

# 5-year Cash vs. CGF Futures vs. 5-year IRS: A Comparative Analysis

## General

We test both a hedge to a long position (i.e. sell bonds/futures or pay fixed in swaps) and a hedge to a short position (buy bonds/futures or receive fixed in swaps) in order to make the analysis applicable to a broad range of clients. However, we anticipate that most buy-side clients will be interested in the cost comparison of the model hedging a long position.

The pro-forma model calculates the cost of hedging identical DV01 amounts of 5-year interest rate exposure in Canada using the benchmark 5-year Government of Canada bond, CGF futures contracts, and 5-year vanilla interest rate swaps. For each instrument, the hedge is purchased or sold at the inception date and the trade is closed completely on the horizon date<sup>1</sup>. Yield curves are assumed to be unchanged between initiation and horizon dates but each instrument is “aged” such that accrued interest accumulates as time passes and the instrument “rolls down” the curve. Bid/ask spreads in 5-year bonds and swaps are tested at a baseline level from a “normal” market but a sensitivity analysis is done on the assumptions after an initial result is found.

## 5-year Cash Bond

An investor initially transacts on the appropriate side of the market based on a closing quote from a Canadian investment dealer. The full price of the bond is funded in the repo/reverse market at the prevailing Bank of Canada overnight rate with no financing squeeze and no haircut on collateral. At horizon, the bond transaction is unwound at a price calculated from the yield implied by the unchanged yield curve plus/minus the assumed bid offer (3 cents/\$100 notional baseline). The sum of all the proceeds from the hedge and its financing is the total cost of hedging using bonds. Booking costs and the labour costs associated with repo financing are ignored and/or assumed to be zero.

## CGF Futures Contract

An investor initially transacts at the futures price on the inception date of the hedge that would make the contract fair value to the cheapest-to-deliver bond, or where the implied repo rate on the 5-year Government of Canada futures contract is equal to the overnight rate. This is done in order to avoid reflecting short-term price anomalies such as rich or cheap futures contracts on the trade date. On initiation, the investor pays the transaction fees to execute the trade and posts initial margin at the minimum rate prescribed by the Montreal Exchange.

At closing, the implied repo rate is assumed unchanged over the hedge horizon and the closing level of the contract is thus determined by the price of the cheapest-to-deliver. A 1-cent bid/ask spread is added or subtracted depending on the direction of the closing trade. Execution costs are again incurred and an opportunity cost associated with the margin posted (initial and maintenance) is calculated and charged to the total cost of the CGF hedge scenario.

1. The horizon date is one month after the inception date, adjusted for next good business day in Canada, if necessary.

## 5-year Over-the-Counter Interest Rate Swap

An investor pays or receives fixed on a vanilla Canada interest rate swap which is cleared via LCH (to calculate costs). Terms of the swap are 5-year fixed versus 3-month BA (3-month reset, paid every 6-months). During the horizon period of the hedge, accruals are realized on both the fixed and floating leg of the swap which are paid/received when the swap is bought out at the horizon date. The swap value evolves with the fixed leg rolling down the swap curve and the floating leg rolling down the BA curve.

The investor pays LCH clearing fees and posts initial and maintenance margin as though this is the only position in their LCH cleared account since the model can't assume the new swap is risk reducing for an individual client. The initial trade occurs at the 5-year mid-rate and the round-trip bid/ask (baseline 1.5 basis points) in the vanilla interest rate swap is paid on closing. Like the futures contract scenario, an opportunity cost for the posted margin is charged against the swap scenario on closing.

## Results

Baseline results favor the 5-year futures hedge over 5-year cash bonds due to lower bid/ask spreads (1-cent versus 3-cents) observed in the listed futures market<sup>2</sup>. This is tempered somewhat by additional costs associated with the futures contract such as execution and clearing fees<sup>3</sup> as well as small opportunity costs incurred by posting cash margin amounts.

Hedging in over-the-counter interest rate swaps fares poorly under normal market conditions as the round trip costs are usually much higher for liquidity-takers. The baseline 1.5 basis point round trip cost to trade 5-year swaps is roughly typical for many clients, especially when taking into consideration the off-date unwind. Obviously an uncleared trade would attract additional higher costs to compensate the transacting Bank for the remaining counterparty risk on an uncleared trade.

The results for hedging a \$100 million notional 5-year bond equivalent DV01 for each direction over a one-month time horizon are shown in Figure 1 and Figure 2. In the Long Portfolio Position Hedged with a Short CGF Position (Figure 1), CGF proves to be the cheapest hedge, beating cash 5-year bonds by 0.4 basis points and the 5-year swap by 1.7 basis points. In the opposite direction (Figure 2), CGF beats cash bonds by the same 0.4 basis points and prevails over the 5-year swap by 0.7 basis points.

**Figure 1**  
Long Portfolio Position Hedged w/ Short CGF

CGF Advantage over Cash	17,292	0.4 bps
CGF Advantage over OTC	82,238	1.7 bps

**Figure 2**  
Short Portfolio Position Hedged w/ Long CGF

CGF Advantage over Cash	17,711	0.4 bps
CGF Advantage over OTC	34,380	0.7 bps

In Figure 3 and Figure 4 below, the baseline assumptions for 5-year cash bond bid/ask (y-axis) and 5-year interest rate swap (x-axis) are shown in the bold row and column. Areas of each figure which correspond to an instrument being the cheapest pro-forma hedge using the model described above are color-coded so a client can determine his/her anticipated swap and bond costs and then look up the appropriate instrument in the figure.

Figure 1 corresponds to the results of hedging a long portfolio position with a short position in bonds or CGF futures or paying fixed in the swap market. Figure 2 depicts the opposite situation where a short portfolio position is hedged with the reverse transactions from Figure 1.

2. A client that has, or can develop, the ability to determine when futures are rich or cheap can potentially augment the cost savings of futures over cash by switching between the two hedges as opportunities arise.

3. Execution and settlement fees are, of course, included in the wider bid/ask spread associated with the 5-year cash bond scenario but are unobservable.

**Figure 3**  
**Long Portfolio Position Hedged with Short**

		Realized IRS Round-Trip Cost (basis points)										
		0.50	0.75	1.00	1.25	<b>1.50</b>	1.75	2.00	2.25	2.50	2.75	3.00
Realized Cash Bond Bid/Offer (cents/100)	0.00000	Cash	Cash	Cash	Cash	<b>Cash</b>	Cash	Cash	Cash	Cash	Cash	Cash
	0.00500	Cash	Cash	Cash	Cash	<b>Cash</b>	Cash	Cash	Cash	Cash	Cash	Cash
	0.01000	Cash	Cash	Cash	Cash	<b>Cash</b>	Cash	Cash	Cash	Cash	Cash	Cash
	0.01500	CGF	CGF	CGF	CGF	<b>CGF</b>	CGF	CGF	CGF	CGF	CGF	CGF
	0.02000	CGF	CGF	CGF	CGF	<b>CGF</b>	CGF	CGF	CGF	CGF	CGF	CGF
	0.02500	CGF	CGF	CGF	CGF	<b>CGF</b>	CGF	CGF	CGF	CGF	CGF	CGF
	<b>0.03000</b>	<b>CGF</b>	<b>CGF</b>	<b>CGF</b>	<b>CGF</b>	<b>CGF</b>	<b>CGF</b>	<b>CGF</b>	<b>CGF</b>	<b>CGF</b>	<b>CGF</b>	<b>CGF</b>
	0.03500	CGF	CGF	CGF	CGF	<b>CGF</b>	CGF	CGF	CGF	CGF	CGF	CGF
	0.04000	CGF	CGF	CGF	CGF	<b>CGF</b>	CGF	CGF	CGF	CGF	CGF	CGF
	0.04500	CGF	CGF	CGF	CGF	<b>CGF</b>	CGF	CGF	CGF	CGF	CGF	CGF
	0.05000	CGF	CGF	CGF	CGF	<b>CGF</b>	CGF	CGF	CGF	CGF	CGF	CGF

**Figure 4**  
**Short Portfolio Position Hedged with Long**

		Realized IRS Round-Trip Cost (basis points)										
		0.50	0.75	1.00	1.25	<b>1.50</b>	1.75	2.00	2.25	2.50	2.75	3.00
Realized Cash Bond Bid/Offer (cents/100)	0.00000	Cash	Cash	Cash	Cash	<b>Cash</b>	Cash	Cash	Cash	Cash	Cash	Cash
	0.00500	OTC	Cash	Cash	Cash	<b>Cash</b>	Cash	Cash	Cash	Cash	Cash	Cash
	0.01000	OTC	Cash	Cash	Cash	<b>Cash</b>	Cash	Cash	Cash	Cash	Cash	Cash
	0.01500	OTC	OTC	CGF	CGF	<b>CGF</b>	CGF	CGF	CGF	CGF	CGF	CGF
	0.02000	OTC	OTC	CGF	CGF	<b>CGF</b>	CGF	CGF	CGF	CGF	CGF	CGF
	0.02500	OTC	OTC	CGF	CGF	<b>CGF</b>	CGF	CGF	CGF	CGF	CGF	CGF
	<b>0.03000</b>	<b>OTC</b>	<b>OTC</b>	<b>CGF</b>	<b>CGF</b>	<b>CGF</b>	<b>CGF</b>	<b>CGF</b>	<b>CGF</b>	<b>CGF</b>	<b>CGF</b>	<b>CGF</b>
	0.03500	OTC	OTC	CGF	CGF	<b>CGF</b>	CGF	CGF	CGF	CGF	CGF	CGF
	0.04000	OTC	OTC	CGF	CGF	<b>CGF</b>	CGF	CGF	CGF	CGF	CGF	CGF
	0.04500	OTC	OTC	CGF	CGF	<b>CGF</b>	CGF	CGF	CGF	CGF	CGF	CGF
	0.05000	OTC	OTC	CGF	CGF	<b>CGF</b>	CGF	CGF	CGF	CGF	CGF	CGF

## Other Costs

While this analysis attempts to include all the normal costs associated with each instrument such as bid/ask spreads, financing costs, execution fees, opportunity cost of posting margin (where applicable), and clearing fees, some costs associated with trading cash bonds and swaps are ignored. In particular, conducting frequent financing transactions in the repo market may incur sizable labour costs. Further, daily valuation of over-the-counter swaps and booking these custom dated instruments may create additional costs at certain clients for valuation and risk measurement. Additionally, bonds and swaps consume more execution time than futures as the latter are more likely to be executed electronically. The bulk of these costs which are client specific and can't be included in this analysis fall on the non-exchange instruments and would therefore tend to favor a hedging program using CGF futures over other instruments.