.S. Futures DV01 by 1 and the LGB DV01 by 0.822.

$$\text{U.S. Futures DV01 (currency adjusted): } \$124.80 \times 1.0005 = \text{C\$}124.86$$

$$\text{LGB DV01: } \$151.90 \times 0.822 = \text{C\$}124.86$$

Therefore, a one basis point yield shift results in the same dollar change in both legs of the spread.

The spread trade will generate gains when the Canada-U.S. 30-year yield spread narrows (that is, when Canadian 30-year yields decrease relative to U.S. 30-year yields). For example, U.S. yields can increase while Canadian yields decrease. Or, both yields can decrease with Canadian yields decreasing more, or both yields can increase with U.S. yields increasing more. All these scenarios will positively impact the spread described above. However, this spread will produce losses any time the spread widens.

Yield Curve Spread 2-Year/30-Year Government of Canada

An investor expects the Government of Canada (GoC) yield curve to continue to steepen in the future. Supporting the outlook is the anticipation of more rate cuts by the Bank of Canada due to a sluggish Canadian economy, as the output gap remains larger than expected as well as the adverse effects of the Canadian dollar's sharp appreciation on the export sector. The investor expects the front end of the yield curve to continue to be pressured to the downside as the yield spread between the benchmark 2-year and 30-year GoC bonds continues to widen.

With the expectations of further steepening in the yield curve, the investor can capitalize on this outlook by buying the yield curve using 2-Year and 30-Year Government of Canada Bond Futures (CGZ and LGB, respectively). A yield curve spread strategy that uses bond futures contracts implies that one buys or sells the yield curve in terms of what one does with the shorter-maturity bond futures contracts. Thus, if one anticipates a steeper yield curve (that is, a widening yield spread), then one would buy the curve by buying the CGZ and selling the LGB. Conversely, if one expects the yield curve to flatten (that is a narrowing yield spread), one would sell the curve by selling the CGZ and buying the LGB.

SETTING:

Price of the CGZ	99.515
Cheapest-to-deliver bond	CAN 5.5% June 1 st , 2010
DV01 of the CGZ	\$24.50
Price of the LGB	93.74
Cheapest-to-deliver bond	Can 5% June 1 st , 2037
DV01 of the LGB	\$151.90
Current 2-yr/30-yr GoC yield spread ("Thirties under Twos")	34 basis points

DV01 refers to the dollar value of a basis point.

The investor buys the spread by buying the CGZ and selling the LGB with gains or losses on the spread dependent on the result of changes in the yield curve as opposed to changes towards interest rates. To neutralize the directional changes of interest rates, a yield curve ratio (hedge ratio) is determined by using the DV01 for each contract. As a result, the investor is assured that each leg will respond equally, in dollar terms, to a given yield change.

The hedge ratio, expressed in terms of CGZ per LGB, is determined as follows:

$$\frac{\text{LGB DV01}}{\text{CGZ DV01}} = \frac{\$151.90}{\$24.50} = 6.2 \text{ contracts}$$

Therefore, to establish a duration neutral spread trade, the investor buys 6.2 CGZ for every 1 LGB sold. This yield curve strategy results in a gain only if the yield curve steepens (that is, the 2-year/30-year spread widens). However, the strategy will generate a loss if the yield curve flattens (that is, the 2-year/30-year spread narrows).

Hedging Open Swap Positions

A swap trader holds a plain-vanilla interest rate swap for which he receives a fixed rate of 5.06% semi-annually for 30 years and pays a floating 3-month bankers' acceptance rate on a notional amount of \$10 million. The trader can realize a profit of 15 basis points on the fixed-rate portion of the swap if the swap position can be immediately offset at the current swap rate of 4.91%. However, no counterparty with a satisfactory credit rating is available. The trader is concerned that a rise in interest rates will erode the profit margin of the swap position.

The trader can hedge the fixed-rate portion of the swap against a rise in interest rates by selling a specific number of 30-Year Government of Canada Bond Futures (LGB). Receiving a fixed-rate on a swap is similar to buying a bond with the corresponding hedge consisting of selling bond futures contracts. Therefore, the trader's borrowing costs can be indexed to the yield of the 30-year Government of Canada benchmark bond. The trader can lock-in current borrowing levels by selling LGB until an offsetting swap can be arranged.

SETTING:

Price of the LGB	93.74
Price of the cheapest-to-deliver bond Can 5% June 1 st , 2037	109.91
Yield-to-maturity of the cheapest-to-deliver bond	4.40%
Conversion factor	1.16
DV01 of the cheapest-to-deliver bond	\$176.20
DV01 of the LGB	\$151.90
DV01 of the fixed-rate portion of the 30-year swap per \$10,000,000 notional amount	\$15,730
Swap rate currently quoted in the market	4.91%

DV01 refers to the dollar value of a basis point.

Step 1

Determine the dollar value of a one basis point increase for the 30-year fixed-rate portion of the swap. The trader determines that the DV01 of the fixed-rate portion of the 30-year swap is \$15,730.

Step 2

Determine how many LGB contracts (hedge ratio) must be sold to hedge the fixed-rate portion of the swap:

$$\frac{\text{Swap DV01} = \$15,730}{\text{LGB DV01} \quad \$151.90} \approx 104 \text{ contracts}$$

The swap trader effectively locked-in the lower cost of funds by selling an appropriate number of LGBs before offsetting the swap.

Cash-and-Carry Trade

A bond trader notes that the price relationship between the cheapest-to-deliver Can 5% June 2037 (GoC) bond and the 30-Year Government of Canada Bond Futures (LGB) is out-of-line.

The trader's observation is supported by:

1. An actual repo rate (4.95%) that is lower than the repo rate (5.15%) implied by the price of the LGB. A condition that provides the trader an arbitrage profit by initiating a cash-and-carry trade, whereby the trader sells bond futures and finances the purchase of the cash bond at a rate below the rate implied by the futures price. The bond is then held until it is delivered to fulfill the obligation of the sale of the futures contract;
2. A net basis (basis after carry) reflecting that the actual price of the LGB is overpriced relative to its theoretical fair value.

June 2008 LGB	Last Delivery Day 06/30/08	LGB Price 93.74	Valuation date 01/15/08			
Coupon	Maturity	Bond Price	Conversion Factor	Implied Repo	Actual Repo	Net Basis
5%	June 37	109.31	1.1691	5.15%	4.95%	-0.087

The trader realizes that the temporary mispricing offers an arbitrage opportunity. Thus, he initiates a cash-and-carry trade consisting of the purchase of the cheapest-to-deliver bond in the cash market and the sale of LGB, to lock-in a profit.

The trader initiates a cash-and-carry trade that involves the following steps:

1. Purchase the cheapest-to-deliver (CTD) bond (bond price + accrued interest).
2. Finance the bond purchase at the current short-term financing rate (actual repo rate).
3. Receive any intervening coupon plus reinvestment income during the life of the futures contract.
4. Receive the futures invoice price + intervening coupon accrued interest from delivering the bond (that is, collect the expected receipt from delivering bond to the buyer).
5. Repay the cash amount borrowed to purchase the CTD bond + interest.
6. Calculate arbitrage profit.

SETTING:

Price of the cheapest-to-deliver bond CAN 5% June 1 st , 2037	109.31
Accrued interest: $48/183 \times 2.5$ (48 days = December 1 to January 18 settlement date)	0.655
Financing rate (actual repo rate)	4.95%
Conversion factor	1.1691
Price of the LGB	93.74
Days from settlement to futures delivery (January 18 to June 30)	164
Days from next coupon to futures delivery (June 1 to June 30)	29

CASH-AND-CARRY TRANSACTION	AMOUNT (per \$100,000.00 notional amount)	REMARKS
Purchase the CTD bond	$\$109,310 + \$655 = \$109,965$	Price of bond + Accrued interest
Financing costs until LGB delivery	$\$109,965 \times 0.0495 \times 164/365$ $= \$2,446$	Amount borrowed to buy bond x Short-term financing rate x Number of days/365
Income during the life of the LGB (credit and reinvestment of the coupon: June 1 to June 30)	$\$2,500 + (\$2,500 \times 0.0495 \times 29/365)$ $= \$2,510$	Coupon income + (Coupon income x Short-term financing rate x Number of days/365)
Total costs of the bond position	$\$109,965 + \$2,446 - \$2,510$ $= \mathbf{\$109,901}$	Investment + Financing - Income
Delivery price of the deliverable bond at LGB delivery	$(\$93,740 \times 1.1691) + \397^* $= \mathbf{\$109,988}$	Futures invoice price x Conversion factor + Accrued interest received by the seller from the bond buyer
	<small>* $\\$100,000 \times 5\% \text{ coupon} \times 29/365$</small>	
Arbitrage profit (per LGB)	$\$109,988 - \$109,901 = \mathbf{\$87}$	Delivery price of the deliverable bond - Total costs of the bond position

By using the LGB, the cash-and-carry strategy results in a profit of \$87 per contract.

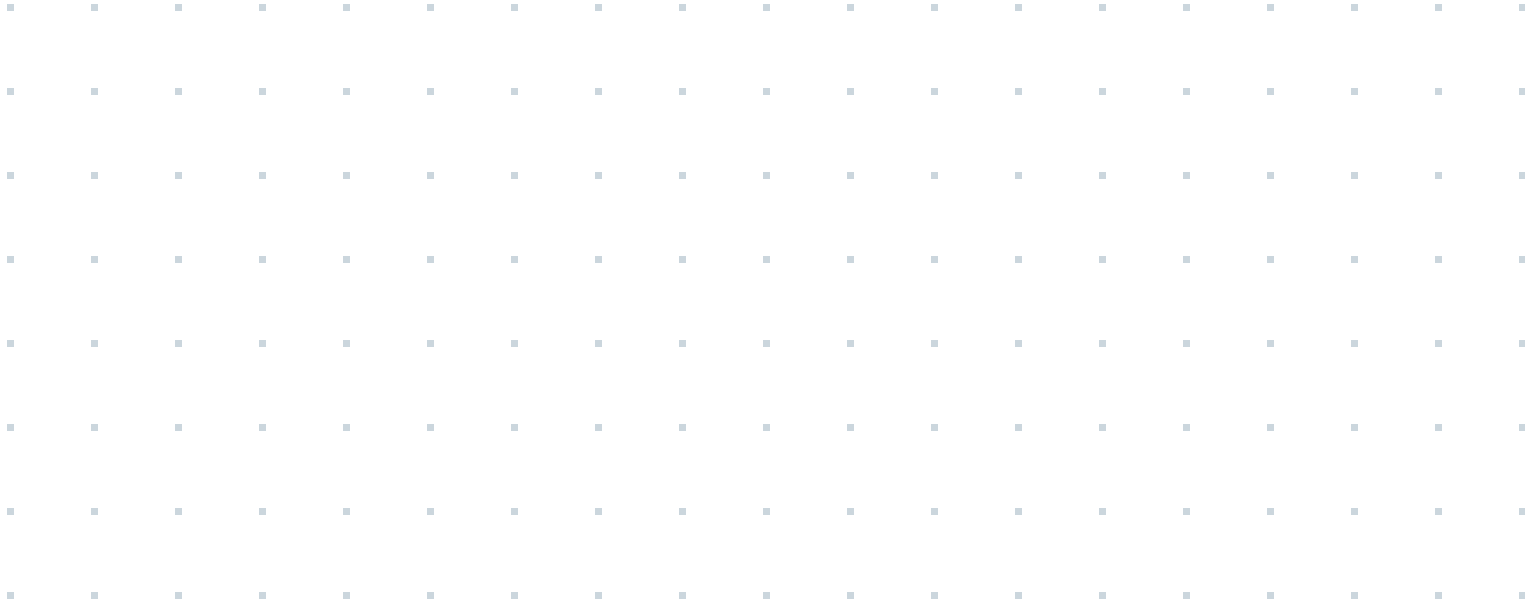


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