ARTICLE

LIBOR: The Final Countdown?

Capital Markets Services

January 2021

An overview of the numerous challenges for the industry ahead of the LIBOR transition.

In many respects, the LIBOR transition can be seen as an escape from past mistakes into what the industry hopes might be a brighter future. As economists and financial markets experts, we propose a technical overview of the challenges ahead and emphasize the importance of history when transitioning towards a more reliable interbank rates benchmarking environment. Benchmarks are by their very nature imperfect substitutes to real markets and therefore hard (if not impossible) to fix. Practitioners willing to rely on such benchmarks should carefully consider such imperfections and the extent to which a benchmark can become a liability before deciding to rely on it. Although solving LIBOR is a complex undertaking and solving complex situations requires compromises, some market participants are not in favour of a clean-cut farewell to the LIBOR index by the end of 2021 and worry about potential disruption to the market. This sentiment is partly driven by the fact that the fallback provisions introduce a new economic value transfer problem in a post-LIBOR world that is impossible to solve without the continuation of LIBOR in some way after 2021.

An introduction to Benchmarking

Financial market participants rely on specific benchmarks as reference points to target performance or replicate a risk and return level. However, benchmarks are imperfect in nature and may not always be reliable as a proxy. The extent to which a benchmark is fully representative of the financial market it is designed to track depends on the robustness of the methodology used to define, govern, compute and publish it. Therefore, the risks associated with the representativeness of benchmarks should be understood by potential users before relying on a benchmark. In this section, we discuss some of the general features and risks associated with benchmarks, which might be relevant to LIBOR.

Transparency

The definition, methodology, policies, data and sources relied upon by the benchmark administrator, and the roles of the various service providers involved in the process of governing and producing the benchmark, should be clearly documented and made available to users. Lack of transparency may mislead users' understanding of the purpose and scope of the benchmark and hinder its representativeness or usefulness to the market.

Representativeness

Benchmarks are usually expected to represent a particular universe of transactions or financial instruments. However, depending on the benchmark methodology, certain criteria or computation methods may alter the benchmark level in an unexpected way. In order to be representative, a benchmark methodology should be pro-actively updated to keep track of market developments and regulations. We describe below four biases that can affect the representativeness of a benchmark:

Sample selection bias: It occurs when the benchmark administrator decides to only include reference transactions or members from a specific market based on certain criteria, minimum transaction size, counterparties involved, the currency and geography, the maturity etc.

Survivorship bias: it occurs when a particular source may be excluded from a benchmark because the source merges with another source or ceases to exist. This may affect the level of the benchmark, but in some instances, the data is adjusted for survivorship bias.

Backfill bias: this occurs when the history of the published benchmark is updated after the inclusion of a new source or the exclusion of an existing source. The backfilled data for a new fund added to an index may be biased, for example, if the fund was added to a benchmark after a period of good performance. Once the data is backfilled, it makes it hard to rectify because removing the backfilled data will then lead to deviation from the benchmark.

Expert judgement/discretion vs. objective measures: data can be cleaned for outliers or errors using objective techniques (such as trimming the data for outliers) and sources can be aggregated in fairly objective formulas (for example using size-weighted and/or time-weighted averages or medians of observed transactions). Where the methodology for identifying outliers or aggregating or weighting the data cannot be automated using an objective technique or measure, expert judgement may be considered as one input to ensure that the published benchmark reflects the market sentiment at the time of publication. Expert judgement may also be exercised at the source level, this is the case when banks contribute indicative quotations for example or, in the context of LIBOR, when contributed information is not based on actual transactions. Expert judgement is subjective and, as a result, introduces a degree of discretion from the source and/or the benchmark's administrator, which should be considered as a potential risk for those relying on such benchmark.

Representativeness is a major challenge, even in major and liquid markets such as money markets for major currencies.

Liquidity

Liquidity varies across financial instruments, geographies, markets and economic cycles. In an illiquid market, the transactions used to compute a benchmark may not be a good indicator of the fair market value at which a financial instrument may be traded. This was certainly one of the major issues regarding money markets, specifically LIBOR, in the wake of the global financial crisis as banks contributing to LIBOR were reluctant to lend to each other on an unsecured basis with a term interest rate payment. Where variance in transactional data is large (due for example to illiquidity), and specific prevailing market and idiosyncratic circumstances regarding such transactional data point are not looked into and adjusted for comparability purpose, then transactions may be wrongly excluded from, or included in, a benchmark computation. A good example is where transactions are restructured, and the pricing of the newly executed transaction appears off-market. In such case, a sensible adjustment would involve disentangling the effect of the restructuring so that the components of the datapoint can be understood properly before deciding whether to include or exclude it from the benchmark.

Integrity

There are many examples of benchmarks that relied upon corrupted sources of information. In the past, markets for interbank lending (the LIBOR market), foreign exchanges, precious metals, SSA (sub-sovereign, supranational and agencies) bonds, commodities, various securities and derivatives have been subject to numerous allegations and investigations of manipulative attempts, misreporting/misrepresentation, collusive behaviours, spoofing, pump and dump, and insider trading. Such allegations of wrongdoing raise questions about the integrity of benchmarks.

Continuity

Continuity of a benchmark is key, particularly when the documentation governing particular arrangements relying on such benchmark do not contemplate discontinuation clauses and fall-back provisions. In absence of industry guidance from regulators, the discontinuation of certain benchmarks could cause substantial market disruption and result in unintended consequences for users. This paper focuses on this particular aspect of benchmarking in the context of LIBOR discontinuation.

Errors

Errors can result from operational issues that delay their publication or human errors that result in erroneous benchmark computation. Statistically speaking, errors are unavoidable, but benchmarks should seek to minimise errors and address the cause so that the same errors do not keep occurring.

Stability

The benchmark methodology should not materially affect the level and volatility such that the benchmark consistently reflects the prevailing market circumstances at the time of its publication.

Benchmarking is not a simple undertaking and will never be a perfect tool. Users have to assess the extent to which relying on a benchmark is valuable, but assessing the limitations of a benchmark requires market and industry knowledge. The following sections focus on LIBOR as a benchmark, in the context of its proposed discontinuation.

General context of LIBOR and the transition

It is well known that past performance is not a good indicator of future results. However, past experiences influence decisions for the future. In that sense, historical results should be considered, but not determining factors when considering alternatives to the London Interbank Offered Rate ("**LIBOR**").

A select history of the LIBOR BBA

LIBOR was introduced as a contractually defined term to facilitate loan transactions in the 1970s. The development of LIBOR was driven by growth in new financial instruments and market requirements for standardised interest rate benchmarks, measuring the real rate at which banks could borrow money from each other on an unsecured basis and paying interest at maturity (term borrowing).

In the 1980's, a standardised rate was developed and was administered by the British Bankers' Association ("**BBA**") through BBA LIBOR Limited. This became increasingly important as London's status grew as an international financial centre.

In 1984, UK banks asked the BBA to develop a calculation for use as an impartial basis for calculating interest on syndicated loans. This led to the creation of the BBA Interest Rate Settlement in 1985, which became BBA LIBOR in 1986.

Initially, in the absence of observable transactions data, the BBA produced LIBOR by asking the banks to answer the question:

> *"At what rate do you think inter-bank term deposits will be offered by one prime bank to another prime bank for a reasonable market size today at 11a.m.?"*

From 1998 onward BBA changed the LIBOR definition to:

> *"The rate at which an individual Contributor Panel Bank could borrow funds, were it to do so by asking for and then accepting inter-bank offers in reasonable market size just prior to 11:00a.m. London time".*

Submissions were processed by Thomson Reuters acting as calculation agent, which calculated the composite benchmarks according to guidelines provided by the Foreign Exchange and Money Markets Committee. The final published rate was calculated as the interquartile mean of the quotes collected. The top 25% and bottom 25% of the banks' submissions were removed and an arithmetic average was then calculated using the remaining quotes. The fixings were then published by Thomson Reuters after 11.00a.m. London time.

LIBOR is still published for the five major currencies USD, GBP, EUR, JPY, CHF and was discontinued in 2013 for AUD, CAD, DKK, NZD and SEK.

Focus on the transition of discontinued LIBORs in 2013

*In March 2013, the International Swaps and Derivatives Association ("**ISDA**") issued a guidance note stating that counterparties will need to bilaterally agree how to deal with transactions that reference LIBOR rates for discontinued currencies if they wish to alter fallback determinations already provided in their Confirmation or the 2006 ISDA Definitions.[1] ISDA provided two non-binding approaches that ISDA members had discussed: (1) agree to use a substitute rate in lieu of the discontinued rate; or (2) terminate affected trades. By way of example, Australia has used the bank bill swap rates (BBSW) since the 1980s. As of 2018, the BBSW was estimated to have been referenced in derivative contracts worth AUD 17 trillion and business loans worth AUD 300 billion.[2] Following the decision to discontinue AUD LIBOR, the Australian Tax Office (ATO) and the Australian Financial Markets Association (AFMA) proposed to use BBSW as a proxy rate for AUD LIBOR.*

Originally, 15 maturities were published for LIBOR and, in recognition of the lack of liquidity in some maturities, 7 are published today. The number of panel banks making up each currency panel and the types of instruments to be included as relevant transactions to assess the LIBOR rate has changed over the years.

LIBOR is referenced in a number of transactions such as syndicated loans, business and retail loans (mortgages, credit cards, auto, consumer, student), floating rate notes, securitisation (RMBS, CMBS, CLOs, ABS, CDOs), deposits and over the counter and exchange traded derivatives (largely interest rate derivatives). Often overlooked, LIBOR is also used as an input for valuation purposes (although is has become less common recently) to forward and discount cash-flows, for performance measurement (for example as a hurdle for hedge funds' incentive fees) and to calculate penalties for delays on payment of invoices or to compute interests on damages in the context of disputes.

In addition, LIBOR was considered as one of the most important macro-economic indicators and was used globally as a gauge of market expectation regarding central bank interest rates, liquidity premiums in the money markets and the health of the banking system.

In the wake of the Global Financial Crisis in 2007-08 ("**GFC**"), central banks such as the Bank of England ("**BOE**") and the US Federal Reserve System ("**FRS**") started to be informed of industry concerns that the LIBOR rate was being under-reported. Banks had little appetite to lend to other banks at 3 months term on an unsecured basis and had preference for overnight secured lending. Allegedly, banks were not posting representative LIBOR rates to avoid drawing attention to a potential increase in their credit risk. Therefore, LIBOR no longer represented the rate at which banks were willing to lend to each other.

In addition, after allegations that LIBOR was also rigged in a collusive fashion, antitrust investigations on LIBOR started around the world involving regulators such as the US Securities and Exchange Commission, the Department of Justice, the Financial Conduct Authority ("**FCA**") and the European Commission. These investigations highlighted structural failings in LIBOR. The failings have led to significant fines globally (over USD 9 billion in total) since 2012 on a number of the panel banks for inappropriate conduct with regard to LIBOR.

Focus on the Findings of the investigations that resulted in a strong push for a LIBOR reform.

Definition: LIBOR was initially created to be a gauge of unsecured funding for banks which was, to a very great extent, driven by interbank activity prior to the GFC. The activity in that market had decreased markedly and wholesale deposits negotiated with other counterparties than banks were playing an increasingly important role in banks' funding.

Methodology*: LIBOR submissions were based on expert judgement, as opposed to transactional data.*

Framework for submissions*: the submission process was at that time largely unsupervised and conflicts of interest were not addressed. For example, in some investigations it was found that money markets traders had contributed to the LIBOR submission process despite an obvious conflict of interest.*

Misconduct*: inappropriate collusive influence on submissions and communications between traders at different banks hindered the integrity of LIBOR as a benchmark.*

Unregulated*: submission to LIBOR fell outside the regulatory perimeter.*

Errors*: the lack of proper audit and controls of the submissions and calculation of the trimmed average led to errors in the calculation of LIBOR.*

A select history of ICE LIBOR

In September 2012, the Wheatley Review of LIBOR set out a ten-point plan for its reform which came into force on 1 April 2013. In January 2014, the ICE Benchmark Administration ("**IBA**") took over from BBA for publishing LIBOR and changed its name to ICE LIBOR, but it continues to be commonly known as LIBOR. The IBA proposes a new methodology to address the issues with LIBOR contributions (the "**Waterfall Methodology**").

IBA changed the definition of LIBOR as:

> *"A wholesale funding rate anchored in LIBOR panel banks' unsecured wholesale transactions to the greatest extent possible, with a waterfall to enable a rate to be published in all market circumstances"*

Focus on the ICE LIBOR Waterfall Methodology[3]

ICE LIBOR is currently computed as the arithmetic average of the banks' contributions excluding the upper and lower quartiles to remove outliers and rounded to five decimal places. Banks contributions are based on the Waterfall Methodology which involves three levels of contribution, namely:

Level 1 - Transactions*: a volume-weighted average price of the bank's eligible transactions with a higher weighting for transactions booked closer to 11a.m. London Time.*

Level 2 - Transactions derived*: transactions derived data including time-weighted historical eligible transactions adjusted for market movements and linear interpolation.*

Level 3 - Expert Judgement*: market and transaction data-based expert judgement, using the bank's own internally approved procedure (based on a set of pre-determined inputs agreed and with IBA).*

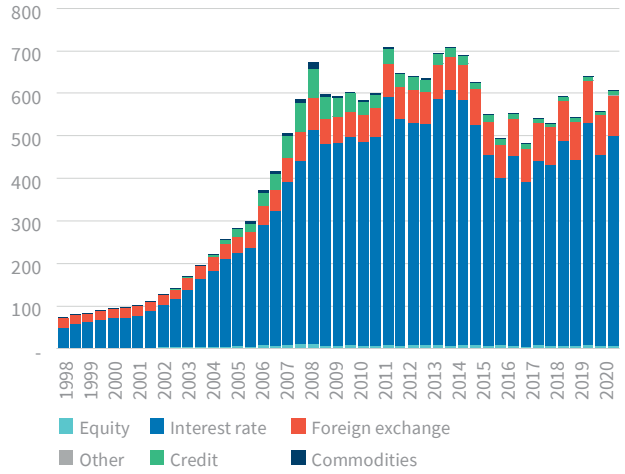
As IBA was undertaking the first reform of LIBOR, the end of LIBOR was announced in July 2017 during a speech by the FCA CEO Andrew Bailey on "*the Future of LIBOR*" in combination with panel banks' support to sustain LIBOR until the end of 2021 and seek a replacement.

On 1 April 2019, the IBA announced that it had completed the transition of all LIBOR panel banks to the Waterfall Methodology. The spirit of the Waterfall Methodology was to (i) anchor LIBOR to the greatest extent possible in actual transactions, (ii) reflect changes in banks' funding models and (iii) ensure that panel banks always make a submit regardless of activity levels on a particular day.

The outstanding LIBOR notional in the five major currencies is estimated at approximately USD 240 trillion as of December 2017, a substantial portion of which is over the counter ("**OTC**") interest rate derivatives.[4] OTC interest rate derivatives represent the bulk of OTC derivatives traded globally (see Figure 1). This estimated value excludes other interbank benchmarks such as the Euro Interbank Offered Rate ("**Euribor**"), which differs from LIBOR in some respects.[5] The substantial size of the outstanding LIBOR notional suggests that, despite the various debates about the integrity of LIBOR over the years, and the various changes to LIBOR in recognition of its deficiencies, LIBOR has been commonly used by the industry and contributed to a significant number of transactions at the service of the global economy.

This brief summary of the LIBOR transition does not include full details of the LIBOR reform implemented by the IBA, which in many respects sought to address all the limitations of the BBA LIBOR. Despite all the incumbent issues related to LIBOR as a benchmark, LIBOR was not an unsuccessful standardisation undertaking.

FIGURE 1: HISTORICAL OTC DERIVATIVES NOTIONAL OUTSTANDING (USD TRILLIONS)



Source: BIS

How will the industry transit out of LIBOR?

Most of the contracts referencing LIBOR did not envisage a permanent cessation of LIBOR. Existing fallback language in these cases may not be appropriate for a number of reasons. The existing fallback language may corrupt the intent of the transaction, lead to a substitute rate significantly higher (or lower),[6] or leave stakeholders in limbo regarding calculation of future payments (or receipts). In this context, contracts referencing LIBOR need to have their fallback language amended to limit disruption.

Proposed fallback language in cash and derivatives markets

Under the impulse of the regulators and market participants, working groups were created to facilitate the transition to a post-LIBOR world. Besides identifying an alternative reference rate to LIBOR called the Risk-Free Rates ("**RFRs**"), such as Secured Overnight Financing Rate ("**SOFR**"), Sterling Overnight Index Average ("**SONIA**"), Euro Short Term Rate ("**€STER**"), Swiss Average Rate Overnight ("**SARON**") and Tokyo Overnight Average Rate ("**TONA**"), working groups and their members are guiding the market towards recommended fallback languages.

In respect of derivative products linked to the interbank offered rates ("**IBORs**"), on 23 October 2020, ISDA launched

the IBOR Fallbacks Supplement and IBOR Fallbacks Protocol. The supplement will amend the 2006 ISDA Definitions for interest rate derivatives to incorporate robust fallbacks for derivatives linked to certain IBORs, with the changes coming into effect on 25 January 2021.[7] From that date, all new cleared and non-cleared derivatives that reference the definitions will include the fallbacks.

The IBOR Fallbacks Protocol will enable market participants to incorporate the revisions into their legacy non-cleared derivatives trades with other counterparties that choose to adhere to the protocol. ISDA bases its IBOR fallbacks on an adjusted version of RFRs to account for the difference between IBORs and RFRs.

The ISDA fallback rate for a LIBOR tenor is the sum of:

— a term adjusted RFR, which is the RFR compounded daily over a period equivalent to the LIBOR tenor being replaced ("**Compounded RFR**"); and,

— a spread adjustment, which is the median of the differences between the LIBOR and the Compounded RFR for the corresponding LIBOR tenor calculated over a static lookback period of five years prior to the date where LIBOR ceases to be published or is considered non-representative by the regulator ("**ISDA Fallback Spread**").

As an illustrative and simplified example, considering 31 December 2021 to be the last date of LIBOR publication of a representative LIBOR (the "**Cessation Date**"), the ISDA fallback rate replacing 3-month USD LIBOR as at 1 March 2022 will be equal to the sum of:

the daily compounded SOFR over the period between 1 March 2022 and 1 June 2022; and, the median of the differences between the 3-month USD LIBOR and the compounded SOFR (over 3 months) over the period from 30 September 2016 to 30 September 2021 (i.e., 3 months prior to the Cessation Date to match the LIBOR tenor).[8]

In respect of USD cash products, the Alternative Reference Rates Committee ("**ARRC**") published "Guiding Principles for More Robust LIBOR Fallback Contract Language in Cash Products" in July 2018, followed by several consultations. The work done by ARRC resulted on recommended languages for adjustable-rate mortgages, bilateral business loans, floating rate notes ("**FRNs**"), securitizations, syndicated loans and variable rate private student loans.[9]

ARRC's recommendations for the fallback language are structurally similar to ISDA's recommendations but embed a waterfall for the RFR and the spread components. The waterfall is different depending on the cash product.

— For adjustable rate mortgages, the replacement benchmark will be the one recommended by the Board of Governors of the FRS, the Federal Reserve Bank of New York, or a committee endorsed or convened by the Board of Governors of the FRS or the Federal Reserve Bank of New York. If not available, the rate will be determined by the note holder. ARCC recommends that the spread adjustment match the ISDA Fallback Spread if the replacement benchmark is SOFR.[10]

— For FRNs, the replacement benchmark will be a term SOFR. If term SOFR is not available, then a compounded SOFR will be used. If compounded SOFR is not available, the replacement benchmark will be the one recommended by the Board of Governors of the FRS, the Federal Reserve Bank of New York, or a committee officially endorsed or convened by the Board of Governors of the FRS and/or the Federal Reserve Bank of New York or any successor thereto. If such an alternative is not available, the ISDA fallback rate will be used. If the ISDA fallback rate is not available, the rate selected by the issuer or its designee will be used. ARRC recommends that the spread adjustment for FRNs would (i) match the ISDA Fallback Spread, or (ii) be determined by the issuer or its designee, if the benchmark rate is itself selected by the issuer or its designee.[11]

The recommendations from ISDA and ARCC are well-regarded, with 257 derivatives market participants already adhering to the ISDA Fallbacks Protocol during the two-week pre-launch 'escrow period' and the BOE publishing a press release announcing its signature on 23 October 2020.[12] However, the work is still left to the parties to agree on which language to choose on a bilateral basis.

As a result of the slight divergence between ARRC waterfall approach and the ISDA fallback rate, there could be a misalignment in fallbacks between derivatives and cash instruments, which could result in ineffective hedging and basis risk. In anticipation, ISDA and ARCC have also provided recommendations and templates to facilitate complex cases that necessitate bilateral negotiations.[13] For example, ISDA recommends amending the fallback language of an FRN to match the one of its derivative hedge to minimize hedging mismatches and this recommendation does not go against the ARCC guidelines.[14]

Asset managers and the LIBOR transition

Whilst ISDA and ARRC, and the UK Working Group on Sterling Risk-Free Reference Rates have made steps to define fallback language, there is no universal language. As a result, some specific products and industries fall outside the scope of the standardised propositions for fallback frameworks.

For instance, certain legacy FRNs will be very difficult, if not impossible, to amend. This is due to the consent rights of impacted parties, as referenced in the terms, requiring 100% noteholder consent for amendments. Propositions have been made to further empower benchmark regulators with the ability to override contracts and limit the possible disruption emerging from failures to amend the terms.[15]

There is no standard fallback provision for hedge funds and asset managers relying on IBORs for benchmarking investment strategies or as a reference hurdle to monitor and value carried interest and incentive fees.

For some specialized investment funds, whose returns rely partly on using debt to leverage investors' equity, such as sophisticated structured credit or distressed debt investors, the transition from LIBOR to fallback terms may result in mismatches between assets and liabilities. The higher the leverage the more such basis risk could impact (positively or negatively) investors' returns and ultimately the fund managers' incentives.

For fund managers, whose performance is linked to LIBOR, substituting LIBOR to one of the fallback propositions from ISDA or ARRC may impact the hurdle rate (positively or negatively) and therefore the net performance to investors.

Following the European Securities and Markets Authority ("**ESMA**") guidance on performance fees, asset managers may want to choose carefully their new benchmark to align it with the fund's investment objectives, strategy and policy. As ESMA states "*it should not be deemed appropriate for a fund with a predominantly long equity-focused strategy to calculate the performance fee with reference to a money market index*".[16]

Consistent with other regulators, the FCA, in its "Dear CEO" letter to UK asset managers dated 27 February 2020, stated that firms exposed to LIBOR without a plan in place should act urgently to avoid market disruption or harm to consumers, emphasizing that asset managers had a responsibility to ensure a smooth LIBOR transition.[17]

Therefore, asset managers will need to conduct detailed due diligence on the various economic, reglementary, legal and operational dimensions of the LIBOR transition and how these impact various stakeholders as well as existing and prospective investors.

Structural, legal, accounting and operational changes for financial institutions

Banks face a multi-faceted challenge in respect to the benchmark transition and are likely to encounter numerous issues with managing legacy products, introducing new products, and collaborating with market participants and stakeholders to enable a smooth transition.

From an operations perspective, a number of issues can arise to disrupt an orderly transition, precipitating the need for an adequate allocation of resources for the transition. A major risk is insufficient human and data management resource capacity to carry out the transition. There might be significant costs associated with procuring additional resources encompassing trading, back-office IT tools, compliance and calculation models factoring in new interest rate curves. Similarly, the lack of internal training and the associated costs of additional training in the aforementioned factors can disrupt the transition.

A number of risks related to legal and compliance procedures may manifest themselves during the transition process. For instance, inadequate and inconsistent definition of targeted fallback language and roll-out procedures may lead to disputes and litigation. It may be harder to resolve such disputes due to deficiencies in assessing the basis for legal cases and understanding the potential implications of fallbacks after LIBOR cessation.

Banks will need to manage the emergence of new basis risks altering the funding and therefore engineering of structured products, the nature and composition of the hedging strategy, the composition of the trading books, and adding complexities to the asset-liability management process. The management of basis risk will be compounded by limited historical parameters relating to liquidity and volatility of the RFRs.

Analysis of the fallback proposition

The main challenge in the LIBOR transition resides in the discontinuation of LIBOR itself and the absence of a perfect substitute to LIBOR. Although the RFRs are considered to be more reliable indicators because they are linked to transactions, RFRs remain fundamentally different from LIBOR.

Differences between RFRs and LIBOR

Contrary to LIBOR, which is a term rate, RFRs are all overnight rates. Therefore, also contrary to LIBOR, the payment on transactions referencing RFRs is not known in advance since they fix and compound daily through the corresponding equivalent LIBOR term. In some respects, this positions RFRs as a counterintuitive substitute to LIBOR since LIBOR is known at the time of fixing for a given period, and RFRs are only known at the end of such period.

We note that the backward-looking characteristic of the RFRs is a main issue for the options market, as it changes materially the nature of the option contract and thus the hedge it can provide. More generally, the creation of a forward-looking term rate indexed on RFRs is a necessity to limit disruption in the market. Aware of this issue, ARCC released Request for Proposals for the Publication of Forward-Looking SOFR Term Rates on 10 September 2020.[18]

LIBOR is an unsecured term lending rate, whereas RFRs such as SOFR or SARON involve secured overnight lending. SONIA, €STER and TONA are unsecured overnight lending rates. Therefore, RFRs are not economic equivalents to LIBOR. As risk-free overnight (secured or unsecured) rates, RFRs are typically lower than LIBOR, which includes elements of credit risk and term and liquidity premiums.

The transactional data, timing and averaging method to compute LIBOR differs from the RFRs.

— **Transactional data**: depending on the waterfall level retained by each contributing bank for the computation of LIBOR, the trimmed average produced by IBA is not comparable to the methodology used to compute RFRs, which are essentially based on transactions. For instance, tri-party repo transactions are not eligible for LIBOR, but they are eligible for SOFR.

— **Timing**: LIBOR may be based on same day data (up to 11a.m. London time for level 1 contributions, but it may not only rely on same day transactions for level 2 and 3; and it is published at 11:55am London time. Some RFRs rely on the previous day transactions such as €STR (which is published at 8a.m. CET the next day) and SONIA (which is published at 9a.m. London time the next day).

— **Averaging method**: While LIBOR is based on a trimmed arithmetic average of level 1, level 2 and/or level 3 banks' contributions, SOFR is based on a volume-weighted median of transactions, SONIA and €STR on a volume-weighted trimmed average of transactions and SARON on a volume-weighted average of transactions. Moreover, LIBOR is rounded to five decimal points, where SOFR is rounded to the nearest basis point, SONIA is rounded to four decimal places, €STR and TONA to three decimal places.

Finally, not all RFRs have been published for as long as LIBOR. Although SONIA has been published since 1997, SOFR only started to be published from April 2018 and was backdated to April 2014. €STER started on October 2019. SARON has been published since August 2009 (and was backdated to June 1999). The lack of comparability between LIBOR and RFRs during periods of high market stress for financial institutions, such as the GFC, leaves uncertainty as to the reliability of the median spread approach used for ISDA Fallback Spread.

As RFRs and LIBOR are fundamentally different benchmarks, the spread between them on a given date is never constant. The relationship between LIBOR and RFRs is not always necessarily obvious and both markets may respond differently to the same market events. Owing to this complex relationship and the non-constant spread, the spread between LIBOR and RFRs is difficult to predict or measure in absence of one of the two benchmarks.

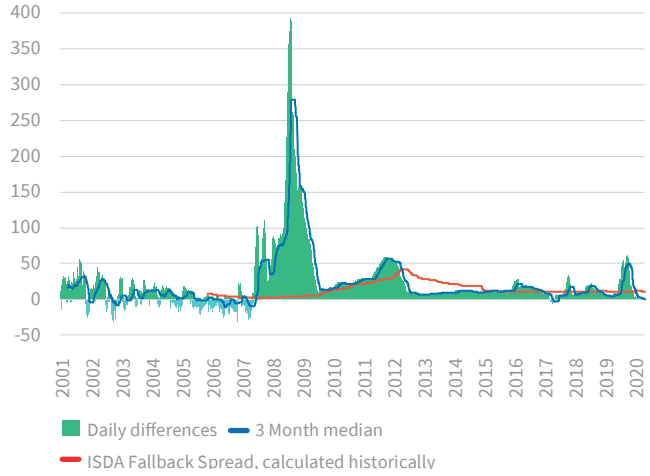
As a result, there will be a value transfer if LIBOR is discontinued and the spread between LIBOR and RFRs is fixed on the last observation date of LIBOR. But, in absence of LIBOR, it will be impossible to determine whether the spread fixed in the fallback language of a particular agreement is lower or higher than what it would have been in a world where LIBOR is not discontinued. Therefore, it will be impossible to determine who wins and who loses in absence of LIBOR.

Analysis of the reliability of the ISDA Fallback Spread

As mentioned previously, the ISDA Fallback Spread will be fixed as the median of the observed spread over a 5-year period at the Cessation Date. In this section, we assess the reliability of the median of the observed spread between LIBOR and its corresponding Compounded RFR over 5 years, as a meaningful substitute for the basis risk between LIBOR and RFR after LIBOR cessation. We focus on SONIA as it is available over a longer period than other RFRs.

We look at the historical spreads between 3-month GBP LIBOR and its corresponding Compounded RFR, i.e. SONIA compounded over the same interest calculation period of 3 months. This spread is shown in Figure 2. We can observe that the spread was very volatile during the GFC but stabilised afterwards.

FIGURE 2: HISTORICAL DAILY DIFFERENCE BETWEEN 3-MONTH GBP LIBOR AND THE CORRESPONDING COMPOUNDED RFR VERSUS THE ISDA FALLBACK SPREAD (IN BASIS POINTS)



Source: The ICE, BOE and FTI Analysis

It is clear from Figure 2 that the daily spread is not constant and although it is mostly positive, it can also turn negative. Therefore, the ISDA Fallback Spread, which will be fixed as a constant, is not a perfect substitute for the differences between LIBOR and the corresponding Compounded RFR in all market circumstances.

As shown in Figure 2, the 5-year median, calculated as per the ISDA Fallback Spread methodology, responds slowly and disproportionately to abnormal market conditions such as the GFC. This observation is due to the long window retained to compute the ISDA Fallback Spread. In theory, a median computed over 5 years of data could bring the first observation point as the median, resulting in a significant lag in the information.

As shown in Figure 2 a shorter window of 3 months to compute the median would be more responsive to market circumstances. Regardless, computing the median over shorter terms would not solve the problem of LIBOR being discontinued. Moreover, it would not be optimal to fix the ISDA Fallback Spread at a level that is not reflective of the long-term relationship between LIBOR and RFRs.

Therefore the 5-year median retained for the ISDA Fallback Spread provides a compromise to a complex problem. Although it could be seen as arbitrary, it is the method retained in consultation with the industry in the spirit of a smooth LIBOR transition.

Alternative approaches to address the shortcomings of the median approach to the ISDA Fallback Spread: looking at forward RFRs and questioning the discontinuation of LIBOR.

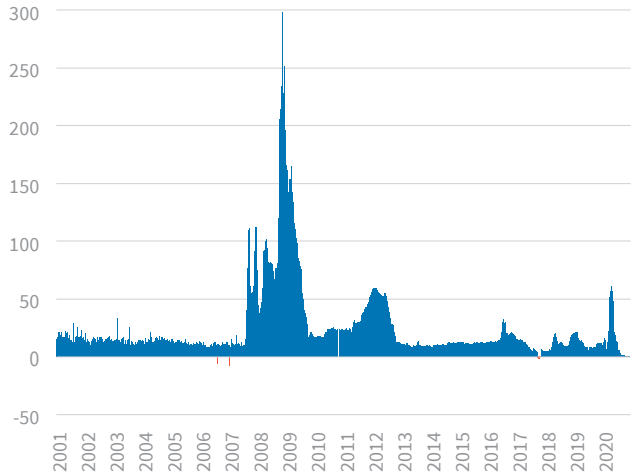
As 3-month GBP LIBOR is known at each LIBOR fixing but not the compounded SONIA rate, the ISDA Fallback Spread incorporates an element of hindsight in the computation of the Compounded RFRs. We explore in the following paragraphs the implications of this hindsight element built into the ISDA Fallback Spread.

A trader looking to replace 3-month GBP LIBOR with SONIA is faced with the dilemma that the effective SONIA rate is not known in advance. One reference point available to traders reflecting the expected SONIA over a period of time is the SONIA swap curve. In the context of LIBOR transition, one should be interested in the spread between 3-month GBP LIBOR and the expectation regarding the corresponding Compounded RFR i.e. the 3-month GBP Overnight Index Swap ("**OIS**") rate.

The difference between the 3-month GBP OIS rate and the realised SONIA rates lies in the quality of the market information available at each point in time. Since no one can predict the future, unexpected large market moves will inevitably skew the difference between expectations and reality. These extreme events will in general occur during stressed periods such as the GFC, as shown in Figure 4.

Figure 3 below shows the daily spread between 3-month GBP LIBOR and the 3-month GBP OIS rate ("**Expected Spread**"). Figure 3 illustrates that the Expected Spread (which is known at the time of fixing LIBOR) behaves similarly to the spread used in the ISDA Fallback Spread calculation (which is unknown at the time of fixing LIBOR).

FIGURE 3: HISTORICAL DAILY SPREAD BETWEEN 3-MONTH GBP LIBOR AND THE 3-MONTH GBP OIS RATE (IN BASIS POINTS)



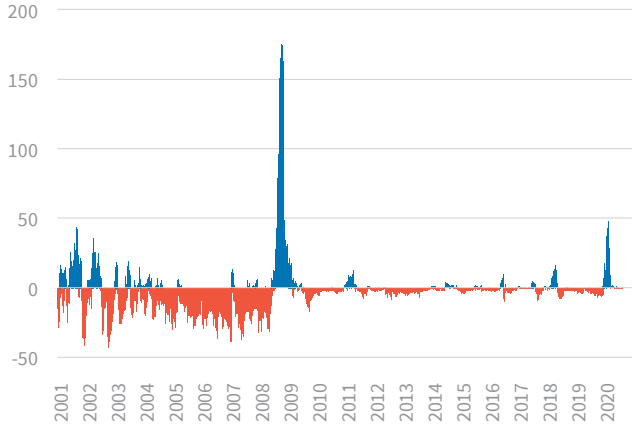
Source: Bloomberg (BPSWSC BGN Curncy), The ICE, BOE and FTI Analysis

Figure 4 shows the difference between the 3-month GBP OIS rate and SONIA compounded over 3 months, which is essentially the difference between the Expected Spread and the daily spread shown in Figure 2. Figure 4 illustrates that the Expected Spread can differ significantly from the spread used in the ISDA Fallback

Spread calculation, which relies on hindsight as it is unknown at the time of fixing LIBOR. In simple terms, the daily spread used to compute the median in the ISDA Fallback Spread is not a good indicator of market expectations at the time of fixing LIBOR.

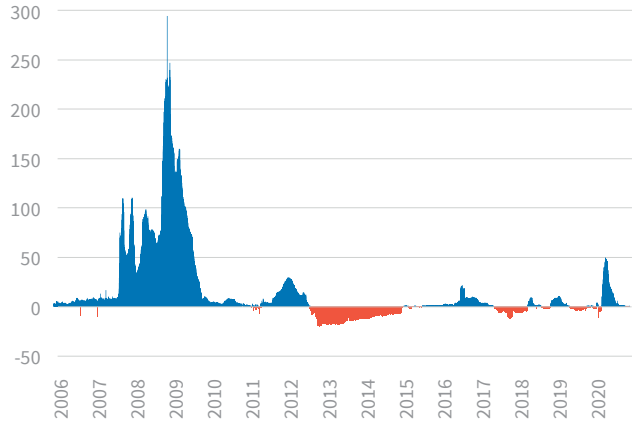
As shown in Figure 5, the difference between the ISDA Fallback Spread and the Expected Spread can be significant. Therefore, while the Expected Spread resolves the hindsight issues resulting from using a Compounded RFR, the value transfer resulting from employing the ISDA Fallback Spread is still non-negligible particularly during stressed market conditions. The value transfer can be estimated or quantified more accurately if LIBOR is known and continues to be published.

FIGURE 4: DIFFERENCE BETWEEN THE SPREAD IN FIGURE 2 AND THE SPREAD IN FIGURE 3 (IN BASIS POINTS)



Sources: see Figure 2 and Figure 3

FIGURE 5: DIFFERENCE BETWEEN THE SPREAD IN FIGURE 3 AND THE ISDA FALLBACK SPREAD, CALCULATED HISTORICALLY (IN BASIS POINTS)



Sources: see Figure 2 and Figure 3

Continuation of USD LIBOR after 2021

On 30 November 2020, the IBA announced that it would consult on its intention to cease the publication of the 1-week and 2-month USD LIBOR on 31 December 2021, and the remaining USD LIBOR tenors on 30 June 2023.[19] While IBA is looking to publish most USD LIBOR tenors until July 2023, it also leaves open the possibility of continuing LIBORs in other currencies beyond 2021, pending the outcome of its consultations. This was confirmed by ISDA when it announced that the IBA statements do not *"constitute an index cessation event under the IBOR Fallbacks Supplement or the ISDA 2020 IBOR Fallbacks Protocol"*.[20]

However, the announcements from IBA were supported by both the US Federal Reserve and the FCA, indicating regulatory support for the cessation of LIBORs on the proposed dates. The US Federal Reserve has encouraged banks to cease entering into contracts referencing USD LIBOR as soon as practicable and in any event by 31 December 2021. Under the UK Financial Services Bill proposed on 21 October 2020, the FCA would have the power to prohibit the use by supervised entities in the UK of a critical benchmark (such as LIBOR) where a benchmark administrator has confirmed that the benchmark will cease. The FCA has stated that: *"we may exercise this power if we consider doing so protects consumers or market integrity"*.[21]

The continuation of USD LIBOR for certain tenors means that even if the 1-week and 2-month USD LIBOR were to discontinue after December 2021, the derivatives referencing these rates will not be subject to the ISDA fallback rate. As the other USD LIBOR tenors would continue to be available and representative, the rate would be determined using linear interpolation under the ISDA terms.[22] However, when all USD LIBOR tenors cease after June 2023, swaps referenced to USD LIBOR would fall back to the fallback rate (i.e., SOFR plus the spread adjustment). In these cases, the spread adjustment would be fixed at the time of the announcement relating to all USD LIBOR tenors, which is currently expected in early 2021.[23]

At the time of publishing this paper the FCA released a statement mentioning that the FCA envisages "*requiring continued publication of a LIBOR setting on a synthetic basis*" which is supportive of the views expressed in this article.[24]

The recent developments in the markets for securities and derivatives

Considerable progress has already been made in relation to the transition from GBP LIBOR with the adoption of SONIA in new public issues of GBP-denominated FRNs,

covered bonds and securitisations. As of September 2020, SONIA-linked FRNs and securitisation issuance amounts to over £90bn since June 2018, and public issuance of GBP LIBOR-linked FRNs and securitisations with a maturity beyond the end of 2021 has all but ceased.[25]

The Working Group on Sterling Risk-Free Reference Rates, working with the FCA and BOE, has recommended that lenders should (i) make non-LIBOR linked products available to their clients by the end of Q3 2020 (ii) include clear contractual arrangements in all new and refinanced LIBOR-referencing loan products after Q3 2020, to facilitate conversion from LIBOR to an alternative rate before the end of 2021 through pre-agreed conversion terms or an agreed process for renegotiation; and (iii) not sell LIBOR-referencing loan products that expire after the end of 2021 after Q1 2021.[26]

In this context, we discuss the recent development surrounding derivative products referencing LIBOR and RFRs. For consistency with previous the section, where we focused on ISDA fallback proposition in the context of SONIA, we focus on securities and derivatives referencing GBP LIBOR.

Outstanding FRNs indexed on GBP LIBOR by 2022, ranked by tenor

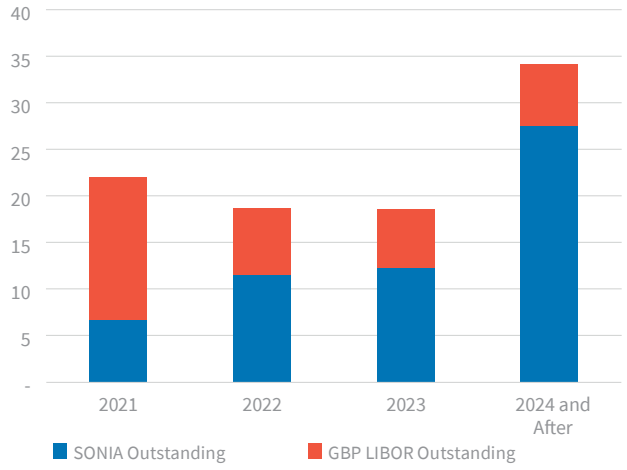
There are a number of outstanding GBP LIBOR-linked FRNs, covered bonds, capital securities and securitisations that are due to mature after the end of 2021 ("**Legacy Transactions**").[27]

Legacy Transaction may contain fallbacks that would typically result in the bond falling back to the rate in effect for the last preceding interest period, which will be applied to every interest period for the remaining life of the bond, resulting in a bond falling back to a fixed rate at the end of LIBOR.[28] This could have negative consequences for consumers, who might be left with an unattractive fixed rate, and lenders, who might need to adjust the hedges on their loan portfolios.

Moreover, some of these bonds may contain no fallbacks at all, meaning there is no default position on the permanent cessation of GBP LIBOR. This could lead to disputes if such contracts are not addressed before the end of GBP LIBOR.

We have analysed data for outstanding corporate and government GBP LIBOR-linked FRNs that are part of the Legacy Transactions. According to the data, there is c.£20.2 bn of notional outstanding for GBP LIBOR-linked FRNs that is maturing after 2021. Figure 6 shows the breakdown of notional outstanding for GBP LIBOR-linked-FRNs by maturity after the end of 2021, with £7.2 bn notional outstanding maturing in 2022, £6.4 bn notional outstanding maturing in 2023 and £6.6 bn notional outstanding maturing after 2023. In contrast, there is c.£51.3 bn of notional outstanding for SONIA-linked FRNs that is maturing after 2021.

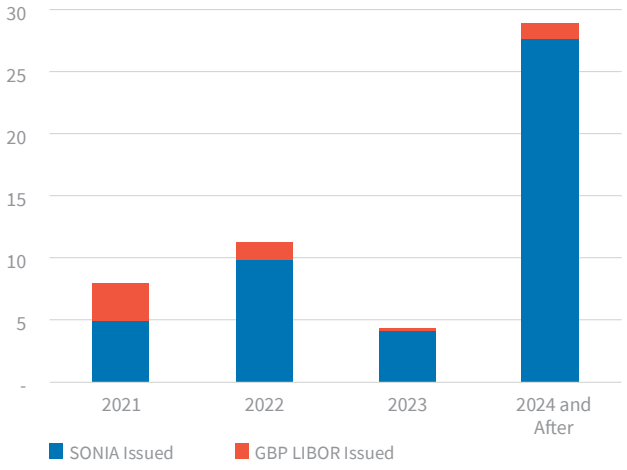
FIGURE 6: NOTIONAL OUTSTANDING FOR FRNS MATURING IN 2021 AND AFTER (GBP BILLIONS)



Source: Bloomberg and FTI Analysis

Figure 7 shows the breakdown of notional issued between 1 January 2019 and 4 December 2020 for GBP-denominated FRNs by maturity. It shows that notional issued for SONIA-linked FRNs represent the significant proportion of the notional issued for FRNs, especially for FRNs maturing after 2022, showing that significant transfer has taken place from FRNs referencing GBP LIBOR to those referencing SONIA.

FIGURE 7: NOTIONAL ISSUED BETWEEN JANUARY 2019 AND DECEMBER 2020 FOR FRNS MATURING IN 2021 AND AFTER (GBP BILLIONS)



Source: Bloomberg and FTI Analysis

Recent liquidity in the market for RFR derivatives

The market for vanilla interest swaps denominated in GBP has been steadily transitioning to SONIA over the last few years. We have analysed transaction data for OIS and fixed-for-floating interest rate swaps ("**IRS**") referenced in GBP for the past five years from ISDA SwapsInfo.[29] The OIS referenced in GBP will be linked to SONIA while the IRS will typically be linked to GBP LIBOR. Therefore, we have used this data to analyse the trends in traded notional of swaps linked to GBP LIBOR and the corresponding RFR (i.e. SONIA).

According to the data we analysed from ISDA SwapsInfo, OIS annual traded notional has been on average c.52% higher than IRS from 2016-2019. However, record-highs were recorded this year with c.USD$15.6 trillion of OIS notional traded until 21 November 2020, 239% higher than the IRS notional traded during the same period. This is predominantly due to unprecedented highs at the peak of the COVID-19 pandemic, with over 50% of recorded OIS traded notional in the year-to-date occurring in Q1 2020.

FIGURE 8: GBP OIS TRADED NOTIONAL (USD TRILLIONS), 2016-2020

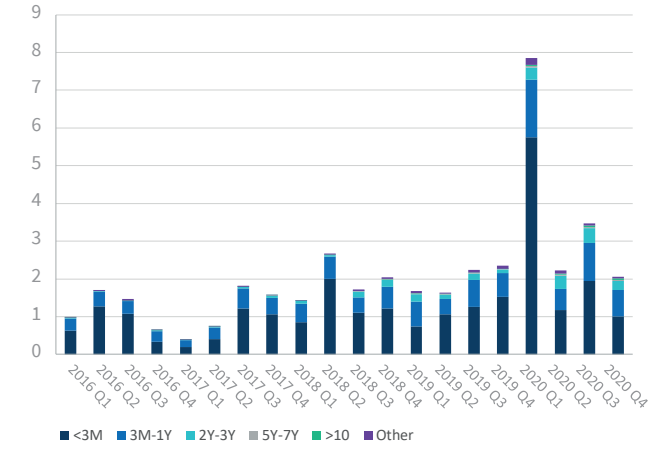
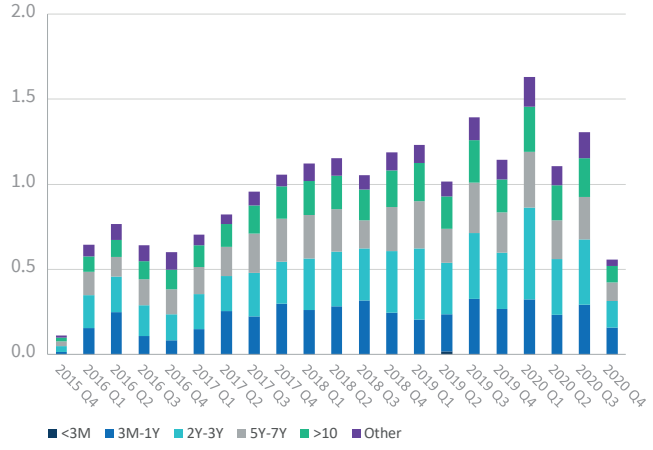


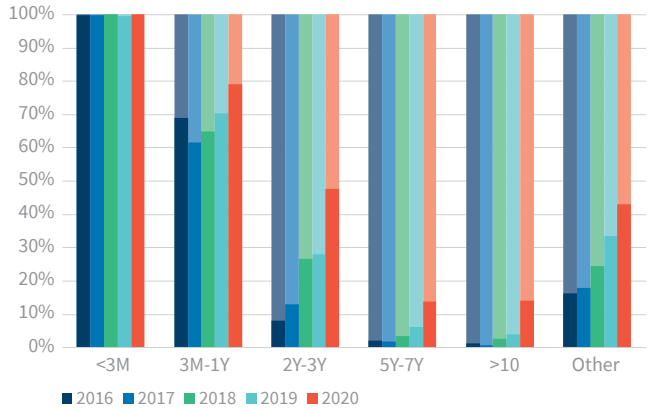
FIGURE 9: GBP IRS TRADED NOTIONAL (USD TRILLIONS), 2016-2020



Source: SwapsInfo, FTI Analysis

As shown in Figure 10, OIS traded notional has typically been characterised by short-term tenors, with an average of 93% of total OIS traded notional being transacted in tenors of 1 year and under. This contrasts to IRS traded notional, which is concentrated in longer tenors (2 years and over). However, the proportion of OIS when compared to IRS has been increasing across all tenors from 2 years and above, over the period from 2016 to 2020.

FIGURE 10: TOTAL TRADED NOTIONAL (%), OIS DARK, IRS LIGHT, 2016-2020



Source: SwapsInfo, FTI Analysis

On the other hand, cross-currency swaps have been slow to transition to the RFRs. The first cross-currency swap involving RFRs on both legs was transacted in November 2019 and involved a cross between SOFR and the euro short-term rate (€STR).[30] Since then, only 21 cross-currency swaps with RFRs on both legs have been reported to the Depository Trust & Clearing Corporation's (DTCC) trade repository. The total notional of these swaps, which is less than $1 billion, also represents less than 1% of the total notional of cross-currency swaps. Industry observers expect cross-currency swaps with RFRs on both legs to become standard by the end of 2021.[31] However, given the slow transition, there may be a significant number of Legacy Transactions for cross-currency swaps at the end of the transition period.[32]

Conclusion on the economics of the transition and the value transfer

This paper touches on some of the challenges underpinning one of the most important economic variables in the world. Although the industry initiatives on RFRs and fallback provisions and the recent developments in the issuance of securities and derivatives referencing RFRs could signal that the industry is on a journey for a smooth and orderly transition, the LIBOR transition remains a complex journey. Financial products and situations not addressed by the fallback reforms will face issues as a result of the LIBOR transition. Not discontinuing the publication of LIBOR in parallel could help the industry in such situations, specifically regarding negotiations on the economics of value transfer in the context of the transition from LIBOR to an RFR.

How FTI Consulting can help?

We cumulate decades of experience in trading, investment management, valuation, risk management and regulation covering a wide range of complex financial instruments and derivatives across asset classes. Our team is composed of industry experts, having worked for global and leading financial institutions, and bring quantitative expertise in developing models and risk analytics in complex trading environments. Having been involved in many precedent market turmoils, FTI Consulting has a long track-record at providing independent valuation and risk management solutions as well as financial and economic expertise in special situations such as restructurings and transactions advisory, and providing independent expert opinions and testimonies in the context of disputes, litigations, arbitrations. It is not possible to determine at this stage how well the LIBOR transition will be handled and the potential adverse consequences. FTI Consulting will continue to monitor market developments in order to best assist its clients when the need arises.

The views expressed in this article are those of the author(s) and not necessarily the views of FTI Consulting, its management, its subsidiaries, its affiliates, or its other professionals.

BRUNO CAMPANA
Senior Managing Director
+44 (0)20 3727 1081
bruno.campana@fticonsulting.com

ESTHER MAYR
Senior Managing Director
+44 (0)20 3727 1165
esther.mayr@fticonsulting.com

DENIS DESBIEZ
Managing Director
+44 (0)20 3727 1387
denis.desbiez@fticonsulting.com

ALEX CANAVEZES
Senior Affiliate
alex.canavezes@fticonsulting.com

BADR IFTIKHAR
Director
+44 (0)20 3727 1365
badr.iftikhar@fticonsulting.com

ANDREW RENNIE
Senior Affiliate
andrew.rennie@fticonsulting.com

BEN RODMAN
Consultant
+44 (0)20 3727 1525
ben.rodman@fticonsulting.com

TOM CORDREY
Consultant
+44 (0)20 3319 5670
tom.cordrey@fticonsulting.com

1283 - 01/21

ANNEX 1 - Calculation of Fallback Rate

1.1 The Fallback Rate, FR, with respect to an IBOR, each Tenor f and each Rate Record Day t on and following the Fallback Rate Base Date, shall be calculated by the Adjustment Services Vendor in accordance with the following formula, and rounded to the nearest Rounding Precision (breaking ties by rounding half away from zero):

$$FRf,t = ARRf,t + SAf,t$$

Where:

FRf,t means the Fallback Rate for Tenor f on Rate Record Day t ;

$ARRf,t$ means the Adjusted Reference Rate for Tenor f on Rate Record Day t ; and

SAf,t means the Spread Adjustment for Tenor f on Rate Record Day t.

CALCULATION OF ADJUSTED REFERENCE RATE

1.2 The Adjusted Reference Rate, ARR, with respect to an IBOR, each Tenor f and each Rate Record Day t on and following the Adjusted Reference Rate Base Date, shall be calculated by the Adjustment Services Vendor in accordance with the following formula, and rounded to the nearest Rounding Precision (breaking ties by rounding half away from zero):

$$ARR_{f,t} = \frac{DayCount_I}{DayCount_{RR}} \times \frac{1}{\delta_{S_{f,t},E_{f,t}}} \times \left[\prod_{u \in AP_{f,t}} \left(1 + \delta_{u,u+1} \times RDR_u\right) - 1 \right]$$

Where:

$ARR_{f,t}$ means the Adjusted Reference Rate for Tenor f on Rate Record Day t;

$DayCount_I$ means, with respect to the IBOR, the Day Count;

$DayCount_{RR}$ means, with respect to the Reference Rate, the Day Count; S

Sf,t means, with respect to Tenor f and Rate Record Day t, the Accrual Start Date;

$E_{f,t}$ means, with respect to Tenor f and Rate Record Day t, the Accrual End Date;

$\delta_{S_t,E_{f,t}}$ means, with respect to Accrual Start Date $S_{f,t}$ and Accrual End Date $E_{f,t}$, the day count fraction calculated in accordance with the following formula:

$$\delta_{S_{f,t},E_{f,t}} = \frac{Days(S_{f,t}, E_{f,t})}{DayCount_{RR}}$$

Where:

Days($S_{f,t}$, $E_{f,t}$) means the number of Calendar Days from and including Accrual Start Date $S_{f,t}$ to and excluding Accrual End Date $E_{f,t}$;

$AP_{f,t}$ means the set of Reference Rate Business Days occurring in the period from and including the Accrual Start Date $S_{f,t}$, to and excluding the Accrual End Date $E_{f,t}$;

u means a Reference Rate Business Day;

$u + 1$ means the Reference Rate Business Day immediately succeeding Reference Rate Business Day u;

$\delta_{u,u+1}$ means, with respect to Reference Rate Business Days u and $u + 1$, the day count fraction calculated in accordance with the following formula:

$$\delta_{u,u+1} = \frac{Days(u, u+1)}{DayCount_{RR}}$$

Where:

Days(u, $u + 1$) means the number of Calendar Days from and including Reference Rate Business Day u to and excluding Reference Rate Business Day $u + 1$; and

RFR_u means the Value of the Reference Rate on Reference Rate Business Day u.

CALCULATION OF SPREAD ADJUSTMENT

1.3 The Spread Adjustment, SA, with respect to an IBOR, each Tenor f and each Rate Record Day t on and following the Spread Adjustment Base Date, shall be calculated by the Adjustment Services Vendor in accordance with the following formula, and rounded to the nearest Rounding Precision (breaking ties by rounding half away from zero):

If Rate Record Day tt is on or prior to the Spread

Adjustment Fixing Date:

$$SA_{f,t} = Median\left(\{u \in MP_{f,t} | L_{f,u} - ARR_{f,u}\}\right)$$

Otherwise:

$$SA_{f,t} = SA_{f,t-1}$$

Where:

$SA_{f,t}$ means the Spread Adjustment for Tenor f on Rate Record Day t;

$SA_{f,t-1}$ means the Spread Adjustment for Tenor f on the Rate Record Day immediately preceding Rate Record Day t;

$MP_{f,t}$ means, with respect to Tenor f and Rate Record Day t, the Median Period;

u means a Median Period Day in the median period $MP_{f,t}$;

$L_{f,u}$ means, with respect to Tenor f, the Value of the IBOR on Median Period Day u if u is prior to the Tenor Cessation Trigger Date, otherwise the interpolated value calculated in accordance with the following formula:

$$L_{f,u} = \frac{L_{f_0,u} \times Days\left(IM_{f,u}, IM_{f_1,u}\right) + L_{f_1,u} \times Days\left(IM_{f_0,u}, IM_{f,u}\right)}{Days\left(IM_{f_0,u}, IM_{f_1,u}\right)}$$

Where:

f_0 and f_1 mean, with respect to Tenor f and Median Period Day u, the Lower Interpolation Tenor and Upper Interpolation Tenor, respectively;

$IM_{f,u}$, $IM_{f0,u}$, and $IM_{f1,u}$ mean, with respect to Median Period Day u, the IBOR Maturity Dates for Tenors f, f_0, and f_1, respectively;

Days($IM_{f,u}$, $IM_{f1,u}$), Days($IM_{f0,u}$, $IM_{f,u}$) and Days($IM_{f0,u}$, $IM_{f1,}u$) mean the number of Calendar Days from and including IBOR Maturity Dates $IM_{f,u}$, $IM_{f0,u}$, AND $IM_{f0,u}$ to and excluding IBOR Maturity Dates $IM_{f1,u}$, $IM_{f,u}$, and $IM_{f0,u}$ respectively; and

$ARR_{f,u}$ means the Value of the Adjusted Reference Rate on Median Period Day u.

Endnotes

1 ISDA, LIBOR Currency/Maturities Discontinuations Guidance Note, 25 March 2013

2 Royal Bank of Australia, Interest Rate Benchmarks for the Australian Dollar, 20 September 2018

3 ICE Benchmark Administration, ICE LIBOR Methodology, retrieved 23 December 2020

4 Oliver Wyman, Changing the World's most important number - Libor Transition, 2018, Page 4, Footnote 1

5 See David Ellis and Bruno Campana, Reforming the Benchmarks: Similarities and Differences between LIBOR and Euribor, March 2013

6 "it would appear that most syndicated loans would effectively convert to ABR upon a cessation of LIBOR (an average of 300 bps higher than current three month LIBOR)" ARCC, ARRC Recommendations Regarding More Robust Fallback Language For New Originations of Libor Syndicated Loans, 25 April 2019, page 13

7 ISDA, Supplements to the 2006 ISDA Definitions, Supplement 70

8 The last day of the 5-year period is 3 months before the Cessation Date to allow for the compounding of the RFR (over the same period as the LIBOR, i.e. 3 months) to finish on the Cessation Date. The example does not consider holidays or offset days for the fixing of the different indices when calculating the relevant dates.

9 ARCC, ARRC Recommendations Regarding More Robust LIBOR Fallback Contract Language For New Closed-End, Residential Adjustable Rate Mortgages, 15 November 2019

10 ARRC, ARRC Announces Further Details Regarding Its Recommendation of Spread Adjustments for Cash Products, 30 June 2020

11 ARCC, ARRC Recommendations Regarding More Robust Fallback Language For New Issuances Of LIBOR Floating Rate Notes, 25 April 2019

12 BOE, Bank of England signs up to ISDA's IBOR Fallbacks Protocol, 23 October 2020

13 ISDA, Bilateral Forms for IBOR Fallbacks

14 ARCC, ARRC Recommendations Regarding More Robust Fallback Language For New Issuances Of LIBOR Floating Rate Notes, 25 April 2019, Part V

15 FCA, Benchmarks Regulation – proposed new powers, first published 23 Jun 2020

16 ESMA, Guidelines on performance fees in UCITS and certain types of AIFs, 3 April 2020

17 BOE, The FCA and the Bank of England encourage market participants in further switch to SONIA in interest rate swap markets, 28 September 2020

18 ARCC, ARRC Press Release for the Publication of Forward-Looking SOFR Term Rates, 10 September 2020

19 ICE, ICE Benchmark Administration to Consult on Its Intention to Cease the Publication of One Week and Two Month USD LIBOR Settings at End-December 2021, and the Remaining USD LIBOR Settings at End-June 2023, ICE Press Release, 30 November 2020

20 ICE, ICE Benchmark Administration to Consult Its Intention to Cease the Publication of GBP, EUR, CHF and JPY LIBOR, ICE Press Release, 18 November 2020

21 FCA, FCA response to IBA's proposed consultation on intention to cease US$ LIBOR, FCA Press Release, 30 November 2020

22 The one-week rate can be interpolated using the overnight and one-month rates, and the two-month rate can be interpolated using the one-month and three-month rates.

23 ISDA, The Path Forward for LIBOR (Transcript of Webinar), 4 December 2020

24 LIBOR – are you ready for a life without LIBOR from end-2021? – Speech by Edwin Schooling Latter, Director Markets and Wholesale Policy at the FCA, delivered at City & Financial's Managing LIBOR transition event on 26 January 2021.

25 The Working Group on Sterling Risk-Free Reference Rates , Active transition of GBP LIBOR referencing bonds, September 2020

26 The Working Group on Sterling Risk-Free Reference Rates, RFR Working Group Roadmap

27 The longest dated LIBOR-indexed bonds mature in 2025.

28 The Working Group on Sterling Risk-Free Reference Rates , Active transition of GBP LIBOR referencing bonds, September 2020

29 ISDA SwapsInfo transforms and summarizes publicly available data on OTC derivatives trading volumes and exposures, as reported to Depository Trust & Clearing Corporation (DTCC) and Bloomberg swap data repositories (SDRs).

30 Risk.net, First all-RFR cross-currency swap traded, 26 November 2019

31 Risk.net, Cross-currency swaps will use RFRs on both legs, says JP exec, 10 December 2020

32 EMEAP Working Group on Financial Markets, Study on the Implication of Financial Benchmark Reforms, September 2019, section 11.

33 ICE Benchmark Administration, ICE LIBOR Methodology, retrieved 23 December 2020