IHS Markit Interest Rate Curve XML Specification (RFRs)

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1. Introduction

This section provides a brief introduction into the requirements for sourcing and publishing the risk free interest rates (RFRs) to be used as input into the ISDA CDS Standard Model available at http://www.cdsmodel.com.

1.1 Interest Rate Curve standardization

On 8 April 2009, the CDS market began quoting in Quoted/Conventional Spreads and Upfront with Running Coupon. To value CDS contracts consistently and in a standardized manner, the industry implemented the ISDA CDS Standard Model. IBOR Interest Rates Curve, an original input to the model, was adopted by all CDS transaction types and CDS indices. IHS Markit publishes Deposit and Swap rates for the following currencies: USD, CAD, EUR, GBP, JPY, CHF, AUD, NZD, HKD, and SGD.

The market is transitioning from IBOR to RFR curves. On 11 February 2021, ISDA announced that the first input to the ISDA CDS Standard Model to transition will be the RFR curve of SONIA (GBP). IHS Markit publishes RFR OIS (Swap) rates for the following currencies: USD, EUR, GBP, JPY and plans to begin publishing CHF and AUD soon for testing purposes. The market will implement RFR curves for additional currencies: SOFR (USD), €STR (EUR), TONA (JPY), SARON (CHF), AONIA (AUD), etc. on future dates to be determined.

Although the use of RFRs will become the market convention, the RFR and IBOR rates will be available in parallel for the shorter period of one year after the relevant RFR goes live or until the IBOR ceases to exist.

1.2 IHS Markit's role

IHS Markit is the administrator and responsible authority for publishing the Interest Rates as covered by this document. IHS Markit sources the interest rate curves from its existing snaps through various rates data providers. Finally, IHS Markit publishes an XML file on its website that can be downloaded through an automated script by directly loading the provided URL or from the RFR website.

1.3 About IHS Markit

IHS Markit is a world leader in critical information, analytics and solutions for the major industries and markets that drive economies worldwide. We deliver next-generation information, analytics, and solutions to customers in business, finance, and government, improving their operational efficiency and providing deep insights that lead to well-informed, confident decisions.

A division of IHS Markit Financial Services, Information Services provides multi-asset-class data, valuations, and index services, along with market-leading primary issuance workflow solutions. Our services enhance issuance, trading, valuations, risk, and compliance processes for both sell side and buy side institutions. IHS Markit's data and workflow solutions help customers manage their processes in both primary and secondary markets with unique content, industry expertise, leading analytics, and flawless technology, and align the synergistic elements of our business lines. The IHS Markit Information Services business lines include Equities & Regulatory Reporting, GMG (Global Markets Group), Indices, and Pricing, Valuations & Reference Data (PVR), the latter of which administers the ISDA Standard Model for ISDA.

2. Document overview

This section provides the purpose of this document and defines a few specialized terms used in this document.

2.1 Purpose

This document provides an overview of the yield curve calculation for OIS rates, details for the XML message and field definitions for the risk-free interest rate curve used in the model, and details for file transmission.

2.2 Definition of terms

This section defines three key terms that are helpful to know as you review this document.

ACT/360: Actual-360 Day Count Convention

ACT/365: Actual-365 Day Count Convention

Business Day Calendar: To avoid calendar maintenance, distribution, and agreement issues, all computations not including JPY assume a business day calendar of only weekdays (Monday through Friday); while weekends (Saturday and Sunday) are the only non-business days. Computations including JPY use a holiday calendar published on cdsmodel.com (see reference [1]).

3. Calculation overview

This section provides an overview of the interest rates sourcing and calculations used to derive yield curves. IHS Markit receives feed from various data sources and snaps the values of the interest rate curves to its database.

3.1 Interest Rate sourcing

In the body of the XML, we produce interest rates from the indicated sources for the following maturities:

Maturity	Type	USD Source	EUR Source	GBP Source	JPY Source	CHF Source	AUD Source
1MO	OIS	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit
2MO	OIS	IHS Markit	<no rate>	IHS Markit	IHS Markit	IHS Markit	IHS Markit
3MO	OIS	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit
6MO	OIS	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit
9MO	OIS	<no rate>	<no rate>	<no rate>	<no rate>	<no rate>	<no rate>
1Y	OIS	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit
2Y	OIS	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit
3Y	OIS	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit
4Y	OIS	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit
5Y	OIS	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit
6Y	OIS	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit
7Y	OIS	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit
8Y	OIS	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit
9Y	OIS	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit
10Y	OIS	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit
12Y	OIS	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit
15Y	OIS	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit
20Y	OIS	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit
25Y	OIS	IHS Markit	<no rate>	IHS Markit	<no rate>	IHS Markit	IHS Markit
30Y	OIS	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit	IHS Markit

Note: <no rate> indicates that for the corresponding maturity point, no rates are published.

The interest rates as provided can be used directly with the ISDA CDS Standard Model.

3.2 Yield Curve calculation

This section describes yield curve inputs and the calculation for OIS Rates.

3.2.1 Yield Curve input

To interpolate the yield curve, the parameters in the table below are needed as inputs to the model. The table also provides the conventions for the published currencies.

Field	EUR	USD	GBP	JPY	CHF	AUD
MM DCC	ACT/360	ACT/360	ACT/365	ACT/365	ACT/360	ACT/365
Floating DCC	ACT/360	ACT/360	ACT/365	ACT/365	ACT/360	ACT/365
Fixed DCC	ACT/360	ACT/360	ACT/365	ACT/365	ACT/360	ACT/365
spotdate	Trade Date + 2 weekdays (ignoring holidays)	Trade Date + 2 weekdays (ignoring holidays)	Trade Date (even if Trade Date is a holiday)	Trade Date + 2 weekdays (accounting for TYO calendar)	Trade Date + 2 weekdays (ignoring holidays)	Trade Date + 1 weekdays (ignoring holidays)
fixedpaymentfrequency	1Y	1Y	1Y	1Y	1Y	1Y
floatingpaymentfrequency	1Y	1Y	1Y	1Y	1Y	1Y
baddayconvention	M	M	M	M	M	M
Holidays	none	none	none	TYO	none	none

Note: The ACT/365 day count convention considers leap years.

The below table provides a summary of the inputs for the yield curve.

Name	Type	Description
Spot Date	Date	See the table above for the spot date for each currency
MM DCC	String	Money market day count convention, e.g., ACT/360
Swap DCC	String	Day count convention for swap curve
Float DCC	String	Day count convention for floating coupon payments
Swap IVL	String	Interval between fixed coupon payments
Float IVL	String	Interval between floating coupon payments
Bad Day Conv	String	Bad day convention for adjusting coupon payment dates, e.g., M represents Modified Following
Holidays	String	Calendar used when adjusting coupon dates

3.2.2 Yield Curve calculation for OIS Rates

The yield curve is bootstrapped instrument by instrument, starting with the first (1M) swap rate, with the result being a set of discount factors and zero rates.

Discount factors can be bootstrapped using an iterative process as described in the table below.

Inputs	Equation	Result
1M Swap rate r_{1M}, 0-1M dcf δ_{1M}	$df_{1M} = \frac{1}{1 + r_{1M}\delta_{1M}}$	1M discount factor
2M Swap rate r_{2M}, 0-2M dcf δ_{2M}	$df_{2M} = \frac{1}{1 + r_{2M}\delta_{2M}}$	2M discount factor
…	…	…
2Y Swap rate 1M, 2M, 3M, 6M, 9M, 1Y discount factor	$\sum_{i=1}^{N=1Y} [coupon_{(i)} \times df_{(i)}] + df_{(2Y)} = 1$	2Y discount factor
3Y Swap rate 1M, 2M, 3M, 6M, 9M, 1Y, 2Y discount factor	$\sum_{i=1}^{N=2Y} [coupon_{(i)} \times df_{(i)}] + df_{(3Y)} = 1$	3Y discount factor
…	…	…

As part of this process, intermediate discount factors are needed to discount coupons that do not fall on swap maturity dates – for example the 2Y calculation requires the coupon at 18 months to be discounted. The intermediate discount factor, in this case for 18 months, is interpolated between the 1Y and 2Y discount factors on the basis of a constant forward rate over the period from 1Y to 2Y, i.e., the discount factor is log-linearly interpolated. The correct value for the forward rate is determined by an iterative search using Brent's method.

After this process, we have discount factors and zero rates. The zero rates are then used as inputs in the converter.

Note: The curve construction as described sets the value of the discount factor for the spot date to 1. Where a discount factor value is required for a day prior to spot (e.g., the curve date itself), it is obtained by extrapolating at the forward rate between spot and the first maturity node – thus the discount factor for the curve date is actually slightly greater than 1. If you require a present value calculated to the date to which the curve applies (instead of to the spot date), divide the spot value by the curve date discount factor.

Note: There is no change in the interpolation method in the model as part of the transition from IBOR to RFR.

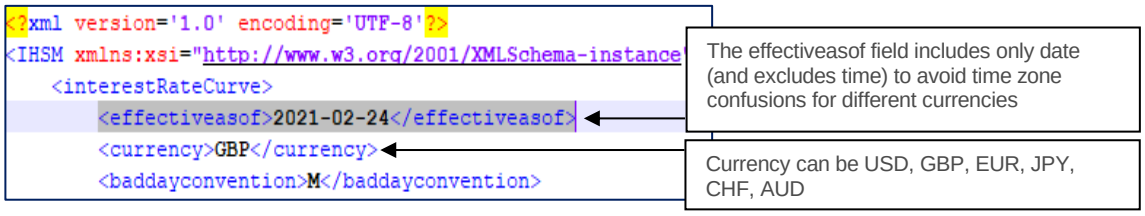
Swaps up to and including the 1Y node are zero coupon instruments, whereas longer maturity nodes have annual coupons. Specify instrument type S when using these rates in the model.

4. XML construction

This section describes the interest rate XML to be delivered to the users of the IHS Markit CDS Converter. The example given is for the GBP currency.

4.1 XML header

The header section of the XML is a summary of the data provided in the rest of the document. Below is a sample of the header of the XML message.



Below is a description of the fields in the header.

Field	Type	Description
interestRateCurve	Element	Includes the OIS (swap) instruments for the curve
effectiveasof	DateTime	Date and time from which the interest file takes effect in ISO 8601 format. The effectiveasof is always the trade date
currency	String	Currency for the OIS (swap) curve
baddayconvention	String	Convention for adjusting for Bad Days

Note: Character encoding is always UTF-8.

4.2 XML body

The constructed XML uses 20 curve points to display the information for the various maturities along the interest rate curves. For each of the 20 curve points, we display the par rate of the interest curve, the maturity rate, and the tenor.

Note: The number of curve points may differ based on currency; see section 3.1.

See the following XML sample.

```
<ois>
    <fixeddaycountconvention>ACT/365</fixeddaycountconvention>
    <floatingdaycountconvention>ACT/365</floatingdaycountconvention>
    <fixedpaymentfrequency>1Y</fixedpaymentfrequency>
    <floatingpaymentfrequency>1Y</floatingpaymentfrequency>
    <snaptime>2021-02-23T16:00:00</snaptime>
    <spotdate>2021-02-24</spotdate>
    <calendars>
        <calendar>none</calendar>
    </calendars>
    <curvepoint>
        <tenor>1M</tenor>
        <maturitydate>2021-03-23</maturitydate>
        <parrate>0.000508</parrate>
    </curvepoint>
    <curvepoint>
        <tenor>2M</tenor>
        <maturitydate>2021-04-23</maturitydate>
        <parrate>0.000502</parrate>
    </curvepoint>
    <curvepoint>
        <tenor>3M</tenor>
        <maturitydate>2021-05-24</maturitydate>
        <parrate>0.000501</parrate>
    </curvepoint>
    <curvepoint>
        <tenor>6M</tenor>
        <maturitydate>2021-08-23</maturitydate>
        <parrate>0.000493</parrate>
        </curvepoint>
    <curvepoint>
        <tenor>1Y</tenor>
        <maturitydate>2022-02-23</maturitydate>
        <parrate>0.00041</parrate>
        </curvepoint>
    <curvepoint>
        <tenor>2Y</tenor>
        <maturitydate>2023-02-23</maturitydate>
        <parrate>0.000455</parrate>
        </curvepoint>
    <curvepoint>
        <tenor>3Y</tenor>
        <maturitydate>2024-02-23</maturitydate>
        <parrate>0.001131</parrate>
    </curvepoint>
```

```
<curvepoint>
    <tenor>4Y</tenor>
    <maturitydate>2025-02-24</maturitydate>
    <parrate>0.002057</parrate>
</curvepoint>
    <curvepoint>
    <tenor>5Y</tenor>
    <maturitydate>2026-02-23</maturitydate>
    <parrate>0.002978</parrate>
</curvepoint>
<curvepoint>
    <tenor>6Y</tenor>
    <maturitydate>2027-02-23</maturitydate>
    <parrate>0.003852</parrate>
</curvepoint>
<curvepoint>
    <tenor>7Y</tenor>
    <maturitydate>2028-02-23</maturitydate>
    <parrate>0.004681</parrate>
</curvepoint>
<curvepoint>
    <tenor>8Y</tenor>
    <maturitydate>2029-02-23</maturitydate>
    <parrate>0.005424</parrate>
</curvepoint>
<curvepoint>
    <tenor>9Y</tenor>
    <maturitydate>2030-02-25</maturitydate>
    <parrate>0.006109</parrate>
</curvepoint>
<curvepoint>
    <tenor>10Y</tenor>
    <maturitydate>2031-02-24</maturitydate>
    <parrate>0.006729</parrate>
</curvepoint>
<curvepoint>
    <tenor>12Y</tenor>
    <maturitydate>2033-02-23</maturitydate>
    <parrate>0.00765</parrate>
</curvepoint>
<curvepoint>
    <tenor>15Y</tenor>
    <maturitydate>2036-02-25</maturitydate>
    <parrate>0.008505</parrate>
</curvepoint>
```

```
            <curvepoint>
                <tenor>20Y</tenor>
                <maturitydate>2041-02-25</maturitydate>
                <parrate>0.009089</parrate>
            </curvepoint>
            <curvepoint>
                <tenor>25Y</tenor>
                <maturitydate>2046-02-23</maturitydate>
                <parrate>0.009181</parrate>
            </curvepoint>
            <curvepoint>
                <tenor>30Y</tenor>
                <maturitydate>2051-02-23</maturitydate>
                <parrate>0.009099</parrate>
            </curvepoint>
        </ois>
    </interestRateCurve>
</IHSM>
```

The table below provides definitions for the fields in the XML file.

Field	Type	Description
OIS	Element	Includes the OIS (swap) instruments
calendars	Element	Includes the holiday calendars
tenor	String	Maturity of Interest Rate Curve Input, the tenor is meant for readability purposes
maturitydate	Date	Maturity Date for the Points of the Interest Rate Curve specified in yyyy-mm-dd format, this date is directly input into the ISDA CDS standard model. Maturity dates for OIS rates are adjusted for weekends (using the 'modified following' convention)
parrate	Double	Raw Interest Rate Curve Point
fixeddaycountconvention	String	Day count convention for fixed leg of swaps
floatingdaycountconvention	String	Day count convention for floating leg of swaps
fixedpaymentfrequency	String	Assumed frequency for the fixed leg payments for swap instruments
floatingpaymentfrequency	String	Assumed frequency for the floating leg payments for swap instruments
snaptime	Date/Time	The exact date and time that the interest rates were snapped into the IHS Markit Data Warehouse
spotdate	Date	See section 0
calendar	String	Effective holiday calendar for the OIS (swap) instruments

5. File transmission

This section provides details of how the files are transmitted including publication information, instructions for how to download a file and understand possible errors, contingency scenarios, and exception handling.

5.1 File name

File names contain the currency and publish date of the rates in the file name where CCY is the currency and yyyymmdd publish date of the file. The syntax of the file name is as follows:

InterestRates_CCY_yyyymmdd.zip

For example, a GBP file published on 23 Mar 2021 would be named as follows:

InterestRates_GBP_20210323.zip

5.2 File publication

Files will be published for each of the following currencies: USD, GBP, EUR, JPY, CHF, and AUD. They are published every weekday (Monday through Friday) including holidays, as per the business day calendars definition in section 2.2 (note JPY difference). The below table defines the publish time and deadline times for each currency.

Currency	Reference City Time Zone	OIS (Swap) Rates Snap Time	Usual Publication Time	Publication Deadline Time
USD	New York local	16:00 New York local	16:30 New York local	17:30 New York local
GBP	London local	16:00 London local	16:30 London local	17:30 London local
EUR	Frankfurt local	16:00 Frankfurt local	16:30 Frankfurt local	17:30 Frankfurt local
JPY	Tokyo local	16:00 Tokyo local	16:30 Tokyo local	17:30 Tokyo local
CHF	Zurich local	16:00 Zurich local	16:30 Zurich local	17:30 Zurich local
AUD	Sydney local	16:00 Sydney local	16:30 Sydney local	17:30 Sydney local

Note: Snap times are local in the reference time zone of the city of the corresponding currency. Daylight savings time is accounted for when snapping levels.

Field definitions are as follows:

Field name	Field definition
Currency	The currency for which rates will be published.
Reference City Time Zone	The reference city time zone to identify end of day snaps for the corresponding currency.
OIS (Swap) Rates Snap Time	Market close for the corresponding currency in the local time zone of the currency.
Publication Deadline Time	The publication deadline time of the Interest Rates file for the corresponding currency. Publication deadline times are as close as possible to the snap times and are based off the greater of the deposit and swap rates snap time. The time difference between the snap time and the publication deadline is to remedy any unforeseen issues with the snaps.

If a database server busy error is encountered, please retry your download process later.

5.3 Files on holidays and weekends

Files are published every weekday (Monday through Friday) irrespective of holidays [see References 1]. No files are published on Saturday and Sunday. The file published on Friday can be used for Saturday and Sunday.

During public holidays relevant for a specific currency, typically new OIS rates are available, except for JPY currency. In cases when new rates are not available, IHS Markit will publish the most recent OIS data for that currency. Similar to a normal day, the OIS rates snap times are provided in the files.

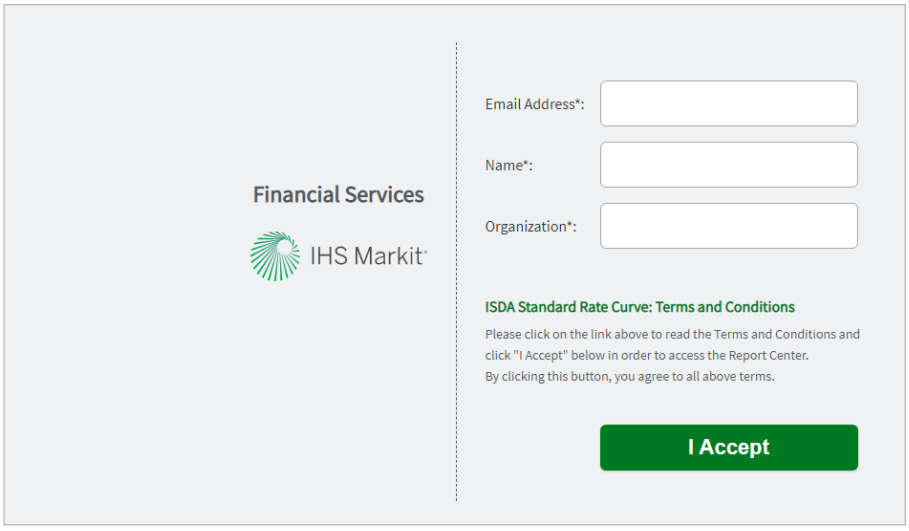
5.4 File download

This section describes the process for downloading a file and provides a table with possible errors that can occur, along with the error messages.

5.4.1 Downloading a file

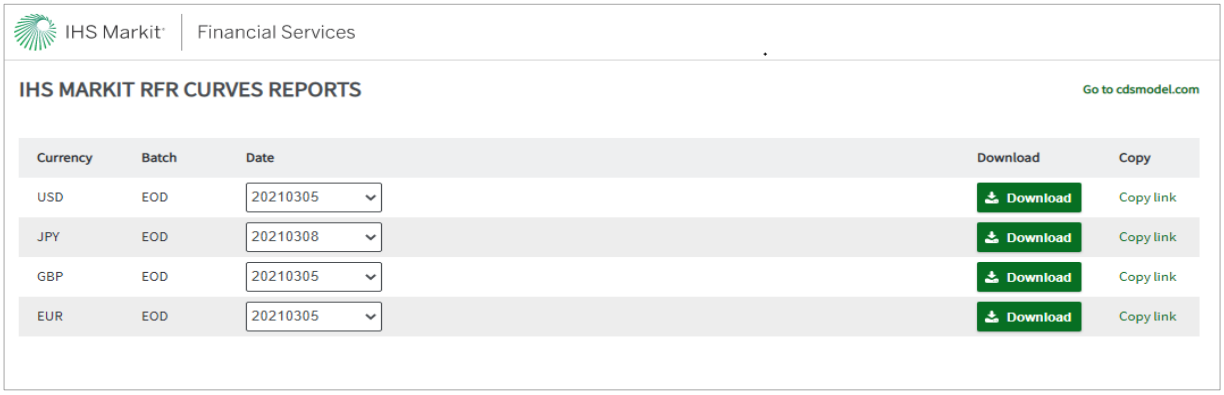
Before accessing the interest rates files via any mechanism, a one-time annual registration / attestation is mandatory to receive or download xml files. Users must accept the Terms and Conditions on behalf of their respective institution to register. The acceptance of Term and Conditions is valid for a year. Users are required to re-accept/attest to the Terms and Condition after the valid acceptance term of one year. To access the Registration and Terms of Conditions acceptance, go to https://rfr.ihsmarkit.com.

When accessing the page for the first time, enter your Email Address, Name, and Organization as indicated. Then, click the **ISDA Standard Rate Curve: Terms and Conditions** hyperlink to read the Terms and Conditions and if appropriate click the **I Accept** button, as shown in the example below, to accept the terms and conditions on the permissible usage allowed.



Note that you can return to this site and download the data daily when needed or automate the download without having to accept the terms and conditions again (within the one-year valid period).

After accepting the Terms and Conditions, the below *IHS Markit RFR Curves Reports* page displays.



To download the RFR interest rate curves on the above page:

- Select the date for which you want the report for a currency.
- Click **Download** at right for that currency and date.
- Use any HTTP client with this URL:
  https://rfr.ihsmarkit.com/InterestRates_CCY_yyyymmdd.zip?email=xxxx@company.com
  For example:
  - cURL
  - web browser
  - Python requests
  - Java with any HTTP client library

Note: The <email> parameter used in the download request must match the email address entered when accepting Terms and Conditions.

The interest rate file is available as a zipped archive. While several programming/scripting languages can be used to download the file, cURL is an easy to use utility for this purpose. cURL is available as source code or as a binary file here:
https://curl.se/download.html

The first step is to download the appropriate cURL application and OpenSSL packages (that enable cURL to transmit information securely with SSL). Once cURL and the SSL library are successfully installed, you can automate the process of downloading the file from IHS Markit as follows:

curl https://rfr.ihsmarkit.com/InterestRates_CCY_yyyymmdd.zip?email=xxxx@company.com > 'local_path'

Enter the file path including file name to direct the file output to the desired location in your local environment.

5.4.2 File download error messages

To validate currency and date combinations, the service generating the interest rate XML file also provides error messages for the following error scenarios:

Error scenario	Example	Error message returned
Requesting Interest Rate Curves Not Yet Published	Requesting date of 20210225 on 20210203	Interest Rates not available, please check date and/or currency entered
Requesting a Date in Invalid Date Format	Requesting date of 2091203	Interest Rates not available, please check date and/or currency entered
Requesting an Invalid Currency	Requesting currency of XHK	Interest Rates not available, please check data and/or currency entered
Server Error		Unable to generate interest rate report at this time. Please try again later.
Username not known	Requesting username that is not known	Username not known, please check username
Acceptance earlier than last 1 year		Accept/re-accept terms of use. Go to https://rfr.ihsmarkit.com to accept the terms of use
Terms of use not accepted		Accept/re-accept terms of use. Go to https://rfr.ihsmarkit.com to accept the terms of use.

5.5 File usage

This section provides information to help you understand how to implement the rates for a given currency on a given trade date.

Let T represent the trade date. The rates file for each currency will be published on T-1 weekday, and will be effective on T. It is implicitly assumed that counterparties always agree to use the same currency and the same trade date when computing cash settlement amount for a given trade [see reference 2].

As an example, see the table below for Trade Dates and the Rates file to be used for a sample week of 22 February 2021. The below sample is applicable for each of the currencies.

Trade date (T)	File publication date (T-1)
Mon 2021-02-22	Fri 2021-02-19
Tue 2021-02-23	Mon 2021-02-22
Wed 2021-02-24	Tue 2021-02-23
Thu 2021-02-25	Wed 2021-02-24
Fri 2021-02-26	Thu 2021-02-25

5.6 Contingency scenarios

Contingency scenarios have been created in the event where operational or technical issues prevent users from downloading the expected interest rate curves. In these situations, IHS Markit will coordinate with ISDA to ensure that proper notification is provided, when deemed necessary.

5.4.1 Website outages

In the event of an outage on the www.ihsmarkit.com site, users will not be able to access the interest rate curves. The website is actively monitored, and all outages are treated as a highest priority issue. If the initial estimate of the time to resolution of the outage is greater than one hour, IHS Markit will inform ISDA and will work with ISDA to notify the market.

Please note that the interest rates in connection to the ISDA Standard Model are solely for cash settlement calculation for next business day CDS transactions.

5.4.2 Inaccurate rates

All interest rate curves are reviewed before IHS Markit publishes them. For cases where we are unable to publish a consistent interest rate curve, as the fallback, we provide the previous business day's interest rate curve in the file for that day.

5.4.3 Changes in published Interest Rate Curves

In cases where there are changes to the values by sources post the publishing of the interest rate curves, IHS Markit will reach out to ISDA to determine if the changes are required. If the changes are deemed necessary, IHS Markit will work with ISDA to notify the market.

5.7 Exception handling

See the *Error Handling* section of the *Locked Interest Rates for Standard Converter* document [see reference 2] for details on how to handle any specific error conditions.

References

[1] Standard North American Corporate CDS Converter Specification, 3 September 2009. Available at www.cdsmodel.com.

[2] Locked Interest Rates for the Standard Converter, 8 May 2009. Available at www.cdsmodel.com.

6. Contact us

For more information on interest rate curves, please contact us using the following methods:

- By email: cds.support@ihsmarkit.com
- By telephone:
  - AMERICAS: +1 800 447 2273
  - EMEA: +44 134 432 8300
  - APAC: +604 291 3600

7. Document history

The table below provides a list of the changes made to this document.

Change date (ver)	Change description
2021-Apr-07 (v1.0)	Created document after ISDA announcement on 11 February 2021 to roll out SONIA as a replacement for GBP LIBOR. Added CHF and AUD to four other RFRs