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CGF Five-Year Government of Canada Bond Futures

CGB Ten-Year Government of Canada Bond Futures

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Understanding the Implied Repo Rate

Finance professionals sometimes fall victim to overly complex language when a simpler explanation will suffice to communicate an idea. Recently, we realized that the notion of implied repo in 10-year and 5-year Government of Canada bond futures contracts (CGB and CGF, respectively) is often described solely in arbitrage terms, which does little to further the understanding of managers who are interested in buying or selling futures for interest rate exposure. Since most clients are not directly involved in futures arbitrage strategies, we attempt to clarify the notion of implied repo and what it means for more traditional users of physical delivery bond futures or cash bonds.

Implied Repo for Real Money Managers

For clients not involved in futures arbitrage, CGF and CGB are a way to hedge or achieve interest rate exposure cheaply and without using cash. However, the concept of implied repo rate is still an important one when comparing futures and bonds as it equates to the cost of financing the futures position until delivery. This cost will be either positive or negative, depending on the position, and can be greater than or less than the costs incurred to transact in the cash market, allowing the Portfolio Manager to choose the most cost effective way to gain/hedge interest rate exposure.

Implied Repo as Forward/Spot Equivalence

Consider the following prices on the Montréal Exchange's 10-year bond futures (CGB) contract and its cheapest-to-deliver (CTD) bond from February 28th, 2020.

Security	Price	Yield-to-Maturity
CGBM20 (Conversion Factor 0.7488)	142.72	1.125%[1]
Canada 2.00% June 1st, 2028	107.009	1.108 %

An investor starting with no position can purchase the Canada 2.00% June 2028 by buying it for cash in the spot market, buying it without cash by financing the purchase in the repo market, or by buying the CGBM20 contract. The two assets above will be identical on the futures delivery date[2] of June 30th, 2020 because the Canada bond will be the CTD bond for the M20 contract[3].

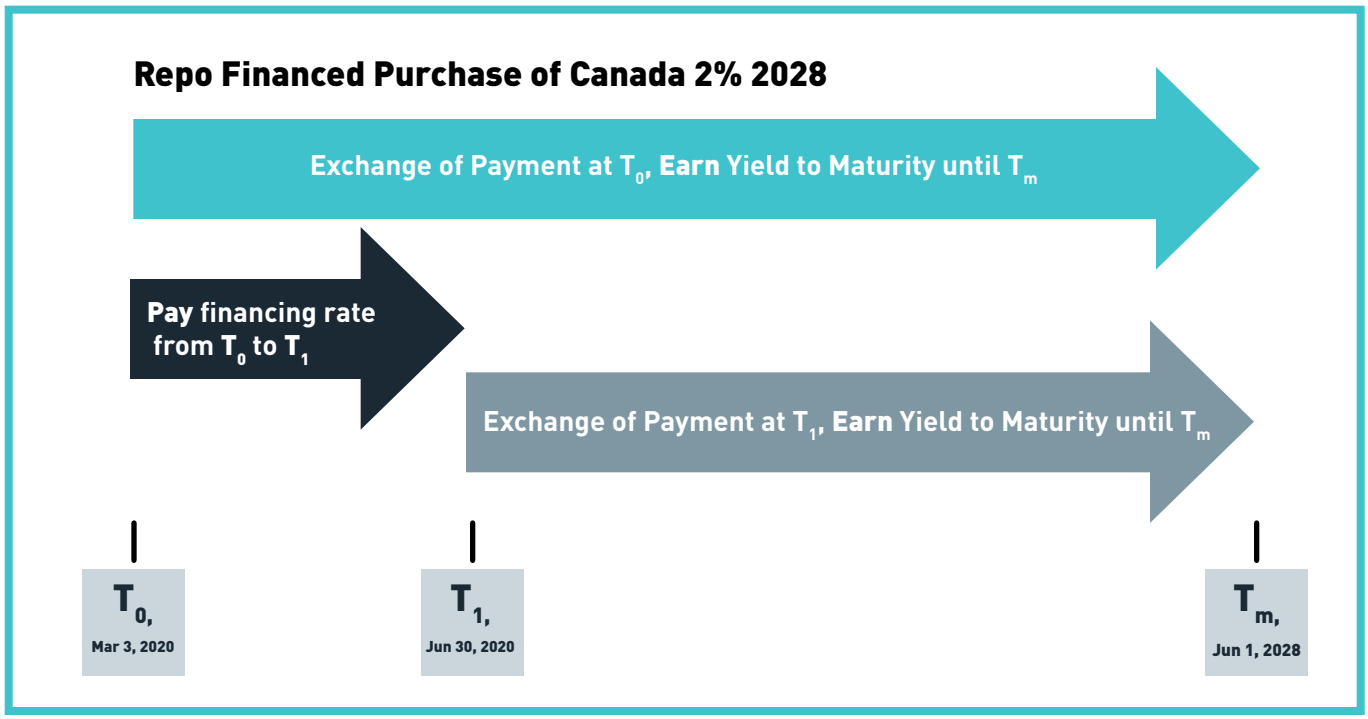
For the purpose of illustration, look at Figure 1 which describes the transaction graphically. For the bond purchase, cash is exchanged at T_0 and the buyer effectively begins to earn the yield to maturity, including both cash accruals and pull-to-par, on T_0 until T_m, the maturity date of the bond.

1. Futures forward yield-to-maturity based on the CTD issue, from the delivery date to the bond maturity date.
2. The delivery date used can be the first or the last delivery date of the delivery month. If the CTD bond coupon is higher than the overnight rate (positive carry), the last business day of the delivery month should be used. If the CTD bond coupon is lower than the overnight rate (negative carry), the first business day of the delivery month should be used.
3. A cheapest-to-deliver switch to June 2029 or June 2030 is theoretically possible but so improbable that the casual user of futures contracts need not consider the possibility at this time.

FIGURE 1

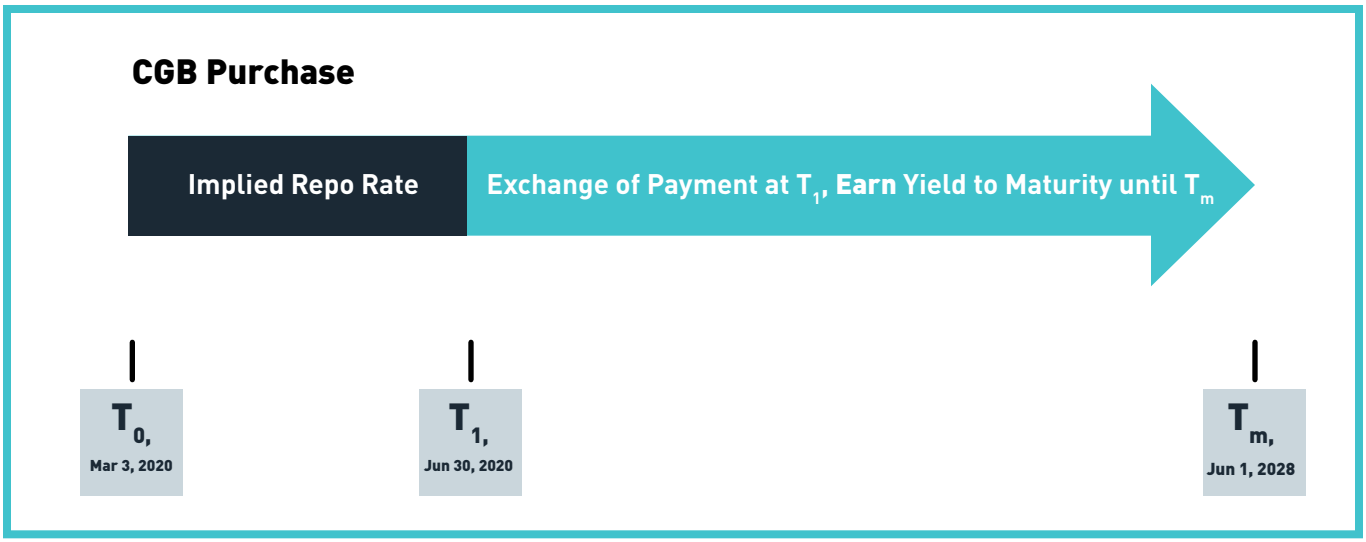
Figure 2 shows the same depiction of the bond purchase but where the portfolio finances the purchase in the repo market. Cash is exchanged at T_0 but the bond is used as collateral for a loan which exactly pays for the purchase price of the bond so the cash exchange for the portfolio nets to zero on T_0. The yield to maturity is earned on the bond from T_0 (the blue arrow) but, for a period of time where cash is borrowed to finance the purchase, a different yield must be paid away to reflect the rate the portfolio must pay to borrow the cash (the black arrow). That rate is paid until the end of the repo financing is reached, at which time the portfolio must produce cash to purchase the bond outright, assuming the financing isn't extended. After T_1, the portfolio earns the yield to maturity until the maturity date, T_m. The net of the two becomes the grey arrow where the portfolio earns the yield to maturity on the bond between T_1 and T_m.

FIGURE 2



Now turn to Figure 3, which depicts a CGF or CGB futures contract purchase. No cash is exchanged at T_0 but instead at T_1 (the delivery date), a future date. Since no money is borrowed, there is no cash financing rate associated with the contract. However, because the futures price and the bond price are not identical at T_0, there is some short-term interest rate applicable between T_0 and T_1 that is equal to the imaginary financing rate that would equate the cash price of the bond and the futures equivalent price of the same asset. That implied financing rate is the implied repo rate and, since the futures purchase looks exactly like the repo financed bond purchase in Figure 2, the implied repo rate can be thought of in exactly the same way as the repo financing rate in that Figure. Implied repo on the futures contract is the interest rate between T_0 and T_1 (expressed in repo market conventions) that equates the futures contract price with the cash bond price[4].

FIGURE 3



Given that Figure 2 and Figure 3 express the same concept, another way of thinking of the implied repo rate is simply the rate one is theoretically paying away between T_0 and T_1, the delivery date, in order to acquire the same interest rate exposure as a bond purchase but for almost no outlay of cash[5].

Of course, for the normal user of futures contracts, delivery will not take place as the position will be closed out and a new position opened in the next contract, if the exposure is still needed, before the delivery period begins[6].

Long the Contracts

From the perspective of a Portfolio Manager that just wants long 10-year bond exposure, buying the CGBM20 contract is equivalent to buying the cheapest-to-deliver bond without using cash to pay for it. Normally, one would borrow the full price of the bond in the repo market or from some other source such as a prime broker, using the purchased bond as collateral, and pay some rate for a specified period of time for doing so. The futures contract is the identical exposure and the rate one theoretically pays away is the implied repo rate – the rate which equates the spot price to the forward price. That implied repo rate (theoretical funding rate) for the buyer of the contract can be compared to the actual borrowing rate in order to evaluate the relative value of futures and cash instruments. If the implied repo rate is lower than the actual borrowing rate, the futures market is considered cheap compared to the cash market. A rule-of-thumb that is shown in the Summary Table below.

4. For more information on the implied repo rate and the formula used to compute it, please refer to the Implied Repo Analysis.
5. Upfront costs such as initial and maintenance margin exist but are much smaller than the purchase price of the bond.
6. For instance, 98% of all CGBZ19 contracts were closed in late November 2019 before delivery was even possible for the contract.

Short the Contracts

A Portfolio Manager that needs short 10-year exposure would do the reverse trade, selling the futures contract instead of selling short the bond. Normally a fund could do this by borrowing the bond in the repo market and lending the proceeds of the sale to someone and thus earning a rate of return on the cash. That rate of return for the seller of the contract can be compared to the implied repo rate, and if a higher rate can be obtained in the repo market, the futures market is considered rich compared to the cash market.

Summary Table

	Long Exposure	Short Exposure
Implied repo rate represents	Funding/borrowing cost	Return on loaned cash
Implied repo rate compared to	Firm's borrowing cost	Firm's earned return from repo
If implied repo > compared rate	Cash market is cheaper	Futures market is cheaper
If implied repo < compared rate	Cash market is richer	Futures market is richer

Of course, there are other reasons to utilize futures contracts instead of cash bonds besides just financing costs, and other metrics could be used to assess the benefits. Transaction costs are typically lower and, for a levered transaction, the firm-wide effort involved in transacting in the repo market can be substantial[7]. Additionally, some firms are not able to access repo markets at all and others prefer the simplicity of transacting and settling futures contracts.

Risks

One important risk to this way of thinking about implied repo rates is that almost all contracts are closed before delivery while the implied repo rate is the financing rate, with certainty, to the delivery date of the futures. If the contract is closed out early, a gain or loss may occur due to the different implied repo rate at the time of closing. This is still exactly analogous to the repo financed bond purchase since closing that trade early would also incur a gain or loss on the financing (black arrow) portion of Figure 2.

Timing Option

Another risk associated with the delivery date is the embedded timing option in the futures contract. While usually predictable in advance, situations can arise where the optimal delivery date for a contract changes from the end of the delivery month to the start of the delivery month or vice-versa. This doesn't mean a portfolio has to make or take delivery, but it does mean that the position has some risk since the implied repo rate is now to a different end date. That means the cash price and futures price will converge on a different date and has repercussions for the relative value of the two instruments.

Other Embedded Options

CGF and CGB contracts are a complex product that we've tried to simplify for non-arbitrageurs. However, minor risk always remains that one or more of the options embedded in the contract would become valuable and/or futures prices will stray temporarily from fair value in other unexpected ways. These risks are quite small while interest rates are low and typically favor short positions in futures if something very unexpected happens since the short position owns the embedded options.

For the most part, participants in CGF and CGB futures need not be experts in valuing switch risk since the probability of a switch in the deliverable bond has been almost nonexistent for several years now in both CGF and CGB contracts. Further, Portfolio Managers that do not carry their position into the delivery period don't need to be able to value the end-of-month or wildcard options but should be aware that these options may sometimes mean the value of a futures contract differs in small amounts from the bond price before the delivery date.

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7. Regardless of the implied repo rate assessment, futures tend to be cheaper because the trading costs (bid/offer) are typically low enough to compensate for any other differences over time. Please refer to the Montréal Exchange Articles to access other publications and analyses.

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