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Documentation of the government securities market benchmark named as ZMAX Index

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Definitions

Primary Dealers: Investment firms and/or credit institutions that have concluded an agency contract with the Government Debt Management Agency Private Company Limited by Shares (hereinafter: ÁKK Zrt.) on the placement and trading of Hungarian Government Bonds.

Ex-coupon day: KELER Central Depository Ltd. conducts the ownership identification of debt securities (including government securities) before a coupon or principal payment two business days before the cash-flow event (E-2), at the close of such day. Accordingly, the given security is traded without its coupon the day before the coupon or principal payment, which day is the ex-coupon day.

Trading day: Trading days are days when the Primary Dealers are obliged to perform their price quotation duties according to the agency contract.

Government security: Hungarian Government Bonds and Discount Treasury Bills (hereafter: T-Bills).

1. Introduction, the objective of the index

The ZMAX index has been developed with the goal of becoming a reliable market benchmark for institutional and private investors alike, in the maturity range of at least 14 days but shorter than 182 days, with the help of which the performance of government security portfolios can be measured.

The index basket of ZMAX Index is equivalent to a passively managed, well-diversified government security portfolio in the targeted maturity range. The constituents of the index basket are Hungarian Forint denominated, domestically issued T-Bills and fixed interest rate Hungarian Government Bonds. Therefore, investors acting on the domestic government security market can at any time construct a portfolio following the composition the ZMAX index basket.

2. Characteristics and calculation of the ZMAX index

The ZMAX Index uses a two-step calculation method. In the first step, ÁKK Zrt. calculates a theoretical zero-coupon yield curve with a so-called cubic spline fitting method, using secondary market price quotations of Primary Dealers, and publishes the results on its website[1]. The value of the ZMAX Index on a given day is determined (as set forth in subsection 2.4.) by using the published theoretical zero-coupon yield curve values as a basis, from which the prices of government securities with a remaining term-to-maturity shorter than 182 days are calculated in the second step. The value of the index is calculated using these prices.

[1] https://akk.hu/en/page/statistics#zero-coupon-yields

2.1. Official Hungarian name of the index

ZMAX Zérókupon Hozamgörbéből Képzett Magyar Államkötvény és Diszkont Kincstárjegy Index

2.2. Official English name of the index

ZMAX Zero Coupon Yield Curve Based Hungarian Government Bond and Discount Treasury Bill Index

2.3. Official abbreviation of the index

ZMAX

2.4. Formula of the index

$$ZMAX_t = ZMAX_{t-1} * \frac{\sum_{i \in D_{t-1}} \left(\hat{P}_{t,i} + A_{t+2,i} + G_{t+2,i}\right) * w_{t-1,i}}{\sum_{i \in D_{t-1}} \left(\hat{P}_{t-1,i} + A_{t+1,i}\right) * w_{t-1,i}},$$

where

$\hat{P}_{t,i}$: is the price calculated for government security i using the theoretical yield curve[2] on trading day t

$A_{t,i}$: is the interest accrued on government security i until day t as value date (ignoring the ex-coupon day), rounded to four decimals; zero in case of T-Bills

$G_{t,i}$: is the interest payment for government security i on day t, rounded to four decimals

$w_{t,i}$: is the weight of government security i on trading day t in the index basket based on its outstanding amount

D_t: is the set of constituent government securities in the index basket on trading day t.

The value of the ZMAX Index is calculated by rounding to four decimals.

2.5. Basis and measure of the index

January 2, 1997 (trading day) = 100.0000 points

2.6. Dates of calculating and publishing the index

The index is calculated once on each trading day during the trading hours of Hungarian

[2] The zero-coupon yield curve, published by ÁKK Zrt. using a cubic spline fitting method, is calculated using the arithmetical average, rounded to four decimals, of the best bid and best offer clean (net) price of government security series i on trading day t with settlement on day t+2 based on Primary Dealers' two-way secondary market price quotations.

Government Bonds. The index value of the given trading day is published at https://akk.hu/en/statistics/yields-indices-and-secondary-market-turnover/max-index-values not later than 3 PM local time on that trading day.

The current value of the index is also published on the following pages of news agencies:

- on the HUBONDINDEX1 page of Refinitiv (formerly Thomson Reuters)

- on Bloomberg's GDMA\ 8) MAX Index page.

2.7. Basic criteria of the index basket composition

The ZMAX index is a so-called "all-securities" index, meaning its constituents include every eligible government security that comply with the given criteria.

A government security series is added to the index basket if it meets all the following criteria:

- It is a Hungarian Forint denominated T-Bill or fixed interest rate Hungarian Government Bond publicly and domestically issued by the Hungarian State as the issuer;
- It has a remaining term-to-maturity of at least 14 days but shorter than 182 days at the time of inclusion in the index basket.

2.8. Weighting of the constituent government securities

Government securities are represented in the index basket by a nominal value (Hungarian Government Bonds) or price value (T-Bills) corresponding to their accepted amount at auctions ('classic' and exchange auctions as well as buyback auctions) held by ÁKK Zrt. The sum of these values constitute the total outstanding amount of the index basket constituents. The weight of the individual government securities in the index basket is equal to the quotient of their nominal value (Hungarian Government Bonds) or price value (T-Bills) accepted at auctions and the total outstanding amount of the index basket constituents. In the case of any other transaction involving government securities ÁKK Zrt. decides at its own discretion whether the given amounts should be taken into account as regards the composition of the index basket. In the case when ÁKK Zrt. publishes data about government security transactions beside auctions and at its own discretion decides that the ZMAX index basket should take these transactions into account, then ÁKK Zrt. discloses such information on its own website (https://akk.hu).

The weights of constituent government securities based on their outstanding amount are determined every Wednesday. If this day is not a trading day, the weights are changed on the next trading day.

2.9. The chain-link method

The index is calculated using the so-called chain-link method, i.e. a given day's index value is the multiple of the previous day's index value and the weighted percentage change of gross prices during the time between. By applying the chain-link method, changes in the

compositions of the index do not cause jumps or distortions in the index value.

2.10. Reinvestment of interest payments

Any interest paid by the Issuer on the constituent government securities is reinvested into the constituent government securities of the current index basket according to their weights. The interest payment is accounted for in the index calculation on the second trading day before the actual interest payment day.

2.11. Changes in the composition of the index basket

2.11.1. Inclusion into the index basket

In case the remaining term-to-maturity of a government security series satisfying all inclusion requirements falls below 182 days, the government security is then added to the index basket on the first trading day on which weights are changed.

2.11.2. Exclusion from the index basket

In case the remaining term-to-maturity of a constituent government security – calculated from the value date of the index to the maturity date of the government security – decreases below 14 days, then the government security is excluded from the index basket on the first trading day on which weights are changed.

In line with the index calculation method, the current gross price value as at the date of exclusion of the government security so excluded is reinvested into the current index constituents according to their weights on the day of exclusion.

2.12. Treatment of extraordinary events

2.12.1. Lack of price quotation

In the case when Primary Dealers' price quotation is for any reason temporarily not available to a degree that it becomes impossible to fit a yield curve using the cubic spline method, the index should be calculated using the theoretical zero-coupon yield curve calculated with the last available correct prices, for a period no longer than 5 consecutive trading days.

In case Primary Dealers' price quotations are not restored within 5 trading days, the calculation of the index is temporarily suspended.

As soon as Primary Dealers' price quotations become available again to a degree that it becomes possible to fit a yield curve using the cubic spline method again, the index weights are changed on the next trading day using the aforementioned principles, and the calculation of the index resumes.