CurveGlobal Monetary Policy Committee (MPC) Watch Tool : technical summary

A collaboration between CurveGlobal Markets and Yield Book

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Abstract

This paper aims to describe the model behind the CurveGlobal Monetary Policy Committee (MPC) Watch Tool used to determine market-implied future Bank of England interest rates. Given the current prices and expirations of the one-month CurveGlobal SONIA futures contracts, as well as the scheduled Bank of England rate decision meeting dates, our model seeks to solve for the market-implied rates for the contract expiration dates. Once these rates are calculated, the model uses them to estimate the movement of rates at each meeting date and uses those to create a probability distribution for the rate movements over the entire available period.

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Model Description

> ## Definitions
>
> **T** = ticker of a futures contract
> $P(T)$ = current price of the futures contract T
> $R_{begin}(T)$ = model-calculated rate for the beginning of the period of futures contract T
> $R_{end}(T)$ = model-calculated rate for end of the period of futures contract T
> Note: when considering two consecutive futures contracts T_1 and T_2,
>
> $$R_{begin}(T_2) = R_{end}(T_1)$$

Given the current prices and expirations of the one-month CurveGlobal SONIA futures contracts, as well as the scheduled Bank of England rate decision meeting dates, we want to generate a single rate that can be applied across the accrual period of futures T from the price. We do so in the following way, based on the compounding formula for the contract:

$$\left(\left(1 + \frac{rate}{36500}\right)^n - 1\right) * \frac{365}{n} = 100 - P(T)$$

Doing this allows us to transform the known price into the implied rate that, if applied uniformly across the period, would result in that price.

Note: In practice, the "rate" term in the equation for each day is given by:

$$\left(1 + k * \frac{rate}{36500}\right)$$

Where k is the number of days that the rate is applied; usually 1 for weekdays, but for Friday rates, it is 3, and holidays affect this as well. Since we are interested in finding a single rate that can be applied across the period, we choose to approximate by setting k=1. The difference between

using a variable k (ignoring holidays) and k=1 in the resulting rate is ~0.002 bp, which can be ignored for the purposes of simplifying the model.

We now want to set up equations for the beginning and ending rate for each period.

For a period which does not have a meeting

We assume that the rate remains constant, and we use the same formula from above for $R_{begin}(T)$ and $R_{end}(T)$. To keep things more straight-forward, we will state all rates as the beginning of period rates, since $R_{begin}(T_2) = R_{end}(T_1)$ for two consecutive futures contracts T₁ and T₂, so we have:

$$\left(\left(1 + \frac{R_{begin}(T_1)}{36500}\right)^n - 1\right) * \frac{365}{n} = 100 - P(T_1)$$

$$\left(\left(1 + \frac{R_{begin}(T_2)}{36500}\right)^n - 1\right) * \frac{365}{n} = 100 - P(T_1)$$

For a period which does have a meeting

We now want to calculate both the beginning and ending rates, depending on how many days remain until the meeting. In that situation, if there was a rate change, we would have some days under the pre-meeting rate, and some days under the post-meeting rate. Suppose that there are k days in the period prior to the meeting, the equation becomes:

$$\left(\left(1 + \frac{R_{begin}(T_1)}{36500}\right)^k * \left(1 + \frac{R_{begin}(T_2)}{36500}\right)^{n-k} - 1\right) * \frac{365}{n} = 100 - P(T_1)$$

For our universe of futures prices and scheduled meetings, we generate a series of these equations, and solve for the start-of-period rates that minimize the sum of the squares of the differences between our price-implied rate and our model-calculated rate.

Once we have these beginning of period rates, we want to turn them into the likelihood of an official rate movement by the Bank of England. We assume that movements can only occur in 25 basis point increments, and we use the following equations:

$$E(rate\ movement) = R_{begin}(T_2) - R_{begin}(T_1)$$

$$E(number\ of\ rate\ shocks) = \frac{E(rate\ movement)}{0.25}$$

Once we have the expected number of rate shocks, we turn that into a probability distribution of the rate movement for that period, with two non-zero probabilities assigned to the integers surround E(number).

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Example

OSN0V covers the period from 2020/10/22 to 2020/11/18 (28 days in all), with a BoE meeting on 2020/11/5 (15 days before the meeting takes place, and 13 after). The price on October 7, 2020, is 99.945, so the equation that we set up is:

$$\left(\left(1+\frac{R_{begin}(OSN0V)}{36500}\right)^{15} * \left(1+\frac{R_{begin}(OSN0X)}{36500}\right)^{13} - 1\right) * \frac{365}{28} = 0.055$$

In conjunction with the other futures prices and meeting schedule, we arrive at the values:

$$R_{begin}(OSN0V) = 0.0593, R_{begin}(OSN0X) = 0.0500$$
$$E(rate\ movement) = 0.0500 - 0.0593 = -0.0093$$
$$E(number\ of\ rate\ shocks) = -\frac{0.0093}{0.25} = -0.037$$

The probability that the Bank of England will lower rates by 25 bp on this meeting is 3.7%, and the probability that the rates will remain unchanged is 96.3%.

Finally, we can use all of the individual probabilities to create a broader distribution of future rate movements by linking the individual probabilities together.

Example

Using the October 7, 2020 prices, the probability of a 25bp rate reduction on 2020/11/5 is 3.7%, and the probability of a 25bp rate reduction on 2020/12/17 is 1.8%. Focusing on those two meetings, we have the following probabilities:

P(50 bp reduction) = 0.018 * 0.037 = 0.07%
P(no rate movement) = (1-0.018) * (1-0.037) = 94.53%
P(25 bp reduction) = 0.018 * (1-0.037) + (1-0.018) * 0.037 = 5.40%

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Accessing the Rate Probability Tool

CurveGlobal MPC Watch Tool

24 Jun 2021	05 Aug 2021	23 Sep 2021	04 Nov 2021	16 Dec 2021	03 Feb 2022

Meeting Information					Probabilities		
Meeting Date	Contract	Expires	Mid-price		Ease	No Change	Hike
24/06/2021	OSN1M	21/07/2021	99.95		0%	100%	0%

Probability for 24/06/2021 BoE meeting
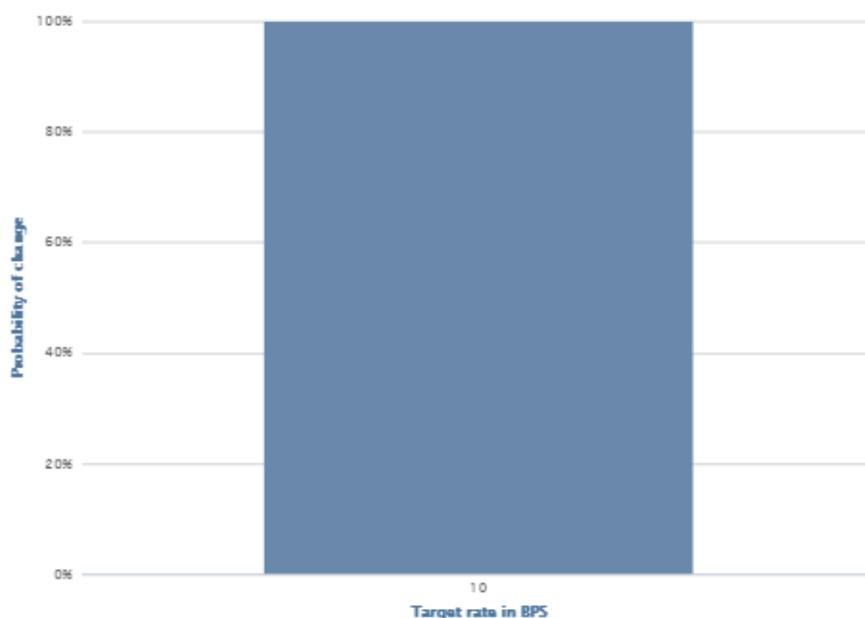
Analytics powered by The Yield Book® Software

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About CurveGlobal Markets

CurveGlobal Markets Listed Futures Exchange operates a central limit order book (CLOB). It facilitates adaptive price trading between the bid and offer, through block trades – delivering lower transaction costs and capital efficiencies. It has added greater competition to the market while providing more choice and opportunity for traders. Created to offer low cost and straightforward competition in the trading of the world's most popular interest rate derivatives contracts with no market data charges, no on-boarding charges and low cost trading fees, CurveGlobal Markets offer an interest rates derivatives pool, clearing alongside LCH Swapclear's OTC interest rate pool, allowing members the option to use LCH's cross margining tools to generate significant capital efficiencies.

CurveGlobal Markets was recognized as Best New Exchange at the FOW International Awards 2017, shortlisted in 2018 for Most Innovative New Contract (Interest Rates) and won the European Derivatives Exchange of the Year at the GlobalCapital Global Derivatives Awards in 2019. Since its launch on 26 September 2016, over 20 million lots have been traded.

About Yield Book

Yield Book is a leading analytics platform with 30 years of experience providing risk analytics for fixed income. Starting its life on a trading floor in 1989 and redefined by industry experts, it is used today by industry leaders across buy-and sell-side institutions and forms the backbone of analytics within the Information Services Division at London Stock Exchange Group.

Capable of handling the most complex fixed income products, Yield Book is a trusted source for in-depth risk analytics, regulatory stress-testing and complex portfolio analysis across global markets. Yield Book offers an expanded set of capabilities to institutional investors and market makers to comprehensively address their requirements.

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