

RBC Insight Total Return U.S. Treasury Index Family Methodology

Index Description

The RBC Insight Total Return U.S. Treasury (TRUST) Indexes are designed to be a broad measure of the U.S. Treasury Note and Bond market. The Indexes, which include a stripped version of each, are rebalanced daily to most closely reflect the dynamic investment environment faced by portfolio managers.

Index Calculation

The TRUST Indexes are calculated by PC Bond, a division of TMX Group. In the calculation of the Index, the Index Securities are weighted by relative market capitalization. Thus, the return on an Index Security influences the return on the Index in proportion to the Index Security's market value. Market value of an Index Security equals the adjusted amount outstanding, multiplied by the gross price (market price plus accrued interest), with the gross price expressed as a percentage.

In regards to the Stripped TRUST Indexes the total amount outstanding of each issue is adjusted so stripped Index Securities (securities whose interest and principal portions have been separated) are excluded, and reconstituted (Treasuries reassembled from Strips) securities are included within 2 business days following the release of the monthly statement of the Public Debt of the United States by the Department of the Treasury.

The Index Securities are priced using inputs from RBC Capital Markets New York, a recognized Primary Dealers of U.S. Treasury Issues. All Index Securities are valued using same day settlement.

Valuation at the 15:00:00 ET close is based on the trader's judgment of where an Index Security should be priced, taking into account such factors as where the Index 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 Index Securities that trade actively, the closing price will generally be close to where it last traded, if not the same. For Index Securities that trade less frequently, however, there could be a larger difference between the closing price and the price where it last traded.

PC Bond applies a data quality check to all data inputs to the Index, including price, and amount outstanding.

The Total Return Index measures the return from capital gains including coupon income and the reinvestment of coupons. The Price Return measures the return from capital gains, excluding coupon income and the reinvestment of coupons. The Yield measures the average yield of the constituent bonds, weighted by market value. A variety of other statistics is also calculated, including average coupon and term.

The Indexes have base values of 100. The TRUST Indexes are calculated when the Securities Industry and Financial Markets Association (SIFMA®) declares the U.S. fixed income markets to be open. Daily values are available at 15:45:00 ET.

Settlement Conventions

Accrued interest on Index Securities is calculated assuming same day settlement. Index Securities accrue interest using an Actual/Actual day count convention. When the last calendar day in a month is not a business day, accrued interest is calculated to the last business day of the month.

Index Risk Measures

Several risk measures are calculated for the TRUST Indexes each day. Modified duration, Macaulay duration, and Convexity are calculated as market-value weighted averages of the respective measures for the Index Securities. 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 Index Security by their adjusted par values. All risk measures are calculated based on same-day settlement.

Routine events like coupon payments and the addition or removal of Index Securities can cause significant changes in Index duration. The payment of a coupon on an individual Index Security causes the duration of the Index Security to increase, holding yield constant.

A single bond issue, of a material size, can also significantly affect Index duration. Issuance of a bond that has a shorter duration than that of the Index causes Index duration to decline, whereas issuance of a longer duration bond causes Index duration to increase.

Eligibility

Index eligibility is limited to specific security types only. The security types eligible for the Index include Treasury Notes and bonds. TIPs (Inflation linked issues) are excluded.

Eligibility Criteria

To be eligible for inclusion to the Index, a security must meet the following criteria:

- must be issued by the United States Treasury;

- must be a semi-annual pay fixed rate denominated in U.S. dollars;
- must have at least \$100 million outstanding; and
- the remaining effective term to maturity must be at least one year.

Maturities

The TRUST Index family is divided into a variety of term sub-indexes according to their effective terms, so that each term sub-index reflects securities that trade off of comparable parts of the yield curve. For an Index Security with an embedded option feature, including puttable, callable, extendible, and retractable Index Securities, the effective term is either the option exercise date, or the Index Security's final maturity date, depending on where it is trading in the market.

The Term sub-sectors are:

Overall

1-3 Years

3- 5 Years

5+ Years

1-5 Years

5-7 Years

1-10 Years

5-10 Years

10 + Years

15+ Years

20+ Years

Each TRUST Index is also available as a separate series with the same sub-indexes as above taking into account all Market stripping that has taken place.

Index Rebalancing

The TRUST Indexes are re-balanced on a daily basis.

Additions

A security is added to the Index on the day it is issued or auctioned. The Index Security is included in the calculation of Index risk statistics of like duration on the day of issue, though it does not affect the return on the Index until the following business day. The new Index

Security does not begin to accrue interest until the new issue settlement date. The cutoff time for inclusion on the day of issue is 15:00:00 ET.

Deletions

An Index Security is removed from the Index on the day its remaining effective term to maturity declines to one calendar year, whether that year has 365 or 366 days. For example, on December 1, 2008, the Index sells an Index Security maturing in one year, December 1, 2009, at the 15:00:00 ET mark-to-market price. This Index Security therefore contributes to the return on the Index from November 30 to December 1, 2008. It does not contribute to Index duration and other risk statistics calculated at the close on December 1, 2008. Analogous rules apply for the movement of bonds from one term sub-index to another, e.g. from 3-5 Years to 1–3 Years.

Roll-Outs

For an Index Security with embedded option features, the rule for moving from one term category to another, and for rolling out of the Index, is based on effective term (either the option exercise date, or the final maturity date), since these Index Securities are classified into Index term categories according to effective term.

Coupon Payment

Coupon income, realized and unrealized, is reinvested daily across all Index Securities in proportion to their market values. A detailed example of how index returns are calculated when the Index constituents change is provided in the appendix.

PC Bond may, from time to time, exercise reasonable discretion as it deems appropriate in order to ensure Index integrity.

Appendix A

Index Return Calculation

The one day index return measures the total return on the Index Securities, 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:

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

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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 Securities 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 Securities. 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 performance¹.

¹ 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	101.7765	1.3233	0.0000
Day3	101.293	102.062	1.3377	0.0151
Day4	102.35	1.3521	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.

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

$$= 0.23690\%$$

The total return from day 2 to day 3 is calculated as follows. Note that now the 5 million reopening 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.

$$r_4 = \frac{\$10M \times (102.35 + 1.3521) / 100 + \$7.5M \times (102.350 + 0.0302) / 100 + 0.0}{\$10M \times (101.293 + 1.3377) / 100 + \$7.5M \times (102.062 + 0.0151) / 100} - 1$$

$$= 0.19340\%$$

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

$$\text{Index}_2 = 100 \times (1.0023698)$$

$$= 100.23698$$

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

$$\text{Index}_3 = 100.23698 \times (1.0020630)$$

$$= 100.44377$$

$$\text{Index}_4 = 100.44377 \times (1.0019348)$$

$$= 100.63811$$

Appendix B

Symbol	Index Name	Description	Base Date
NQUST13	RBC Insight TRUST 1 to 3 US Treasury	The daily rebalanced TRUST 1-3 Yr US Treasury Index measures the performance of U.S. Treasury Notes and Bonds under 3 Years in Term	12/31/98
NQUST1T5	RBC Insight TRUST 1 to 5 US Treasury	The daily rebalanced TRUST 1-5 Yr US Treasury Index measures the performance of U.S. Treasury Notes and Bonds under 5 Years in Term	12/31/98
NQUST110	RBC Insight TRUST 1 to 10 US Treasury	The daily rebalanced TRUST 1-10 Yr US Treasury Index measures the performance of U.S. Treasury Notes and Bonds under 10 Years in Term	12/31/98
NQUST35	RBC Insight TRUST 3 to 5 US Treasury	The daily rebalanced TRUST 3-5 Yr US Treasury Index measures the performance of U.S. Treasury Notes and Bonds from 3 to 5 Years in Term	12/31/98
NQUST57	RBC Insight TRUST 5 to 7 US Treasury	The daily rebalanced TRUST 5-7 Yr US Treasury Index measures the performance of U.S. Treasury Notes and Bonds from 5 to 7 Years in Term	12/31/98
NQUST5	RBC Insight TRUST 5+ US Treasury	The daily rebalanced TRUST 5+ Yr US Treasury Index measures the performance of U.S. Treasury Notes and Bonds above 5 Years in Term	12/31/98
NQUST10	RBC Insight TRUST 10+ US Treasury	The daily rebalanced TRUST 10+ Yr US Treasury Index measures the performance of U.S. Treasury Notes and Bonds above 10 Years in Term	12/31/98
NQUST15	RBC Insight TRUST 15+ US Treasury	The daily rebalanced TRUST 15+ Yr US Treasury Index measures the performance of U.S. Treasury Notes and Bonds above 15 Years in Term	12/31/98
NQUST20	RBC Insight TRUST 20+ US Treasury	The daily rebalanced TRUST 20+ Yr US Treasury Index measures the performance of U.S. Treasury Notes and Bonds above 20 Years in Term	12/31/98
NQUSTAG	RBC Insight TRUST Overall US Treasury	The daily rebalanced TRUST Overall US Treasury Index measures the performance of all U.S. Treasury Notes and Bonds above 1 Year in Term	12/31/98
NQUST510	RBC Insight TRUST 5 to 10 US Treasury	The daily rebalanced TRUST 5-10 Yr US Treasury Index measures the performance of U.S. Treasury Notes and Bonds from 5 to 10 Years in Term	12/31/98
NQUST13S	RBC Insight	The daily rebalanced TRUST Stripped 1-3	12/31/98

	TRUST Stripped 1 to 3 US Treasury	Yr US Treasury Index measures the performance of U.S. Treasury Notes and Bonds under 3 Years in Term	
NQUEST1T5S	RBC Insight TRUST Stripped 1 to 5 US Treasury	The daily rebalanced TRUST Stripped 1-5 Yr US Treasury Index measures the performance of U.S. Treasury Notes and Bonds under 5 Years in Term	12/31/98
NQUEST110S	RBC Insight TRUST Stripped 1 to 10 US Treasury	The daily rebalanced TRUST Stripped 1-10 Yr US Treasury Index measures the performance of U.S. Treasury Notes and Bonds under 10 Years in Term	12/31/98
NQUEST35S	RBC Insight TRUST Stripped 3 to 5 US Treasury	The daily rebalanced TRUST Stripped 3-5 Yr US Treasury Index measures the performance of U.S. Treasury Notes and Bonds from 3 to 5 Years in Term	12/31/98
NQUEST57S	RBC Insight TRUST Stripped 5 to 7 US Treasury	The daily rebalanced TRUST Stripped 5-7 Yr US Treasury Index measures the performance of U.S. Treasury Notes and Bonds from 5 to 7 Years in Term	12/31/98
NQUEST5S	RBC Insight TRUST Stripped 5+ US Treasury	The daily rebalanced TRUST Stripped 5+ Yr US Treasury Index measures the performance of U.S. Treasury Notes and Bonds above 5 Years in Term	12/31/98
NQUEST10S	RBC Insight TRUST Stripped 10+ US Treasury	The daily rebalanced TRUST Stripped 10+ Yr US Treasury Index measures the performance of U.S. Treasury Notes and Bonds above 10 Years in Term	12/31/98
NQUEST15S	RBC Insight TRUST Stripped 15+ US Treasury	The daily rebalanced TRUST Stripped 15+ Yr US Treasury Index measures the performance of U.S. Treasury Notes and Bonds above 15 Years in Term	12/31/98
NQUEST20S	RBC Insight TRUST Stripped 20+ US Treasury	The daily rebalanced TRUST Stripped 20+ Yr US Treasury Index measures the performance of U.S. Treasury Notes and Bonds above 20 Years in Term	12/31/98
NQUESTAGS	RBC Insight TRUST Overall Stripped US Treasury	The daily rebalanced TRUST Stripped Overall US Treasury Index measures the performance of all U.S. Treasury Notes and Bonds above 1 Year in Term	12/31/98
NQUEST510S	RBC Insight TRUST Stripped 5 to 10 US Treasury	The daily rebalanced TRUST Stripped 5-10 Yr US Treasury Index measures the performance of U.S. Treasury Notes and Bonds from 5 to 10 Years in Term	12/31/98