

# **Implementing the BEASSA Total Return Indices**

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## **1. History**

The JSE Actuaries Bond indices were used to measure the performance of the bond market before the Total Return Indices (TRIs) were introduced. It was widely accepted that the JSE Actuaries Indices had some shortcomings and at best only approximated the total return of the bond market.

The TRIs were introduced in July 2000 and have since been accepted by the majority of the financial market.

## **2. Brief Overview**

BESA publishes three main indices (ignoring the term splits), namely the ALBI, GOVI and OTHI. The ALBI is the main index and contains a full set of constituents. The GOVI consists of all the government constituents and the OTHI consists of all the non-government constituents.

The constituents are selected on terms of liquidity, total amount issued as well as the term to maturity. At present there are twenty constituents. This selection process occurs every quarter (ignoring special events like early redemptions etc.)

The index consists of two components, namely bonds and coupons. The bond part is the total value of all the bonds in the index and the coupon part is the value of all the coupons due as a result of bonds being in their ex-period. These expected coupons are discounted<sup>[1]</sup> to the valuation date. All received coupons are reinvested in the portfolio using the weightings of the constituent bonds.

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[1] Note that BESA specifies that all coupons should be discounted using the specific bond's YTM. This is not done in this document, as it is difficult to set up in most Treasury and Risk systems. Also note that BESA specifies a special discounting of the all-in price from settlement to valuation date using the bond's yield. This is ignored as well, as it is assumed that the all-in price in this document is the price as on the valuation date and not the settlement date. The above deviation from the BESA specification does not have a major impact on the value of the index.

### 3. Calculations

The total value of the bond portfolio is given by the following formula:

$$B_t = \sum_i (N_{t,i} \times P_{t,i})$$

where

$N_{t,i}$  is the issue notional of the  $i^{\text{th}}$  bond at time  $t$ ; and

$P_{t,i}$  is the all-in price of the  $i^{\text{th}}$  bond at time  $t$ .

It is market practice and convenient to have a base value of 100 for the index. This makes it necessary to scale the portfolio value to 100 on the day that the index starts.

This is achieved through using a scaling factor  $K$  which, at time 0, is given by:

$$K_0 = \frac{100}{B_0}$$

The  $K$ -factor will change when rebasing occurs, as well as on a day that coupons are received. The  $K$ -factor for time  $t$  is given by the following formula:

$$K_t = \frac{B_t + \sum_i R_{t,i}}{\sum_i (N_{t,i} * P_{t,i})}$$

where  $R_i$  is the coupon for the  $i^{\text{th}}$  bond.

Note that  $N_{t,i}$  is the new issued notional after rebasing has taken place.

## **4. Implementation**

BESA publishes all the information needed to implement the index on a daily basis.

The only slightly tricky part is to determine which bonds are ex and to bring these coupons in as zero coupon bonds maturing on the day that the coupon is expected to be paid.

## 5. Example

The following data is obtained from BESA:

Constituents: {R150, R153, ...}

Issued Notional: {1 500 000, 450 150, ...}

$K = 0.0003457$

You would have the following positions:

Instrument	Position Units
R150	51.85500
R153	15.56169
...	...

If we assume that the R150 is ex and that it pays a coupon of 12%, we get a coupon of R0.311130. This can be modelled as a zero coupon bond as it is a future cash flow.

Note that the  $K$ -factor is different for the ALBI, GOVI and OTHI as the portfolio values will be different for all of them.