

# Fixed Income Relative-Value Weekly

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## Highlights

- The volatility in the US Treasury market remained high this past week. 10-year yields reached new highs toward 3.60% support. There were however a few signs that the selloff may be ending.
- US Treasury yields and Quantitative Easing: the Treasury market response to QE2 has been surprisingly similar to the response to QE1. There are substantial differences between the two episodes, however, which suggests a further selloff is unwarranted (or would provide a good buying opportunity).
- Canada—US Spreads: the 10-year Canada bond declined only moderately as the Treasury market sold off, causing the spread to tighten more than 50 bps. We think 10-year Canadas are now fairly expensive relative to the US.
- Canada 19s remain cheap. We update the 14/19/23 butterfly recommendation from earlier in the week. Bond futures basis: although 19s are cheap, futures are even cheaper, a situation that has persisted for some time. The implied repo remains around 0.8% or lower, compared to term OIS closer to 1.05%.
- Canada 14s are expensive vs 12s and 17s. Selling the butterfly carries positively.
- Buy provincial bonds for income. We reiterate this view from October, and take the opportunity to show off our new long-term 10-year provincial benchmark spread series.
- Provincial spreads vs risk aversion: We look at the relationship between provincial spreads and the VIX, something we haven't updated since May, when we had argued provincials were cheap. The 10-year spread seems to provide better protection to a rise in the VIX than the 5-year.
- New Canada auction schedule: One less 2 year auction, one more 3 and 5 year auction.
- Publishing schedule: we are not publishing until the New Year. Happy Holidays!
- The appendix shows 1) the Canada curve when the BoC was on hold for an extended period, 2) extracts from the daily butterfly reports for bonds and swaps, 3) implied central bank rate expectations, 4) Canada bonds valued off our theoretical multi-factor yield curve model, 5) carry and convexity-adjusted rolldown returns on Canada bonds, and 6) Canada bond asset-swap spreads.



## Treasury Yields and Quantitative Easing: Comparison of QEs 1 and 2

(originally published Thursday December 16th)

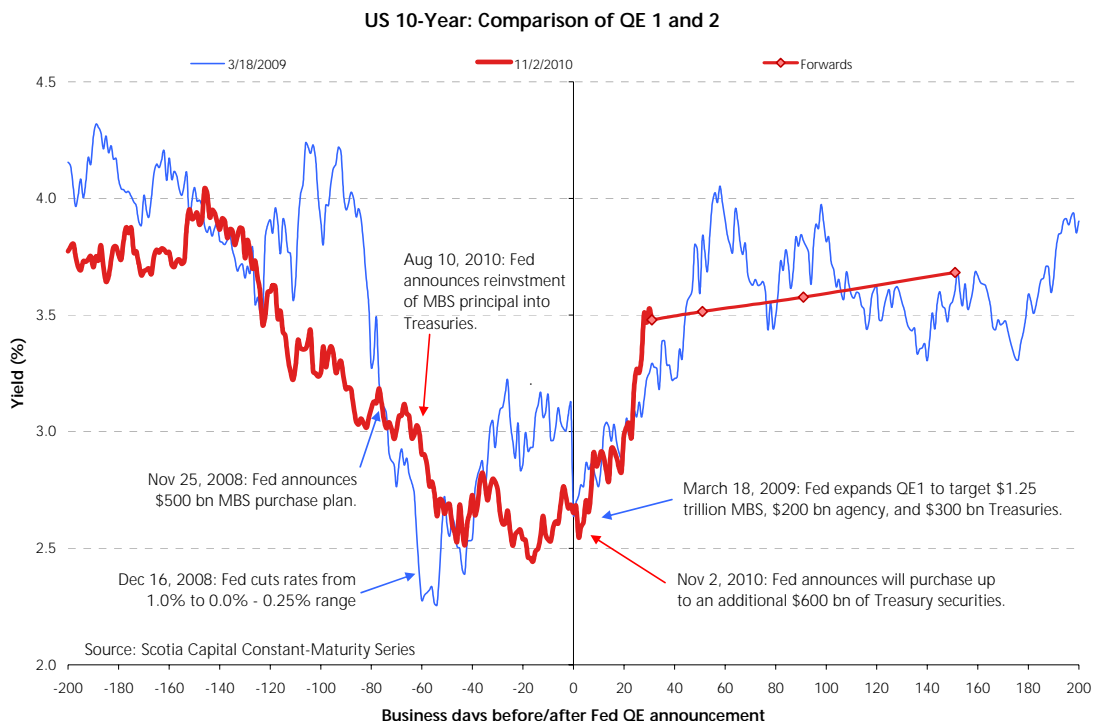
The selloff in the Treasury market since October has been dramatic, especially in the past two or three weeks, when yields have increased more than 50 bps. It has been driven by several factors, but one of the main ones has been the Fed's asset-purchase program, and the market's perception of how this will affect growth and inflation. We had argued previously (Sep 27) that the best strategy would be to sell a post-announcement rally, but even so the speed of the selloff was a surprise.

To provide some perspective on the current Treasury selloff, the attached chart compares today's response to QE2 with the Treasury market's response to the Fed's first round of quantitative easing in 2008-09. The similarity is striking, though the pace of the recent Treasury selloff still looks extreme, even by the already dramatic standard of the 2009 Treasury selloff (n.b. see the end of this note for discussion about our choice of the start date for QE1).

A superficial comparison of the two episodes suggests that US 10-year yields could rise even further, up to another 50 bps in the next two months, to 4.0%. But is this likely? The answer to that question depends a lot on how valid it is to compare the two episodes. There are of course similarities. Most obviously, both involve Fed stimulus driving expectations of higher growth and higher inflation, or at least of avoiding severe deflation.

There are at least as many differences as similarities between the two periods. We discuss a few of the ones that seem most important:

1. Coordination of policy: in 2008-09, QE1 was one part of a coordinated set of measures, both with fiscal policy in the US, and with policies in other countries. These programs were intended, for better or worse (AIG bailout?), to restore confidence and avert another 1930s-style depression and deflation. Today, policy coordination is not anywhere near as close, with most government stimulus programs set to expire. The recent deal to extend tax cuts in the US has however brought a bit more coordination in policy than might have been anticipated when the Fed first announced the new asset-buying program.



2. Growth: QE1 and other measures preceded a massive increase in growth and growth expectations, as the economy recovered from a deep recession. Growth today may be higher because of more monetary stimulus and the extension of the tax cuts, but I think most forecasts would put growth next year at about half of its pace reached during the 2009 recovery.
3. Risk appetite: In 2008-09 investors were extremely risk averse. This was one of the key factors driving many of the Fed programs, from lending to primary dealers, to the asset-backed securities program (TALF). The subsequent increase in risk appetite in 2009 caused a massive shift out of Treasuries into credit and equities. In contrast, investors today have been risk tolerant for a long time (notwithstanding the current reluctance of US banks to put capital at risk at bank year end).
4. Deflation v Inflation Debate: In 2008-09 it was expectations that the Fed, in combination with other measures, would succeed in averting a 1930s-style Deflation. Today, it was also the expectation that the Fed would avoid deflation, albeit a more modest risk of deflation. But there is I think also the sense in at least some sectors of the market that the Fed is somewhat less in control today, and could be underestimating economic strength.
5. Debt levels: This is a much bigger concern today than it was in 2008-09. The high level of government debt has been an important theme for much of the past year, because of the problems in peripheral Europe. It became a bigger theme in the US Treasury market more recently (at least in some circles) with the tax deal, in particular the deficit-financed extension to jobless benefits.

Conclusion? The first three differences suggest that yields don't need to rise as much this time, while the last two suggest that yields could rise further. I think the most significant risk to higher Treasury yields in the future probably comes from an increase in new private-sector borrowing, because that would drive money supply growth, and also provide competition for Treasury issuance. There will need to be some increase in private-sector borrowing simply due to technological obsolescence. But with a lot of excess slack still in the economy, it is not yet clear to me that new loan demand will increase substantially for a long time. In the event the 10-year yield does rise to 4.0% again in the next month or two, that would seem to be a pretty good buying opportunity.

Background on the chart: Note that in the case of QE1, we are showing day zero as March 18, 2009, the day that the Fed greatly expanded the program to a total of \$1.75 trillion of securities, including \$300 bn of Treasuries. This is technically not the start of the program. The original program of buying \$500 bn of MBS was announced in November 2008. However, at that time, the Fed was still cutting interest rates, which likely had as big or bigger an impact on Treasury yields than the announcement of the initial QE program.

Background note on the size of the two QE programs: we deliberately didn't list the smaller size of the current program as an important difference, even though it might seem that the smaller program today might justify a smaller impact on markets and the economy, all else equal. What matters the most is how much of the market the Fed would ultimately own, not how much it buys each week. The Fed already holds a lot of securities, so it didn't need to buy as much in QE2 as it did the first time in order to have a substantial impact (in that sense the first round of QE still has its effect felt).

## US Treasuries

The Treasury market selloff this past month has been dramatic. As we noted on pages 2-3, it even looks extreme when compared to the 2009 Treasury selloff, which was already quite something. The selloff was driven by a combination of factors, including concerns that the Fed was underestimating growth and that its policies would be inflationary, and concerns about the level of US debt, which received a lot of attention after the announcement of the deal to extend the tax cuts, which also included a deficit-financed increase in jobless benefits. Another big factor pushing yields higher was mortgage hedging, made necessary by the increase in effective mortgage durations following the recent rise in rates. And finally, relatively thin pre-holiday markets and the reluctance of banks to risk capital ahead of year end has likely helped to exaggerate some of the market moves.



A striking example of the market's unease about the Fed was evident in the response to the FOMC statement. Yields were already some 10 bps higher on the day after a very strong US retail sales report. They backed up another 10 bps and the curve steepened following the FOMC statement, which was not materially different from the previous statement. The market seems increasingly concerned that the Fed may be underestimating growth, and may be underestimating the risks of its bond-buying program. Especially on a day when we got very strong US retail sales data, investors were looking for the Fed to recognize that growth has been better, and to indicate that it might consider curtailing its asset-purchases in the future if conditions improved. US CPI on Wednesday was benign, though the long end continued to selloff, and break-even inflation rates moved higher.

There were however a couple of signs that the selloff may be reversing or at least stalling. For example, in two of this week's reverse auctions, the market offered relatively few bonds to the NY Fed (Monday's 6-7 yr had just over 18bn offers, and Wednesday's 4-6 yr had only \$13 bn). This could just be a reflection of thin volumes. But, given that it follows a more than 50 bps backup in yields in two weeks, it may also indicate that a lot of positions have already been cleared out, and/or investors didn't see the selloff extending a lot further. The market was stronger again at the time of writing Friday. In the near term, the NY Fed's reverse auctions should continue to provide support to the market the week of Dec 20. Note though that US supply returns the week of Dec 27th, which could be a challenge given what will likely be relatively thin markets.

### New Canada Bond Auction Schedule:

There are a couple of changes to the auction schedule for the upcoming quarter. There will be fewer two-year and more 3 and 5-year auctions than we have had lately. There will only be two auctions of 2-year bonds, instead of the three auctions per quarter that we have had for some time. However, there will also be two auctions of 3 and 5-year bonds; in the past quarter there was only one of each. This may reflect the fact that 3y and 5y bonds have tended to be relatively expensive recently (though the best time to issue more 5s would have been earlier in the last quarter).

There will be no long auction, but this had already been announced at the start of the year in the Government's Debt Management Strategy. There will be one long switch-buyback, on March 10. The only other switch buyback is a 2-year on Feb 16, which will undoubtedly target the June-dated bonds again. The other long issue will be the quarterly RRB auction on Feb 23.

The first auction in the new year is a 5-year, on January 12 (no more supply in Canada's this month, though the US has 2s, 5s, and 7s the week of Dec 27th).

### Canada-US spreads

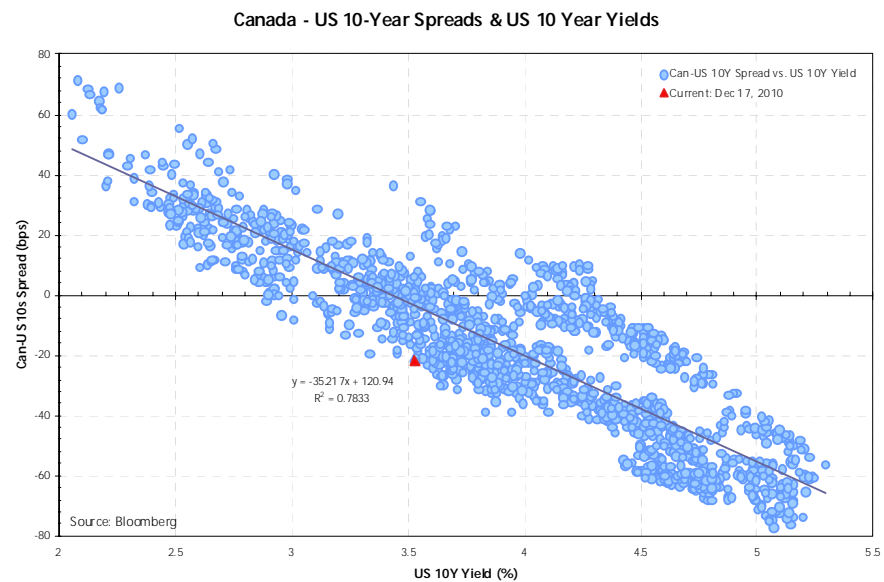
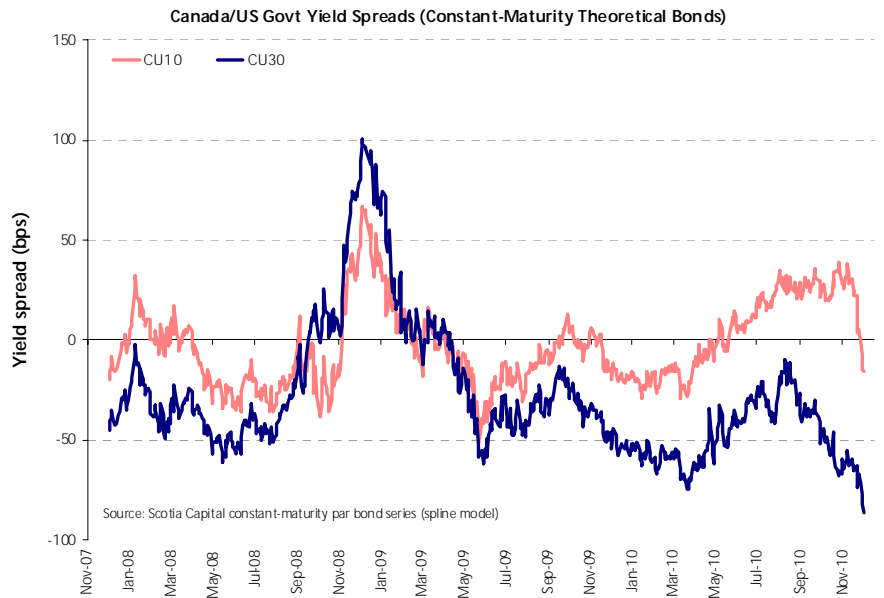
Canada 10-year bonds held in extremely well during the US Treasury selloff of the past month, outperforming the US Treasury market substantially. The 10-year Canada has moved from 35 bps over Treasuries to 16 bps through in less than 3 weeks, a change in spread of more than 50 bps (those are constant-maturity spreads. The benchmark 10-year spread, which includes a 5-month term mismatch, has moved from about +30 to minus 19 bps).

Canadian 10-year bonds are now at fairly expensive levels vs the US. If the US market sells off further, in particular if it sells off further on concerns about high debt levels, then Canada would still outperform, given its better fiscal position. However, the potential for much further outperformance seems limited now. For example, the scatterplot at right shows the 10-year spread graphed against the level of Treasury yields, and highlights the generally negative relationship between the spread and Treasury market direction. The spread is already toward the outer edge of the typical levels we would expect to see given current Treasury yield levels.

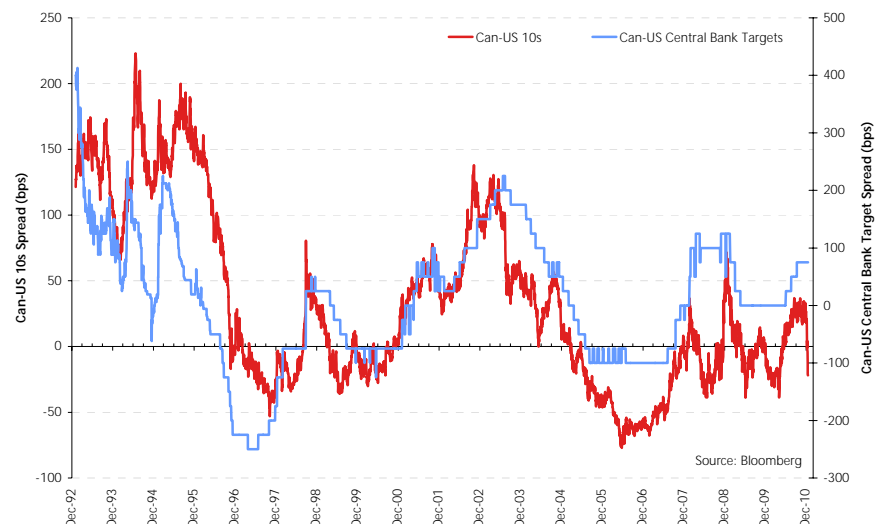
There have been times when the 10-year spread was substantially more negative, e.g. 40 to 60 bps, but those tended to be periods when the Canadian overnight target was 50 to 100 bps below the US overnight target (chart 3). Today, with the spread between overnight targets at +75 to +100 bps, it seems it would be difficult to get the 10-year Canada more than about 30 bps through the US without a substantial further increase in concerns about US debt levels and/or the Fed's credibility.

### CDA/US 10/30 Box (not shown)

Back on November 10th we noted that the 10/30 box was at extreme levels, that long spreads in Canada were very negative in comparison to wide 10-year spreads more than +30 bps. Since that time, the box spread has moved some 40 bps to less extreme levels, as the 10-year spread has tightened faster than the 30 year.



Canada-US Spreads: 10 Year Govt Bonds & Central Bank Target Rates



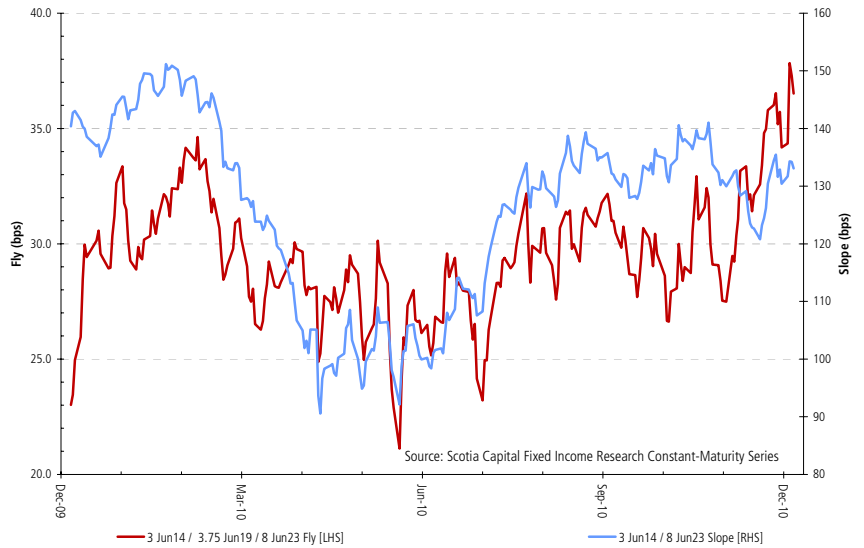
### Canada J14/J19/J23 Butterfly.

The J14/19/23 butterfly is cheap vs the curve. It has richened a bit more than a basis point since we recommended this trade on December 15. However, it still is 6 bps or so cheap vs the slope of the curve, as shown in the scatterplot (n.b. all butterfly spreads use 50/50 weights on the wings unless otherwise noted).

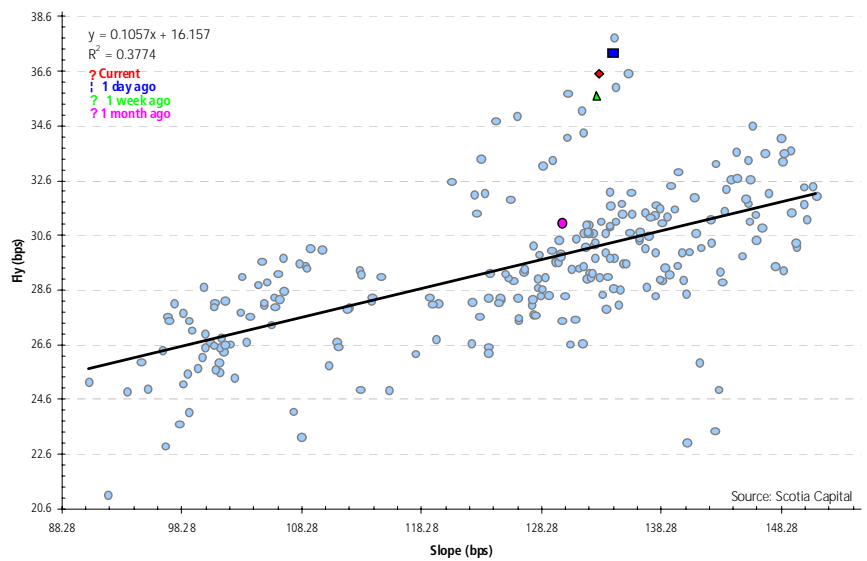
It has cheapened a lot with the selloff in the market of the past couple of months, reflecting in part the influence of selling via the futures market. Historically though it has not been strongly related to market direction, suggesting that the recent cheapening of the fly may have gone too far.

Carry is only slightly negative. For example, the butterfly would have to tighten less than 1 bp in the next three months to break even.

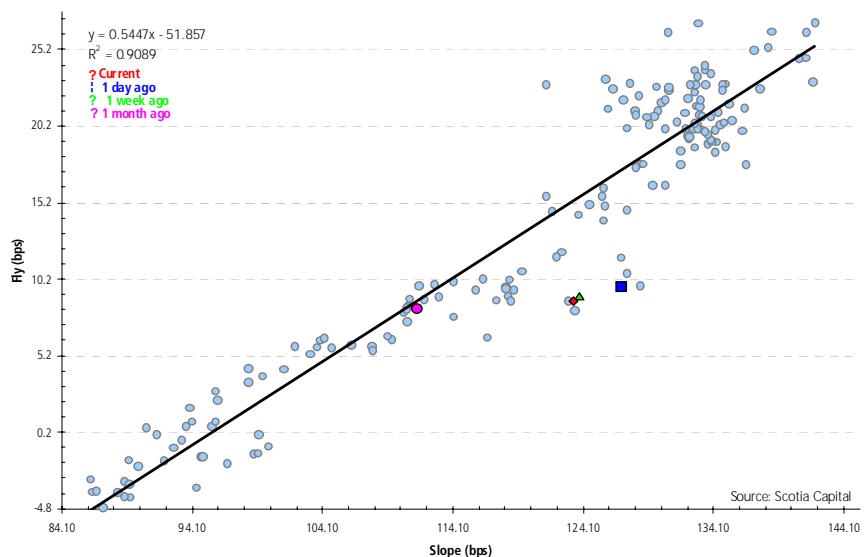
3 Jun14 / 3.75 Jun19 / 8 Jun23 Fly and 3 Jun14 / 8 Jun23 Slope



3 Jun14 / 3.75 Jun19 / 8 Jun23 Fly versus 3 Jun14 / 8 Jun23 Slope



1.5 Jun12 / 2 Dec14 / 4 Jun17 Fly versus 1.5 Jun12 / 4 Jun17 Slope



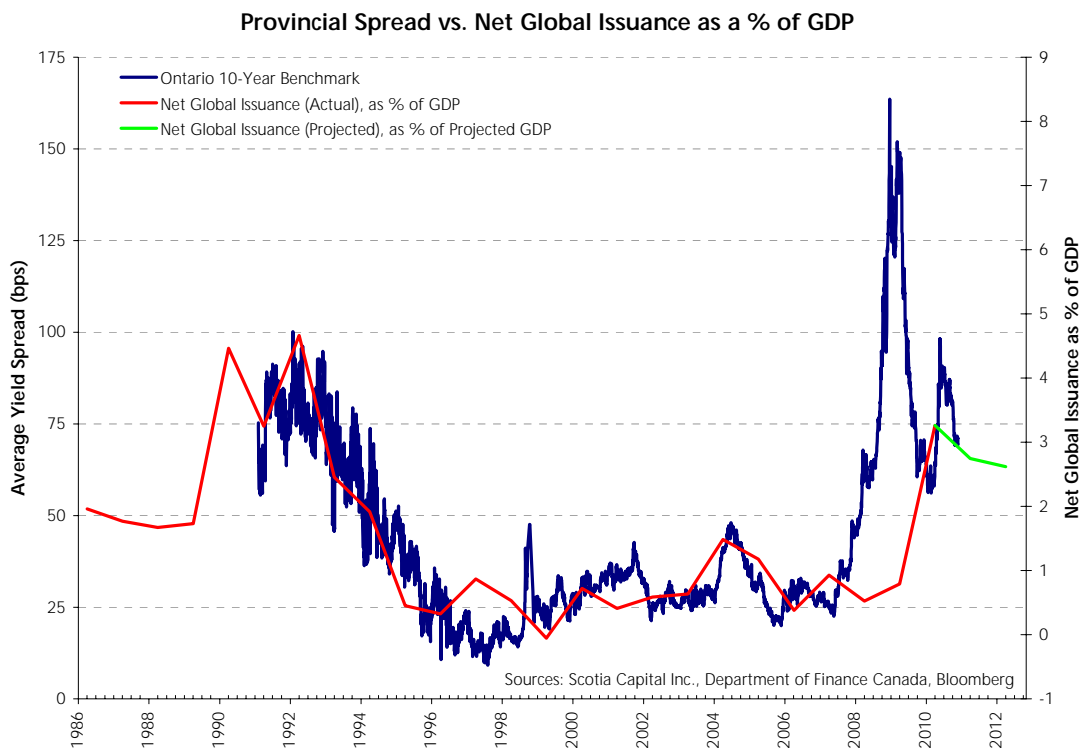
### CDA 2/4/7-Yr Butterfly

December 14s are expensive relative to the curve. The J12/D14/J17 butterfly tends to be strongly related to the slope of the curve, but since the start of the month this relationship has broken down. It now looks to be 7 or so bps expensive vs the curve. Selling Dec14s versus the 1.5 Jun12 and 4 Jun17 carries positively. This butterfly tends to be positively related to market direction, which makes it more unusual that it has richened this month. Under normal times, selling this butterfly would tend to be a bearish trade.

## Provincial Bonds: Buy for Spread Income

We still think provincial spreads are attractive from an income standpoint. This is a reiteration of our view since October 12th (prior to that we had been more bullish –see the discussion on the next page under Provincial Spreads and Risk Aversion). We don't expect substantial spread tightening, though over time as provincial issuance gradually declines, spreads could tighten further. There is a risk of spreads widening on a resumption of global risk aversion, but we think this would be fairly moderate, as we discuss on the next page.

As the graph shows, provincial spreads provide reasonable compensation for the level of fiscal risk in Canada. The graph shows the Ontario 10-year benchmark spread, which we are using here to represent provincial bonds generally. Issuance will remain quite high for some time, but is projected by our economics' group to gradually decline in the next few years. The graph also only tells one part of the story. Although issuance and deficits are high today, albeit below the early 1990s levels, overall debt levels today are substantially lower than in the 1990s.



### Background info on the data in the graph:

This is a new version of a graph we have used many times over the past couple of years. It is a kind of crude measure of reward vs risk. We used to show this graph using the spread between yields on the DEX Provincial and Canada bond indexes, because that was the only very long history we had. We now have a better measure, the 10-year benchmark Ontario bond spread over the interpolated Canada curve. The data from 2002 onward are from Scotia's trading system. The data prior to that are from Bloomberg. The Bloomberg spread data is quite noisy in the early 1990s, but we think it still provides a reasonable indication of the general level of 10-year spreads at that time. The overall pattern of spreads is generally consistent with the aggregate index yield spreads from the DEX Index.

There are two limitations to using the Index data: yields change as the composition of the index changes, and hence index spreads might change independent of any spread changes on the underlying bonds. Second, the Provincial and Canada indexes measure bonds of different terms, so the resulting spread will capture differences in the slope of the Canada yield curve, as well as the "true" credit spread.

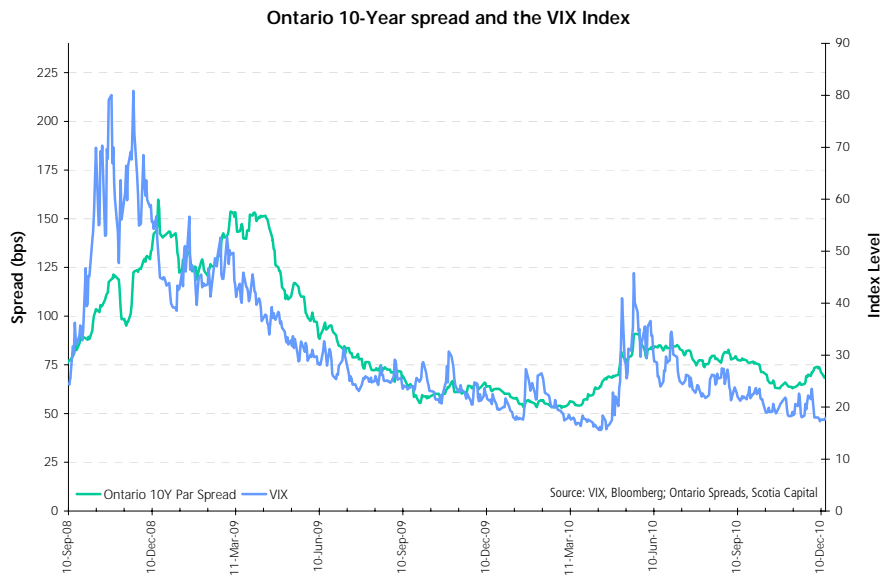
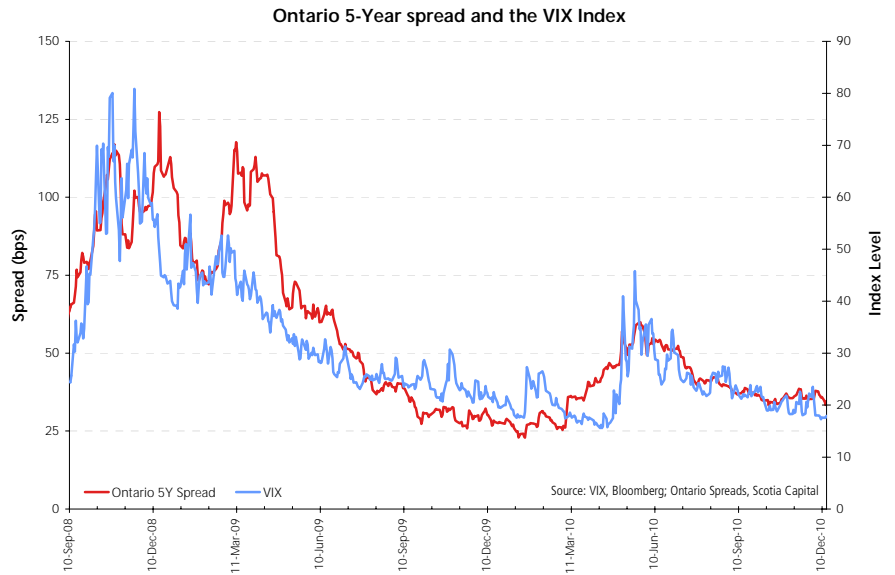
### Provincial Spreads and Risk Aversion

These two charts show provincial 5 and 10-year spreads graphed against the VIX index, which provides a sort of proxy of market risk aversion. The series tend to be reasonably closely related.

We had been bullish on provincial bonds back in May and June, arguing that the widening of spreads on global risk aversion was unsustainable. It was not based on much that was Canada-specific, and the threat of contagion to US banks, let alone Canadian banks, was overstated, and therefore the VIX was likely to decline as well. That was a pretty good call – 10-year spreads tightened some 25 bps, and the VIX declined. We shifted to our current more neutral “buy for income” stance on October 12.

The more recent rounds of sovereign debt problems in Europe have not led to the same kind of increase in global risk aversion, as it has become clearer that US banks are not exposed to peripheral Europe in the same way as European banks, hence a repeat of the contagion that happened during the subprime crisis is far less likely. Provincial spreads have been relatively stable through the Europe turmoil of recent months.

An increase in risk aversion, as measured by the VIX, would likely have some widening impact on provincial spreads. However, we think that kind of impact would again likely be fairly temporary, and so would be a buying opportunity. Second, with Fed policy expansionary and some of the tax uncertainty reduced after the recent agreement to extend the Bush tax cuts, it seems less likely that the VIX would spike higher in the near term, say at least over the next quarter. In the event risk aversion were to rise, the graphs at right suggest to me that there is more protection in the 10-year spread than in the 5-year, which has followed the VIX more closely, and is already comparatively tight.













## Appendix: Implied Central Bank Rate Expecations (Break-Even Forwards)

Canada			AU		
Meeting Date	Forward Rate	Cumulative Change	Meeting Date	Forward Rate	Cumulative Change
18-Jan-11	1.05%	4.7	1-Feb-11	4.77%	2.1
1-Mar-11	1.12%	11.8	1-Mar-11	4.82%	7.5
12-Apr-11	1.22%	21.8	5-Apr-11	4.84%	9.2
31-May-11	1.34%	33.9	3-May-11	4.85%	10.4
19-Jul-11	1.47%	47.1	7-Jun-11	4.94%	18.5
7-Sep-11	1.57%	57.1	5-Jul-11	5.10%	35.2

US			JP		
Meeting Date	Forward Rate	Cumulative Change	Meeting Date	Forward Rate	Cumulative Change
26-Jan-11	0.17%	-7.9	21-Dec-10	0.09%	-1.0
16-Mar-11	0.20%	-4.5	25-Jan-11	0.10%	-0.1
27-Apr-11	0.20%	-4.7	17-Feb-11	0.11%	0.6
22-Jun-11	0.24%	-0.5	15-Mar-11	0.11%	0.9
10-Aug-11	0.30%	5.2	7-Apr-11	0.10%	0.3
21-Sep-11	0.35%	10.1	20-May-11	0.10%	-0.3

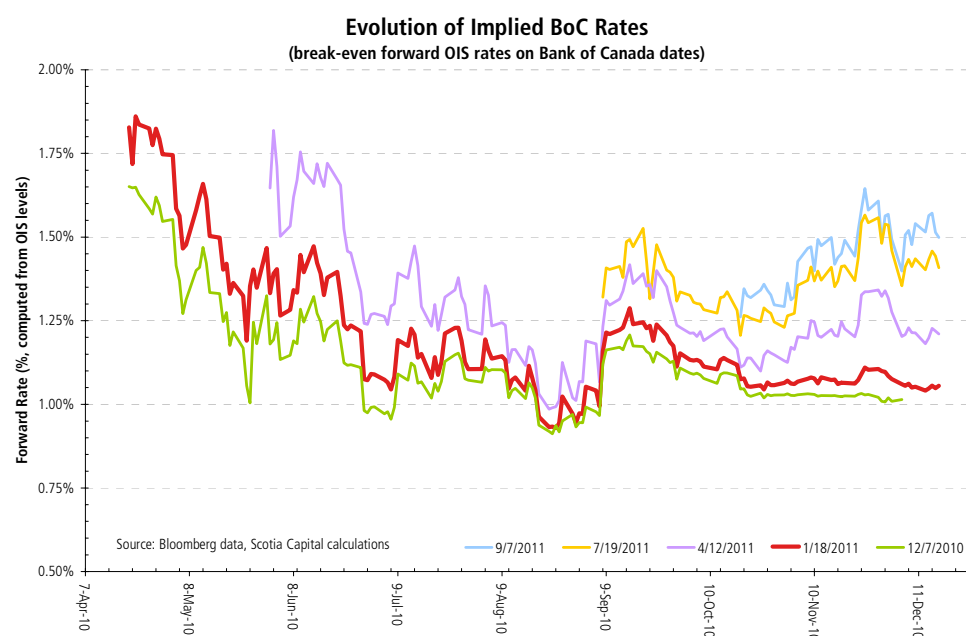
UK			EU		
Meeting Date	Forward Rate	Cumulative Change	Meeting Date	Forward Rate	Cumulative Change*
13-Jan-11	0.54%	3.9	13-Jan-11	0.62%	8.1
10-Feb-11	0.55%	4.6	3-Feb-11	0.69%	15.6
10-Mar-11	0.56%	5.6	3-Mar-11	0.76%	22.4
7-Apr-11	0.58%	7.7	7-Apr-11	0.78%	23.9
5-May-11	0.61%	11.2	5-May-11	0.80%	26.6
9-Jun-11	0.65%	15.4	9-Jun-11	0.87%	33.8

\* Effective Fed Funds rate is 0.22%

\* Over the 1 week EONIA rate of 0.54%

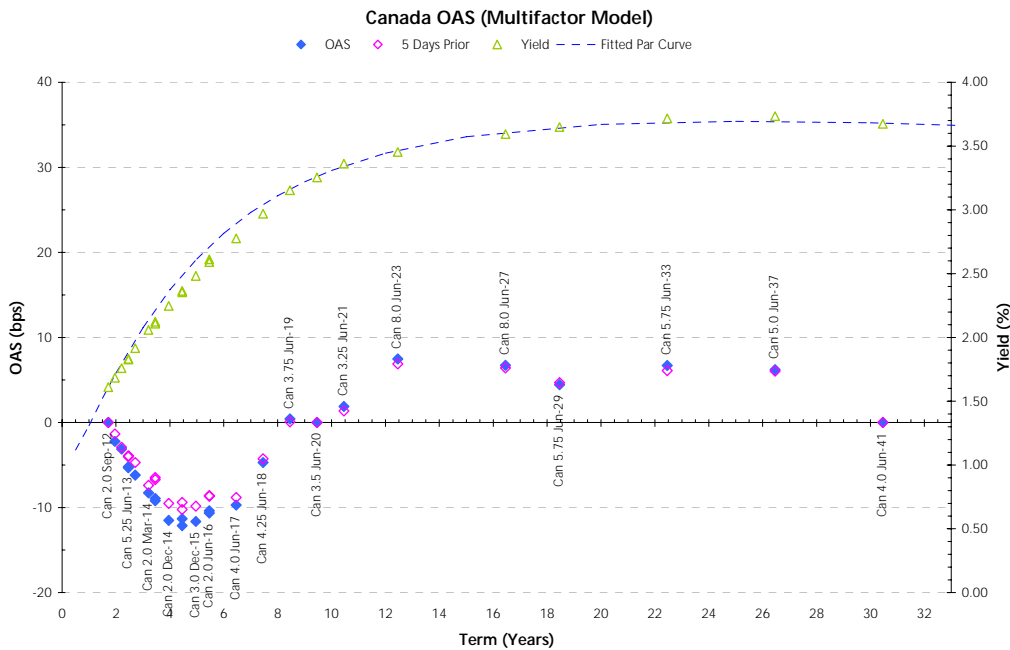
All calculations use Overnight Indexed Swaps, except for the US, which use Fed Funds futures. Break-even forwards assume no risk premiums, and hence may be biased predictors of future rates.

Data from Bloomberg, calculations by Scotia Capital Fixed Income Research.



## Appendix: Canada Bonds vs Theoretical Yield Curve

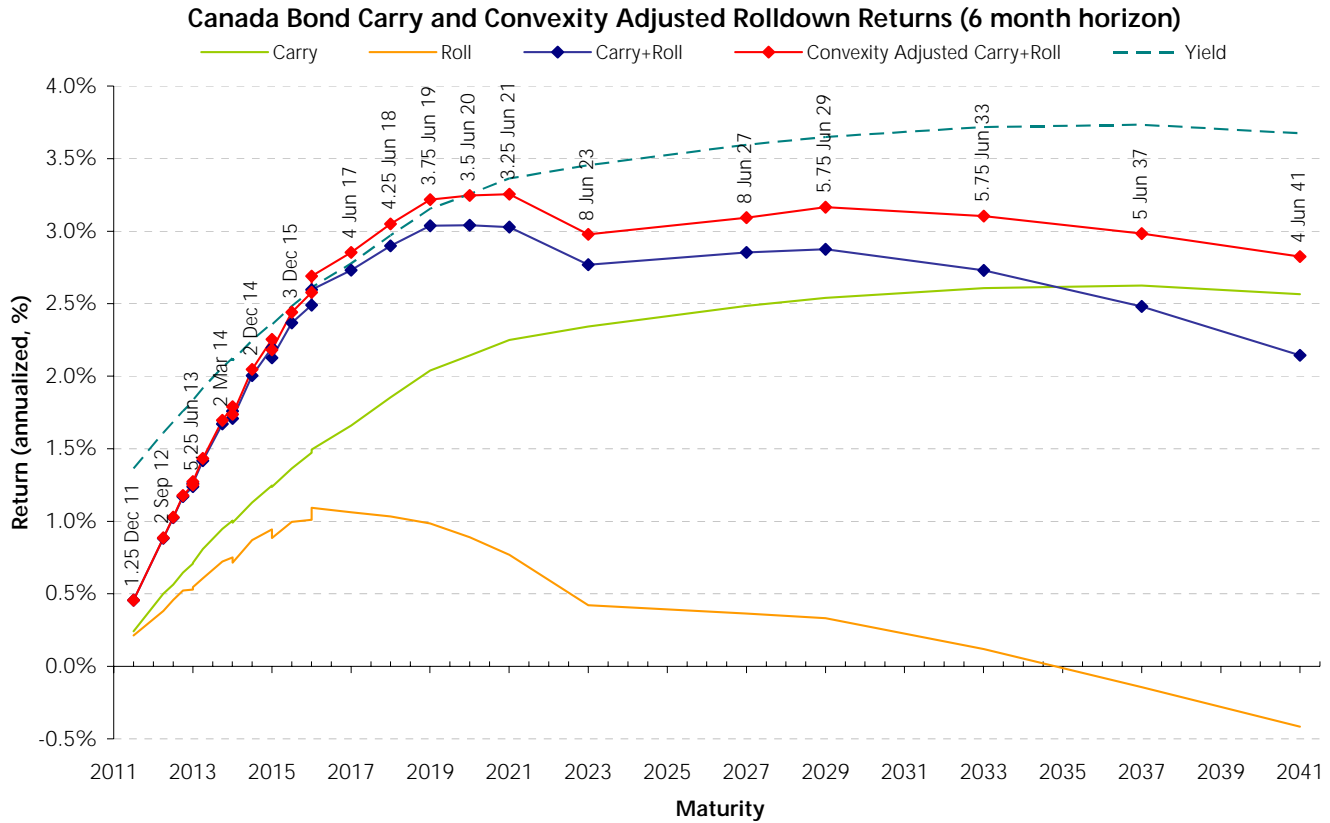
Coupon	Maturity Dt	Yield	Chg vs 20			Chg vs 75							
			OAS	Chg 1	Chg 5	Avg 20	MA	SD 20	# SD 20*	Avg 75	MA	SD 75	# SD 75*
2.000	9/1/12	1.610	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.500	12/1/12	1.685	-2.2	-0.3	-0.9	-2.0	-0.2	0.4	-0.5	-2.3	0.3	0.9	0.1
1.750	3/1/13	1.760	-3.1	-0.4	-0.2	-2.9	-0.3	0.6	-0.4	-3.4	0.6	1.4	0.2
5.250	6/1/13	1.828	-5.2	-0.7	-1.3	-4.8	-0.4	0.7	-0.5	-6.7	1.9	2.1	0.7
3.500	6/1/13	1.833	-5.3	-0.7	-1.3	-4.9	-0.5	0.7	-0.6	-6.7	1.8	2.0	0.7
2.500	9/1/13	1.917	-6.2	-0.4	-1.5	-5.6	-0.6	0.8	-0.8	-7.2	1.6	2.4	0.4
2.000	3/1/14	2.060	-8.3	0.4	-0.9	-8.4	0.1	0.8	0.2	-8.4	0.0	0.8	0.2
3.000	6/1/14	2.124	-8.9	-1.0	-2.5	-7.0	-1.9	1.1	-1.8	-10.2	3.2	3.8	0.3
5.000	6/1/14	2.109	-9.2	-1.0	-2.5	-7.0	-2.1	1.1	-1.9	-9.9	2.9	3.8	0.2
2.000	12/1/14	2.247	-11.5	-1.3	-2.0	-9.6	-1.9	1.1	-1.8	-11.9	2.3	4.4	0.1
4.500	6/1/15	2.355	-11.3	-1.6	-1.9	-9.8	-1.5	1.1	-1.3	-12.8	3.0	5.0	0.3
2.500	6/1/15	2.365	-12.1	-1.6	-1.9	-10.6	-1.5	1.1	-1.4	-13.3	2.7	5.0	0.2
3.000	12/1/15	2.483	-11.6	-1.7	-1.8	-10.4	-1.2	1.3	-1.0	-12.9	2.4	4.7	0.3
2.000	6/1/16	2.612	-10.6	-1.5	-2.1	-9.2	-1.5	1.2	-1.2	-10.6	1.5	3.0	0.0
4.000	6/1/16	2.590	-10.4	-1.4	-1.7	-9.3	-1.1	1.3	-0.9	-11.3	2.1	4.1	0.2
4.000	6/1/17	2.776	-9.7	-1.1	-0.9	-9.3	-0.4	1.1	-0.4	-10.8	1.5	3.0	0.3
4.250	6/1/18	2.970	-4.7	-0.5	-0.4	-4.6	-0.1	0.5	-0.3	-5.4	0.8	2.1	0.3
3.750	6/1/19	3.154	0.4	-0.4	0.3	0.4	0.0	0.5	0.1	0.1	0.3	1.1	0.3
3.500	6/1/20	3.254	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
3.250	6/1/21	3.363	1.9	0.4	0.5	1.9	0.0	0.2	0.1	2.7	-0.8	0.6	-1.3
8.000	6/1/23	3.454	7.5	0.1	0.6	7.2	0.3	0.4	0.7	10.5	-3.3	2.2	-1.4
8.000	6/1/27	3.595	6.7	0.9	0.3	7.2	-0.5	1.4	-0.4	13.4	-6.1	4.8	-1.4
5.750	6/1/29	3.649	4.4	0.9	-0.2	5.2	-0.8	1.3	-0.6	11.2	-5.9	4.5	-1.5
5.750	6/1/33	3.717	6.7	0.5	0.6	7.1	-0.4	0.7	-0.6	10.7	-3.6	2.7	-1.5
5.000	6/1/37	3.734	6.2	0.3	0.1	5.9	0.3	0.3	1.1	7.0	-1.1	1.1	-0.8
4.000	6/1/41	3.674	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3



**Description of the model:** The option-adjusted spread (OAS) is the spread to the theoretical curve that would equate the model price to the market price. A positive OAS means that a bond is cheap to the theoretical curve, all else equal, while a negative OAS means that a bond is rich.

The term-structure model that underlies this report is similar to models used for option pricing, in that it explicitly models the uncertainty in the future evolution of interest rates (as a simplified analogy, think of the standard binomial option-pricing tree). However, it differs from the usual option pricing model in two main ways. First, the term structure model used here has multiple, partially-correlated sources of risk, which enables it to capture a wide range of interest-rate and volatility term structures. Second, it is a so-called equilibrium model. Models for interest-rate options typically try to fit the underlying term structure exactly. In contrast, the equilibrium model is calibrated to fit the prices of just a few key benchmark bonds (typically 6-month T-Bills, and 2, 10, and 30-year benchmarks). We do, however, make use of option-market data to estimate the model's volatility and correlation parameters.

## Canada Bond Carry & Rolldown Returns (with Convexity Adjustment)



	Coupon	Maturity	Carry (bps)	Rolldown (bps)	Carry + Rolldown (%)	Convexity Value (bps)	Total (%)
Canada	1.25	12/1/2011	24.2	21.4	0.46%	0.0	0.46%
Canada	2	9/1/2012	50.0	38.2	0.88%	0.3	0.89%
Canada	1.5	12/1/2012	56.4	45.8	1.02%	0.5	1.03%
Canada	1.75	3/1/2013	64.6	52.2	1.17%	0.8	1.18%
Canada	5.25	6/1/2013	70.8	52.9	1.24%	1.2	1.25%
Canada	3.5	6/1/2013	71.3	54.6	1.26%	1.2	1.27%
Canada	2.5	9/1/2013	80.8	60.7	1.42%	1.6	1.43%
Canada	2	3/1/2014	94.7	72.1	1.67%	2.5	1.70%
Canada	3	6/1/2014	100.5	75.1	1.76%	3.0	1.79%
Canada	5	6/1/2014	99.0	71.5	1.71%	2.9	1.74%
Canada	2	12/1/2014	112.8	87.1	2.00%	4.3	2.05%
Canada	2.5	6/1/2015	124.7	94.3	2.20%	5.8	2.25%
Canada	4.5	6/1/2015	123.7	88.5	2.13%	5.5	2.18%
Canada	3	12/1/2015	136.5	99.6	2.37%	7.3	2.44%
Canada	4	6/1/2016	147.3	101.0	2.49%	8.9	2.58%
Canada	2	6/1/2016	149.5	109.2	2.60%	9.3	2.69%
Canada	4	6/1/2017	166.0	106.2	2.73%	12.3	2.85%
Canada	4.25	6/1/2018	185.5	103.4	2.90%	15.1	3.05%
Canada	3.75	6/1/2019	204.1	98.6	3.04%	18.0	3.22%
Canada	3.5	6/1/2020	214.2	89.0	3.04%	20.5	3.25%
Canada	3.25	6/1/2021	225.1	76.9	3.03%	22.6	3.25%
Canada	8	6/1/2023	234.3	42.2	2.77%	20.8	2.98%
Canada	8	6/1/2027	248.4	36.4	2.85%	24.0	3.09%
Canada	5.75	6/1/2029	254.0	33.1	2.87%	29.0	3.17%
Canada	5.75	6/1/2033	260.8	12.0	2.73%	37.5	3.10%
Canada	5	6/1/2037	262.5	-14.3	2.48%	50.2	2.98%
Canada	4	6/1/2041	256.5	-41.6	2.14%	68.1	2.82%

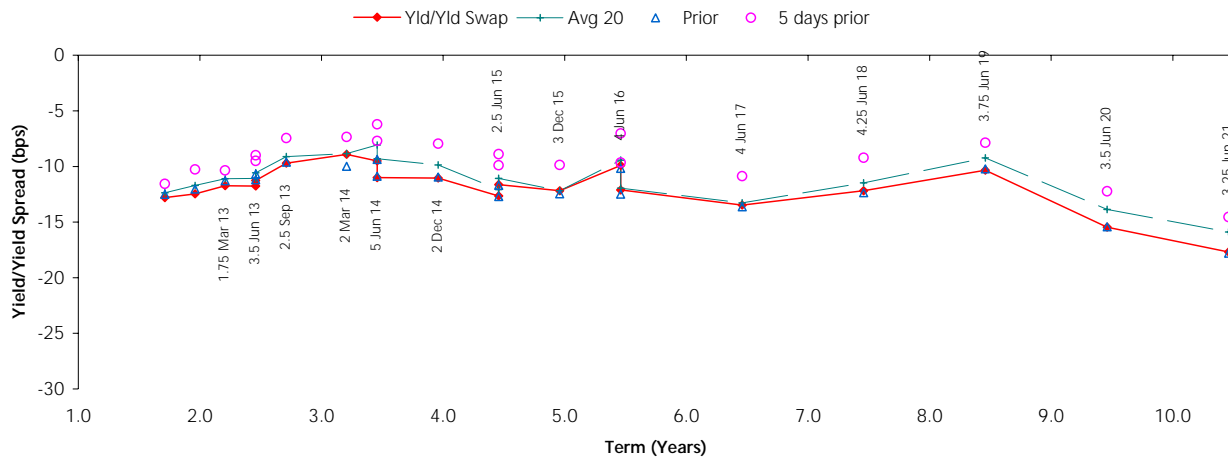
\* Carry, Roll, and Value of Convexity calculations over a 6 month horizon. The Value of Convexity uses historical basis point yield volatility over the past six months.

## Appendix: Canada Asset-Swap Spreads

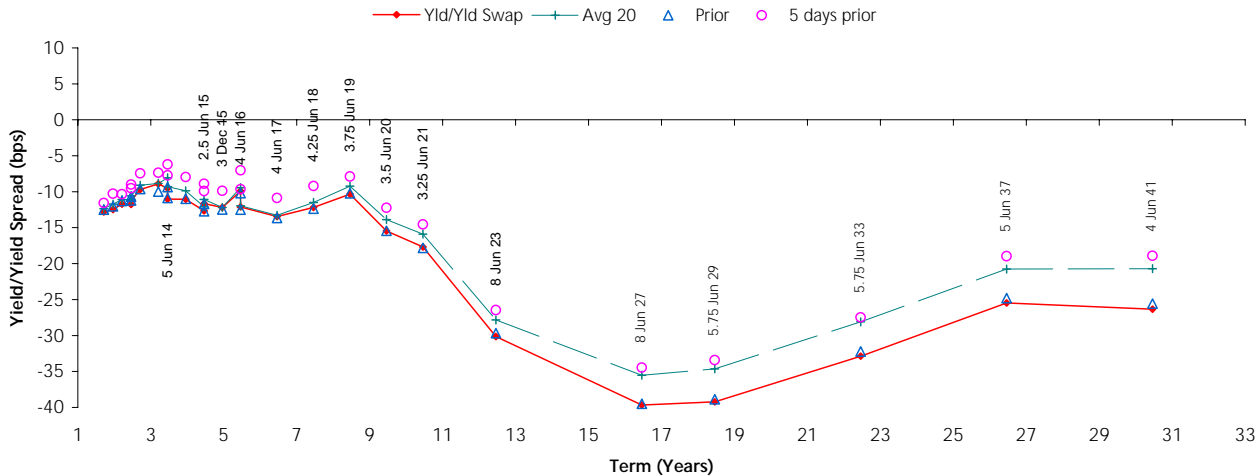
Coupon	Maturity Dt	Par Asset Swap	Yld/Yld Swap	Chg 1	Chg 5	Avg 20	Chg vs 20 MA	SD 20	# SD 20*	Avg 60	Chg vs 60 MA	SD 60	# SD 60*	Carry (\$K) <sup>1</sup>	Carry Delta (\$K) <sup>2</sup>
2.000	9/1/2012	-14.0	-12.8	-0.3	-1.2	-12.4	-0.4	1.1	-0.4	-12.9	0.2	1.2	0.1	85.2	55.5
1.500	12/1/2012	-13.3	-12.5	-0.4	-2.2	-11.7	-0.8	0.8	-0.9	-12.6	0.2	1.1	0.2	88.8	47.8
1.750	3/1/2013	-11.6	-11.7	-0.5	-1.4	-11.1	-0.6	0.7	-0.9	-11.9	0.2	0.9	0.2	69.2	42.5
5.250	6/1/2013	-12.1	-11.8	-0.6	-2.3	-11.1	-0.7	0.9	-0.8	-12.7	0.9	1.6	0.6	80.2	39.2
3.500	6/1/2013	-11.7	-11.3	-0.6	-2.3	-10.6	-0.7	0.9	-0.8	-12.2	0.9	1.6	0.6	78.7	38.6
2.500	9/1/2013	-10.3	-9.7	-0.1	-2.3	-9.1	-0.6	1.0	-0.6	-10.1	0.4	1.4	0.3	65.4	34.9
2.000	3/1/2014	-9.4	-8.9	1.1	-1.6	-8.8	-0.1	0.9	-0.1	-8.8	-0.1	0.9	-0.1	56.8	29.3
3.000	6/1/2014	-9.5	-9.5	-0.1	-3.3	-8.1	-1.4	1.3	-1.1	-9.4	-0.1	1.9	-0.1	61.7	27.4
5.000	6/1/2014	-10.5	-11.0	-0.1	-3.3	-9.3	-1.7	1.2	-1.5	-10.3	-0.7	1.7	-0.4	64.3	28.2
2.000	12/1/2014	-11.3	-11.0	-0.1	-3.1	-9.9	-1.2	1.2	-1.0	-9.8	-1.2	1.4	-0.9	46.8	23.7
4.500	6/1/2015	-11.6	-12.6	0.1	-2.7	-12.1	-0.6	1.2	-0.5	-12.1	-0.5	1.6	-0.3	49.2	22.1
2.500	6/1/2015	-11.6	-11.6	0.1	-2.7	-11.1	-0.6	1.2	-0.5	-11.0	-0.6	1.6	-0.4	42.3	21.3
3.000	12/1/2015	-12.0	-12.2	0.3	-2.3	-12.2	0.0	1.2	0.0	-11.1	-1.1	2.0	-0.6	39.7	19.4
2.000	6/1/2016	-10.6	-9.9	0.3	-2.9	-9.4	-0.5	1.2	-0.4	-9.3	-0.6	1.1	-0.5	34.6	17.4
4.000	6/1/2016	-11.2	-12.1	0.4	-2.5	-11.9	-0.2	1.2	-0.1	-10.4	-1.7	2.1	-0.8	42.1	18.1
4.000	6/1/2017	-12.4	-13.5	0.2	-2.6	-13.3	-0.2	1.3	-0.2	-11.2	-2.2	2.3	-1.0	35.6	15.6
4.250	6/1/2018	-10.6	-12.2	0.2	-3.0	-11.5	-0.7	1.1	-0.7	-9.3	-2.8	2.5	-1.1	35.9	13.8
3.750	6/1/2019	-9.8	-10.3	-0.1	-2.5	-9.2	-1.1	1.1	-1.0	-7.0	-3.3	2.5	-1.3	32.0	12.2
3.500	6/1/2020	-15.3	-15.5	0.0	-3.2	-13.9	-1.6	1.3	-1.2	-11.5	-3.9	2.3	-1.7	21.6	11.0
3.250	6/1/2021	-18.1	-17.7	0.1	-3.1	-15.9	-1.8	1.4	-1.3	-13.0	-4.7	2.7	-1.8	15.1	10.1
8.000	6/1/2023	-23.7	-30.1	-0.5	-3.7	-27.8	-2.3	1.7	-1.4	-23.3	-6.9	4.0	-1.7	33.7	10.1
8.000	6/1/2027	-37.6	-39.7	-0.2	-5.2	-35.5	-4.2	2.4	-1.7	-30.2	-9.5	5.1	-1.9	22.3	8.3
5.750	6/1/2029	-39.3	-39.2	-0.4	-5.8	-34.6	-4.6	2.6	-1.8	-29.3	-9.9	4.9	-2.0	8.8	7.2
5.750	6/1/2033	-34.6	-32.9	-0.6	-5.4	-28.1	-4.8	2.2	-2.1	-24.0	-8.9	3.7	-2.4	10.4	6.3
5.000	6/1/2037	-27.6	-25.5	-0.7	-6.5	-20.8	-4.7	2.1	-2.2	-17.8	-7.7	2.8	-2.7	8.1	5.6
4.000	6/1/2041	-27.5	-26.3	-0.8	-7.4	-20.7	-5.6	2.3	-2.5	-18.4	-7.9	2.5	-3.1	-0.4	4.9

<sup>1</sup> Carry over 1-mo for 100K of DV01 risk, assuming bond financed at general collateral. <sup>2</sup> Carry Delta is the change in carry for a 10bp decline in the bond financing rate.

Canada Yield/Yield Asset-Swap Spreads, 2 through 10 Year Bonds



Canada Yield/Yield Asset-Swap Spreads, all terms



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