SOLUM FINANCIAL
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IBOR Reform
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Executive Summary

Since its first official publication in 1986 the BBA LIBOR fixing and other related IBORs have helped contribute to the exponential growth of the derivatives market. Alongside cash-based products that also reference IBORs, the total outstanding is estimated to run in hundreds of trillions of dollars[1]. IBORs are therefore pervasive in financial markets and their replacement with new regulatory approved reference rates is a monumental undertaking.

Solum Financial formulates this white paper to provide the reader with an overview of key developments that have shaped the IBOR reform debate; current collaborative initiatives being undertaken by industry bodies, regulators and key market participants; the challenges they face and the current status of these reforms.

The reforms are further complicated by the replacement of IBORs with transactional based RFRs where volumes and liquidity are concentrated in overnight trades. Although a term RFR is not proposed at this point, even if it were, the absence of a banking credit premium would cause a significant change in market value for legacy transactions. The various options to fix a term credit premium as part of the fallback mechanism are an attempt to minimise this value transfer between entities, however it is unlikely to be a seamless process.

The approach in some jurisdictions to continue with a reformed IBOR alongside IBA expectations of a newly approved LIBOR would on the face of it obviate the need for such a large-scale exercise.

However, no prudent regulator or financial market participant can operate hoping for indefinite continuation of IBORs. Addressing the fundamental flaws in IBOR procedures may present the industry with a unique opportunity to strengthen confidence in the financial markets and all participants need to plan ahead and be prepared for more challenging alternative outcomes as and when they emerge.

As developments are being made on a frequent basis, the reader should bear in mind that Solum presents a snapshot as of the date of this White Paper publication and that the reform landscape is continuously changing.

[1] *Preparing for Transition: Update on LIBOR and a possible shift to alternative reference rates – March 2018*

Glossary

AFME	Association of Financial Markets in Europe
ALCO	Asset-Liability Committee
ARRC	Alternative Reference Rate Committee
BBA	British Bankers Association
BBSW	Bank Bill Swap
BGCR	Broad General Collateral Rate
BMR	(European) Benchmark Regulation
BoE	Bank of England
BoJ	Bank of Japan
CARR	Canadian Alternative Reference Rate Working Group
CCP	Central Counterparties
CDOR	Canadian Dollar Offered Rate
CME	Chicago Mercantile Exchange
CORRA	Canadian Overnight Repo Rate Average
DV01	Dollar Duration
ECB	European Central Bank
EMMI	European Money Markets Institute
EONIA	Euro OverNight Index Average
ESTER	Euro Short Term Rate
ETD	Exchange Traded Derivatives
EURIBOR	Euro Interbank Offered Rate
FCA	Financial Conduct Authority
FRN	Floating Rate Note
FSB	Financial Stability Board
G20	Group of Twenty
GFC	Global Financial Crisis
IBA	ICE Benchmark Administration
IBOR	Interbank Offered Rate
ICMA	International Capital Market Association
IFRS	International Financial Reporting Standards
IOSCO	International Organisation of Securities Commission
ISDA	International Swaps and Derivatives Association
LDI	Liability Driven Investment
LIBOR	London Interbank Offered Rate
NWG	National Working Group on CHF Reference Rates
OIS	Overnight Index Swap
OSSG	(FSB) Official Steering Group
OTC	Over the Counter
PAI	Price Alignment Interest
PV	Present Value
RFR	Risk Free Rate
SARON	Swiss Average Rate Overnight

SIFMA	Securities Industry and Financial Markets Association
SOFR	Secured Overnight Financing Rate
SONIA	Sterling Overnight Index Average
TGCR	Tri-Party Collateral Rate
TIBOR	Tokyo Interbank Offered Rate
TONAR	Tokyo Overnight Average Rate
TOIS	(Switzerland) Tomorrow/Next Indexed Swaps
xVA	Derivatives Valuation Adjustment (includes all of CVA/DVA/FCA/FBA/KVA/etc.)

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IBOR Reform

1.1 Why Reform IBOR?

IBOR fixings are intended to represent the interest rate charged on short-term (unsecured) loans made between banks. Since the financial crisis the volume of these transactions has diminished significantly leading regulators to question their transaction-based definition. IBORs are systemically important to financial markets due to the fact they are extensively referenced in derivative, bond and loan documentation, and in a wide range of consumer lending instruments such as mortgages and student loans.

It is reported that there are over $350 trillion worth of LIBOR referencing financial products, with 3-Month USD LIBOR rate being the most commonly quoted[2]. It is also estimated OTC and ETD account for 80% of IBOR-linked contracts[3].

Historically, IBOR has been widely used as a measure of trust in a given financial system as it reflects the confidence banks have in each other's financial health. Thus, it serves as a barometer for market participants and observers to assess the general health of the banking sector and consequentially the wider economy. The recent manipulation scandal has led many to question the validity of these benchmarks and whether it truly serves its intended purpose. Furthermore, strict regulations, brought in since the GFC, have inadvertently reduced the liquidity within the interbank funding market further compounding the lack of transparency of the reported rates.

In the absence of robust transactional data to base IBOR consensus on, individual submissions have become a subjective and unclear process requiring "expert" judgment by each contributing bank. Consequently, there has been an observable downwards trend in rate submitters willing to sustain the various benchmarks, due to their sensitivities towards perceived litigation risks. Since 2013, EURIBOR panel of contributor banks has decreased from 43 to 20.

In addition, the definition of IBOR implies that it must contain an inherent banking credit risk premium and as such it may not be suitable for certain financial products. For example, one could argue that borrowers should not be burdened with the risks that their variable rate payments would increase by virtue of the general confidence in banks falling.

Following on from the Wheatley review into LIBOR, the FSB and various other industry bodies have been spearheading collaborative initiatives to strengthen or reform the IBOR processes[4].

1.2 IBOR vs. RFR

Before continuing with the paper, it is worth establishing the fundamental differences between IBOR and RFR:

- IBOR is a rate used for unsecured transactions and some RFRs are related to secured transactions.
- IBORs are set considering the credit risk of the borrowing institution i.e. it is not risk free by definition. RFRs do not (broadly) reflect this credit risk.
- IBORs are set for various maturities not just overnight and for the longer terms include an additional credit risk element not included in overnight RFRs.
- RFRs do not use one uniform method for their calculation e.g. the way SONIA is calculated differs from the way SARON is calculated. This is not such an acute issue between different IBOR rates.

[2] *LIBOR's Uncertain Succession Triggers $350 Trillion Headache – July 2017*
[3] *IBOR Global Benchmark Survey 2018 Transition Roadmap – February 2018*
[4] *The Wheatley Review – July 2012*

- IBORs are a forward-looking rate that can be set at the beginning of an interest period and allow a borrower to calculate its interest bill in advance. This facilitates cash flow budgeting. On the other hand, RFRs in their current form, have no term element and so would need to be modified for use in loans possibly by compounding overnight rates for the relevant period in arrears. This would imply that RFRs would be backwards looking. Some borrowers might find this problematic at least initially.

1.3 Industry Work to Facilitate IBOR Reform

The FCA is currently responsible for regulating LIBOR while IBA administers and publishes LIBOR. ICE LIBOR, formerly known as BBA LIBOR, is the benchmark rate produced for CHF, EUR, GBP, JPY, USD with seven maturities quoted for each ranging from overnight to 12 months, producing 35 rates each business day.

In February 2013, the G20 commissioned the FSB to review the major interest rate benchmarks following its concerns regarding the reliability and robustness of major benchmarks such as EURIBOR, LIBOR and TIBOR, collectively known as the IBORs.

A review conducted by the FCA in 2013 recommended the replacement of LIBOR with alternative RFRs. The FSB published its report on interest rate benchmark reform in July 2014 and concluded that an RFR is in many cases are more suitable than an IBOR which is not supported by sufficient transactional data to make it robust[5]. As well as establishing working groups to identify alternative IOSCO compliant RFRs, they also launched initiatives for transition planning.

In July 2017, Andrew Bailey announced that the FCA had reached a voluntary agreement between current panel banks to sustain LIBOR in its current form until the end of 2021[6]. As LIBOR will not be banned post 2021, it is possible that it will continue to be published by the IBA if it can garner sufficient submissions from the panel banks. It is in fact an objective of the IBA to ensure that a revised version of LIBOR, using its "Waterfall Methodology", satisfies regulators in order for continued publications [7].

As the industry grapples with the complexity and scale of amending existing contracts with new reference rates, the continued publication of LIBOR in a revised format could seem appealing. However, it is debatable as to whether panel banks will continue to voluntarily provide the submissions or whether the revised LIBOR would satisfy BMR[8].

Furthermore, there is clear regulatory guidance that although the transition to RFRs is led by the market, it is neither safe nor acceptable to assume that IBORs will continue to be published indefinitely. In this respect, regulators support the work being done to incorporate a fallback rate into existing documentation and to see a transition to derivatives that reference new benchmarks based upon liquid transactions.

Some market participants would prefer IBORs to continue and not have to deal with a transition. As it is quite possible that LIBOR will continue to be published after 2021, there is a degree of wait and see in the market, which will undoubtedly hinder a faster adoption of the new RFRs. In addition to this, the situation is not uniform across major jurisdictions. Some regional regulators have approved the continued use of their own IBORs alongside the new RFRs, most notably Japan and Australia with TIBOR and BBSW respectively. There is also some indication that a reformed EURIBOR will also be maintained[9].

[5] *Reforming Major Interest Rate Benchmarks – July 2014*
[6] *The future of LIBOR – July 2017*
[7] *ICE LIBOR*
[8] *EU Benchmark Regulations – June 2016*
[9] *EURIBOR can stay if reforms succeed – ECB's Holthausen – May 2018*

Additionally, the roll-off of LIBOR linked products is significant. The New York Fed has estimated that approximately 80% of the existing USD LIBOR market footprint matures by the end of 2021. However, it is worth noting that new contracts referencing LIBOR are being written everyday which may negate the validity of the previous statistic[10].

Bailey's speech alongside BMR coming into force has resulted in renewed momentum within the industry. ISDA along with the various FSB OSSGs are working to identify alternative RFRs and to develop a mechanism to implement fallbacks into existing and future contracts.

The areas of work broadly fall into two categories: firstly, fallback rates need to be documented into legacy contracts. Secondly a transitional arrangement is needed to move current contracts on to new RFRs if major IBOR benchmarks cease to exist.

1.3.1 Fallback Rate Documentation

ISDA is leading the work on implementing the fallback rate documentation. In 2016, ISDA established working groups on the development of alternative reference rates and fallbacks. ISDA has confirmed that the current approach, subject to change, is to consider RFRs as the successor/fallback rate for IBOR.

According to ISDA, existing fallback provisions reference bank polling and address a scenario where IBOR is temporarily unavailable rather than permanently withdrawn. This is an unsustainable solution as it is likely that banks may not respond to a poll and it is certainly not transparent or scalable. This would mean that new fallback clauses for all derivative positions linked to IBORs would need the help of an industry-wide protocol. ISDA admits it may not be possible to develop consistent fallback rates for all currencies involved.

As RFRs represent a risk-free rate it does not contain the bank credit risk inherently embedded within IBOR. Furthermore, RFRs are overnight rates and are therefore not mechanically equivalent to IBOR which represents a term tenor such as 3 months. As such, there will undoubtedly be a value transfer between entities if a transaction switches from IBOR to their respective RFRs. At this point it is not clear how this value transfer will be quantified and how this will be remediated. As a result, some swaps users are already considering moving out of IBOR-linked products early, most notably on the buy-side[11].

One potential remedy to minimise the value transfer has already been proposed by the ISDA working groups. It involves the introduction of fallback rates that are aligned with IBOR by applying a credit spread on to the relevant RFR, the so-called "synthetic IBOR". To date, no consensus has been reached on how to calibrate this missing credit spread embedded within IBORs.

Suggested proposals range from a snapshot of the IBOR-RFR basis on a single day before the benchmark ends to an average calculation over a defined period or alternatively via a two-way auction.

Another prospective solution is that the credit element embedded in IBOR based transactions is represented by the IBOR-OIS basis term market. Therefore, any resultant PV change that occurs by switching to the new rate can be cash settled by referencing a market observable spread. To avoid cash settlement a spread can be added to the OIS leg or alternatively the fixed coupon could be amended.

This methodology would aid all transactions in switching to the new rate without the need for a synthetic IBOR. It is possible that the Interbank broker dealer market could transition in this way however for end users this may be more problematic. For example, the IBOR trade may be hedging a cash based IBOR transaction which

[10] *Federal Reserve Bank of New York: Reference Rates – April 2018*
[11] *LIBOR concerns prompt switch to SONIA swaps – March 2018*

would not transition simultaneously thereby creating a new basis risk. Additionally, hedge accounting tests may be broken creating the possibility of revenue impacts, net income volatility and growing balance sheets.

Some argue that the use of a synthetic IBOR is the least disruptive way of managing a sudden discontinuation of a major IBOR benchmark. Others contend that they would get locked in at some arbitrary spread that is not reflective of the trade economics.

ISDA has acknowledged that whichever methodology is adopted, it needs to be robust enough to tackle the risk of manipulation as well as minimise the value transfer of moving a contract to a new rate.

1.3.2 RFR Transitional Arrangements

Industry working groups, including the ARRC and equivalent groups in the UK and Japan, are focused on RFR transitional arrangements.

The development of each RFR is made more complicated by the currency specific proposals from the respective jurisdictional working groups. For example, the US and Swiss RFRs will be secured rates, whilst the UK and Japan have opted for an unsecured rate. In Europe, however, a decision on whether to use secured or unsecured has not been made, following on from their announcement to not progress with a reformed EONIA. These regional differences have provided an obstacle in the development of a single, global methodology for each currency's fallback rate.

1.3.3 RFR Liquidity Requirement

As most of the proposals result in a new rate for the currency-specific RFR, there is a requirement to establish liquidity in the new swaps market in a short timeframe, in order to measure the basis between the RFRs and their respective IBORs. For example, in the US (the biggest IRS market), SOFR has only been in existence since April 2018 with the associated futures only debuted by CME in May 2018[12].

Furthermore, building liquidity in the term structure of overnight rate swaps is not a straightforward process. For example, in many currencies the OIS swap rate is currently only liquid for relatively short dated trades and not for longer dated maturities. This would require the spread to be inferred from longer term IBOR-OIS basis swaps which currently reflect an element of supply/demand imbalances rather than exclusively containing a bank credit spread.

Using a fixed point in time or an average rate to determine the relevant spread to the RFR would essentially plot out a curve which could then be applied as the fallback to IBOR in the eventuality of a major benchmark discontinuation at any point in the future. However, the issue of having to establish liquidity in the underlying RFR swaps to observe the spread and concerns around whether the curve could be moved in anticipation of switching activity have already arisen in the sterling market.

It is also possible to apply an observed bank credit spread to the RFR dynamically on a daily basis to replicate a 3-month IBOR that is set every day to include bank credit but the methodology, governance and regulation of this is unclear at this stage.

[12] *CME Group: Secured Overnight Financing Rate (SOFR) Futures*

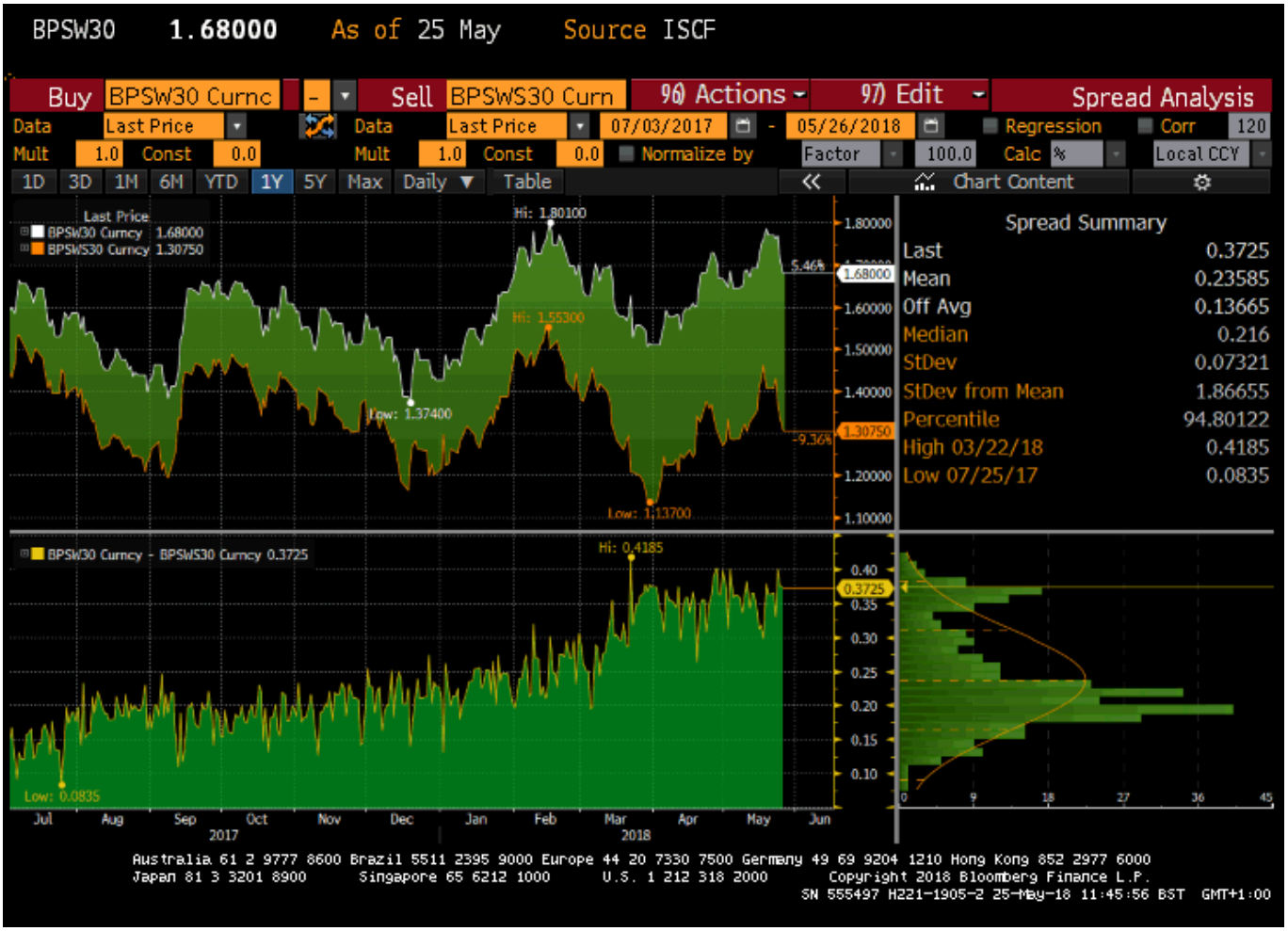
Current Status

There are broadly four demographics of market participants.

i. Wait and See – Assume IBOR publication will continue in the longer term
ii. Fallback – Accept the default fallback solution
iii. Opportunistic Switching – Trade out of IBOR based products over time
iv. Movers – Eliminate the uncertainty and move to RFRs for example SONIA swaps

It has been reported that certain LDI funds are already using SONIA swaps in their hedging activity[11]. This has caused long dated LIBOR-SONIA spreads to move from 12bps in July 2017, prior to the Andrew Bailey speech, to a level of 37bps in May 2018.

Figure 1 – Long dated 30Y LIBOR-SONIA spread (Source: Bloomberg)



This is mainly due to a lack of SONIA based paying products. Alternatively, this may have also been driven by an extension of the asset management industry moving away from derivatives into gilts brought about by the inclusion of xVAs, clearing and leverage costs now inherent in derivative pricing.

1.4 Selection of Appropriate RFRs

Working groups have been set up, in several jurisdictions, to bring together representatives from both the public and private sectors to determine the most appropriate RFRs in the relevant jurisdictions.

Table 1 – Jurisdictional Working Group

Jurisdiction	Working Group Title
UK	Working Group on Sterling Risk Reference Rates
US	The Alternative Reference Rates Committee
Japan	The Japanese Study Group on Risk Free Reference Rates
Switzerland	The National Working Group on CHF Reference Rates

European policy-makers have also announced the launch of a similar public/private-sector working group to consider a euro risk-free rate[13]. Similarly, The Bank of Canada announced, in March 2018, the formation of an Alternative Reference Rate Working Group, CARR, to consider the creation of a new risk-free Canadian dollar rate to exist alongside CDOR[14]. Similar to other central bank approaches, it is expected to look at ways of broadening the traded volumes that are included in the existing Canadian overnight rate, CORRA.

The working groups listed in Table 1 have already identified their preferred RFRs. This represents four of the five currencies for which LIBOR is currently published.

Table 2 – Selected RFRs

Jurisdiction	RFR Selected	Comments
UK	SONIA	The BoE took over the administration and publication of the SONIA on April 23 (St Georges day)
US	SOFR	The New York Fed began publication of the Treasury repo reference rates on April 3, 2018, reflecting the SOFR, alongside the BGCR and the TGCR from April 2, 2018
Switzerland	SARON	SARON became the reference overnight fixing leading to the discontinuation of the TOIS fixing and clearing of TOIS swaps in 2017
Japan	TONAR	TONAR is currently published by the BoJ

It is ISDA's belief that a multi-rate approach in Japan and Australia could reduce the amount of bilateral negotiation and the amended rates could be used in non-derivative products.

For EUR the decision on a preferred RFR has yet to be made. An added complication is that EONIA is currently not an approved benchmark from 2020. An ECB overnight rate based on wholesale borrowing rates, ESTER, is expected to follow a consultation this year but is unlikely to be published until 2019. Meanwhile, the EMMI is reforming EURIBOR such that it remains an approved benchmark; the current plan is for EURIBOR to remain as a fixing rate for derivatives.

1.5 Non-Derivative Products

Other products also reference IBORs; loans, bonds and securitised products all use these benchmarks to some degree. According to the ARRC, around $1.2 trillion of FRNs reference LIBOR, as well as a total of roughly $6.2 trillion of syndicated loans, corporate loans, general business loans and commercial mortgages[15].

[13] *New Working Group on a risk-free reference rate for the euro area – September 2017*
[14] *Canadian Alternative Reference Rate Working Group*
[15] *Second Report: The Alternative Reference Rates Committee – March 2018*

For these products the existing contractual fallbacks differ and in some cases, they are non-commercial. As an example, in the US loan market, the rate may transfer to the US prime rate which is currently 2% higher. For FRNs the fallback could be the last published rate effectively converting them into fixed rate bonds.

While ISDA, as a centralised body, is working on a protocol to migrate legacy derivatives contracts on to new reference rates should major IBOR benchmarks cease, this protocol would not be applicable to individual bond issuances or consumer loans where, unlike the standardised ISDA derivative documentation, terms are unique to the bank provider. Contracts referencing these instruments would require manual repapering, an expensive and time-consuming process for banks and clients alike. This may help explain why some regulators are keen to strengthen the existing benchmarks rather than adopt new RFRs for cash-based products.

1.6 Nine Challenges to Overcome for a Successful IBOR Transition

In February 2018, ISDA, AFME, ICMA and SIFMA produced a transition roadmap that highlighted the challenges to overcome for a successful transition and a significant reduction in the reliance on IBOR with minimal market disruption[3]. These challenges have been summarised in Table 3.

Table 3 – Nine Challenges to Overcome for Successful Transition

Challenge	Comments
Market Adoption of RFRs and Liquidity	It should be a prerequisite that the alternative RFR market is sufficiently liquid prior to adoption as a benchmark reference rate. This can be achieved by dedicated resources and educating all market participants about RFRs. Exchanges and CCPs can also play their part by listing and clearing standardised products that reference alternative RFRs. Selection of an overnight rate as an RFR would remove any IBOR-OIS basis risks currently seen in collateralised trades. It is unclear whether the collateral remuneration rates will be standardised to the jurisdiction's chosen RFR.
Legal	Inconsistent approaches exist when it comes to fallback rates in the documentation of legacy transactions referencing IBORs. These documents need to be reviewed and segmented accordingly. Other contractual amendments, which may lead to an increased upfront cost and increased operational risks must be considered when transitioning from IBORs to RFRs. This is will be made more difficult when counterparties have diverging incentives. The legal exercise of amending existing documentation will require a significant amount of administrative effort.
Valuation and Risk Management	Mechanisms need to be established to minimise value transfer between entities with respect to legacy transactions. For less effective hedges, the transition to RFRs may not occur at the same time or on the same terms for both the underlying asset/liability and the corresponding hedge(s). It is worth noting that IBORs provide market participants certainty because they are fixed in advance, meanwhile RFRs by design can only be determined at the end of the period (i.e. in arrears).
Infrastructure	Once definitive RFRs have been chosen and there is a clear jurisdictional transition plan, institutions must perform broad risk assessments to identify

	whether their infrastructure is adequate enough to support an RFR environment. The exact definition of infrastructure could include trading and clearing data; systems, operational procedures etc. Market participants may have to make significant investments to meet these operational requirements.
Tax	Market participants must consider whether alternative RFR transition would result in an acceleration of payments on financial contracts or tax structures.
Accounting	A switch to alternative RFRs may lead financial instruments and their corresponding hedges to be booked separately in the event that IBOR and RFR are not effectively offset. This may result in net income volatility and growing balance sheets if not managed in proactively. Institutions utilising accrual accounting under IFRS may crystallise profit or loss upon RFR conversion. Maintaining hedge accounting relationships would require significant work. Furthermore, an inconsistent adoption of a new RFR could cause an economic mismatch and a broken hedge.
Governance and Controls	Once definitive RFRs have been chosen and there is a clear jurisdictional transition plan, institutions must establish robust governance and controls when transitioning their contracts from IBORs to alternative RFRs.
Regulatory	Existing regulatory requirements may add unnecessary burdens to the alternative RFRs transitions. For example, existing margining rules may be triggered for existing derivative transactions if they are transitioned to an alternative RFR. Regulators need to explore the possibility of implementing exemptions to the clearing mandate for legacy contracts.

1.7 The Role of Clearing Houses

In order to promote market acceptance of the new RFRs it is essential that Clearing Houses broaden their offerings to accept transactions against the new indices. For currencies where the RFR is a modification of an existing rate such as SONIA this will not be problematic. However, for currencies where a new rate has been established, such as SOFR, these will need to be added to the suite of cleared products.

The current usage of OIS swaps in various markets also represents a challenge for some currencies. TONAR OIS swaps have traded significantly less than their peers in other currencies. According to swap data compiled by Clarus FT, TONAR only makes up a total of 0.4% of all swaps traded in the JPY market over the first half of 2017. By contrast, in the US dollar market, its OIS rate (Fed Funds) comprised 61% of all swaps traded across the main clearing houses. In Sterling and Euro, OIS as a percentage of total swap volume across the clearing houses was 48.4% and 47.4%, respectively. It should be noted that this is in notional terms rather than DV01 which also suggests that liquidity needs to be built across the term structure rather than just in the shorter end of the curve[16].

[16] *OIS Volumes: What is the trend – April 2018*

1.8 Conclusion

Since its first official publication in 1986 the BBA LIBOR fixing and other related IBORs have helped contribute to the exponential growth of the derivatives market. Alongside cash-based products that also reference IBORs, the total outstanding is estimated to run in hundreds of trillions of dollars. IBORs are therefore pervasive in financial markets and their replacement with new regulatory approved reference rates is a monumental undertaking.

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The approach in some jurisdictions to continue with a reformed IBOR alongside IBA expectations of a newly approved LIBOR would on the face of it obviate the need for such a large-scale exercise.

However, no prudent regulator or financial market participant can operate hoping for indefinite continuation of IBORs. Addressing the fundamental flaws in IBOR procedures may present the industry with a unique opportunity to strengthen confidence in the financial markets and all participants need to plan ahead and be prepared for more challenging alternative outcomes as and when they emerge.

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