



## **20+ Bond Index – Methodology**

October 26, 2006

### **Introduction**

PC-Bond\* has been publishing indices to measure the performance of the Canadian fixed income market since 1947. Our indices are the most widely used fixed income performance benchmarks in Canada. The best known of these indices is the Universe Bond Index, which tracks the broad Canadian bond market. In addition to the Universe, we publish a variety of sub-indices for different term and credit sectors, as well as indices for tracking other segments of the market, including High Yield, Euro, and Yankee Bonds, inflation-indexed Real Return Bonds, Strip Bonds, 20+ Bonds, Maple Bonds, T-Bills, and residential and commercial Mortgage-Backed Securities.

### **Overview – Scotia Capital 20+ Bond Index**

This 20+ Bond Index is designed to be a broad measure of the Canadian investment-grade fixed income marketplace where the effective term for all issues is equal to or exceeds 20 Years.

The 20+ Bond Index is comprised of a 50:50 split between:

1. The full market value weight of the Strip 20+ Bond Index i.e. those Strip issues contained in the Scotia Capital Strip Bond Index with an effective term to maturity equal to or greater than 20 years and;
2. The matching market value weight for the 20+ maturity bonds in the Scotia Capital Universe Bond Index.

Thus the 20+ Bond Index will always have equal market value components from both the Strip 20+ Bond Index (50%) and the Universe 20+ Bond Index (50%).

**Statistics as of December 28, 2005:**

20+ Bond Index

- 335 securities each with an effective term of 20 years of greater
- Total market value of approximately \$22.6 billion
- Modified duration of 19.50 years

20+ Strip Bond Index

- 141 Government issues (Corporate issues are ineligible due to illiquidity)
- Total market value of \$11.3 billion
- Modified duration of 25.18 years

*The Strip 20+ Bond Index is created by selecting all the Strip issues contained in the Scotia Capital Strip Bond Index with an effective term equal to, or greater than, 20 years.*

*To review the complete methodology for the Scotia Capital Strip Bond Index please follow the link below:*

[http://www.canadianbondindices.com/PDF/stripbond\\_methodology.pdf](http://www.canadianbondindices.com/PDF/stripbond_methodology.pdf)

20+ Universe Index (Re-Weighted)

- 194 Government, and Corporate issues
- Market value set equal to that of the 20+ Strip Bond Index
- Modified duration of 13.82 years

*This sector includes all the issues contained in the Universe Index with an effective term equal to, or greater than, 20 years.*

*To review the complete methodology for the Scotia Capital Universe Bond Index please follow the link below:*

[http://www.canadianbondindices.com/PDF/RE\\_universe.pdf](http://www.canadianbondindices.com/PDF/RE_universe.pdf)

The Scotia Capital 20+ Bond Index has been built with daily history, calculated and available from December 29, 2000 and is calculated and published daily. It is also a transparent index, with individual security holdings and prices, disclosed electronically each day. All prices used for this index (both historically - from December 29, 2000, and going forward) are provided directly by Scotia Capital.



### Eligibility Criteria

**Minimum issue size:** \$50 Million for Federal and / or Provincial Government Coupons and Residuals (Strip Bonds) \$100 Million for Corporate Bonds (non-Strip Bonds)

\$50 Million for Federal and / or Provincial Government Bonds (non-Strip Bonds)

\$100 Million for Corporate Bonds (non-Strip Bonds)

**Minimum number of buyers:** 10 institutional buyers for all non Strip Issues

**Minimum Credit Rating:** BBB(low) for all non Strip Issues (Only Federal Strip and Provincial Strip Issues are eligible, regardless of Credit Rating)

**Currency:** Canadian dollars

**Country of issuance:** Canada

**Country of issuing entity:** Canada

### **Weighting**

The securities in the Scotia Capital 20+ Bond Index are weighted by relative market capitalization. Thus, the return on any issue in the index influences the return on the index in proportion to the individual issue's market value. Market value of any issue equals the adjusted amount outstanding, multiplied by the gross price (market price plus accrued interest), with the gross price expressed as a percentage.

Regarding Strip issues; the total amount outstanding of each issue is adjusted according to the monthly disclosure of Strip Amounts outstanding by CDS (Canadian Depository for Securities)

### **Effective Term**

For a bond with an embedded option feature, including puttable, callable, extendible, and retractable securities, the effective term is either the option exercise date, or the bond's final maturity date, depending on where the bond is trading in the market. In the case of a fixed-floater, the effective term is the date of the final fixed coupon payment.



## **Re-Balancing: Handling New Issues, Coupon Payments, and Roll-Outs**

### Entering the Index (Strip Bonds)

The Scotia Capital Strip Bond Index is re-balanced on the first of each month according to the issues and amounts outstanding provided by CDS (Canadian Depository for Securities) for the Canadian Strip marketplace.

### Entering the Index (non Strip Bonds)

New issues enter the index on the day they are issued, or as soon thereafter once it is confirmed that they meet all eligibility criteria. Eligibility criteria must be established by 3:00pm EST for a security to enter the index on that day.

### Exiting the Index (all issues)

A Bond and / or Strip Bond is removed from the 20+ Bond Index on the day its remaining effective term to maturity declines below twenty calendar years. For example, on December 1 2005, the index sells an issue maturing in twenty years, December 1 2025, at the 4:00 pm mark-to-market price. This issue therefore contributes to the return of the Long 20+ Weighted Bond Index from November 30, 2005 to December 1, 2005. It does not contribute to index duration and other risk statistics calculated at the close on December 1st 2005. A June 1, 2030 bond callable as of June 1, 2025 and trading to its call date would be removed from the index on June 1, 2005. A non-Strip security that is downgraded below BBB(low) is removed from the index 3-months after the date of the downgrade.

### Coupon Payments

Coupon income is reinvested across all bonds in the index in proportion to their market value. Coupon income is recognized each day as coupon income accrues, as well as when an actual coupon payment is made.

## **Valuation**

The securities that make up the 20+ Bond Index are priced each day by the Scotia Capital trading desk at 4:00 pm Eastern Standard Time. The same 4:00 pm prices are electronically distributed to investors through a variety of channels, including the PC Bond software system, the PC-Bond\* FastQuote Pricing service, and also via numerous third party data vendors. Thus, a portfolio valued using one of these sources can be compared on a consistent basis with all other Scotia Capital indices.

The 20+ Bond Index is constructed using mid-market prices.

Valuation at the 4:00 pm close is based on the trader's judgment of where a security should be priced, taking into account such factors as where the security previously traded, liquidity, and any



market-wide as well as security-specific developments that can be expected to affect the price. This policy is intended to reflect changing market conditions, even in cases where a security may not frequently trade. For securities that trade actively, the closing price will generally be close to where the security last traded, if not the same. For securities that trade less frequently, however, there could be a larger difference between the closing price and the price where the security last traded.

### **Settlement Conventions**

The Scotia Capital 20+ Bond Index risk measures are calculated from July 15, 2003 forward, using same day settlement. The index risk measures for the period of December 29, 2000 to, and including, July 14, 2003, were calculated using a three day settlement convention. The use of three day settlement for the period of December 29, 2000 to and including July 14, 2003, is consistent with the methodology for the Scotia Capital Universe Bond Index.

### **Credit Rating Categories**

The Strip Bond Index is at this time not classified into the broad credit rating categories of AAA/AA, A, and BBB, due to the lack of coverage of individual stripped issues from multiple rating agencies.

### **Index Risk Measures**

Several risk measures are calculated for the Scotia Capital 20+ Bond Index each day. Modified Duration, Macaulay Duration, and Convexity are calculated as market-value weighted averages of the respective measures for constituent bonds. Val01, which measures the dollar price sensitivity to a change in yield (in contrast to modified duration, which measures percentage price sensitivity), is calculated by weighting the individual bonds by their adjusted par values. Since July 15, 2003, all risk measures are calculated based on same-day settlement .

### **Data Quality**

The integrity of the prices in the index begins with the trading desk, which directly values virtually every security that goes into the database. All data inputs to the index, including price, credit rating, and amount outstanding, must pass through a scrubbing process each day that checks for data variances. The scrub results must be approved by the PC-Bond\* data analyst each day before the system will allow the index to run.

The data inputs into the index calculation are based on electronic transfer of information as much as possible, with minimal user involvement. This includes the electronic transfer of prices from the trading desk to the various indices engines, PC Bond, and the FastQuote Pricing services.

### **Revision of Index Rules Over Time**

The rules and practices for constructing the Strip Bond and other fixed income indices necessarily



change over time in order to reflect developments in the market. We will endeavor to provide reasonable advance notice of any such changes, as well as an assessment of the expected impact on the index.

**PC Bond**

PC-Bond is a software suite that provides daily price & yield updates for more than 15,000 fixed income securities. Users have the ability to generate daily portfolio measurement, or view specific prices, yields and yield curves as historical charts. The main module, BondMan XLC is an excel-based application. In addition to being used for portfolio measurement and analytics, it allows users to retrieve daily index holdings (and specific sub-sectors of the index), or even generate custom benchmarks using blended components of the Index. Prices in PC-Bond are the same prices used to value the Scotia Capital indices each day. The PC-Bond Index Team also provides the FastQuote service, which provides users same-day access to the 4:00pm bond prices used in the Index calculations and PC-Bond database.

**ScotiaBond Performance Attribution**

ScotiaBond is the PC-Bond\* interactive Windows-based performance attribution system that can be used to break down the returns on a portfolio or index into several different factors. ScotiaBond computes and analyzes daily returns, breaking them down to sources such as the passage of time, changes in the yield curve, changes in spreads, and transaction costs. Returns can be analyzed at the absolute level or relative to a benchmark such as the Universe Bond Index.

**Information Sources and Publications**

The Scotia Capital Bond Indices can be monitored on a daily basis through a variety of electronic information channels.

The PC-Bond\* internet site, [www.canadianbondindices.com](http://www.canadianbondindices.com), also provides daily index returns and statistics for the domestic Short, Mid, Long and Universe Bond Indices and for the Money Market Indices. In addition, this site provides methodologies and general descriptions of the many different indices.

Daily index performance is also available through electronic information sources like Bloomberg, Reuters, as well as major newspapers.

Bloomberg	SMFR		
Reuters	Pages SM2A to SM2N SM2E: month to date returns SM2F: quarter to date returns SM2G: year to date returns	In print	Globe and Mail, National Post, Bank of Canada Weekly, Monthly Financial Review
Index Email	<a href="mailto:pcbond@scotiacapital.com">pcbond@scotiacapital.com</a> Index Inquiries	Internet	<a href="http://www.canadianbondindices.com">www.canadianbondindices.com</a>



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**Disclaimer**

PC-Bond\* calculates and publishes the Scotia Capital 20+ Bond Index and other Scotia Capital fixed income indices at its own expense as an information service to financial market participants. The indices are published on a best-efforts basis, and do not constitute a recommendation to trade any particular security.

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## Appendix: Index Return Calculation

The one day index return measures the total return on the constituent bonds, including capital gains, accrued income, and coupon payments. The one day return from time t-1 to time t is calculated as follows, where P and AI denote market price and accrued interest, respectively, Q denotes the adjusted amount outstanding, and CPN denotes the total coupon cash flow:

$$r_t = \frac{\sum_i Q_{i,t-1} \cdot (P_{i,t} + AI_{i,t}) / 100 + \sum_{i^*} CPN_{i,t}}{\sum_i Q_{i,t-1} \cdot (P_{i,t-1} + AI_{i,t-1}) / 100} - 1$$

Ignoring coupon payments, the equation says that the return on the index is calculated from the change in price and accrued from t-1 to t, holding the index constituents fixed as of t-1. The coupon cash flows are summed only for those bonds that pay coupons on day t.

Given the index value at day t-1 and the one-day return, the index value for day t is calculated as follows:

$$Index_t = Index_{t-1} \times (1 + r_t)$$

A series of one-day returns calculated as described above can be linked together geometrically to obtain the total return index over a longer time period:

$$Index_t = Index_{t-k} \times (1 + r_{t-k+1}) \times \dots \times (1 + r_{t-1}) \times (1 + r_t)$$

Given two index levels, the periodic rate of return can be calculated as follows:

$$r_{t-k,t} = \frac{Index_t}{Index_{t-k}} - 1$$

The above chain-linking procedure ensures that the measurement of market performance is not distorted by changes in index composition. Note that it is consistent with the Time-Weighted Rate of Return (with daily weighting) advocated by the Association for Investment Management and Research (AIMR) for measuring portfolio performance<sup>1</sup>.

<sup>1</sup> AIMR Performance Presentation Standards Handbook 1997, Association for Investment Management and Research.



### Calculation Example

To illustrate the index total return calculation, consider a simple 2-bond index, with prices and accrued as shown below. Assume there is initially 5 million outstanding of bond 1, and 10 million of bond 2. On day 2 an additional 5 million of bond 1 is issued, and bond 2 pays a coupon of 275,000. On day 3, the outstanding amount of bond 2 is reduced by 2.5 million to reflect amounts that have been stripped.

	Market Price		Accrued Interest	
	Bond 1	Bond 2	Bond 1	Bond 2
Day1	101.083	101.489	1.3089	2.7274
Day2	101.188	101.775	1.3233	0.0000
Day3	101.293	102.062	1.3377	0.0151
Day4	101.398	102.350	1.3521	0.0301

The total return from day 1 to day 2 is calculated as follows. Note that the coupon payment is included in the return calculation, but that the 5 million re-opening of bond A is not included.

$$r_2 = \frac{\$5M \times (101.188 + 1.3233)/100 + \$10M \times (101.775 + 0.00)/100 + \$0.275M}{\$5M \times (101.083 + 1.3089)/100 + \$10M \times (101.489 + 2.7274)/100} - 1$$

$$= 0.23698\%$$

The total return from day 2 to day 3 is calculated as follows. Note that now the 5 million re-opening of bond 1 is included in the return calculation, and the day 2 coupon payment no longer appears.

$$r_3 = \frac{\$10M \times (101.293 + 1.3377)/100 + \$10M \times (102.062 + 0.0151)/100 + 0.0}{\$10M \times (101.188 + 1.3233)/100 + \$10M \times (101.775 + 0.00)/100} - 1$$

$$= 0.20630\%$$

From day 3 to day 4, the total return is calculated as follows, using the reduced amount of 7.5 million for bond 2 to reflect the 2.5 million of this bond that has been stripped.

$$r_4 = \frac{\$10M \times (101.398 + 1.3521)/100 + \$7.5M \times (102.350 + 0.0301)/100 + 0.0}{\$10M \times (101.293 + 1.3377)/100 + \$7.5M \times (102.062 + 0.0151)/100} - 1$$

$$= 0.19348\%$$



If we assume an index value of 100 on day 1, the index value for day 2 is:

$$\begin{aligned} Index_2 &= 100 \times (1.0023698) \\ &= 100.23698 \end{aligned}$$

Similarly, the index values for days 3 and 4 are:

$$\begin{aligned} Index_3 &= 100.23698 \times (1.0020630) \\ &= 100.44377 \end{aligned}$$

$$\begin{aligned} Index_4 &= 100.44377 \times (1.0019348) \\ &= 100.63811 \end{aligned}$$