NORDIC BOND PRICING

Index Methodology

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1 Index Description

The Nordic Bond Pricing (NBP) Index family is composed of a universe of bonds issued by Norwegian, Swedish or foreign domiciled issuers with bonds registered in the Norwegian CSD (Euronext Securities Oslo) or the Swedish CSD (Euroclear Sweden). The indices are created to offer fixed income investors independent benchmarks to evaluate the performances of their portfolios. The Index family is constructed to meet different needs of market participants; thus, it aims to measure underlying bond markets, in aggregate or based on more specific investment mandates. The fundamental philosophy behind the indices are as follows:

- Transparent and objective rules, to provide constituents eligible for inclusion or exclusion from the indices.

- The eligibility rules aim at investability and replicability, providing a credible return benchmark.

- Hierarchical structure of the index family.

The purpose of this publication is to provide the index users with the philosophy behind the creation of these indices, their construction and the accuracy of the measures used to explain the performance of the underlying markets for the different indices. First the index family is presented, including the various criteria and conventions used throughout. Subsequently, the rebalancing process and the method for publication as well as its frequency are disclosed. Lastly the underlying calculations for return and various key ratios are presented before the document is rounded off with information of practical matter.

1.1 The index family

Figure 1.1 gives an overview of the NBP index family. Current indices cover the government market (GOV), the high yield market (HY) and regular market (RM). This section will describe the NBP indices for all markets. Classification of Regular Market and High Yield Market is done in accordance with the principles as
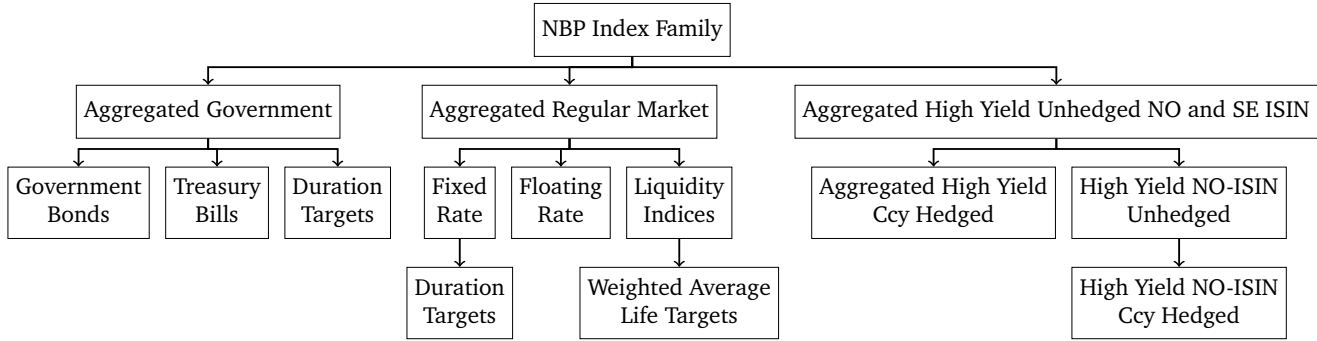

Figure 1: NBP Index family

outlined in Appendix B. The classification is based on the price level of the constituents in terms of a credit spread relative to a reference curve as defined for the various tiers of securities as communicated by NBP.

1.1.1 Regular market

The regular market branch of the index family consists of an aggregate index, which contains all eligible bonds in the regular market universe. Based on the RM universe two indices will be calculated based on their interest type, one consisting of solely fixed rate issues and one of solely floating rate issues. From the set of fixed rate issues three duration targeted indices are calculated, with duration targets of 1, 3 and 5. The universe is then divided into their respective RM sector groups, defined in section 1.5.2. For each RM group (except RM group 4) one pure floating rate index and three fixed rate indices with a modified duration

target of respectively 1, 3 and 5. With a monthly rebalancing process the target will be aimed at achieving a monthly average duration of the specified target. Details about the methodology can be found in appendix C.
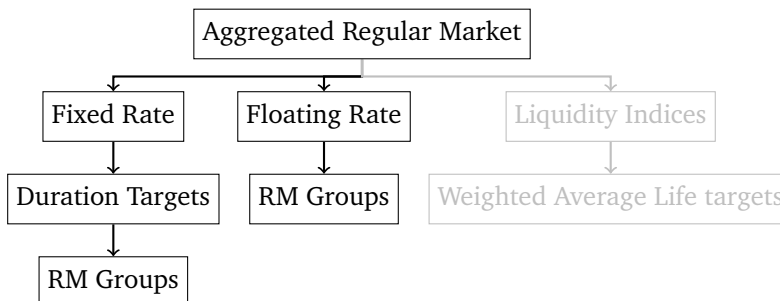
Aggregated Regular Market

Fixed Rate — Floating Rate — Liquidity Indices

Duration Targets — RM Groups — Weighted Average Life targets

RM Groups

Figure 2: Regular Market Branch

1.1.2 High Yield market

The high yield branch of the index family consists of an aggregate index, which contains all eligible bonds in the high yield universe. The high yield universe consists of securities with NO and SE ISIN, denominated in all currencies specified in appendix A. Sub-indices may be available, currently an index with NO-ISIN only. All high yield indices are unhedged regarding currency effects; however, currency hedged indices are available. The index base currency is optional for a limited selection of currencies, and a currency hedge is set to the chosen base currency.[1]
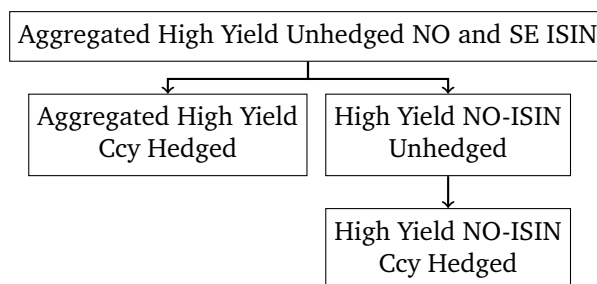
Aggregated High Yield Unhedged NO and SE ISIN

Aggregated High Yield Ccy Hedged — High Yield NO-ISIN Unhedged

High Yield NO-ISIN Ccy Hedged

Figure 3: High Yield Branch

1.1.3 Goverment market

The government market branch of the index family consists of an aggregate index, which contains all eligible Norwegian government bonds and bills. Based on instrument types, the aggregate index is split in a all bonds and a all treasury bills indices. Five duration targeted indices are calculated, with modified duration targets of 0.25, 0.5, 1, 3 and 5. Given a monthly rebalancing, the duration target will be achieved by a monthly average duration of the specified target. Details on the duration target methodology can be found in appendix C.

1.1.4 Liquidity indices

Liquidity indices seek to fill the need for indices with low interest rate risk, i.e., securities with a maximum of one year interest rate fixing period. The indices are set out to comply with 'Liquidity Fund' rules as outlined in VFF document 'Bransjestandard for informasjon og klassifisering av rentefond'[2] as of June 6th, 2021
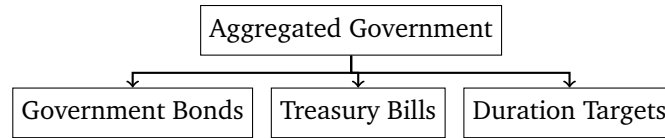
Figure 4: Government Market Branch

(hereafter referred to as 'VFF Standard'). The indices comply to the VFF Standard by a set of rules making the indices as representative to a Liquidity Fund as possible within the boundaries of a fixed income security index. One of these rules Liquidity Indices will have is a Weighted Average Life ('WAL') target. Details on Liquidity Indices and WAL target methodology can be found in appendix D. Since NBP classification rules depends solely on credit spread, High Yield classified issues may enter Liquidity Indices due to VFF Standard eligibility rules.
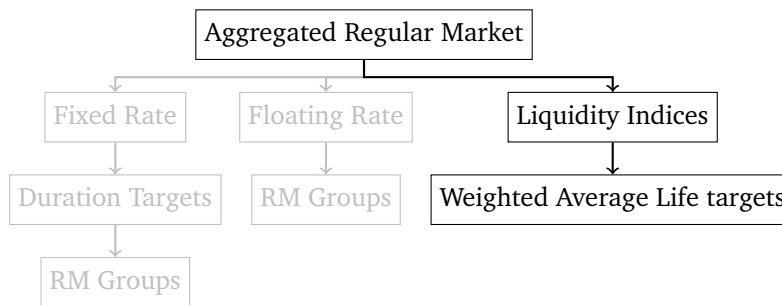

Figure 5: Liquidity Indices

1.2 Eligibility Rules

The NBP Bond Indices are total return indices, based on eligibility rules to provide index transparency and objectiveness. Further, the index rules are designed with the goal of providing a representative benchmark for the bond market accessible to professional investors. The following rules will be applicable for all indices:

- New securities qualify for inclusion in this month's index if the required security reference information and pricing are readily available on the selection date (defined in section 2.1).

- No securities can have an issue date later than the next rebalancing date.

- All issues must have an ISIN which starts with 'NO' except for the high yield branch where an ISIN may start with 'NO' or 'SE'.

- No convertible bonds are included.

- Both floating and fixed rate instruments are eligible.

- At the rebalancing date, with reference to the amount registered by Stamdata, NO-ISIN securities must have an outstanding nominal amount of minimum NOK 300 million. For issues denominated in other currencies (applicable for the high yield branch only) the NOK exchange rate on the selection date is used when converting the outstanding amount into NOK to evaluate this criterion. For SE-ISIN securities (applicable for the high yield branch only), the criterion is an outstanding nominal amount of minimum SEK 300 million or equivalent for issues denominated in other currencies, using SEK exchange rate on the selection data converting the amount into SEK.

4

- The securities are listed or are applying for listing on a regulated marketplace. In cases where the listing process on each rebalancing date exceeds one year, the relevant security will be excluded. Listed securities ensure access to relevant information and are assumed to be available to a wide range of investors[3].

- Securities declared to be in default or in insolvency proceedings[4] will be excluded upon the first rebalancing date following the registration of such an event. The technical treatment will be further elaborated in section 3.4.

- Several securities in the Nordic region are placed among a limited number of investors. However, to ensure that the indices constitute relevant benchmarks for the market available to professional investors on an ongoing basis, some securities may be defined as private placements and excluded from the index universe. The classification as private placement will be done at NBP's sole discretion and based on information available at the time of decision. NBP will in general emphasize on the ownership distribution for the aggregated amount of similar securities issued by the same issuer.

1.2.1 Specific rules for Regular Market Indices

Securities eligible for inclusion in the Regular Market universe must be denominated in NOK. Only bonds with at least one month to expected maturity [5] at the rebalancing date are included.

Embedded optionality in the form of call/put options are only allowed for the Regular Market universe when the first call/put date is assumed to be the expected redemption date and is embedded in covered, hybrid and subordinated bonds. Thus, for bonds other than those mentioned in the latter, only bullet bonds without options are eligible.

1.2.2 Specific rules for High Yield Indices

Securities eligible for inclusion in the High Yield universe are allowed to be denominated in currencies other than NOK. These currencies are defined in appendix A. NBP may decide to amend the list of eligible currencies. Bonds must have a minimum of 12 months to maturity upon inclusion into the index, but will be eligible to stay in the index until there is one month until maturity.

Bonds with regular call and/or put options are allowed in this branch of the index family. Bonds with a step-up schedule will be included in the index, if a predetermined schedule exists. Payment-in-kind (PIK) bonds and toggle notes are also included, with the methodology to handle these special events explained in section 3.3. Unlike the Regular Market branch, serial and irregular redemption types are allowed for in addition to bullet bonds.

1.2.3 Specific rules for Government Market Indices

Securities eligible for inclusion are bonds and treasury bills issued by the Norwegian government and denominated in NOK. Only bonds or treasury bills with at least one month to maturity at the rebalancing date are included.

1.2.4 Specific rules for Liquidity Indices with Low Risk

Securities eligible for inclusion in Liquidity Indices with low risk follows the rules laid out for Regular Market Indices. In addition, the following rules apply to comply with eligibility rules laid out for 'Liquidity fund with low risk' in section 3.3.1. in the VFF standard:

- Fixed-rate securities shall have a maximum maturity of 365 + 14 calendar days.

- Floating-rate securities shall have a maximum maturity of 3 years + 14 calendar days.

- Subordinated and senior non-preferred issues are excluded from the index.

- Securities in the index must have minimum «AA-» rating except for securities issued by banks or financial institutions which must have minimum «BBB-» rating or be classified as RM2. Bonds issued by Norwegian municipalities or local government are considered as «AA» rated securities.

Rules affecting constituent weights for indices that comply to 'Liquidity fund with low risk':

- The weighted average time to maturity (WAL) shall be maximum 1 year.

- Floating rate securities maturing between 365 + 14 calendar days and 3 years + 14 calendar days shall not exceed 25% weight at rebalancing date.

Weighting rules are described in detail in appendix D.

1.2.5   Specific rules for Liquidity Indices Standard

Securities eligible for inclusion in Liquidity Indices follows the rules laid out for Regular Market Indices. In addition, the following rules apply to comply with eligibility rules laid out for 'Liquidity fund' in section 3.3.2. in the VFF standard:

- Fixed-rate securities shall have a maximum maturity of 365 + 14 calendar days.

- The issuer or the security must have minimum «BBB-» rating ("Investment Grade") or be classified as Regular Market. For issuers of subordinated debt, rating must be at least «BBB+» or, if rating is not available, the security must be classified as Regular Market.

- Perpetual subordinated issues are excluded from the index.This is done by capping the time to maturity on floating rate securities at thirty years. This rules is not in the VFF Standard but have been added by NBP to keep the WAL concept consistent.

Rules affecting constituent weights for indices that comply to 'Liquidity fund':

- Weighted modified duration shall be below 1.

- Weighted Average Life ("WAL") shall be maximum 1.5 years.

- Subordinated issues can have a share of a maximum of 10% of the index's market value at rebalancing date.

Weighting rules are described in detail in appendix D.

1.3   Index Pricing

All the calculations will be based on evaluated prices provided by NBP. Bonds in the index will be priced at the evaluated market price ("EVAL"), usually considered as a mid price. Bonds will also enter and exit the index at the EVAL price.

1.4   Accrued Interest

1.4.1   Settlement Convention

The daily assumption is a same day settlement (T+0), except of the rebalancing date in December; then, settlement is assumed to be on the last calendar day of the month.

1.4.2   Calculations

The accrued interest is calculated for the period between the previous coupon date and the settlement date. Calculations are done in accordance with the day count convention as specified for accrued coupon payments in the loan agreement, alternatively the coupon payment convention (paid over) following from the Recommended Conventions for the Norwegian Certificate and Bond Markets (NFF).

1.5 Classifications

1.5.1 Security Classification

The classification of securities eligible for indices will be based on seniority in the issuer's capital structure and sector. NBP classify the securities into the following groups:

- Government debt,

- Debt issued by local government and covered bonds,

- Senior debt issued by financial institutions,

- Senior debt issued by corporates and subordinated debt issued by financial institutions, and

- Hybrid debt (Tier 1) issued by financial institutions.

Bullet points 2 - 5 above is the basis for the classification of Regular Market Groups 1- 4 as defined in 1.5.2.

1.5.2 Regular Market Groups

Regular Market Group 1 (RM1)
The Regular Market Group 1 consist of bonds issued by all Norwegian counties and municipalities and in addition, covered bonds. Covered bonds will included in accordance with the *Covered Bonds Regular Market* definition as set out in Appendix B.

Regular Market Group 2 (RM2)
Senior bonds issued by financial institutions will be included in the Regular Market Group 2 in accordance with the *Senior Bonds Financials Regular Market* definition as set out in Appendix B.

Regular Market Group 3 (RM3)
All other senior issues not covered by the definition of RM1 and RM2, in accordance with the *Senior Bonds ex Financials Regular Market* definition as set out in Appendix B[6]. Subordinated bonds issued by financial institutions will be included in RM3 in accordance with the *Subordinated Financials Regular Market* definition as set out in Appendix B.

Regular Market Group 4 (RM4)
Hybrid bonds (Tier 1) issued by financial institutions will be included in RM4 in accordance with the *Hybrid Bonds Regular Market* definition as set out in Appendix B.

1.5.3 Government (GOV)

Bonds and treasury bills issued by the by the Norwegian Government, denominated in NOK.

1.6 Holiday Convention

All indices in the NBP index family follows the Norwegian holiday calendar. Since the HY branch of the corporate bond index family are made up by multiple currencies, the closing FX rate of the previous day will be used on days where WM/Reuters do not publish closing FX rates due to local holidays.

2 Index Rebalancing and Publication

2.1 The Rebalancing Process

In the rebalancing process there are two dates of interest; the *rebalancing date* on the last business day of the month and the *selection date* which is three business days prior to the rebalancing date. All NBP bond

indices are rebalanced on a monthly basis, after the close of business on the rebalancing date. On the rebalancing date, unless otherwise specified, sets of market value weights are calculated for the constituents of the various indices. The set of constituents and their respective weights are held constant throughout the month until the next rebalancing date, as it will be used in the return calculations.

On the selection date, after the close of business, all securities eligible on the previous rebalancing date will again be considered whether they still meet the requirements of the relevant index. In addition to the existing set of index eligible securities, all new issues with available prices and principal amount that meet the eligibility rules will be included. For securities that are denominated in currencies other than NOK, the FX rate on the selection date will be used to assess the minimum outstanding amount criteria. Further, the listing status of all bonds needs to be available. The bonds will be divided into the Regular Market and High Yield universe based on their price level on the selection date. The set of securities that meets the requirements listed in this section and 1.2, will constitute the maximum number of issues that will be eligible on the rebalancing date. Which means that no new bonds will be allowed into the list of constituent's post selection date.

On the rebalancing date, after the close of business, the set of securities that was decided upon on the selection date will be reassessed. The requirement of a minimum of NOK 300 million outstanding will be assessed for securities which have been affected by corporate actions, e.g. currencies fluctuations will not affect the sample between the selection date and the rebalancing date. Issues with changes to their maturity which causes the bond to no longer fulfill the required remaining maturity, as specified for their index in 1.2 will be excluded. Following this reassessment, all prices, FX rates and principal amounts are updated. The resulting universe will now constitute the next month's index universe.

Intra month changes to the constituents due to corporate action will be reflected in the return of the index where the relevant constituent is included, but will not change the weight of the constituent in the index as set at the last rebalancing date nor will it change the status of an issue from eligible to ineligible during the month. This extends to non-overlapping indices, a bond will not change its index affiliation due to changes in its sector mapping nor pricing level intra month. Further, all intra month payments (interest, principal etc.) earns no reinvestment income intra month but contributes to the total return of the index and will be reinvested pro rata across the entire index at the next rebalancing date.

2.2   Index History

The index base date is December 31st 2014 (index value=100), with the first adjustment made on the last business day in January 2015.

2.3   Publications

On the first business day following the selection date, a preliminary list of the constituents for the next month will be published. No additional securities will be included in the index following the selection date, and thus this list reflects the maximum number of issues to be included in the index on the rebalancing date. The final list of next month's constituents will be published during business hours on the first business/calendar day following the rebalancing date.

2.4   Corrections

NBP strives to produce indices free of errors; however, there may be occasions where erroneous data is published. Such errors may be caused by incidents of pricing errors or incorrect reference information. If such an event were to occur, it would in the most extreme cases entail a restatement. A restatement of the indices would only be relevant if the magnitude of the error will have a significant impact on the daily/monthly index values, in aggregate or sectoral. If such an event occur NBP reserves the right to recalculate the affected indices. NBP will in such events give notice to affected clients. Minor errors in the return calculations for a constituent, due to e.g. insufficient information about a corporate event, may

occur. NBP will correct such errors by offsetting the erroneous calculation when the error is detected and confirmed.

2.5 Precision and Quality Control

- Exhaustive information regarding corporate action data, that can/will affect index return, may not always be timely available at all times. NBP will therefore use its best effort, based on the available information, to adjust the affected return components on the record date of the corporate actions.

- Index values will be rounded off to 6 decimals.

- Return values will be rounded off to 10 decimals.

- All sub-indices will be calculated as long as there exist one or more eligible bonds. In instances where this is not fulfilled, the previous months level will be continued. This exception extends to a maximum of six months (six replications), at which point the index will be dissolved.

3 Index Calculations

3.1 Total Return

The month-to-date index total return in local currency (TR^{LC}), on any given date t, is defined as the sum of the weighted return of the n constituents of the index.

$$\text{TR}_t^{\text{LC}} = \sum_{i=1}^{n} w_{i,t-s}^{\text{MV}} \times \text{TR}_{i,t}^{\text{LC}} \tag{1}$$

where $w_{i,t-s}^{\text{MV}}$ is the monthly market value weight of constituent i set on the last rebalancing date, $t - s$.

$$w_{i,t-s}^{\text{MV}} = \frac{\text{MV}_{i,t-s}}{\sum_{i=1}^{n} \text{MV}_{i,t-s}}, \text{ where } \sum_{i=1}^{n} w_{i,t-s}^{\text{MV}} = 1 \tag{2}$$

The security level calculation of total return in local currency will be divided into 5 components: price return, coupon return, paydown return, redemption return and the return on all extra cash payments.

$$
\begin{aligned}
\text{TR}_{i,t}^{\text{LC}} &= \frac{\text{MV}_{i,t} + \text{Cash}_{i,(t-s,t)} - \text{MV}_{i,t-s}}{\text{MV}_{i,t-s}} \\
&= \underbrace{\frac{\text{P}_{i,t} - \text{P}_{i,t-s}}{\text{P}_{i,t-s} + \text{AI}_{i,t-s}}}_{\text{Price Return}_{i,t}} + \underbrace{\frac{\text{AI}_{i,t} - \text{AI}_{i,t-s} + \text{Coupon}_{i,t}}{\text{P}_{i,t-s} + \text{AI}_{i,t-s}}}_{\text{Coupon Return}_{i,t}} + \underbrace{\frac{\text{Extra Cash}_{i,t}/\text{N}_{i,t-s}}{\text{P}_{i,t-s} + \text{AI}_{i,t-s}}}_{\text{Extra Cash Return}_{i,t}} \\
&\quad + \sum_{q=1}^{Q_i} \left(\alpha_{i,q,t} \left[\underbrace{\frac{\text{K}_{i,q} - \text{P}_{i,q,r}}{\text{P}_{i,t-s} + \text{AI}_{i,t-s}}}_{\text{Redemption Return}_{i,t}} + \underbrace{\frac{(\text{P}_{i,q,r} + \text{AI}_{i,q,\text{settle}}) - (\text{P}_{i,t} + \text{AI}_{i,t} + \text{C}_{i,m})}{\text{P}_{i,t-s} + \text{AI}_{i,t-s}}}_{\text{Paydown Return}_{i,t}} \right] \right)
\end{aligned} \tag{3}
$$

where $q = 1, ..., Q_i$ is the corporate actions for bond i in the index period, and $\alpha_{i,q,t}$ takes on different values depending on the nature of the relevant corporate action.

$$
\alpha_{i,q,t} = \begin{cases} (1 - b_{i,t}) \times \text{C}_{i,t} & \text{, if PIK} \\ \text{N}_{i,q,t}/\text{N}_{i,t-s} & \text{, if redemption} \\ 0 & \text{else (e.g. bullet bonds without any corporate actions)} \end{cases}
$$

In the function above, $b_{i,t}$ denotes the share of a coupon payment $C_{i,t}$ that is settled in cash. $N_{i,t-s}$ is the notional amount outstanding at the last rebalancing date and $N_{i,q,t}$ is the amount redeemed for corporate action number q at date t. P denotes the clean price, AI the accrued interest and $AI_{i,q,\text{settle}}$ captures any accrued interest payment up to the settlement date for corporate action q. The clean price on the record date of the corporate action is denoted as $P_{i,q,r}$ and coupon payments made post settlement of redemption, on date m, is denoted as $C_{i,m}$. $K_{i,q}$ can take on four different values, depending on what corporate action that leads to the change in the outstanding amount:

$$
K_{i,q} = \begin{cases}
\text{Call/put price} & \text{, if partial call/put} \\
\text{Par/Contractual amortization price} & \text{, if amortization} \\
\text{Market price/agreed offer price} & \text{, if buy back} \\
0 & \text{, PIK coupon}
\end{cases}
$$

The redemption return measures the price return from deviations between any agreed price $K_{i,q}$ and the clean price $P_{i,q,r}$ on the record date of redemption. Paydown return, on the other hand, captures the potential loss of future cash flows following early redemption. This adjustment is necessary since the total return calculation assumes full investment until next rebalancing date, and thus measures what the investor would have received if the bonds were not redeemed. The last element of (3), Extra Cash$_{i,t}$, captures any other extra agreed payments for bond i on day t not captured by the other return elements. Modifications to (3) due to various corporate actions and/or PIK bonds will be further elaborated in sections 3.3 and 3.4.

3.2 Index Value

The daily closing index value (IV_t) in local currency (LC) is a function of the prior month-end index value (IV_{t-s}), and the current month-to-date return (TR_t^{LC}) in local currency.

$$
\text{IV}_t^{\text{LC}} = \text{IV}_{t-s}^{\text{LC}} \times \left(1 + \text{TR}_t^{\text{LC}}\right) \tag{4}
$$

3.3 Payment-In-Kind Bonds

This section describes how PIK bonds are handled in the index calculations. All PIK bonds that are not marked as being in non-payment nor trading flat of accrued will accrue interest. This accrued interest will be valued at the market price of the relevant bond. If the PIK status is known at the rebalancing date the accrued interest in the denominator in (3) will be adjusted accordingly. More specifically:

$$
\text{PIK adj}_{i,t-s} = \begin{cases}
\text{P}_{i,t-s}/100 & \text{, if PIK coupon at } t-s \\
1 & \text{, else}
\end{cases}
$$

The interest that accrue intra month ($AI_{i,t}$) will also be subject to an adjustment according to the daily market price ($P_{i,t}$):

$$
\text{PIK adj}_{i,t} = \begin{cases}
\text{P}_{i,t}/100 & \text{, if PIK coupon at } t \\
1 & \text{, else}
\end{cases}
$$

A bond that does not have a PIK status at the beginning of the month will change status when a formal approval of such a change to the terms of the bond has been approved or when an interest payment leads to a change in the relevant bond's principal in VPS, whichever event that is observed first.

For PIK bonds the total return in (3) can be expressed as follows for a single coupon payment made ei-

ther fully or partially in-kind:

$$
\text{TR}_{i,t}^{\text{LC}} = \underbrace{\frac{P_{i,t} - P_{i,t-s}}{P_{i,t-s} + \text{PIK adj}_{i,t-s} \times \text{AI}_{i,t-s}}}_{\text{Price Return}_{i,t}} + \underbrace{\frac{\text{PIK adj}_{i,t} \times \text{AI}_{i,t} - \text{PIK adj}_{i,t} \times \text{AI}_{i,t-s} + b_{i,t} \times C_{i,t}}{P_{i,t-s} + \text{PIK adj}_{i,t-s} \times \text{AI}_{i,t-s}}}_{\text{Coupon Return}_{i,t}} \tag{5}
$$

$$
+ \alpha_{i,t} \left[\underbrace{\frac{-P_{i,r}}{P_{i,t-s} + \text{PIK adj}_{i,t-s} \times \text{AI}_{i,t-s}}}_{\text{Redemption Return}_{i,t}} + \underbrace{\frac{(P_{i,r} + \text{PIK adj}_{i,r} \times \text{AI}_{i,\text{settle}}) - (P_{i,t} + \text{PIK adj}_{i,t} \times \text{AI}_{i,t})}{P_{i,t-s} + \text{PIK adj}_{i,t-s} \times \text{AI}_{i,t-s}}}_{\text{Paydown Return}_{i,t}} \right]
$$

where $b_{i,t} \times C_{i,t}$ is the share of the coupon payment made in cash and $\alpha_{i,t}$ as defined in section 3.1. The sum of the redemption and paydown return can be considered as the market price adjusted value of the PIK coupon. Bonds that enters the index as PIK bonds at the beginning of the month will have PIK $\text{adj}_{i,t-s} = P_{i,t-s}/100$ throughout the month, but if changes are made to the applicable loan agreement which specifies that there shall be no more PIK coupon payments then PIK $\text{adj}_{i,t}$ will be set to 1 following the announcement. Further, all bonds issued intra month will be added to the outstanding amount at the next rebalancing date.

3.4 Intra month special events

3.4.1 Redemptions

1. **Full redemption**
   Securities that are fully redeemed due to a full call, put or buyback will exit the index at their respective call/put or offer price.

$$
\text{Adjusted coupon return} = \frac{\text{AI}_{i,\text{settle}} - \text{AI}_{i,t-s} + C_{i,\text{settle}}}{P_{i,t-s} + \text{AI}_{i,t-s}} \tag{6}
$$

2. **Partial redemption (Buyback, Amortizations and Partial Call or Put)**
   For corporate actions such as buybacks, amortizations, offers and partial call or put, the calculated price and coupon return assumes that the full position is held throughout the month. To adjust for this effect, paydown return and redemption return will adjust for the reduced market exposure in the respective bond. Paydown return measures the potential loss of all future cash flows following early redemption, that is what the investors would have received if the bonds were not redeemed, while the redemption return measures the premium/discount relative to the market price on the record date of redemption. The price at which the paydown return and redemption return is calculated is given below, as in section 3.1.

$$
K_{i,t} = \begin{cases} \text{Call/put price} & \text{if call/put} \\ \text{Par/ contractual amortization price} & \text{if amortization} \\ \text{Market price/agreed offer price} & \text{if buyback} \end{cases}
$$

Finally, it should be noted that for amortized bonds, it is assumed that the coupon and installment are paid on the same date.

3.4.2 Defaulted and Non-Payment Bonds

If a bond is marked as insolvent, declared as in non-payment or defaults intra month, any accrued interest and scheduled coupon payments will be nulled following the announcement ($\text{AI}_{i,t} = 0$ and $C_{i,t} = 0$)[7]. This will result in a negative coupon return for the defaulted security throughout the month[8]. The price return, as defined in (3) remains unchanged while the coupon return can be rewritten as:

$$
\text{Adjusted coupon return} = \frac{0 - \text{AI}_{i,t-s} \times \text{PIK adj}_{i,t-s}}{P_{i,t-s} + \text{AI}_{i,t-s} \times \text{PIK adj}_{i,t-s}} \tag{7}
$$

If the pricing of a defaulted bond is discontinued, the bond will continue to be priced at the last available price until the next rebalancing date where the bond is eliminated from the Index.

3.4.3 Bonds trading flat of accrued

For bond issues where the issuer does not meet its coupon payment obligation, the buyer of the bond is not considered responsible for paying the accrued interest since the last payment was made. Computationally, when bonds are identified as trading flat of accrued then $\text{AI}_{i,t} = 0$.

$$\text{Adjusted coupon return} = \frac{0 - \text{AI}_{i,t-s} + \text{C}_{i,t}}{\text{P}_{i,t-s} + \text{AI}_{i,t-s}} \tag{8}$$

3.5 Currency Hedging & Returns

Indices consisting of bonds denominated in currencies other than the base currency will have a currency return component in the total return calculation. The calculated currency return can be both hedged (H) and unhedged (UH), with the relevant calculus given in the following subsections. The currency convention will be that of WM Reuters' spot foreign exchange rates and forward fixing at 16:00 GMT.

3.5.1 Unhedged return

Indices with exposure towards other currencies than the *base currency (BC)* of the index will at the beginning of each month buy the bonds denominated in a foreign currency, *local currency (LC)*, and unwind this currency position at month-end. The unhedged total return ($\text{TR}^{\text{BC, UH}}$) on bond i, denominated in currency j, can be expressed as follows:

$$\text{TR}_{i,j,t}^{\text{BC, UH}} = \text{TR}_{i,j,t}^{\text{LC}} + \underbrace{(1 + \text{TR}_{i,j,t}^{\text{LC}}) \times \frac{\text{FX}_{j,t}^{\text{LC/BC}} - \text{FX}_{j,t-s}^{\text{LC/BC}}}{\text{FX}_{j,t-s}^{\text{LC/BC}}}}_{\text{Currency Return}} \tag{9}$$

where $\text{TR}_{(i,j,t)}^{\text{LC}}$ is the total return of bond i in its local currency j. The second part of (9) describes the total currency return, both the pure currency investment and the currency return on the increments in the bonds value. $\text{FX}_{j,t-s}^{\text{LC/BC}}$ and $\text{FX}_{j,t}^{\text{LC/BC}}$ are the foreign exchange rates at respectively the last rebalancing date $t-s$ and the index date t.

The index level of total unhedged return can then be calculated by weighting the return of the individual bonds, in J currencies, by the weights defined in section 3.6.1:

$$\text{TR}_t^{\text{BC, UH}} = \sum_{j=1}^{J} \sum_{i=1}^{n} w_{i,j,t-s}^{\text{MV}} \times \text{TR}_{i,j,t}^{\text{BC, UH}} \tag{10}$$

The calculation of the closing index value on day t, given in (4), will for the unhedged index translate into

$$\text{IV}_t^{\text{BC, UH}} = \text{IV}_{t-s}^{\text{BC, UH}} \times \left(1 + \text{TR}_t^{\text{BC, UH}}\right) \tag{11}$$

3.5.2 Hedged return

The monthly currency-hedged total index return is based on the assumption of a rolling strategy of buying each foreign currency at the beginning of the month and selling one-month forwards. The value of each currency forward contract is assumed to be the full market value at the beginning of the month, $\text{MV}_{t-s}^{\text{LC}}$. The index will be fully hedged as of the rebalancing date and no adjustments will be made between rebalancing dates to adjust for price movements, corporate actions or any other changes. During the month the market value of the bonds will fluctuate, and thus the return of a hedged index are driven by two components:

1. Growth in the individual bonds' value

2. The hedge itself

For bond i, denominated in currency j, these two components can at time t be summarized as:

$$\text{TR}_{i,j,t}^{\text{BC, H}} = \text{TR}_{i,j,t}^{\text{BC, UH}} + h_{j,t-s} \times \text{HR}_{j,t} \tag{12}$$

where $h_{j,t-s}$ is the hedge ratio and $\text{HR}_{j,t}$ is the hedged return. All indices assume a 100% hedge of the index market value, e.g. $h_{j,t-s} = 1$, unless otherwise stated. The unhedged total return is that defined in (9) and $\text{HR}_{j,t}$ is defined as:

$$\text{HR}_{j,t} = \underbrace{\frac{\text{FWD}_{j,(t-s,1M)}^{\text{LC/BC}} - \text{FX}_{j,t-s}^{\text{LC/BC}}}{\text{FX}_{j,t-s}^{\text{LC/BC}}}}_{\text{Forward Return}} + \underbrace{\frac{\text{FX}_{j,t}^{\text{LC/BC}} - \text{FWD}_{j,(t,T-t)}^{\text{LC/BC}}}{\text{FWD}_{j,(t,T-t)}^{\text{LC/BC}}}}_{\text{Hedge Reversal Return}} - \underbrace{\frac{\text{FX}_{j,t}^{\text{LC/BC}} - \text{FX}_{j,t-s}^{\text{LC/BC}}}{\text{FX}_{j,t-s}^{\text{LC/BC}}}}_{\text{Spot FX Return}} \tag{13}$$

where $\text{FWD}_{j,(t,T-t)}^{\text{LC/BC}}$ is the linear interpolated forward rate between the current spot and forward rate for daily intra month calculations on day $t < T$, defined as:

$$\text{FWD}_{j,(t,T-t)}^{\text{LC/BC}} = \text{FX}_{j,t}^{\text{LC/BC}} + \left(\text{FWD}_{j,(t,1M)}^{\text{LC/BC}} - \text{FX}_{j,t}^{\text{LC/BC}}\right) \frac{\text{remaining days in month}}{\text{actual days in month}} \tag{14}$$

where $\text{FWD}_{j,t,1M}^{\text{LC/BC}}$ is the one-month forward for currency j on day t. The index level of total hedged return can then be calculated by weighting the return of the individual bonds by the weights defined in section 3.6.1:

$$\text{TR}_t^{\text{BC, H}} = \sum_{j=1}^{J} \sum_{i=1}^{n} w_{i,j,t-s}^{\text{MV}} \times \text{TR}_{i,j,t}^{\text{BC, H}} \tag{15}$$

The calculation of the closing index value on day t, given in (4), will for the hedged index translate into

$$\text{IV}_t^{\text{BC, H}} = \text{IV}_{t-s}^{\text{BC, H}} \times \left(1 + \text{TR}_t^{\text{BC, H}}\right) \tag{16}$$

3.6 Weighting

All return calculations are based on monthly weights, fixed on the last rebalancing date $t - s$. All index statistics are based on the daily positions, measured by the market value or the nominal value depending on the statistics calculated.

3.6.1 Market Value Weighting

The market value weights for the bonds included in the index can be divided into two groups, the first is the monthly market value weight as defined in (2) and the other being a daily market value weight that reflects the exposure of the index intra month:

$$w_{i,t}^{\text{MV}} = \frac{\text{MV}_{i,t}}{\sum_{i=1}^{n} \text{MV}_{i,t}}, \text{ where } \sum_{i=1}^{n} w_{i,t}^{\text{MV}} = 1 \tag{17}$$

3.6.2 Credit Duration Adjusted Weighting

The credit duration adjusted weighting is each issues market value weight adjusted by its credit duration:

$$w_{i,t}^{\text{CD}} = \frac{\text{CD}_{i,t} \times \text{MV}_{i,t}}{\sum_{i=1}^{n} \text{CD}_{i,t} \times \text{MV}_{i,t}}, \text{ where } \sum_{i=1}^{n} w_{i,t}^{\text{CD}} = 1 \tag{18}$$

3.7 Key Ratios

This section will explain how all index key ratios are weighted. Important to note is the treatment of defaulted securities. Following such an announcement of default, all key-ratios for the relevant security will immediately be set to zero. In instances where no spread or yield can be calculated the bond will not be included in the averaged key ratio, and thus the denominator in the following subsections will be adjusted accordingly.

3.7.1 Average Modified Duration

The index' weighted modified duration is the market value weighted sum of the constituents modified duration $MD_{i,t}$:

$$IMD_t = \left(\sum_{i=1}^{n} MD_{i,t} \times w_{i,t}^{MV} \right) \times (1 - \text{share of cash}) \tag{19}$$

3.7.2 Average Credit Duration

The index' weighted credit duration is the market value weighted sum of the constituents credit duration $CD_{i,t}$:

$$ICD_t = \left(\sum_{i=1}^{n} CD_{i,t} \times w_{i,t}^{MV} \right) \times (1 - \text{share of cash}) \tag{20}$$

3.7.3 Index Spread

The index' weighted average spread is the credit duration adjusted weighted sum of the constituents spread $S_{i,t}$ over 3-month NIBOR:

$$IS_t = \left(\sum_{i=1}^{n} S_{i,t} \times w_{i,t}^{CD} \right) \times (1 - \text{share of cash}) \tag{21}$$

3.7.4 Average Yield

The index' weighted average yield to maturity is the credit duration adjusted value weighted sum of the constituents yield to maturity $Y_{i,t}$:

$$IY_t = \left(\sum_{i=1}^{n} Y_{i,t} \times w_{i,t}^{CD} \right) \times (1 - \text{share of cash}) \tag{22}$$

4 Additional Information

4.1 Index Reviews

To ensure the relevance and stability of the indices, all rules noted in this document will be subject to a full review once a year. Amendments will be communicated to registered subscribers of the indices.

4.2 Contact Information

Visiting address:

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Notes

[1]Currency hedges are not perfect and an index' performance will divert between different base currencies due to currency weights of constituents and carry of the hedges.

[2]https://vff.no/storage/Bransjestandard-for-informasjon-og-klassifisering-av-rentefond-vedtatt-24.6.2021.pdf.

[3]The listing requirement does not include securities issued by a Norwegian government or municipality.

[4]When a scheduled payment (interest payment or installment) is not made as agreed or the issuer has notified that it will not make the payment, the bond is marked as *non-payment*. When formal insolvency proceedings have been initiated the bond is marked as *insolvent*. When a final notice of default has delivered, the bond is marked as *defaulted*

[5]The expected maturity depends of several criteria. If the security is early redeemed, that date will used as the maturity date. For Subordinated and Hybrid Financials the first call date will in general be the expected maturity date. In most other cases the expected maturity is the contractual maturity.

[6]Bonds issued by non-financial companies which rank lower than senior debt issues (e.g., subordinated corporate debt) will be classified in accordance with *Senior Bonds ex Financials Regular Market* definition as set out in Appendix B. These issues are rare and seldom qualify for inclusion in any index.

[7]Except for bonds not officially declared as in default, if there are information available in the market indicating so then accrued interest will continue to be attributed to the specific bond until new information is provided.

[8]All scheduled coupon payments post default date will be set to zero, but if any coupon payment was made post rebalancing date and prior to default date it will be included into the coupon return as a positive return.

Appendices

A Accepted Currencies High Yield

- NOK

- DKK

- GBP

- SEK

- USD

- EUR

B Definition of Regular and High Yield Market

Classification of Regular Market and High Yield Market is done in accordance with the principles outlined in this appendix. Regular and High Yield Markets are classified based on the price level of the constituents in terms of a credit spread relative to a reference curve as defined for the various tiers of securities as communicated by NBP.

NBP may seek information and advice among market participants regarding the assessment of one or several constituents. NBP will make the decision based on own sole discretion, in accordance with the principles as outlined here. The principles will be subject to changes based on decisions made, and communicated, by NBP.

Bonds with equal seniority will in general be treated in the same manner for each Issuer. Price level for instruments with an expected maturity in 2.5 to 5.5 years will usually be given more weight in the assessment[9] Instruments with a short or very long time to maturity will usually be given less weight. The assessment may emphasize and adjust for specific characteristics with the current supply/demand situation in the market[10].

To avoid frequently reclassifications based on short-time volatility, a safety barrier of 15 per cent of the benchmark level will be added to the benchmark level when considering a reclassification to High Yield, and similar 15 per cent of the benchmark level will be subtracted from the benchmark level when considering reclassification to Regular Market. If the constituents reside within the safety barrier for two consecutive months reclassification should be expected to be effective. If there are clear indications that the price shift is of not temporary nature, i.e. when the price level exceeds the safety barrier in a single month, the shift will be effective immediately.

B.0.1 Covered Bonds Regular Market

The benchmark for the Covered Bond Regular Market will be the NBP curve *Covered Residential 6* plus a spread of 30 basis points. All covered bonds with a spread level within this range will qualify for inclusion into the Covered Bond Regular Market.

B.0.2 Senior Bonds Financials Regular Market

The benchmark for the Senior Bonds Financials Regular Market will be the NBP curve *Bank 8* plus a spread of 50 basis points. All senior bonds with a spread level within this range and with affiliation to the financial sector will qualify for inclusion into the Senior Bonds Financials Regular Market.

The benchmark for the Senior Non-Preferred Bonds Financials Regular Market will be Senior Unsecured Bonds Financials Regular Market with the addition of the basis point spread between senior non-preferred bonds and senior unsecured bonds for benchmark issuers. All senior non-preferred bonds with a spread level within this range and with affiliation to the financial sector will qualify for inclusion into the Senior Bonds Financials Regular Market.

B.0.3 Senior Bonds ex Financials Regular Market

The benchmark for the Senior Bonds ex Financials Regular Market will be the NBP curves *Senior Non-Financials BBB- Composite* with the addition of 10 basis points for NO-ISIN and *Senior Non-Financials BBB-/BB+ Composite (SWE)* with the addition of 10 basis points for SE-ISIN. All senior bonds with a spread level within the respective ranges and without any affiliation to the financial sector will qualify for inclusion into the Senior Bonds ex Financials Regular Market[11].

B.0.4 Subordinated Financials Regular Market

The benchmark for the Subordinated Bonds Financials Regular Market will be the NBP curve *Ansvarlig lån 8*. All subordinated bonds with a spread level within this range and with affiliation to the financial sector will qualify for inclusion into the Subordinated Financials Regular Market.

B.0.5 Hybrid Financials Regular Market

The benchmark for the Hybrid Financials Regular Market will be the NBP curve *Fondsobligasjoner 2*. All hybrid bonds with a spread level within this range and with affiliation to the financial sector will qualify for inclusion into the Hybrid Bonds Regular Market.

B.0.6 High Yield

All bonds that do not fall within the spread range as defined for their respective security classifications will be classified as High Yield bonds. The following exceptions apply to SE-ISINs:

- All covered and municipal bonds are not classified and are thus not eligible for a high yield index.

- All senior financial bonds are classified utilizing the curve *Senior Non-Financials BBB-/BB+ Composite (SWE)* with the addition of 10 basis points.

- All subordinated financial bonds are not classified and are thus not eligible for a high yield index.

- All hybrid financial bonds are not classified and are thus not eligible for a high yield index.

B.0.7 Amendments to the definitions

Based on shifting market conditions, NBP may decide to adjust benchmark levels. NBP may also decide to add or adjust the different tiers to make the definitions relevant to the universe of constituents from time to time. Such decisions will be duly communicated to registered subscribers of the indices.

C Duration Target Indices

The object of this section is to present an in-detail description of the duration target indices. Unlike the general index calculation described in section 3 where index constituent weights are market value weights based on total outstanding nominal amount, duration target indices constituent weights are adjusted to equal target modified durations (hereafter referred to as duration) of 0.25 (3M), 0.5 (6M), 1, 3 and 5 respectively.

The matrix in figure 6 depicts the full set of 12 sector specific RM duration targeted indices that NBP provides (framed by the red line), based on combinations of Regular Market (RM) groups and duration targets 1, 3

and 5. In addition, 9 compound sector duration target indices will be available, with the compound sectors RM1/RM2, RM2/RM3 and RM1/RM2/RM3 and duration targets 1, 3 and 5 (not shown in figure 6).

Three market value based floating rate notes only indices with the compound sectors RM1/RM2, RM2/RM3 and RM1/RM2/RM3, are published as well.
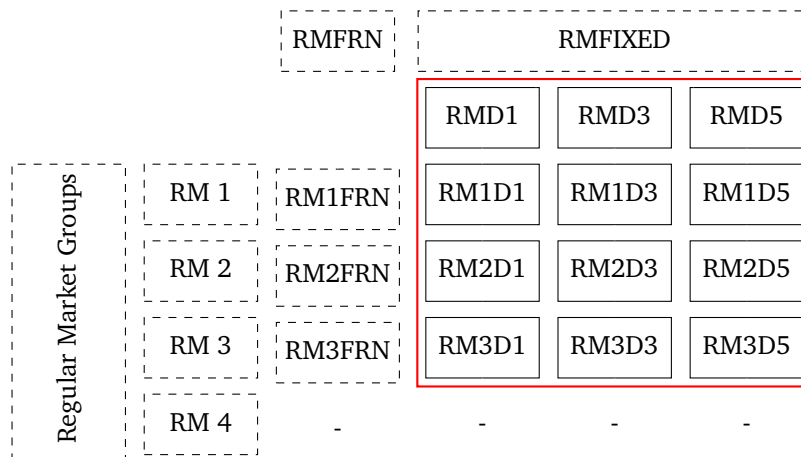

Figure 6: Full set of sector specific duration targeted regular market indices (in red).

The matrix in figure 7 depicts the set of government duration targeted indices NBP will provide (framed by a red line). NBP will offer five duration targets indices with duration targets between 0.25 and 5.
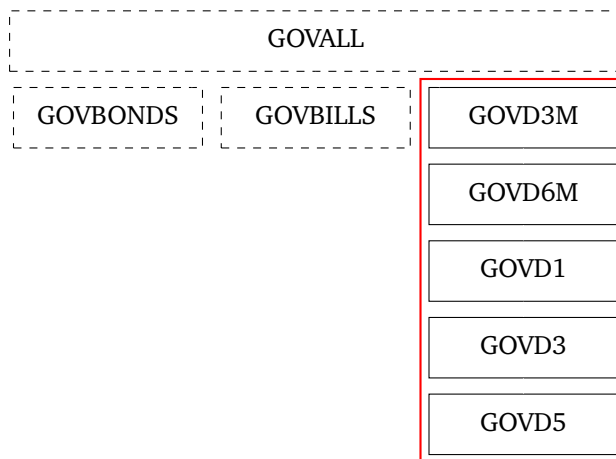

Figure 7: Full set of duration targeted government indices (in red).

All indices with duration targets consist of only fixed rate and zero-coupon issues and are weighted according to the following methodology:

1. The index constituents are either selected from the aggregated fixed interest constituents for the aggregated duration indices or divided into their respective Regular Market group.

2. To ensure that constituents in the duration target indices are representative, the following rules apply to the selection of eligible issues:

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Duration target 0.25:	Include exclusively issues with a modified duration below 0.875.
Duration target 0.5:	Include exclusively issues with a modified duration below 1.25.
Duration target 1:	Include exclusively issues with a modified duration below 3.
Duration target 3:	Include exclusively issues with more than a year to maturity and a modified duration below 8.
Duration target 5:	Include exclusively issues with a more than a year to maturity.

Allowing the full set of constituents into all duration targeted indices would result in adjusted weights which markedly deviates from its market value weight, hence the narrowing of the assortment of bonds.

3. The eligible issues in the various indices are then divided into two portfolios, portfolio 1 (P1) includes all issues with a modified duration lower than the target duration (D^{target}) and portfolio 2 (P2) includes all issues with a modified duration higher than the target duration of the index.

4. Market value weights within each of the two portfolios at rebalancing date $t - s$ are calculated, and the weight of bond i in portfolio P1 and P2 is given as:

$$w_{i,t-s}^{P1} = \frac{MV_{i \in P1,t-s}}{\sum_{i=1}^{n} MV_{i \in P1,t-s}}, \quad \text{where} \quad D_{i,t-s} < D^{target} \quad \text{and} \quad \sum_{i=1}^{n} w_{i,t-s}^{P1} = 1 \tag{23}$$

$$w_{i,t-s}^{P2} = \frac{MV_{i \in P2,t-s}}{\sum_{i=1}^{n} MV_{i \in P2,t-s}}, \quad \text{where} \quad D_{i,t-s} >= D^{target} \quad \text{and} \quad \sum_{i=1}^{n} w_{i,t-s}^{P2} = 1 \tag{24}$$

5. The weighted durations of the two portfolios are calculated (D^{P1} and D^{P2}) using the weights calculated in step 4. Given the weighted durations and the target duration (D^{target}), an adjustment factor x_1 can be solved in the following set of equations:

$$D^{target} = D^{P1} \times x_1 + D^{P2} \times x_2, \text{ where } x_1 + x_2 = 1 \text{ and } x_1, x_2 \geq 0 \tag{25}$$

Solving this with respect to x_1:

$$x_1 = \frac{D^{P2} - D^{target}}{D^{P2} - D^{P1}} \tag{26}$$

6. Final index constituent weights are given by $w_{i,t-s} = w_{i,t-s}^{P_j} \times x_j$ where $i = 1, \ldots, n$ and $j = 1, 2$, where market value weights in P1 is multiplied by x_1 and by x_2 in P2.

The duration of floating rate notes (FRNs) the duration is piecewise declining in time; the duration is declining until the next fixing date where it is reset to the length of the fixing period. For fixed interest bonds on the other hand, the duration should be expected to decline over time. To allow for this drifting effect and keeping the average duration within a month equal to the target, an addendum (ϵ) is added to the duration target D^{target}. This applies for all duration targets.

Special circumstances for duration targeted indices

As the markets which the duration targeted indices are based on are not static across time, some special events may arise when the issued volume in various market segments change. The duration target indices require a minimum of two bonds for the methodology described above to be applicable, one on each side of the duration target. This illustrates an event where the fixed duration may not be maintained. The handling of such an event is outlined in the final bullet point in section 2.5. As for duration target 0.25, only one security may be eligible (given the condition on minimum one month to maturity at rebalancing date). In this event the index may consist of only one security for the actual period with a weight of 100 % and the duration of the index will be equal to the actual security's duration in that particular period.

D Weighted Average Life (WAL) Target Indices

The object of this section is to present an in-detail description of the WAL target indices. 'Weighted Average Life' (WAL) is the average length of time unpaid principal on a bond remains outstanding. The WAL of the index is thus the average time until the principals of the underlying securities are repaid. To calculate index WAL the time to maturity for each constituent is multiplied by the corresponding weight.

Using market value weights for all eligible securities, based on total outstanding nominal amount, as constituent weights, index WAL will most likely not equal the target WAL. To equal the target WAL, constituent weights are adjusted by dividing the constituents into two sub-portfolios by the target WAL: Issues with time to maturity equal to or below the target WAL will be in put in one sub-portfolio and issues with time to maturity above the target WAL will be in put in another sub-portfolio. For each sub-portfolio a factor is calculated, based on the sub-portfolios weighted time to maturity. The sub-portfolio market value weights are multiplied by the corresponding factor to obtain the index constituents' adjusted weights. The adjusted weights will give the target WAL.

When calculating WAL, the VFF Standard specify that the securities' time to maturity is the final maturity date[12] and, unlike market conventions, this applies for subordinated issues too. Exempt from this rule is covered bonds, where the first call is used as maturity date. It should be noted, however, that the time to maturity rule applies for weighting purposes only, ordinary time to maturity market conventions is used in price and key ratios calculations for index constituents.

D.0.1 WAL Index Low Risk Method

Constituent securities eligible for WAL Index Low Risk are weighted according to the following methodology to meet a specified WAL target:

1. The eligible issues are divided into two sub-portfolios: P1, which includes all issues with time to maturity equal to below the WAL target (W^{target}) and P2, which includes all issues with time to maturity above the target time to maturity.

   Market value weights within each of the two sub-portfolios at rebalancing date $t - s$ are calculated, and the weight of bond i in the sub-portfolios are:

   $$w_{i,t-s}^{\text{P1}} = \frac{\text{MV}_{i \in \text{P1}, t-s}}{\sum_{i=1}^{n} \text{MV}_{i \in \text{P1}, t-s}}, \quad \text{where} \quad \text{TM}_{i,t-s} <= W^{\text{target}} \quad \text{and} \quad \sum_{i=1}^{n} w_{i,t-s}^{\text{P1}} = 1 \tag{27}$$

   $$w_{i,t-s}^{\text{P2}} = \frac{\text{MV}_{i \in \text{P2}, t-s}}{\sum_{i=1}^{n} \text{MV}_{i \in \text{P2}, t-s}}, \quad \text{where} \quad \text{TM}_{i,t-s} > W^{\text{target}} \quad \text{and} \quad \sum_{i=1}^{n} w_{i,t-s}^{\text{P2}} = 1 \tag{28}$$

   $w_{i,t-s}^{\text{P}_j}$ is the market value weight of constituent i in sub-portfolio j at rebalancing date $t - s$, $\text{MV}_{i \in \text{P}_j, t-s}$ is the market value of constituent i in sub-portfolio j at rebalancing date $t - s$ and $\text{TM}_{i,t-s}$ is the time to maturity of constituent i at rebalancing date $t - s$.

2. The WAL of the two sub-portfolios are calculated (W^{P1} and W^{P2}) using the weights calculated in step 1:

   $$W^{\text{P}_j} = \sum_{i=1}^{n} \text{TM}_{i \in \text{P}_j, t-s} \times w_{i \in \text{P}_j, t-s}^{\text{P}_j}, \text{ where } i = 1, \ldots, n \text{ and } j = 1, 2 \tag{29}$$

3. Based on the WALs and the target WAL, adjustment factors f_j are given by:

   $$W^{\text{P1}} \times f_1 + W^{\text{P2}} \times f_2 \leq W^{\text{target}}$$
   $$\text{where } f_1 + f_2 = 1, \tag{30}$$
   $$0.75 \leq f_1 < 1, \text{ and } 0 < f_2 \leq 0.25$$

The constraint $0 < f_2 \leq 0.25$ reflects the 25% weight limit of floating rate securities maturing between 365 + 14 calendar days and 3 years + 14 calendar which will belong to P2. Solving for f_2 gives following equation:

$$f_2 = min\left(0.25, \frac{W^{P1} - W^{target}}{W^{P1} - W^{P2}}\right) \tag{31}$$

Adjustment factors f_1 and f_2 can be interpreted as weights to P1 and P2 respectively. Each market value weight $w_{i,t-s}^{P_j}$ in P1 and P2 are multiplied by f_1 and f_2, such that the final index constituent weights are given by:

$$\overline{w}_{i,t-s} = w_{i,t-s}^{P_j} \times f_j \text{ where } i = 1, \ldots, n \text{ and } j = 1, 2. \tag{32}$$

Thus, by combining and rearrangning equations (27), (28) and (32), the index' constituents sum to 1: $\sum_{i=1}^{n} \overline{w}_{i,t-s} = 1$. By combining equations (29), (30) and (32) and rearranging, it can be shown that the weighted time to maturity is less than or equal to the target WAL: $\sum_{i=1}^{n} \overline{w}_{i,t-s} \times TM_{i,t-s} \leq W^{target}$.

D.0.2 WAL Index Standard Method

Constituent securities eligible for the WAL Index Standard are weighted according to the following methodology to meet a specified WAL target:

1. Let all subordinated bonds eligible for the index be held in a sub-portfolio S denoted PS. The subordinated issues' share of the index can not exceed 10% of the total index, measured by market value weights at rebalancing date $t - s$:

$$\sum_{i=1}^{n} w_i^{PS} = min\left(\sum_{i=1}^{n} \frac{MV_{i \in PS, t-s}}{\sum_{i=1}^{n} MV_{i,t-s}}, 0.1\right), \tag{33}$$

where market value weight of subordinated bond i is $w_i^{PS} = \frac{MV_{i \in PS, t-s}}{\sum_{i=1}^{n} MV_{i,t-s}}$.

$MV_{i,t-s}$ is the market value of constituent i at rebalancing date $t - s$.

An adjustment factor f_S is assigned to all subordinated bonds' weights. f_S will have one of the values:

$$f_S = \begin{cases} 1, & \text{if } \sum_{i=1}^{n} w_{i,t-s}^{PS} \leq 0.1 \\ 0.1 \times \left(\sum_{i=1}^{n} w_{i,t-s}^{PS}\right)^{-1}, & \text{if } \sum_{i=1}^{n} w_{i,t-s}^{PS} > 0.1 \end{cases} \tag{34}$$

The adjustment factor f_S is necessary in case of a total weight above 10% for subordinated bonds, where the adjustment factor will ensure the 10% limit. Each market value weight $w_{i,t-s}^{PS}$ in PS is multiplied by f_S, such that the final index constituent weights for subordinated bonds are given by $\overline{w}_{i,t-s}^{j} = w_{i,t-s}^{P_j} \times f_j$ where $i = 1, \ldots, n$ and $j = S$.

2. Two variables, α and β, are introduced. Let α be defined as:

$$\alpha = 1 - \sum_{i=1}^{n} \overline{w}_{i,t-s}^{PS} \tag{35}$$

α can be interpreted as the remaining share of weights available to non-subordinated issues. This share is minimum 90%.

Let β be defined as:

$$\beta = W^{\text{target}} - \sum_{i=1}^{n} \overline{w}_{i,t-s}^{\text{PS}} \times \text{TM}_{i \in \text{PS}, t-s}, \tag{36}$$

where $\text{TM}_{i \in \text{PS}, t-s}$ is the time to maturity of subordinated bond i at rebalancing date $t - s$. β can be interpreted as the remaining share of weighted time to maturity available to non-subordinated issues. Thus β is the target WAL for the non-subordinated issues.

3. The eligible issues ex subordinated bonds are divided into two sub-portfolios, sub-portfolio 1 (P1) which includes all issues with time to maturity below or equal to β and sub-portfolio 2 (P2) which includes all issues with time to maturity above β.

$$w_i^{\text{P1}} = \frac{\text{MV}_{i \in \text{P1}, t-s}}{\sum_{i=1}^{n} \text{MV}_{i \in \text{P1}, t-s}} \quad \text{where } i \in \text{P1 if } 0 < \text{TM}_i \leq \beta \text{ and } \sum_{i=1}^{n} w_{i,t-s}^{\text{P1}} = 1 \tag{37}$$

$$w_i^{\text{P2}} = \frac{\text{MV}_{i \in \text{P2}, t-s}}{\sum_{i=1}^{n} \text{MV}_{i \in \text{P2}, t-s}} \quad \text{where } i \in \text{P2 if } \text{TM}_i > \beta \text{ and } \sum_{i=1}^{n} w_{i,t-s}^{\text{P2}} = 1 \tag{38}$$

4. The WAL of the two portfolios are calculated (W^{P1} and W^{P2}) using the weights calculated in step 3.

$$W^{\text{P}_j} = \sum_{i=1}^{n} \text{TM}_{i \in \text{P}_j, t-s} \times w_{i \in \text{P}_j, t-s}^{\text{P}_j}, \text{ where } i = 1, \ldots, n \text{ and } j = 1, 2 \tag{39}$$

5. Given the respective WAL for P1 and P2 and the target WAL for P1 and P2 defined by β in step 3 above, adjustment factors f_1 and f_2 ensure the desired target WAL (β) available for the two sub-portfolios.

$$\begin{aligned} W^{\text{P1}} \times f_1 + W^{\text{P2}} \times f_2 &= \beta \\ f_1 + f_2 &= \alpha \end{aligned} \tag{40}$$

Solving for f_1 gives the following equation:

$$f_1 = \frac{\alpha W^{\text{P2}} - \beta}{W^{\text{P2}} - W^{\text{P1}}} \tag{41}$$

f_2 follows from the constraint in equation (40):

$$f_2 = \alpha - f_1 \tag{42}$$

Adjustment factors f_1 and f_2 can be interpreted as weights to sub-portfolios P1 and P2 respectively. Each market value weight $w_{i,t-s}^{\text{P}_j}$ in P1 and P2 are multiplied by f_1 and f_2, such that the final index constituent weights (including subordinated bonds) are given by $\overline{w}_{i,t-s} = w_{i,t-s}^{\text{P}_j} \times f_j$ where $i = 1, \ldots, n$ and $j = 1, 2, \text{S}$.

Thus, by combining and rearranging equations (35), (37), (38) and (40), it can be shown that the sum of constituents will equal 1: $\sum_{i=1}^{n} \overline{w}_{i,t-s} = 1$.

Equivalent, by combining and rearranging equations (36), (39) and (40), it can be shown that the weighted sum of time to maturity will equal the target WAL: $\sum_{i=1}^{n} \overline{w}_{i,t-s} \times \text{TM}_{i,t-s} = W^{\text{target}}$.

Special circumstances for liquidity indices

All Liquidity indices has a maximum duration limit, and this limit is not included in any rule for both types of Liquidity indices. This is due to a large portion of eligible securities are floating rate notes with a three-month interest rate fixing period and hence a short interest duration. As the markets are not static across time, this circumstance may change. In the event of a reduced portion securities with a short interest rate duration, NBP may change the methodology for incorporating rules or other measures where the duration limits are met.

Notes

[9]If an issuer has multiple active issues with a remaining time to maturity between 2.5 and 5.5 years, the issues in this segment will be weighted based on the product of each issues market value and its time to maturity. On the other hand, if an issuer with multiple issues within a seniority class with time to maturity lower and higher than the segment (2.5,5.5), these issues will also be weighted according to time to maturity and market value. The last possible case is when an issuer has one issue within the interval 2.5 and 5.5 years, and multiple issues outside the interval, then the one issue with a time to maturity between 2.5 and 5.5 years will be decisive for the issuer classification.

[10]NBP reserves the right to overrule a reclassification in instances where the reclassification is an obvious case of pricing and/or market imperfection.

[11]This does not include Norwegian counties and municipalities, which will be classified as RM.

[12] For details, refer to "Bransjestandard for informasjon og klassifisering av rentefond" footnote 4, page 4.

E   Changes to NBP index methodology

E.1   August 2018

E.1.1   Added limitation to issue date to section 1.2.

E.1.2   Added description for accrued interest calculations to section 1.4.

E.2   Mars 2019

E.2.1   Added benchmark for Senior Non-Preferred Bonds in appendix B.0.2.

E.2.2   Corrected last sentence in fourth section in in appendix B by adding ", the shift will be effective immediately".

E.3   May 2020

E.3.1   Changed benchmark for Senior Bonds ex Financials Regular Market to "*Senior Non-Financials BBB- Composite* with the addition of a spread of 10 basis points" in appendix B.0.3.

E.4   November 2020

E.4.1   The describtion of NBP index family in section 1.1 was changed to allow for goverment bond indices.

E.4.2   Sections 1.1.3 and 1.2.3 were added due to inclusion of government bond indices in NBP index family.

E.4.3   Appendix C was changed to allow for duration targets 0.25 and 0.5 and for inclusion of zero-coupon treasury bills in duration target indices.

E.5   June 2021

E.5.1   Appendix C Inclusion of compound sectors RM2/RM3 duration targets and floating rate note indices.

E.6   December 2021

E.6.1   The description of NBP index family in section 1.1 was changed to allow for Liquidity Indices.

E.6.2   Sections 1.1.4, 1.2.4 and 1.2.5 were added due to the inclusion of Liquidity indices in NBP index family.

E.6.3   Appendix D was included to describe the Weighted Average Life (WAL) target indices methodology.

E.6.4   The formulas in Appendix C was updated to specify that constituent weights are set at rebalancing date $t - s$.

E.6.5   Throughout the document typos and minor corrections have been done without changing the content or the meaning of the content.

E.7   September 2022

E.7.1   Section 1 Index Description: Open up for Swedish CDS registered bonds in the index family. Simplifying description.

E.7.2   Section 1.1 The index falily: Updated figure 1 to allow for expanded High Yield branch

E.7.3   Section 1.1.2 High Yield market: Updated description and figure 3 to allow for expanded High Yield branch

E.7.4 Section 1.2 Eligibility Rules: Updated bullet point three and six and six to allow for SE-ISIN. Bullet point seven, regarding listing added, which was previously last paragraph in 1.2.1

E.7.5 Section 1.2.4 Specific rules for Liquidity Indices with Low Risk: Third bullet point, exlude senior non-preferred issues.

E.7.6 Section 1.5.1 Security Classification: This section has been changed entirely since 5 classes are more in line with the description laid out in section 1.5.2 and 1.5.3.

E.7.7 Section 1.5.2 Regular Market Groups: New wording, same content. RM4 has always consited solely of Hybrid Bonds, thus "*Securities otherwise eligible in the Regular Market Indices, but not included in any of the RM groups defined above*" has been removed.

E.7.8 Section 2.5.2 Hedged return: In formula 13, changed under brace text from "*Currency Return*" to "*Spot FX Return* which is more precise. "*Currency Return*" is defined in 3.5.1 Unhedged return, formula 9.

E.7.9 Appendix B, Section B.0.3 Senior Bonds ex Financials Regular Market: Addition of a Swedish benchmark curve.

E.7.10 Appendix B, Section B.0.6 High Yield: Exceptions for SE-ISINs.

E.8 June 2023

E.8.1 Corrected typo in formula solving for adjustment factor f_1 in section D.0.2.

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