

Guide to the Calculation of Tradeweb FTSE Gilt Closing Prices

v2.3



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Section 1

Introduction

1. Introduction

1.1 Tradeweb FTSE Gilt Closing Prices

1.1.1 This guide describes the method by which Tradeweb FTSE Gilt Closing Prices for UK gilts are derived. Three Tradeweb FTSE Gilt closing prices are calculated for each security, reflecting a bid-, mid- and offer-side quote type.¹ The process is the joint responsibility of Tradeweb and FTSE Russell. The closing prices of conventional and index-linked gilts are used in the calculation of the FTSE Actuaries UK Gilts Index Series. Prices for gilt strips and UK treasury bills are also produced.

1.2 FTSE Russell

FTSE Russell is a trading name of FTSE International Limited, Frank Russell Company, FTSE Global Debt Capital Markets Limited (and its subsidiaries FTSE Global Debt Capital Markets Inc. and FTSE Fixed Income Europe Limited), FTSE Fixed Income LLC, FTSE (Beijing) Consulting Limited, Refinitiv Benchmark Services (UK) Limited, Refinitiv Limited and Beyond Ratings.

1.3 Tradeweb

1.3.1 Tradeweb Europe Limited is incorporated in the UK and regulated by the Financial Conduct Authority. Tradeweb builds and operates electronic marketplaces including a multilateral trading facility (MTF) pursuant to the Markets in Financial Instruments Directive (MiFID) that was implemented in the UK in 2007.

1.4 Overview of the origination of the closing prices

1.4.1 Since 1998, end-of-day gilt reference prices were published by the UK Debt Management Office (DMO) on behalf of the Gilt-Edged Market Makers Association (GEMMA) based on aggregating prices submitted by gilt-edged market makers (GEMMs).

1.4.2 In 2015, the DMO announced its intention to withdraw from providing end-of-day GEMMA reference gilt and treasury bill prices, and the publication of its intra-day prices.

1.4.3 Following a review of alternative sources of reference prices by the independent reference prices review team appointed by HM Treasury, Tradeweb and FTSE Russell were selected to provide reference prices following a transition period agreed in conjunction with the DMO.

1.4.4 The DMO ceased publishing end-of-day reference prices on 21 July 2017. From 24 July, the responsibility for publishing the prices has resided with Tradeweb and FTSE Russell.

1.5 Publication

1.5.1 The reference prices are calculated at the end of each business day. Delivery is available through a variety of mechanisms, including the Tradeweb Close file service.

¹ Prices that reflect bid-side and offer-side were introduced in August 2024. Prior to this date, only mid-side prices were calculated.

Section 2

Management responsibilities

2. Management responsibilities

2.1 FTSE International Limited (FTSE)

2.1.1 FTSE is the administrator of the Tradeweb FTSE Closing Gilt Prices².

2.2 Tradeweb

2.2.1 Tradeweb is responsible for calculating the reference prices based on price quotes available on their electronic trading platform.

2.2.2 Tradeweb is the calculation agent of the Tradeweb FTSE gilt closing prices as defined by the IOSCO Principles.

2.3 FTSE Russell Governance Framework

To oversee its indices, FTSE Russell employs a governance framework that encompasses product, service and technology governance. The framework incorporates the London Stock Exchange Group's three lines of defense risk management framework and is designed to meet the requirements of the IOSCO Principles for Financial Benchmarks³, the European benchmark regulation⁴ and the UK benchmark regulation⁵. The FTSE Russell Governance Framework can be accessed using the following link:

[FTSE_Russell_Governance_Framework.pdf](#)

2.4 FTSE EMEA Fixed Income Advisory Committee

2.4.1 The FTSE EMEA fixed income advisory committee has been established by FTSE Russell.

The committee provides external oversight of the methodology under which Tradeweb calculates end-of-day closing prices for all conventional and index-linked gilts, gilt strips and UK treasury bills. The committee may also provide their feedback on changes to this methodology. The terms of reference of the FTSE EMEA fixed income advisory committee are set out on the FTSE Russell website and can be accessed using the following link:

[FTSE EMEA Fixed Income Advisory Committee.pdf](#)

² The term administrator is used in this document in the same sense as it is defined in the IOSCO Principles for Financial Benchmarks and Regulation (EU) 2016/1011 of the European Parliament and of the Council of 8 June 2016 on indices used as benchmarks in financial instruments and financial contracts or to measure the performance of investment funds (the European Benchmark Regulation) and [The Benchmarks \(Amendment and Transitional Provision\) \(EU Exit\) Regulations 2019](#) (the UK Benchmark Regulation).

³ IOSCO Principles for Financial Benchmarks Final Report, FR07/13 July 2013.

⁴ Regulation (EU) 2016/1011 of the European Parliament and of the Council of 8 June 2016 on indices used as benchmarks in financial instruments and financial contracts or to measure the performance of investment funds.

⁵ The Benchmarks (Amendment and Transitional Provision) (EU Exit) Regulations 2019.

Section 3

Derivation of Tradeweb FTSE gilt closing prices

3. Closing prices

Tradeweb FTSE gilt closing prices are calculated by Tradeweb using the methodology outlined below, with FTSE Russell responsible for governance and oversight of the calculation process. Prices are calculated reflecting a bid-, mid- and offer-side quote type for conventional and inflation-linked gilts.⁶

3.1 Prices for conventional and index-linked gilts

Prices are based on executable bid- and offer-side price quotes supplied by gilt-edged market makers (GEMMs) to Tradeweb's electronic trading platform for institutional market makers and clients (the "Tradeweb Platform") in a two-minute collection window centred around the notional market closing time of 16:15 p.m. (London) and 12:15 p.m. (London) on dates when the UK Gilt market closes early. Only price quotes from GEMMs are used. Price quotes sourced from the Tradeweb Platform are attributable to specific GEMMs and are executable by the receiving liquidity takers, subject to liquidity providers accepting the trade.

The two-minute collection window captures all observed price quotes that are submitted between 16:14 to 16:16 (London). From each market maker's contributions, a single input price quote per instrument is derived, reflecting the median bid- mid- and offer-side price. All non-zero prices are incorporated, regardless of size.

The two-minute price collection window is divided into one-second time intervals where, for each market maker, a value will be populated starting from when the first price quote submission occurs within the window. For each market maker, an average price is calculated for each instrument resulting in a single price per instrument per market maker. The Tradeweb FTSE closing mid-side price is then derived as the median price of all market maker input prices.

A bid-offer spread is calculated as the difference between the median bid of all market maker input bid-side prices and the median offer of all market maker input offer-side prices. To calculate the closing bid- and offer-side price, the median bid-offer spread of all bid-offer spreads from the collection window is calculated and applied to the closing mid-side price by adding one-half of the spread to closing mid-price (closing offer-side price) and subtracting one-half of the spread from the closing mid-side price (closing bid-side price).

The closing bid-, mid- and offer-side prices are rounded to three decimal places for bonds with 10 years or less to maturity and two decimal places for bonds with more than ten years to maturity.

3.2 Price verification

Tradeweb compares derived prices against the Tradeweb composite prices, the previous day's price in the context of yield curve movements, and prices from transactions on the Tradeweb system. For conventional and index-linked gilts, at least three market makers must contribute prices during the collection window.

⁶ Prior to August 2024, only mid-side prices were calculated.

Deviations outside of pre-set tolerances will be investigated. In the event that a price is unable to be calculated, the previous day's closing price will be used for that day.

A Tradeweb composite price may be assigned for When-Issued securities.

3.3 Prices for strips

Mid-side prices for UK gilt strips are derived from a yield curve, which is fitted to the end-of-day gilt yields corresponding to the Tradeweb FTSE gilt prices. Additional detail on the derivation of this curve is provided in Section 4.

3.4 Prices for bills

Mid-side prices are derived for UK treasury bills from a daily closing yield curve, which is based on client sell transactions over the preceding five business days that were conducted through Tradeweb's electronic platform. The window runs from 16:15 (London) on date T-5 to 16:15 (London) on date T, where T = trade date. Prices from executed transactions only are used. Additional details on the derivation of this curve is provided in Section 4.

The contingency price for a bill is the previous day's closing price.

3.5 Governance and oversight

On a periodic basis, Tradeweb provides reports to the FTSE Russell EMEA fixed income advisory committee showing details of price contributions of all GEMMs for each gilt, and the number of times contingency plans have been required. Also every quarter, FTSE Russell requests Tradeweb data from 10 randomly chosen business days in the past quarter to reproduce the calculations of primary and window-based contingency prices for all gilts on those days. Bill and strip curves are also reproduced.

Section 4

Methodologies for pricing of strips and bills

4. Methodologies for pricing of strips and bills

- 4.1 End-of-day UK gilt strip mid-side prices are derived from a zero-coupon yield curve calculated from the closing prices of conventional gilts. This approach follows the practice of the DMO and is in accordance with Bank of England publications^{7,8}. The methodology uses cubic splines to model an instantaneous forward curve function $f_{\beta}(m)$ where β is the vector of cubic spline parameters. The price of zero-coupon strips can be written as a function of the instantaneous forward curve:

$$B(\tau) = \exp \left[- \int_0^{\tau} f_{\beta}(m) dm \right]$$

where τ is the maturity of the bond.

The price of a coupon-paying bond can be written as:

$$P(c, \tau) = \sum_{i=1}^n cB(\tau_i) + 100B(\tau)$$

where c is the coupon payment each period, and n is the number of payments.

By minimising the following objective function, the values of the cubic spline parameters β are found:

$$X_s = \sum_{i=1}^N \left[\frac{P_i - \Pi_i(\beta)}{D_i} \right]^2 + \int_0^M \lambda(m) [f_{\beta}''(m)]^2 dm$$

where $P_i, D_i, \Pi_i(\beta)$ are respectively the observed price, the modified duration and the fitted price of bond i . $f_{\beta}''(m)$ is the second derivative of the fitted forward curve and M is the maturity of the longest bond.

The objective function has two terms: the first is the sum of the squared bond price differences, weighted by modified durations. The second term is the variable roughness penalty, which is the integral of the forward curve curvature multiplied by a smoothing function $\lambda(m)$ which satisfies:

$$\log \lambda(m) = L - (L - S) \exp \left(-\frac{m}{\mu} \right)$$

where L, S, μ are three parameters.

⁷ Nicola Anderson and John Sleath (1999), "New estimates of the UK real and nominal yield curves", Bank of England Quarterly Bulletin, November, pp384-392.

⁸ Nicola Anderson and John Sleath (2001), "New estimates of the UK real and nominal yield curves", Bank of England working paper, no. 126.

4.2 End-of-day mid-side UK treasury bill prices are derived using a similar methodology to that used to price strips. The methodology uses a piecewise constant spline to model an instantaneous forward curve function $f_{\beta}(\mathbf{m})$, where β is the vector of spline parameters and, analogously to strips, the price of a bill can be written as a function of the instantaneous forward curve:

$$B(\tau) = \exp \left[- \int_0^{\tau} f_{\beta}(\mathbf{m}) d\mathbf{m} \right]$$

where τ is the maturity of the bill.

The price of a bill can also be written as:

$$P(\tau) = 100B(\tau)$$

By minimising the following objective function, the values of the spline parameters β are found:

$$X_s = \sum_{i=1}^N \frac{e^{-(Today-TrdDate[i])/5}}{\sum_{j=1}^N e^{-(Today-TrdDate[j])/5}} * \left[\frac{P_i - \Pi_i(\beta)}{D_i} \right]^2$$

where $P_i, D_i, \Pi_i(\beta)$ are respectively the observed price, the modified duration and the fitted price of trade i . $TrdDate[i]$ is the date of trade i , N is the total number of bill trades. This objective function is the sum of the squared differences between fitted and observed prices, weighted by modified durations and exponential weights. The division of each date range by five within the exponential weights arises from the fact that transaction data from a collection window of five business days are used to arrive at the observed prices.

Constant yield extrapolation is used where maturities lie outside of the range of available data.

Based on the derived curve the yield of individual bills can be obtained (rounded to six decimal places) and the corresponding price (rounded to six decimal places).

Section 5

Price challenges

5. Price challenges

- 5.1 Tradeweb and FTSE Russell have established a means by which clients can query or challenge the price or other measures of value of any gilt which has been calculated using the closing pricing methodology.
- 5.1.1 Users who wish to challenge a price or other measure of value can do so using the following link:
reports.tradeweb.com/closing-prices/challenge/
- 5.1.2 Clients contacting FTSE Russell with the intention of challenging a price or with a query that may reasonably be expected to result in a challenge, will be referred to Tradeweb and the above link. FTSE Russell will subsequently contact Tradeweb to check whether a challenge was made and the outcome.
- 5.1.3 Clients submitting a query will receive an email acknowledgement. Details of the resolution of the issue will be further communicated to the client in a timely manner. Where files are republished, all clients using the price service will be notified by email.
- 5.1.4 Details of challenges and ensuing actions will be tracked and reported on a periodic basis to the FTSE Russell EMEA fixed income advisory committee.

Appendix A

Further information

A Glossary of Terms used in FTSE Russell's methodology documents can be found at:

[Fixed Income Glossary of Terms.pdf](#)

Further information on the FTSE Actuaries UK Gilts Series is available from FTSE Russell.

For contact details, please visit the FTSE Russell website or e-mail FTSE Russell client services at info@ftserussell.com.

Website: www.lseg.com/en/ftse-russell/

For further information on the delivery mechanisms for the Tradeweb FTSE Gilt Closing Prices, please e-mail Tradeweb at ECS@Tradeweb.com.

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