

# **WISDOMTREE RULES-BASED METHODOLOGY**

**U.S. High Yield Corporate Bond Index Family**

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## **WisdomTree U.S. High Yield Corporate Bond Index Family**

### **Overview of Core Index Methodology**

Each index is designed to capture the performance of selected issuers in the US non-investment-grade corporate bond market with favorable fundamental and income characteristics. Each index employs a multi-step process, which screens on fundamentals to identify bonds with favorable characteristics and then tilts to those individual securities which offer favorable income characteristics (screen for favorable bonds and tilt towards income). The goal is to improve the risk-adjusted performance of traditional market-cap approaches for high-yield corporate bond indices.

Each index utilizes a screen and tilt approach to isolate bonds that have favorable fundamentals and tilts to those bonds with favorable income and valuation characteristics. Each index defines the universe, scores the individual issues across a fundamental metric distinguishing cash flow characteristics (*i.e.*, free cash flow) and discards the securities with poor cash flow performance. An income tilt score with adjustments accounting for the probability of default and recovery values is then applied to the market capitalization of each remaining security. The income tilt score incorporates the incremental income offered over Treasuries with similar maturities within the context of the credit risk they entail. The income tilt scores are translated into a multiplier, which is applied to the market cap percentile ranking to determine the issue weight within each index. As a final step, issuer exposure is capped as described in the index methodology rules. The index is rebalanced every six months with bonds removed monthly due to ratings changes, if any.

### **Relevant Indices in the Family**

- WisdomTree U.S. High Yield Corporate Bond Index
- WisdomTree U.S. Short-term High Yield Corporate Bond Index
- WisdomTree U.S. High Yield Corporate Bond, Zero Duration Index

## **Index Methodology**

### **1. Index Universe**

Each index is comprised of corporate bonds of public issuers domiciled in the United States. All eligible bonds are denominated in US dollars.

#### **1.1 Liquidity**

For the WisdomTree U.S. High Yield Corporate Bond Index, each issue must have at least \$500 million in par amount outstanding.

For the WisdomTree U.S. Short-term High Yield Corporate Bond Index, each issue must have at least \$350 million in par amount outstanding.

Each issue must have a remaining maturity of at least one year, or equivalent of 365.25 days.

#### **1.2 Rating**

Each issue must be rated high-yield (below BBB- or Baa3) by Standard & Poor's or Moody's. The final rating is determined by the lower rating from the rating agencies. Issues in distress state (issuer rated C or below by Standard & Poor's or Moody's) are excluded.

#### **1.3 Short Term**

For the WisdomTree U.S. Short-term High Yield Corporate Bond Index, each issue must have at least one year to maturity and at most five years to maturity.

#### **1.4 Sector**

Each issue is classified into one of five sectors: Industrial, Financial, Utility, Consumer, or Energy. Government, quasi government, foreign agencies, or supra-nationals issuers are excluded.

#### **1.5 Regulation S**

Bonds issued under Regulation S are excluded.

### **2. Rating Change**

In the case that an issuer has defaulted or is in distress, the issue(s) would be removed at month-end of the downgrade/default event is announced. The value associated with any such issue(s) is applied to the remaining index constituents pro rata at the end of the month.

### **3. Factor Definition**

### Free Cash Flow

Five-year annual average of Free Cash Flow, or such lesser period based on available data.

#### 4. Fundamental Cut

All issues with a non-positive factor (*i.e.*, non-positive free cash flow) are excluded. The issues with no factor data (*i.e.*, no free cash flow) available are excluded.

#### 5. Liquidity Cut

A liquidity score is assigned to each issue, calculated by:

$$\text{liquidity} = 0.5 * \ln(\text{amount outstanding}) - \ln(\text{age of issuance}),$$

where amount outstanding is determined at index reconstitution, and the age of issuance (in years) is calculated by the number of calendar days between the index reconstitution date and the issuance date, divided by 365.25.

Issues that fall below the bottom 5% of the liquidity scores within their respective sectors, and issues with no liquidity scores are removed from the index.

The *reference constituents* are defined as all the remaining bonds after the fundamental cut and the liquidity cut that are applied.

#### 6. Distance-to-Default (D2D) and Probability of Default (PD) Measure

D2D is obtained using Merton's formula. Denote  $\sigma_E$  as the annualized volatility of trailing 1 year daily equity price changes, the firm's asset volatility  $\sigma$  is given by:

$$\sigma^2 = \frac{\sigma_E^2}{1 + L} + \frac{(0.05 + 0.25 * \sigma_E^2)}{1 + 1/L}, \text{ where } L = \frac{\text{Total Debt}}{\text{Common Shares Outstanding} * \text{Equity Price}}$$

The distance to default of a firm is calculated as:

$$D2D = \frac{\ln \left( 100 * \frac{\text{Short Term Debt} + \text{Long Term Debt}}{\text{Total Assets}} * \text{Default Barrier} \right)}{\sigma} + \frac{R_E - 0.5\sigma^2}{\sigma},$$

where  $\text{Default Barrier} = \text{Short Term Debt} + 0.5 * \text{Long Term Debt}$  and  $R_E$  refers to the equity return. Correspondingly, each index uses a PD measure given by a transformation of the D2D:

$$PD = 1 - \frac{e^{-0.5+0.75*D2D}}{1 + e^{-0.5+0.75*D2D}}$$

## 7. Income Tilt and Amount Outstanding Adjustment

For each issue an income tilt score is obtained by its ROAS(1-PD), which is then ranked (in descending order) within each sector. The ROAS (in bp) is recovery-adjusted OAS calculated by:

$$ROAS = \frac{60\% * OAS}{LGD},$$

where LGD (loss given default) is determined using the following look up table

Senior Unsecured	60%
Senior Subordinate	70%
Subordinate	70%
Junior	75%
Junior Subordinate	80%

The amount outstanding of each issue is adjusted by  $2\alpha$  (a constant between 0 and 2), where  $\alpha$  is the percentage rank of the issue's income tilt score within its sector. For an issue with the top tilt score within its sector, its weight in the index would be doubled; for an issue with the worst tilt score within its sector, its weight in the index would be set to 0.

Issues with no income tilt score are excluded from each index.

## 8. Issuer Cap

For the WisdomTree U.S. High Yield Corporate Bond Index, an issuer cap of 2% in total market value is applied to the index. For the WisdomTree U.S. Short-term High Yield Corporate Bond Index, an issuer cap of 3% in total market value is applied to the index. Issues with the same ultimate parent ticker are aggregated under the same issuer.

If an issuer in an index exceeds the cap, the total market value of the issues under this issuer would be scaled down to conform with the cap at rebalance.

## 9. Index Constitution and Rebalancing

Each index is rebalanced semi-annually on the last business days of May and November.

### 9.1 Determination of the Reference Constituents

The reference constituents are determined ten business days (T-10) preceding each rebalancing date.

### 9.2 Determination of Constituent Weights

Five business days (T-5) preceding each rebalancing date, the tilt step and the issuer cap are applied to the reference constituents based on the most current pricing data. The corresponding T-5 constituent weights are applied to the index on the rebalancing date. This allows for advanced notice concerning potential weight changes in the index.

### **9.3 Exclusions prior to Rebalancing**

If an issue in the T-10 reference constituents fails the index universe screening prior to the rebalancing date, it will be removed from the index.

### **9.4 Index Rebalancing**

On the rebalancing date, each index is updated to reflect the T-5 constituent weights, and the updated par amounts for the new constituents are calculated.

## **10. Exclusion due to Delayed or Unfiled Annual Report**

If a company filed an NT 10-K report stating that it is not going to file the annual 10-K report within the extension period as dictated by the SEC based on reasons involving financial or accounting aspects solely pertaining to this company, all bonds issued by this company will be excluded from the reference universe. If such company is already in the index, its bonds will be dropped on the 3rd business day after the filing.

If a company filed an NT 10-K report and subsequently did not file the annual 10-K report during the extension period based on reasons involving financial or accounting aspects solely pertaining to this company, all bonds issued by this company will be excluded from the reference universe. If such company is already in the index, its bonds will be dropped on the 3rd business day after the end of the extension period.

If a company has been excluded from the reference universe or the index due to the reasons listed above, it will need to file or restate its 10-K and then file the next 10-Q on time before the next reference universe determination date to be eligible for inclusion into the reference universe.

## **11. Index Maintenance**

Index Maintenance includes monitoring and implementing the adjustments for redemptions, conversions, calls, or other corporate actions.

If a bond is converted, called or redeemed early at any point between rebalancing periods, the bond will be removed from the index, and the weights of the remaining components are adjusted proportionately to reflect the change in composition of the index.

Any corporate action will be implemented after the close of trading on the day prior to the ex-date of such corporate actions. Whenever possible, changes to the index's components, such as

deletions as a result of corporate actions, will be announced at least two business days prior to their implementation date.

## 12. WisdomTree U.S. High Yield Corporate Bond Zero Duration Index

The WisdomTree U.S. High Yield Corporate Bond, Zero Duration Index measures the return of the WisdomTree U.S. High Yield Corporate Bond Index with its interest rate (duration) exposure hedged to zero years using a short position in five on-the-run (OTR) US Treasury bellwether securities. The interest rate hedge is rebalanced on a monthly basis to achieve the target duration exposure.

### 12.1 Index Calculation Methodology

The return of the WisdomTree U.S. High Yield Corporate Bond, Zero Duration Index can be represented as the following:

$$\begin{aligned} \text{WisdomTree U.S. High Yield Corporate Bond, Zero Duration Index}_{\text{Total Return}} \\ = WFCHY_{\text{Total Return}} - WFCHY_{\text{Zero Duration Hedge}} + \text{Funding}_{1M T-Bills} \end{aligned}$$

Where:

$WFCHY_{\text{Total Return}}$   
= published return of the WisdomTree U.S. High Yield Corporate Bond Index, including a price, coupon and paydown return component

$WFCHY_{\text{Zero Duration Hedge}}$   
= the return of a portfolio of 6M, 2Y, 5Y, 10Y and 30Y OTR securities weighted to bring the duration of the WisdomTree U.S. High Yield Corporate Bond Index to zero years

$\text{Funding}_{1M T-Bills}$   
= the return of a basket of 1 month T – Bills to make the total return a funded return

### 12.2 Construction of Hedged Position

1. Bucketing of the Option Adjusted Duration (OAD) of the WisdomTree U.S. High Yield Corporate Bond Index
2. Selection of on-the-run Treasury bellwethers for the hedge portfolio
3. Calculation of hedge portfolio weights
4. Calculation of hedge portfolio and funding returns

Step 1: The hedge portfolio consists of OTR US Treasury securities in five different tenors: 6m, 2y, 5y, 10y, and 30y. The first step to constructing the hedge portfolio is to sort the underlying WisdomTree U.S. High Yield Corporate Bond Index (Statistics Universe) into five non-overlapping duration buckets, and to identify the duration contribution to be hedged by each of

these instruments in the hedge portfolio. The duration measure used is OAD, as computed and reported by Bloomberg Barclays.

Contribution to OAD is calculated by multiplying the market value percent of each duration bucket as of the month-end index rebalancing date by the OAD of each bucket.

Step 2: The selected securities for each monthly rebalance match the instruments that are used for Bloomberg Barclays US Treasury Bellwether Indices. OTR instruments for the portfolio are selected once a month on the last business day to include the most recently issued instrument for each tenor used in the hedge.

Step 3: To replicate the duration exposure from Step 1 with the five on-the-run US Treasuries selected in Step 2, an optimization technique is employed that establishes an aggregate duration equivalent to that of the underlying index ( $\pm 0.02$  year) and minimizes the sum of squared differences of the contribution to duration of the index in each bucket vs. the contribution to duration of the OTR US Treasuries.

Step 4: To calculate the return of the hedged position, the weights assigned for each US Treasury security are multiplied by the total return of that security for the month.