Hedging Canadian Corporate Debt: A Comment and Extensions

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In a recent article in this journal by Gagnon, Mensah, and Blinder ((1989); hereafter GMB), the week-to-week hedging performance of various futures contracts was evaluated for a portfolio of Canadian corporate bonds (as proxied by the McLeod, Young, Weir AAA Long-term Corporate Bond Value Index). Considered as hedging vehicles were the Canada Long-term Bond futures contract traded on the Toronto Futures Exchange, the U.S. T-bond contract traded on the Chicago Board of Trade, and a composite hedge using the latter and a position in the Canadian dollar contract traded on the International Monetary Market of the Chicago Mercantile Exchange. The sample was the four year period beginning in January 1983. The authors purport to demonstrate that, abstracting from such frictions as margins, marking to market, commissions, and spreads, the T-bond contract on occasion exhibited superior hedging performance relative to the Canada Bond futures contract; and that the joint T-bond-Canadian dollar position was generally superior to the domestic contract. This is surprising since one would expect at least a component of interest rate movements to be purely domestic in nature (even in an economy as open as Canada's), and thus not best hedged using offshore contracts. The article has, however, methodological flaws (as well as likely data errors) which render the results spurious.

Ex post hedging effectiveness is often measured using (after Ederington (1979)) the R^2 in a regression of cash market returns ($r_{s,t}$) on appropriately specified futures contract "pseudo-returns."[1] This method was used by GMB. For example, in the case of a hedge using a domestic contract, the dollar return (R_t) on a portfolio (whose initial value is V_{t-1}) hedged with X short futures contract units (priced initially at $P_{f,t-1}$) is as follows:

$$R_t = r_{s,t}V_{t-1} - X(P_{f,t} - P_{f,t-1})$$

Expressing this in percentage return form yields:

$$R_t/V_{t-1} = r_{s,t} - xr_{f,t}$$

$$\text{where } x = XP_{f,t-1}/V_{t-1}$$

$$r_{f,t} = P_{f,t}/P_{f,t-1} - 1$$

Minimization of the variance of this hedged return implies that $x = \text{cov}(r_{s,t}, r_{f,t})/\text{var}(r_{f,t})$ which is estimated by the slope coefficient in a regression of $r_{s,t}$ on $r_{f,t}$. The R^2 from this

[1]All notation is as in GMB unless indicated with an asterisk.

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regression is equivalent to the percentage of the variance of the unhedged return which could have been eliminated by employing the hedge ratio x.[2]

What should be done when the futures contract is denominated in a foreign currency? Any gains or losses (ignoring margins and marking to market as done by GMB and here) must be converted into domestic currency at the spot rate in effect at the time of the close-out of the hedge (q_t).[3] Thus:

$$R_t = r_{s,t}V_{t-1} - Xq_t(P_{f,t} - P_{f,t-1})$$

$$\Rightarrow \quad R_t/V_{t-1} = r_{s,t} - x^*r^*_{f,t}$$

$$\text{where } x^* = XP_{f,t-1}q_{t-1}/V_{t-1}$$

$$r^*_{f,t} = (q_t/q_{t-1})(P_{f,t}/P_{f,t-1} - 1)$$

Thus, analogous to the domestic hedge, the appropriate regressor in the hedging effectiveness regression is $r^*_{f,t}$, not GMB's misspecified $Z_{f,t} = q_tP_{f,t}/q_{t-1}P_{f,t-1} - 1)$. A similar criticism applies to their treatment of the composite hedge. It is straightforward to make analogous adjustments in this case as well.

A table, which is similar to GMB's upper panel of Table I, provides measures of hedging effectiveness using the nearby Canada Bond contract, the nearby and next five T-bond contracts, and the latter coupled with the nearby and next three Canadian dollar contracts (for a total of 24 composite hedges).[4] The upper panel (of Table I below) shows results for U.S. contract-based strategies. It is apparent that all R^2's are higher than in GMB. This is due mostly to the correction described above, and actually serves to make U.S. strategies more appealing (temporarily strengthening the anomaly).[5]

Hedging effectiveness for the domestic strategy also is substantially higher without any methodological divergence. Since virtually the identical sample period and data were used, this must be due to data errors. The finding of GMB regarding frequent superiority of U.S. contracts over the Canada Bond contract is not supported here. It must be granted, nevertheless, that several of the composite hedges are not too far inferior to the Canadian hedge.

[2]Since x is estimated using the sample in question and is not known *ex ante*, this provides an *ex post* measure of hedging effectiveness.

[3]If one abstracts from margins and marking to market, entering into a futures contract entails *no initial cash flow consequences*. Thus the beginning of hedge exchange rate is irrelevant.

[4]The McLeod Young Weir Corporate AAA Long-term Bond Value Index was supplied by David Adamo of the company. Canada Bond settlement prices were taken from the TSE's Daily Record. T-bond prices were made available by the Chicago Board of Trade (on diskette). Canadian dollar futures prices were taken from various CME Yearbooks. Finally the Canadian/U.S. dollar spot exchange rate was provided by the Bank of Canada (on diskette). As in GMB, all observations fall on Wednesdays (except in a few cases, where holidays necessitated the use of Thursday observations). No trading or open interest existed for the last two Wednesdays of 1986, so these observations were deleted. With differencing the overall sample had 206 observations. Also one obvious error was remedied. The Canada Bond futures price for May 1, 1985, though in the TFE quotes (and reproduced in the *Globe and Mail*, GMB's source), is almost certainly erroneous, and with differencing two data points would be affected. On this day the Wednesday settlement price is 3 and 16/32s below the Tuesday preceding and 4 and 10/32s above the Thursday following, this when the TFE price limits were supposedly 64/32s. (On the same Wednesday the second to nearby contract saw a slight price *gain*, and no unusual activity in Canadian fixed income markets is apparent.) Thus the following Thursday's observation was substituted for the Wednesday.

[5]Note that, for the composite hedges, GMB used $\overline{R}^2$'s. Using simple R^2's (as here) also strengthens apparent hedging effectiveness. If one simply replicates GMB's methodology, $\overline{R}^2$'s range from .45 to .51. Contrast these with GMB's surprising hedging performance *variability*. One suspects data errors, since it is not credible that the nearby T-bond contract would provide by far the worst hedge.

Table I
HEDGING EFFECTIVENESS USING DIFFERENT FUTURES CONTRACTS FOR MCLEOD, YOUNG, WEIR AAA LONG-TERM CORPORATE BOND CASH POSITION

T-bond Contract Maturity	Simple T-bond Hedge	Composite Hedge with Canadian Dollar Canadian Dollar Contract Maturity			
		0–3 mos.	3–6 mos.	6–9 mos.	9–12 mos.
0–3 months	.61	.64	.64	.64	.65
3–6 months	.61	.64	.64	.64	.65
6–9 months	.60	.63	.64	.64	.64
9–12 months	.59	.63	.63	.63	.64
12–15 months	.58	.62	.62	.62	.63
15–18 months	.56	.60	.60	.60	.61

Nearby Canada Bond Hedges

	N	R^2
Full Sample	206	.72
Positive Volume at Both Ends of Hedge	115	.80
Zero Volume at Only One End of Hedge	46	.71
Zero Volume at Both Ends of Hedge	45	.48

Note: All measures of hedging effectiveness are simple R^2's in regressions of cash market returns on appropriately specified pseudo-returns of futures contract(s). See text for details.

A second methodological difficulty with GMB's article, however, further weakens their finding. Typically, in testing hedging effectiveness, settlement prices are used as likely approximate trading prices. This is quite adequate for contracts as liquid as the T-bond and Canadian dollar. It is easy to show that this approach is flawed for the Canada Bond contract. When no trading took place during the day, which was not uncommon for Canada Bond futures, market officials had little information for determining reasonable settlement prices; and, therefore, such prices did not necessarily resemble likely transaction prices.[6]

The last three rows of the lower panel of Table I illustrate the importance of this factor. For example, if all observations are omitted such that either the beginning of hedge day or the hedge close-out day (or both) experience zero volume, then it is clear that the Canada Bond futures contract was a markedly superior hedging vehicle relative to any of the U.S. contract-based strategies.[7]

The fact that interest rate futures are not traded any longer on the Toronto Futures Exchange (at a time when the T-bond pit is the world's most active) suggests that U.S. contracts may have been viewed as good (if not better) substitutes. If this is so, it must have been due to factors ignored here (as well as in GMB) such as differential transaction costs or fears of illiquidity in the Canadian market.

[6]Note that on other days as well settlement prices may well have had a high discretionary component. This is especially obvious when the settlement price falls outside the high-low range.

[7]Some may argue that the removal of data is inappropriate because imperfect information is better than no information. For certain purposes this might be so. For example, if the main intention was to estimate the hedge ratios (i.e., the slope coefficients in the regressions), it would be appropriate to utilize all data even if some embodied noise. The estimation of hedging performance is quite another matter, since what is being calculated is the *percentage* of variation in bond return explained by futures returns. Including non-trading futures prices clearly biases this percentage downwards.

Bibliography

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