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LIBOR Transition Series

ISDA consultation – US perspectives on adjustments to overnight risk-free rates

October 2018

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On July 12, 2018 ISDA launched a market-wide consultation related to fallback provisions for derivative contracts that reference various Interbank Offered Rates ('IBOR'). The consultation, amongst other things, requests feedback from market participants on the various approaches for adjusting the relevant alternative Risk-Free Rate ('RFR') to account for the move from a term rate IBOR to an overnight RFR.

Four Potential alternatives

On July 12, 2018 ISDA launched a market-wide consultation related to technical issues associated with introducing fallback provisions for derivative contracts that reference various Interbank Offered Rates (IBORs). The consultation focuses on various adjustments that will apply to the alternative risk-free rate (RFR) if the fallback is triggered. These adjustments are a consequence of differences between the RFRs and the relevant IBORs they replace. This article focuses on the four approaches provided by ISDA[1] for developing a term adjustment to the applicable RFRs given that the RFRs reflect overnight rates. Note, the prolonged environment of central bank intervention compared to previous economic recoveries has left most market participants unsure what a "normal interest rate environment" is. Therefore, as participants review the consultation they should consider which approach most accurately results in the desired economic outcome and is least susceptible to manipulation.

The ISDA consultation covers GBP LIBOR, CHF LIBOR, JPY LIBOR, TIBOR, Euroyen TIBOR, and BBSW. It does not specifically address USD LIBOR and SOFR (the alternative RFR selected for USD LIBOR) given that there are only a few months of available SOFR data. ISDA plans to launch a supplemental consultation addressing USD LIBOR at a later date which will likely consider feedback on the technical issues raised in this consultation.

Option 1: Spot Overnight Rate (SORf)

Under this method, the fallback rate would be the RFR that sets at the beginning of the interest period consistent with the applicable reset date convention.

Option 2: Convexity-adjusted Overnight Rate (CORf)

This method is similar to SORf, but with a first-order modification to adjust for convexity. The modification attempts to account for the difference between the overnight rate and the realized rate of interest that would be delivered by compounding daily the RFR over the relevant IBOR term.

Option 3: Compounded Setting in Arrears (ARRf)

This method would use the daily RFR observed over the relevant LIBOR tenor compounded daily during that period.

Option 4: Compounded Setting in Advance (ADRf)

This method is mathematically similar to ARRf. However, while the observation period would be equal in length to the relevant IBOR tenor, it would end immediately prior to the start of the relevant IBOR tenor. Therefore, unlike ARRf, the rate would be known at the beginning of the period.

In addition to the description of each method, ISDA provided the following list[2] of potential advantages and disadvantages for each alternative.

[1] Source: ISDA (http://assets.isda.org/media/f253b540-193/42c13663-pdf/)

[2] Potential advantages and disadvantages per ISDA quoted from pages 8-10 of the consultation

Approach	Potential Advantages	Potential Disadvantages
Spot	• It would be accessible to all market participants because it is easy to understand, simple to implement and relies on readily available information. • It reflects risk-free interest rate market conditions for one-day borrowing just prior to the start of the relevant IBOR tenor.	• It ignores the inherent variation in risk-free interest rates over different tenors. • Overnight rates are sometimes more volatile than term rates so the adjusted RFR computed using this approach may also be more volatile than it should be. • It does not mirror the structure of overnight index swaps that reference the RFRs.
Convexity Adjusted	• It relies on data readily available at the beginning of the relevant IBOR tenor. • To the extent that it renders overnight RFR exposure more closely comparable to term IBOR exposure by accounting for daily compounding of the overnight RFR, it is a closer match for the term structure of risk-free interest rates.	• The "convexity adjustment" may not match the shape of the term structure of risk-free interest rates, especially in market conditions with high and/or volatile short-term rates. • Many market participants may not appreciate the benefit provided by the convexity adjustment against the increased complexity. • It ignores the inherent variation in risk-free interest rates over different tenors. • Overnight rates are sometimes more volatile than term rates so the adjusted RFR computed using this approach may also be more volatile than it should be. • It does not mirror the structure of overnight index swaps that reference the RFRs.
Compounded Setting in Arrears	• It reflects actual daily interest rate movements during the relevant period. • It is calculated as an "average" rate and therefore should be less volatile than the spot overnight rate. • It should be understandable by most market participants. • It mirrors the structure of overnight index swaps referencing the RFRs.	• The information needed to determine the rate is not available at the start of the relevant period. • Actual interest rate movements may not reflect prior expectations of interest rate movements over the period.
Compounded setting in Advance	• It would be available at the beginning of the relevant IBOR tenor because it is set in advance. • It reflects actual daily interest rate movements over a comparable tenor during a period near the relevant period. • It should reasonably match the market interest rate term structure at the start of the period over which it applies. • It is calculated as an "average" rate and therefore should be less volatile than the spot overnight rate. • It should be understandable by most market participants. • Its payment structure is similar to that of overnight index swaps referencing the RFRs.	• It is inherently backward-looking. Market conditions may have changed since the relevant historical period, which could lead to differences from the current market term structure and may affect hedging.

Key observations

Along with the consultation, ISDA/Bloomberg released illustrative graphs plotting historical SORf, CORf, ARRf, and ADRf for the IBORs covered by the consultation[3]. As the consultation does not directly address USD LIBOR, we reviewed the illustrative graphs pertaining to SONIA/GBP LIBOR historical results[4] to see how the various alternatives behaved over varying economic conditions. We then performed an analysis to compare the various methods using the few available months of SOFR[5] data to one-month USD LIBOR to determine whether the trends are consistent with the ISDA/Bloomberg-provided SONIA/GBP LIBOR graphs.

[3] To view the graphs, see the appendix or http://assets.isda.org/media/8d902403/99707168-pdf/

[4] Bloomberg/ISDA provided graphs for 1M and 6M tenors as they are standard term conventions for GBP LIBOR

[5] Only 1M tenor is used in the analysis due to the limited SOFR data available (though standard USD LIBOR convention also includes 3M tenor).

Observation 1a: volatility of spot methods (SONIA)

The primary disadvantages of the two spot methods (SORf and CORf) are that neither reflect economic conditions over the entire applicable interest period and they may be more susceptible to volatility. The severity of this volatility can be observed in the ISDA provided graph '*GBP 1m Adjusted RFR Long History*' (See Appendix A – Graph 1).

From July 2000 through July 2016, the volatility of the SORf and CORf[6] methods over a one-month interest period is more pronounced during times of economic volatility or uncertainty. As summarized in the tables below, [7] the SORf- and CORf-adjusted SONIA methods each exhibit greater maximum historical rates than those produced by the compounded methods (ARRf and ADRf) by as much as 78-82 basis points(bps). The minimum observed spot rates are also lower than the results of the compounded methods; however, the disparity is not as pronounced as in the maximum historical rates given that the time period analyzed includes a significant economic downturn environment. In an economic upturn environment, we would expect to observe a similar pattern whereby the SORf and CORf methods would result in lower rates than ADRf and ARRf methods.

ARRf/ADRf difference from SORf for 1M tenor SONIA, July 2000 – July 2016

	SORf -ARRf	SORf -ADRf
MIN	-0.05%	-0.05%
MAX	0.78%	0.76%
AVERAGE	0.02%	0.00%
ST DEV	0.02%	0.01%

ARRf/ADRf difference from CORf for 1M tenor SONIA, July 2000 – July 2016

	CORf-ARRf	CORf-ADRf
MIN	-0.05%	-0.05%
MAX	0.82%	0.80%
AVERAGE	0.03%	0.01%
ST DEV	0.03%	0.02%

The disparity between SORf/CORf and ADRf/ARRf is further exaggerated in longer tenor interest periods as illustrated by graph '*GBP 6m Adjusted RFR Long History*' (See Appendix – Graph 2). From December 2000 through July 2016, the volatility of the SORf and CORf methods is generally more pronounced over a six-month interest period than a one month interest period. As shown in the tables below, the disparity between the maximum historical rates of six month SONIA adjusted rates under the SORf and CORf methods are up to 115 bps higher than those of the two compounding methods. Similarly, the greatest differential in standard deviations across approaches for one month SONIA was three bps (CORf vs ARRf) compared to a variance of 10 bps between the six month GBP Sonia CORf and ADRf methods.

ARRf/ADRf difference from SORf for 6M tenor SONIA, December 2000 – July 2016

	SORf -ARRf	SORf -ADRf
MIN	-0.05%	-0.05%
MAX	0.90%	0.72%
AVERAGE	0.02%	-0.10%
ST DEV	0.03%	-0.03%

ARRf/ADRf difference from CORf for 6M tenor SONIA, December 2000 – July 2016

	CORf-ARRf	CORf-ADRf
MIN	-0.05%	-0.05%
MAX	1.15%	0.97%
AVERAGE	0.12%	0.00%
ST DEV	0.10%	0.04%

Observation 1b: volatility of spot methods (SOFR)

Similar volatility is also observed when applying the various methods to SOFR data over its available history as illustrated in the '*SOFR 1m Adjusted RFR Long History*'[8] graph and summary statistics below. Despite a relatively stable period of low interest rates, SORf and CORf are more volatile than ARRf[9] and ADRf.[10] Additionally, the

[6] CORf, as illustrated in the BBG analysis, is a proxy of the convexity-adjusted approach described in the ISDA consultation. In order to calculate true convexity-adjusted spot, the exact payment dates of an instrument and the volatility term should be considered.

[7] Based on the tables and graphs provided by ISDA/Bloomberg. Figures in the tables represent the absolute difference between the summary statistics of the different methods.

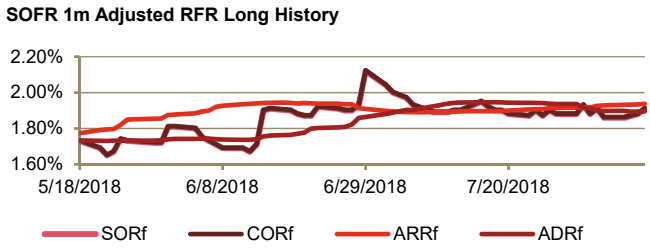
[8] PwC calculated based on data from Bloomberg and ISDA calculation notes.

[9] Our ARRf calculations leveraged historical information, so the rate for the interest period could be calculated at the commencement of the interest period. In practice, the ARRf rate in effect cannot be known until the end of the interest period.

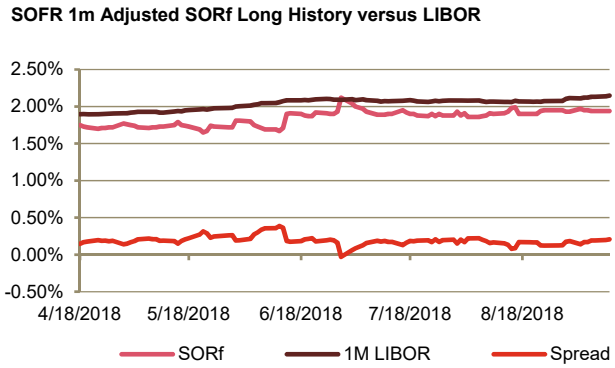
[10] Note that the SORf and CORf lines track nearly perfectly; the convexity adjustment is minimal for shorter tenors, but the difference would be more pronounced for longer tenors.

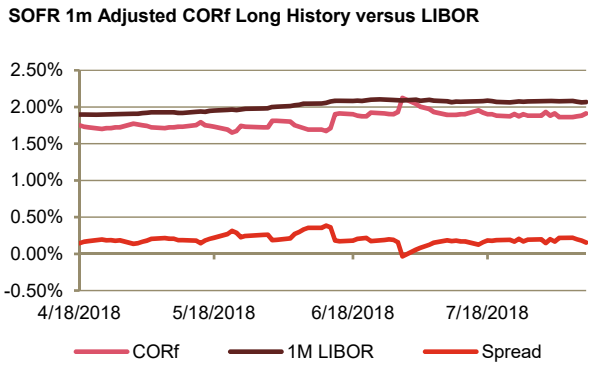
standard deviation as well as the minimums and maximums of the spot methods span a wider range than the compounded methods.

	SORf	CORf	ARRf	ADRf
MIN	1.65%	1.65%	1.68%	1.67%
MAX	2.12%	2.12%	1.88%	1.88%
AVERAGE	1.84%	1.84%	1.82%	1.74%
ST DEV	0.12%	0.12%	0.06%	0.08%



Market participants have acknowledged that SOFR can be more volatile at month-end and particularly quarter-end due to increased levels of US Treasury repo activity. This was observed on June 29 when SOFR jumped up 22bps to 2.12% for the day (as shown in the graph above). This volatility is also observed when comparing SORf- and CORf-adjusted SOFR to one-month USD LIBOR as shown in the graphs below.[11] The spread between the SOFR-adjusted rate and one month USD LIBOR fluctuates from as low as -3 bps for SORf and -4 bps for CORf to as high as 42 bps for SORf and 41 bps for CORf.





Observation 2a: The lag in ADRf (SONIA)

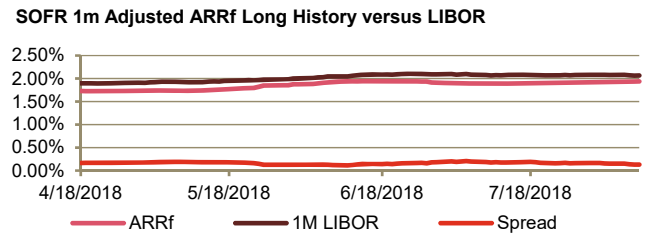
As highlighted in the previous sections, the ADRf and ARRf methods are similar in that they more closely mirror the structure of overnight indexed swaps and both exhibit reduced volatility in comparison to the spot methods. However, as illustrated below the ADRf method produces a result which lags behind market interest rates. In reviewing the ISDA/BBG GBP SONIA graphs, it is evident that in times of low volatility and over shorter tenors the rate will reasonably resemble current rates, but in periods of high volatility and over longer tenors, the difference becomes more pronounced.

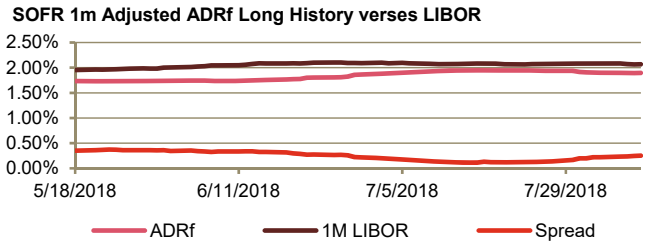
The effect of volatile markets on the lag can be observed as illustrated by graph '*GBP 1M Rates During-crisis*' (See Appendix – Graph 3). From September 2007 through June 2009 significant differences appear between ARRf and ADRf (at times in excess of 200 bps), during a swift downward shift in interest rates in late 2008. The severity of the lag between ADRf and ARRf in a volatile environment is magnified in longer interest rate periods as illustrated by graph '*GBP 6M Rates During-crisis*' (See Appendix – Graph 4). In the fall of 2008 when rates dropped, the lag effect on a six month interest period could have caused a difference of nearly as much as 450 bps between the ADRf and ARRf methods.

[11] PwC calculated based on data from Bloomberg and ISDA calculation notes

Observation 2b: The lag in ADRf (SOFR)

The short history of SOFR has occurred during a time of relatively low volatility when compared to the economic environment of the financial crisis. However, the lag between ADRf and ARRf can still be observed as illustrated below. Each graph compares one month ARRf SOFR and ADRf SOFR to one month USD LIBOR.[12] The first graph shows that the spread between LIBOR and ARRf is relatively consistent over time, fluctuating between 19 bps and 27 bps over the course of 13 weeks. However, the comparison between ADRf and LIBOR in the second graph highlights the lag effect in the fluctuating spread which moves from as low as 18 bps to as high as 41 bps. In a higher volatility environment the differences would be even more pronounced.





Closing considerations

The approaches proposed by the ISDA consultation inherently cannot replicate the behavior of LIBOR, however they do provide a practical means of approximating term rates through representations of overnight rates.

Despite the downside of not knowing the rate in advance, the ARRf method appears to be the least susceptible to volatility, the least likely to magnify nuances in temporary market behavior, and the most reflective of current interest rate data during the interest term. Also, the smoothing effect of the ARRf approach leaves it least susceptible to market manipulation given that it takes the average rate over the period rather than on a given day. In addition, as debt issuances referencing overnight rates by the European Investment Bank (SONIA-linked), Fannie Mae (SOFR-linked), the World Bank (SOFR-linked), and most recently,[13] MetLife (SOFR-linked), have shown, not knowing the rate in advance may not be a debilitating issue. As the interest rate period progresses, the applicable rate for the period becomes more defined.[14]

All market participants are encouraged to participate in the ISDA consultation. As a reminder, the consultation can be reviewed and responses submitted online[15] by October 12, 2018.

[12] Source: PwC calculated based on data from Bloomberg and ISDA calculation notes

[13] As of September 13, 2018

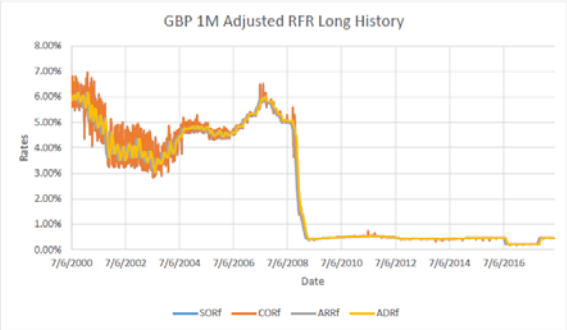
[14] For further discussion using overnight rights in place of forward-looking term rates, please refer to our other article in the LIBOR Transition Series: *Perspectives on SOFR and SONIA Linked Debt Issuances.*

[15] The consultation is available at https://www.isda.org/2018/07/10/interbank-offered-rate-ibor-fallbacks-for-2006-isda-definitions.

Appendix – ISDA provided graphs

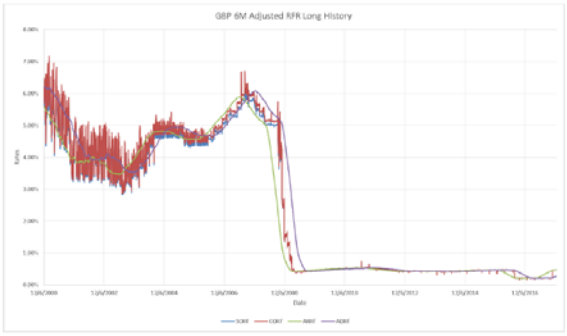
Graph 1 – GBP 1M Adjusted RFR Long History

	SORf	CORf	ARRf	ADRf
MIN	0.16%	0.16%	0.21%	0.21%
MAX	6.93%	6.97%	6.15%	6.17%
AVERAGE	2.45%	2.46%	2.43%	2.45%
ST DEV	2.191%	2.201%	2.170%	2.180%



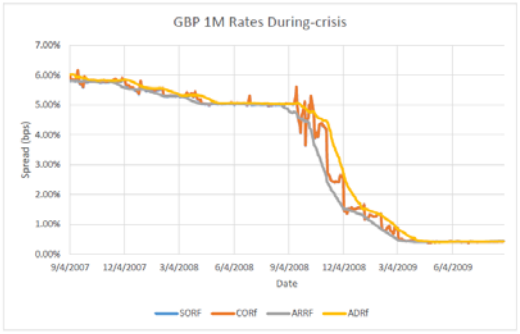
Graph 2 – GBP 6M Adjusted RFR Long History

	SORf	CORf	ARRf	ADRf
MIN	0.16%	0.16%	0.21%	0.21%
MAX	6.93%	7.18%	6.03%	6.21%
AVERAGE	2.45%	2.55%	2.43%	2.55%
ST DEV	2.191%	2.257%	2.159%	2.220%



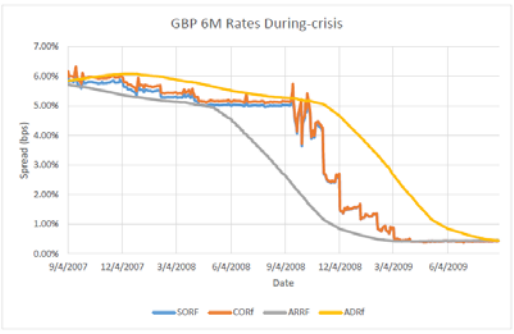
Graph 3 – GBP 1M Rates During crisis

	SORf	CORf	ARRf	ADRf
MIN	0.37%	0.37%	0.41%	0.41%
MAX	6.14%	6.17%	5.82%	6.02%
AVERAGE	3.46%	3.47%	3.35%	3.61%
ST DEV	2.2162%	2.2276%	2.2237%	2.2049%



Graph 4 – GBP 6M Rates During-crisis

	SORf	CORf	ARRf	ADRf
MIN	0.37%	0.37%	0.42%	0.44%
MAX	6.14%	6.33%	5.71%	6.08%
AVERAGE	3.46%	3.55%	2.82%	4.28%
ST DEV	2.2162%	2.2840%	2.1473%	1.9689%



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