

Russian Federation Government Bonds Futures Duration Methodology

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Output file structure

Output file is a comma-separated-values (CSV) text file which includes the following fields:

Name		Description
TRADEDATE	-	Date of calculation
NAME	-	Name of a futures contract
RV01	-	Ruble value of a basis point of a futures contract
MDUR	-	Modified duration of a futures contract
CTD	-	Name of the cheapest-to-deliver bond
IREPO	-	Implied REPO rate
CTDPRICE	-	Price of the cheapest-to-deliver bond
FUTPRICE	-	Price of a futures contract

Calculation process

1. Calculate prices for futures and bonds in baskets (see algorithm for prices calculation).
2. Determine the cheapest-to-deliver (CTD) bond for each futures
3. Calculate RV01 for CTD bond. RV01 for a futures contract is a ratio of RV01 of the CTD bond and the corresponding conversion factor:

$$RV01_F = \frac{RV01_{CTD}}{CF_{CTD}} \cdot L$$

Here CF_{CTD} is the conversion factor for the cheapest-to-deliver bond, L is the lot size for a futures contract (the number of bonds per futures contract is equal to 10)

4. The modified duration of a futures contract is a ratio of RV01 and the futures price:

$$MDur_F = -\frac{RV01_F}{F}$$

Schedule

1. All prices are calculated at 12:30 MSK
2. The CSV file with durations is published at 16:00 MSK

Algorithm for prices calculation

Let T be the current business day, T-1 be the previous business day. Then the prices for bonds and futures are to be calculated at 12:30 MSK according to the following rules:

1. If there are both the best bid and the best offer prices in the order book on day T at 12:30 MSK, then the price is an average of the best bid and the best offer. Otherwise, go to step 2.
2. If there are both the best bid and the best offer prices in the order book on day T-1 at 12:30 MSK, the price is their average. Otherwise, go to step 3.

3. The price for a futures contract is the settlement price on T-1. The price for bond is the last available end-of-day VWAP price in the Main Trading mode traded over the previous 14 calendar days.

Algorithm for identification of the cheapest-to-deliver (CTD) bond

1. If there are more than 7 calendar days between the current day and the last trading day of a futures contract, then the CTD bond is the bond in the basket with the maximum implied REPO rate (IRR). IRR is calculated with the following formula using the futures and bond prices (see the algorithm for price calculation):

$$irr^i = \frac{F(t_0) \cdot CF^i / L + AI^i(T) - (P^i(t_0) + AI^i(t_0)) + \sum_k c_k^i}{(P^i(t_0) + AI^i(t_0)) \cdot (T - t_0) - \sum_k c_k^i (T - t_k^i)}$$

Here irr^i is the implied REPO rate for the i -th bond in the basket, t_0 is the current date, T is the futures expiry date, $F(t_0)$ is the futures price, CF^i is the conversion factor for the i -th bond in the basket, L is the futures lot size (the number of bonds per futures contract), $AI^i(T)$ is the accrued interest for the i -th bond at T , $AI^i(t_0)$ is the accrued interest for the i -th bond at t_0 , $P^i(t_0)$ is the bond price (clean) at t_0 , c_k^i is the k -th coupon, t_k^i is the date of payment of the k -th coupon.

All differences between the dates mentioned are calculated in years on ACT/365 basis.

2. If there are less than 7 calendar days between the current day and the last trading day of a futures contract, then the CTD bond is the bond in the basket with the minimum ratio of the bond price and the conversion factor (see the algorithm for price calculation):

$$\frac{P_{CTD}}{CF_{CTD}} = \min_i \frac{P_i}{CF_i}$$