MONTRÉAL EXCHANGE

A Deep Dive into Switch Risk

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Regular readers of the Montréal Exchange's quarterly update for fixed income futures contracts will recognize our mantra "no switch risk this quarter" as we have repeated it nearly every quarter over the past five years. However, to deepen our readers' understanding of the switch option (technically called the quality option) embedded in futures contracts, we undertake a thorough investigation into the factors contributing to the minimal impact of switch risk in Canadian fixed income futures contracts.

Switch Risk/Quality Option

Switch risk refers to the possibility that the optimal bond for delivery in a futures contract changes due to market developments. This means the cheapest-to-deliver (CTD) bond shifts from the bond investors originally expected to another bond in the delivery basket. This option is given by the quality option (also called the delivery option), the name given to the option to choose the bond to deliver. This choice belongs to the seller of the futures contract, not the buyer.

The quality option exists because the short party in a futures contract can decide which bond in the delivery basket to deliver to the long party. If the relative pricing of the bonds in the basket is such that a bond other than the bond that was CTD at the time the contract was sold becomes more favourable for the futures short position to deliver into the contract, the CTD has switched. The short futures investor will then make the rational choice to deliver the new CTD into the contract, essentially exercising the quality option. The buyer of the futures contract is short the quality option[1] and is obligated to take delivery of the bond chosen by the seller of the contract.

Note that changes to the CTD have significant effects on the characteristics of the futures contract, as the DV01 and duration can change drastically when a CTD switch becomes more probable at any point during the contract's life. This is particularly true in Canada, where the switch between bonds in the basket would extend the duration of the futures contract by at least six months for both CGB® and CGF® contracts. In comparison, a switch from the current CTD in the U.S. 10-year futures contract to the next most likely deliverable bond would change the futures contract's maturity by less than one month, given the preponderance of issuance there and the subsequently well-populated delivery basket.

Implied Coupon of 6%

Undoubtedly, the biggest factor in reducing or eliminating the potential for CTD switches in Canadian futures contracts is the 6% implied coupon used to calculate the conversion factors for the bonds in the delivery basket. This 6% assumption is currently applicable to all the physical delivery fixed income futures contracts traded on Montréal Exchange, including the CGZ® (2-year), CGF (5-year), CGB (10-year), and LGB® (30-year) contracts.

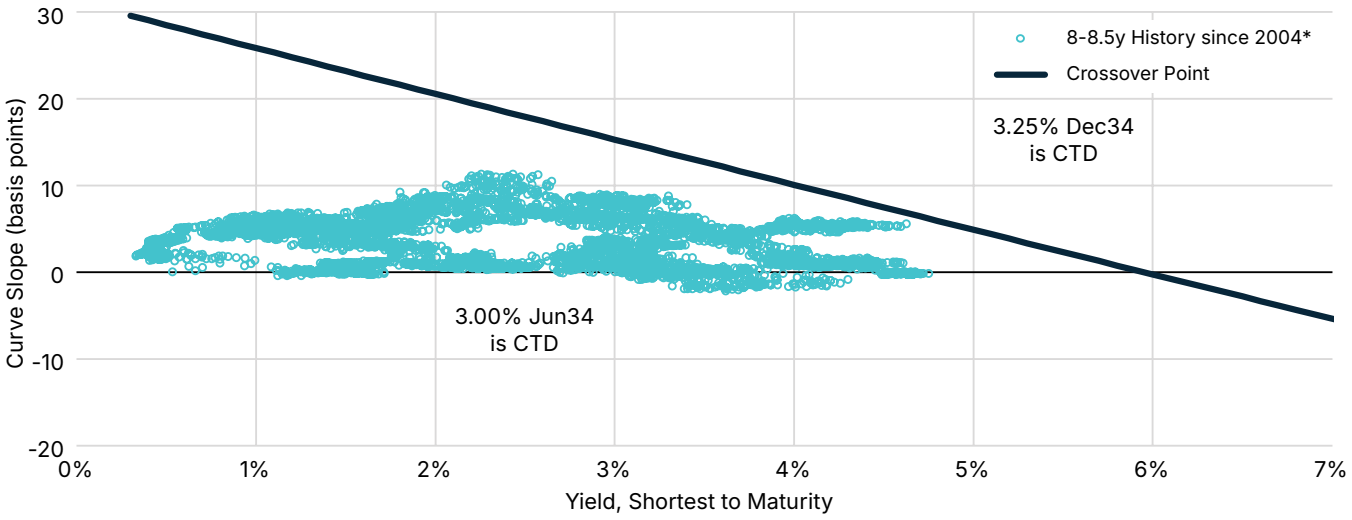
Recall that the conversion factor formula is designed to make all bonds equivalent for delivery at the implied coupon rate – in this case, 6%. However, when the current interest rate level differs from this implied rate, differences develop in the economic viability of delivering one bond over another. In recent years, interest rates have remained well below 6% across all bond maturities. Even during the bond selloff following the COVID inflation event, interest rates never neared 6% at any point on the Canadian yield curve.

1 In fact, the long position in a futures contract is short all the embedded options, not just the quality/delivery option.

The combination of a high implied coupon used to calculate delivery conversion factors and low interest rates results in the scenario shown in Figure 1. In the figure, the crossover points between the Canada 3% June 2034 bond, the shortest-maturity bond in the CGBM26 delivery basket, and the Canada 3.25% December 2034 bond are represented as the diagonal line. This line shows the combinations of yield for the June 2034 bond and the slope between the June and December bonds at which a short position in a CGBM26 contract would be completely indifferent between delivering the two bonds – meaning that on the line, they are equally cost-effective to deliver to the long position to satisfy the contract terms and conditions. Similarly, the longer-maturity bond is the optimal choice to deliver if the yield/slope combination is above the line, while the shorter-maturity bond is the optimal bond to deliver at all combinations of yield and slope below the line. The plotted points in the figure represent all the daily observations of the generic 8-year bond yield (constant maturity) and the 8-8.5-year curve slope since 2004. Note that using the 6% implied coupon to calculate conversion factors means that no combination of yield and slope observed over the past two decades could lead to a CTD switch for this contract.

FIGURE 1

Cheapest-to-Deliver Crossover Points CGBM26 with 6% Implied Coupon



Source: Author calculations, BMO Capital Markets[i] Fixed Income Sapphire database, Montréal Exchange

To further illustrate this, we can easily recalculate the conversion factors using a different implied coupon and then use those factors to determine the theoretical frontier of yield and slope combinations that produce a CTD change. In Figure 2, we calculated new conversion factors using a 4% implied coupon to equate all bonds in the delivery basket at delivery and compare them with the existing conversion factors that used a 6% implied coupon.

FIGURE 2

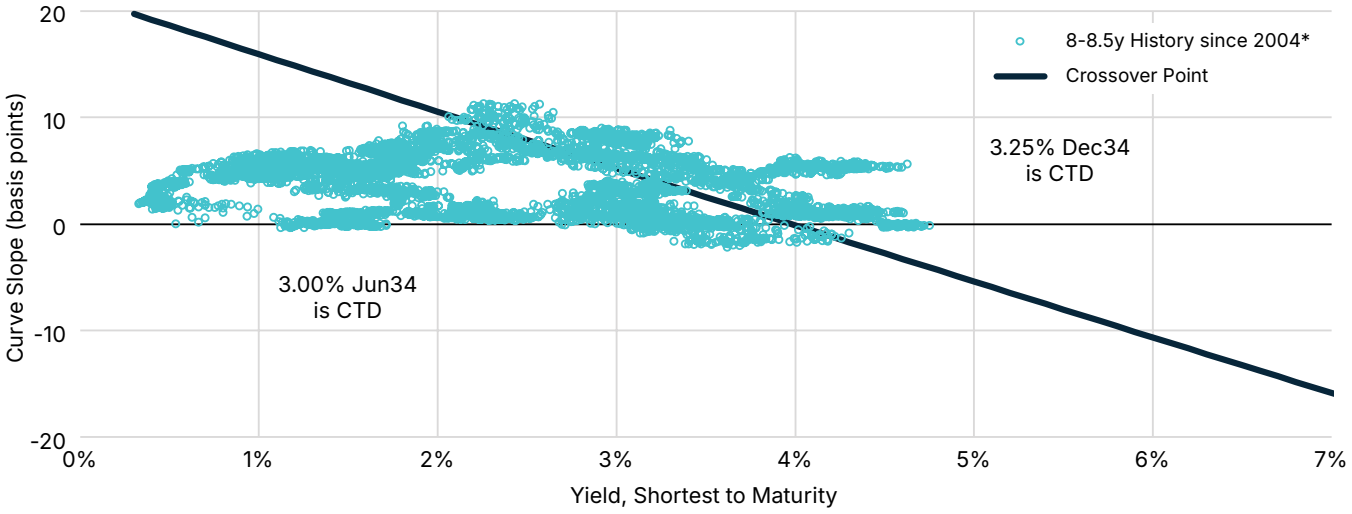
BOND	CF @6%	CF @4%
3.00% Jun34	0.8306	0.9395
3.25% Dec34	0.8339	0.9518

Source: Author calculations, Montréal Exchange

Similarly, we can reproduce Figure 1 for the new CTD crossover points, which is shown in Figure 3. Note that in the new figure, roughly 25% of all yield and slope observations over the past 22 years would trigger a CTD switch if the implied coupon for the bond conversion factors was 4% instead of 6%. We also note that the switch risk is even more significant than it appears in our simplified example since the basket contains more than just these two bonds. As the overall yield in the 10-year sector approaches and exceeds the 4% point in this example, each bond eligible for delivery could take turns serving as the CTD.

FIGURE 3

Cheapest-to-Deliver Crossover Points CGBM26 with 4% Implied Coupon

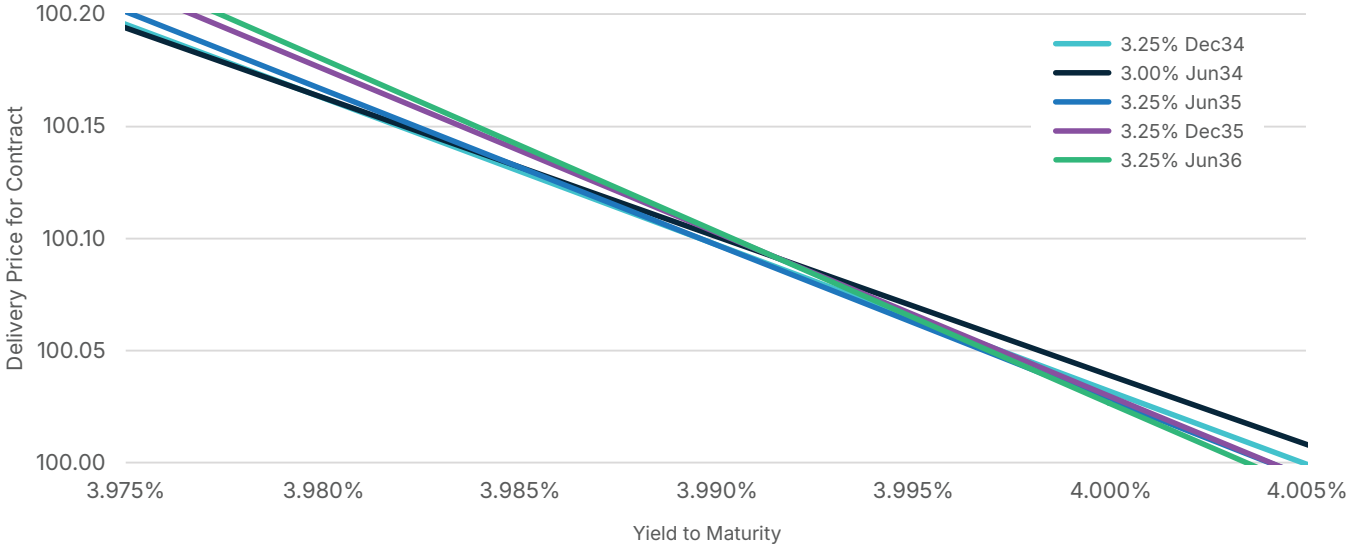


Source: Author calculations, BMO Capital Markets[i] Fixed Income Sapphire database, Montréal Exchange

This instability in the CTD is illustrated in Figure 4, where, at any given yield level, the lowest line on the chart is the CTD bond as interest rates cross through the 4% point on the curve. Since the bonds have similar or identical coupons, each bond in the delivery basket becomes the CTD near the 4% point in this theoretical example. With five eligible bonds in the delivery basket for this contract, constantly adjusting hedges as rates fluctuate would be burdensome and potentially expensive, to say the least.

FIGURE 4

Delivery Price, CGBM26, Flat Curve



Source: Author calculations

Auction Schedule and Market Structure

A second important factor that reduces switch risk in Canadian fixed income futures contracts is the structure of the federal bond market. Unlike in some other, larger debt markets, the Government of Canada issues relatively few new bond maturities on a rigorous schedule. Updated at least annually, the Canada Debt Management Strategy currently plans to issue a new 2-year bond every three months, a new 5-year and 10-year bond every six months, and a new 30-year bond every two to three years. As most bond market participants know, 2-year bonds mature on the first day of February, May, August, and November, while 5-year bonds mature only[2] on the first day of March and September. Similarly, 10-year bonds mature in June and December while 30-year bonds mature only in December. As mentioned above, these are the current conventions and are subject to change, but they have been maintained, with just a few adjustments to meet the federal government's changing borrowing needs over many years.

Unless there is a pressing need, the Bank of Canada generally does not reopen old bond issues. This means a certain maturity of bond is unlikely to be reissued or auctioned again after a new bond with the next maturity date is created. In this way, Canada bonds follow a very regular lifecycle, starting with the bond's auction, followed by taking benchmark bond status for a period of time, then later, or even concurrently, they become the CTD bond for a futures contract before becoming a truly off-the-run bond until they mature. This predictable lifecycle influences the dynamics of futures contract delivery baskets and helps explain why switch risk is minimal in Canada – there are few, if any, surprises from the auction schedule for Canada bonds.

Strict Delivery Baskets

Importantly, the criteria for inclusion in the Montréal Exchange futures contracts delivery basket are more restrictive than those of many other bond markets. Specifically, we focus on the third bullet point in Figure 5, which shows the delivery standards for the CGB (10-year) futures contract. Note that the delivery criteria exclude bonds that were not originally issued with a 10-year maturity. For example, a 30-year bond issued 20 years ago that would qualify for the delivery basket under the maturity criteria in the first bullet point is excluded unless it has been reopened for significant size in the past 12 months. As we noted above, reopenings occur very rarely, and only in exceptional circumstances, so old bonds, often with very high or very low coupons, are almost always excluded from delivery into the futures contracts in Canada.

2 The schedule changes from time to time so bonds exist that don't follow this formula. For example, a 30-year bond matures in June 2029 but it was first issued in early 1998 before the convention of December maturity dates for all 30-year bonds was adopted.

FIGURE 5

Delivery standards

Government of Canada Bonds which:

1. have a remaining time to maturity of between 8 years and 10½ years as of the first day of the delivery month, calculated by rounding down to the nearest whole three-month period;
2. have an outstanding amount of at least C$3.5 billion nominal value;
3. are originally issued at ten-year auctions (a bond not issued at a 10-year auction which would otherwise meet the standards of this rule, is also deemed to be deliverable, if during the last 12-month period preceding the first Delivery notice day of the Delivery Month, its re-openings total a minimum nominal amount of $3.5 billion);
4. are issued and delivered on or before the fifteenth day preceding the first delivery notice day of the contract.

More information on delivery standards is available in article 12.312 of the Rules of the Bourse.

Source: Montréal Exchange

With older bonds explicitly excluded from delivery and a strict, predictable auction schedule that regularly creates new maturities but with relatively long intervals between maturity dates, the number of bonds eligible for delivery into the futures contract remains quite small[3], especially compared to some other markets that have similar, physical delivery, fixed income contracts.

Perhaps the effect of rigid, and therefore small, delivery baskets is best illustrated by comparing the 5-year Treasury futures contract in the U.S. market (FV) with the 5-year (CGF) contract in Canada. For the June 2026 FVM6 (May 2026 5-year) contract, there are seven different bonds that can potentially be delivered with just 6 months difference between the shortest and longest maturity. In Canada, for the June 2026 CGF contract, there is currently only one bond eligible for delivery, although this should increase to two as more 5-year bond auctions take place.

Repo Specials

Another factor that can influence the determination of the CTD bond is its scarcity in the securities lending market. Repo specials, where bonds become scarce in the lending market and therefore more expensive to borrow, can also affect the CTD, although this factor is usually less significant than the other factors discussed above.

At delivery time, the day a short position chooses to deliver bonds into the contract, not the entire delivery period, the CTD bond is simply the bond that costs the least when acquired in sufficient quantity to be delivered. Financing costs have no bearing on this calculation. However, before the delivery date, the CTD bond is the one with the lowest basis net-of-carry[4], or the one that provides the maximum profit for a long-basis position (sell futures, buy bonds). If the investment has a time horizon of even a single day, financing costs become relevant.

In a long-basis position, an investor sells the futures contract and buys the CTD bond. Importantly, the investor also lends the bond in the repo market to raise the funds needed for the initial bond purchase.

3 The delivery basket for the 5-year contract often includes only a single bond at the start of the quarter and incorporates a second maturity only after subsequent bond auctions increase the size of the issue past the criteria for inclusion in the basket.

4 Investors who are more familiar with implied repo can substitute “highest implied repo rate” for “lowest basis net-of-carry”. This substitution works for participants who prefer to think of the long basis position as “earning the implied repo rate to delivery” as well.

When lending the bond, the investor receives the term repo rate for that security, which might differ from the general collateral rate for the same term. Receiving an interest rate lower than expected can alter the calculation of the CTD bond if that calculation is made days or weeks before the intended delivery date (which is common).

However, repo specials rarely occur in Canada because large domestic pension and insurance companies hold significant bond inventories and run sophisticated lending operations. In some cases, the Bank of Canada will lend its own holdings, which currently include a range of less-liquid, commonly held bonds, to primary dealers if a “repo squeeze” develops.

Summary

In conclusion, our examination of the factors affecting the likelihood of switch risk has identified four main drivers, each of which reduces the probability of a CTD switch from a possible event to a highly unlikely one. Of course, even unlikely events can happen, so we will probably need to acknowledge that CTD switches are possible but not likely for many years to come.

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