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## Considerations for a Transition to SOFR and other Alternative Rates

By Parth Purohit

With the sunset on LIBOR approaching, regulators have consistently urged market participants to be prepared to support floating rate instruments that are not linked to the index. In June 2017, the Alternative Reference Rates Committee (ARRC) chose the Secured Overnight Financing Rate (SOFR) as the replacement rate for USD LIBOR in financial contracts because of its transparency and robust underlying market.

Although there has been progress in the development of the SOFR market, it has not been fully embraced yet by all investors as it may lack certain features that are important to market participants. Other alternative rates are being developed by various parties to help facilitate the transition away from LIBOR without losing some of its important traits. We attempt to examine certain hurdles for the SOFR market and explore other alternative rates to see how they may apply for investors in managing their own balance sheet.

### ***Secured Overnight Financing Rate (SOFR)***

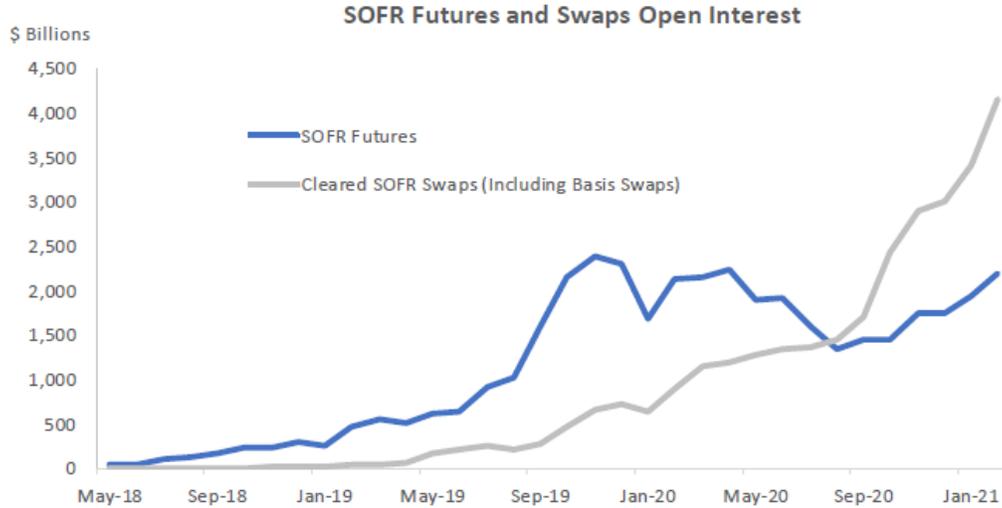
SOFR represents the cost of borrowing cash collateralized by Treasury securities overnight. The US treasury repo markets tend to exhibit very deep liquidity with an average daily volume of \$900 billion in March 2021<sup>1</sup>, making it a good indication of how a broad range of financial institutions fund themselves today. The benefit of SOFR's resilient underlying market makes the index construction very transparent and difficult to manipulate. However, it presents other challenges including the development of the SOFR-based derivative and loan market, the lack of a credit component and difficulty in developing a forward-term SOFR rate. We illustrate some of these obstacles below.

### ***The development of the SOFR market is progressing***

As of March 2021, there is over \$6 trillion notional of open interest on SOFR-based futures and swaps, with a noticeable increase in swaps since the clearinghouses moved to SOFR discounting in October 2020 as shown in the chart below.

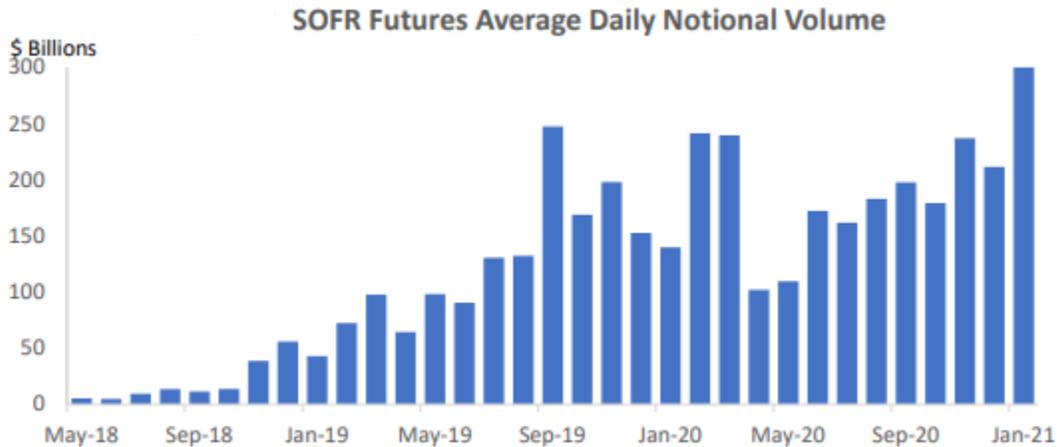
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<sup>1</sup> Federal Reserve Bank of New York, "Secured Overnight Financing Rate Data", *The Federal Reserve Bank of New York*, New York, 2021



Source: The Commodity Futures Trading Commission (CFTC), ARRC

It is encouraging that we are seeing open interest in SOFR-based derivatives increase in just a few years. SOFR futures average daily volumes have generally increased since May 2020 to nearly \$300 billion notional per day in January 2021, adding to market liquidity as illustrated below.



Source: CME Group, Intercontinental Exchange (ICE), ARRC

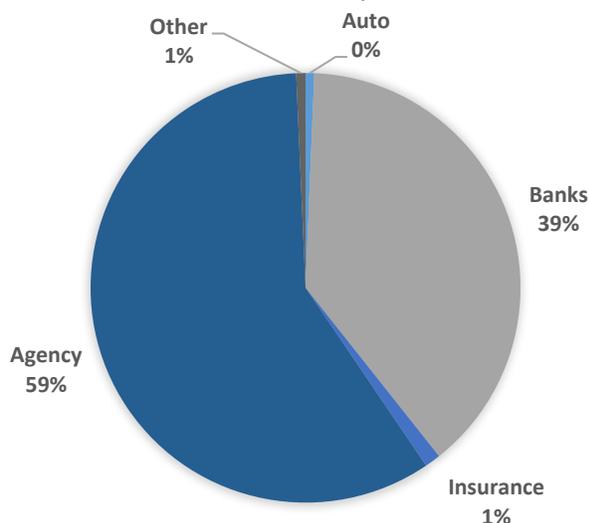
Although currently a small percentage of the LIBOR-based derivative market<sup>2</sup>, there is an identifiable potential for the derivative market to strengthen as we get closer to the end of the year since the official sector has recommended that investors cease entering into new LIBOR-based contracts by December 31,

<sup>2</sup> The Alternative Reference Rates Committee, “Progress Report: The Transition from U.S. Dollar LIBOR”, *The Federal Reserve Bank of New York*, New York, 2021, p. 6

2021<sup>3</sup>. Some investors may actively convert their derivatives to SOFR. Prior to the cessation dates<sup>4</sup>, LCH and CME will transition legacy LIBOR contracts to the appropriate risk-free-rate plus a non-compounded credit spread adjustment which should help facilitate the development of the SOFR derivative market. There could also be increased usage of SOFR for LIBOR-based derivatives that expire after June 2023.

The issuance of SOFR floaters increased by approximately \$575Bn in 2020. As of the end of February 2021, there was nearly \$950bn in total SOFR public floating rate debt issuance. In fact, SOFR issuance in floating rate notes has been larger than LIBOR issuance since the beginning of 2020<sup>5</sup>. However, nearly all the SOFR issuance came from agencies, banks and the financing arms of some non-financial corporations as shown in the pie chart below. Participation from a broader range of issuers should aid in the development of the market.

**SOFR FLOATING RATE NOTE ISSUANCE \$744 BN: JAN 2020 - FEB 2021**



Source: SECOR, Barclays

Some positive signs for further development in the SOFR-based cash market include<sup>6</sup>:

- First non-financial SOFR-based corporate issuance
- Agencies accepting SOFR ARMs with consistent conventions based on ARRC recommendations
- Agencies have ceased the acceptance of LIBOR ARMs after December 31, 2020

<sup>3</sup> Board of Governors of the Federal Reserve System (Fed), Federal Deposit Insurance Corporation (FDIC), Office of the Comptroller of the Currency (OCC), “Statement on LIBOR Transition”, *The Fed, FDIC, OCC*, November 30, 2020

<sup>4</sup> Cessation Dates = Immediately following publication on December 31, 2021 for 1-week, 2-month USD LIBOR and June 30, 2023 for overnight and 1, 3, 6 and 12-months USD LIBOR settings

<sup>5</sup> CME Group, “Secured Overnight Financing Rate (SOFR) Futures”, *CME Group, Inc*, Chicago, Illinois, 2021

<sup>6</sup> The Alternative Reference Rates Committee, “Progress Report: The Transition from U.S. Dollar LIBOR”, *The Federal Reserve Bank of New York*, New York, 2021, p. 8-15f

- Cooperation between ARRC and ISDA to ensure consistent fallback language where possible on new cash products
- NYS legislation, to address LIBOR-based products with insufficient language being included in the proposed 2022 Budget

Thus far there has been a lack of uniformity in cash flow accrual and payment conventions for SOFR- based notes. As mentioned above, normalizing the conventions to bring consistency among the products, as agencies have been doing, should help with cash flow planning, modeling and valuations, which may improve market liquidity. Including legislation, based on the ARRC's recommendations, into the NYS Executive Budget is also very important because it may lead to passing a law to automatically switch tough legacy contracts lacking LIBOR fallback language to SOFR contracts. This would, at a minimum, help to ensure the continuation of those contracts without potentially lengthy legal battles.

One area that the ARRC points out that seems to be progressing particularly slowly is bilateral floating rate business loans where banks are still primarily offering LIBOR-based loans. Based on a survey of the ARRC's Nonfinancial Corporate Working Group members, roughly two-thirds of those who responded reported not having discussed or been offered any alternatives to LIBOR by banks.

It is crucial that the cash markets offer lending based on SOFR. The derivative and cash markets are dependent on each other. It is difficult to develop one without the other. As we begin to see more institutions offering SOFR-based loans, it should help facilitate liquidity in the derivative market.

Perhaps SOFR-based loans have been slow to develop in part due to how certain market participants manage their assets and liabilities. Ideally, an all-encompassing benchmark (1) would reflect interest rates in core money markets, (2) could be used to price and discount cash products and derivatives, and (3) would accurately represent term lending and funding or hedging costs<sup>7</sup>. LIBOR, in principle, should represent at least the second and third points. However, SOFR's lack of a sensible forward term structure and a credit spread curve potentially make it difficult to use for certain cash loans or for hedging purposes in derivatives.

### ***SOFR potentially lacks a reliable forward term rate***

A LIBOR rate is a forward-looking rate. For example, the 3-month LIBOR rate should reflect the market's expectations of unsecured interbank lending today for the next 3 months. Since LIBOR is typically set in advance, it helps issuers prepare for outgoing cash flow payments. In contrast, SOFR is an overnight rate that has been realized. To equate it to LIBOR, a SOFR term rate needs to be computed over the same period. The SOFR term rate can be either a backward-looking compounded average of observed overnight rates, set at the end or the beginning of the applicable term, or a market implied rate of future expectations, set at the beginning of the term.

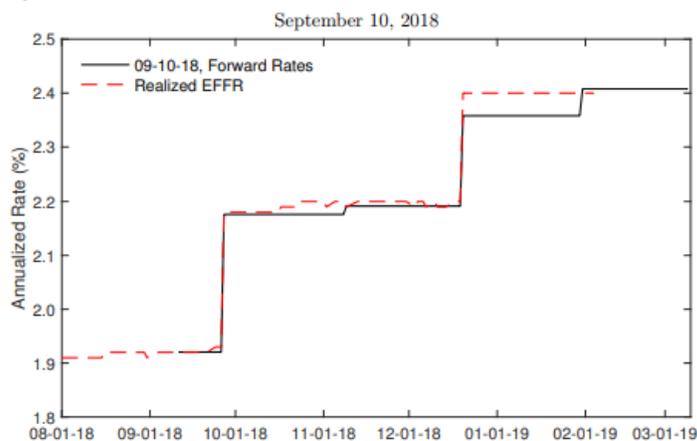
A backward-looking term SOFR rate should be transparent and easy to compute, making it a good candidate to meet The International Organization of Securities Commissions' (IOSCO) Principles for Financial Benchmarks. However, if it is set in arrears, the payment will not be known until the end of the

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<sup>7</sup> Schrimpf and Sushko, "Beyond LIBOR: a primer on the new reference rates", *Bank for International Settlements*, Basel, Switzerland, 2019, p. 30-31

period, making it difficult to prepare for cash flows. Setting the SOFR rate in advance should help with the cash flow problem; however, it still will not reflect the market's future expectations of rates which could be important as rates move over time.

Building a model to estimate an implied SOFR forward term structure can potentially be difficult because the market still has a limited set of observations. Although SOFR futures volumes have been rising, the ARRC stated that they will not be able to provide a forward-looking SOFR term rate by their mid-2021 target based on current liquidity in the market<sup>8</sup>. A model will need to adjust for the limited data to create a forward rate path. Unlike a smooth LIBOR curve, model rates derived from SOFR futures may spike up or down on Federal Open Market Committee (FOMC) policy rate announcement dates and remain flat in between. SOFR typically tracks closely with the Effective Federal Funds Rate (EFFR)<sup>9</sup>. Both rates generally trade within a narrow band and move sharply after the Federal Reserve changes the policy target rate. Like the EFFR, SOFR is a backward-looking rate that lacks data on future market expectations. With a limited amount of futures and derivative prices, there is not enough data available to calculate daily forward rates. Hence a SOFR-based forward curve may be flat with jumps from future anticipated Fed hikes or cuts. The chart below illustrates the realized EFFR and a SOFR-based forward curve.



[Source:](#) Heitfield and Park, "Inferring Term Rates from SOFR Futures Prices," *Finance and Economics Discussion Series 2019-014*. Washington: Board of Governors of the Federal Reserve System, 2019, p. 18

While this method may be a simple and sensible approach, unless a more robust market develops with a potential for daily/weekly observations, it may not be possible to produce a smooth forward curve. The model may also potentially exaggerate SOFR rate movements especially when there are no policy adjustments. It may need to adjust for random undesired price fluctuations or dislocated markets as well.

<sup>8</sup> Alternative Reference Rates Committee, "ARRC Provides Update on Forward-Looking SOFR Term Rate: Market Participants Encouraged to Transition without Reliance on SOFR Term Rate", *The Federal Reserve Bank of New York*, New York, 2021

<sup>9</sup> The Effective Federal Funds Rate (EFFR) represents the volume weighted annualized overnight rate at which major banks borrow unsecured overnight funds to meet reserve requirements. SOFR and EFFR have a correlation of ~0.99 based on daily observations from April 2018 – April 2021. Unlike EFFR, SOFR rates may experience short-term spikes when there is stress in overnight repo markets.

Another potential problem is that the cash SOFR market will be impacted by the derivative market. Since the term SOFR rates will be derived from the swap and futures transactions, any non-economic changes in the derivatives market will directly impact the published term SOFR rates. Those published term SOFR rates will then change the valuation and cash flows in floating rate notes. This is different from LIBOR and even overnight SOFR rates which are published independently from either the derivative or cash markets. It would be even more problematic if SOFR derivative rates were pushed around to intentionally impact the cash market for accounting or performance purposes<sup>10</sup>.

It is important to note that the Federal Reserve has presented research indicating that forward-looking term rates have not always accurately indicated what occurs in the market. Moreover, the longer the term, the less reliable the rate tends to be in predicting actual market outcomes<sup>11</sup>. This research combined with the ARRC's comments that they do not expect to meet their mid-2021 target may suggest that we should not expect a forward term SOFR rate in the near future even though there has been an RFP to create one. This means that investors need to be prepared to move forward with the compounded in arrears methodology used by SOFR derivatives today (i.e., backward-looking and set at the end of the applicable term).

### ***SOFR excludes a credit component***

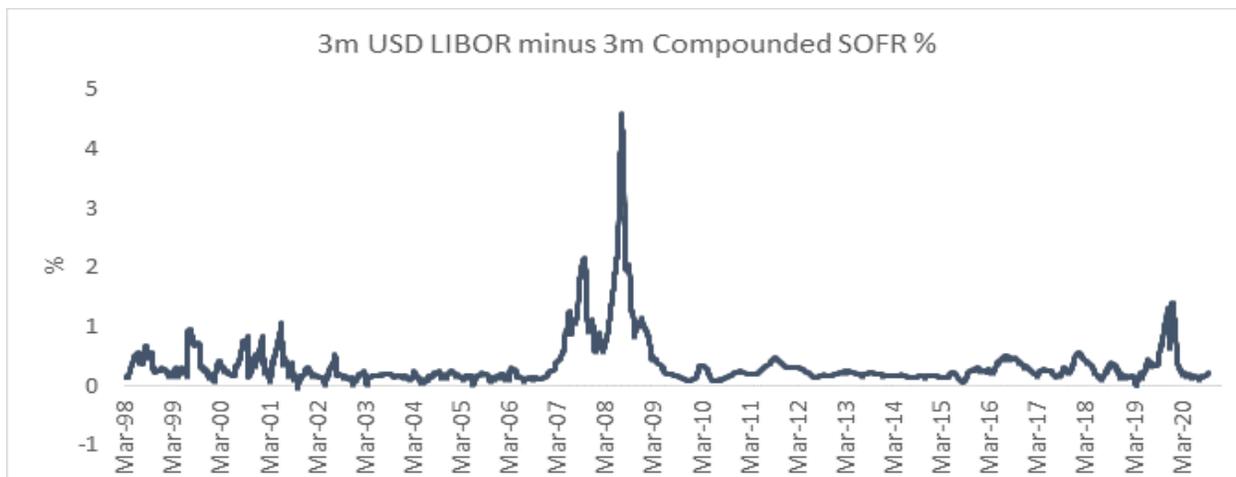
For market participants, liabilities may consist of deposits, capital market debt, secured financing, wholesale short term funding (such as commercial paper and CDs), loans, pension benefits, insurance payments, etc. As prudent risk managers, investors would want to ensure that their liabilities move in tandem with their assets. For example, a bank may provide a 1-year loan to a business at a fixed rate. That loan will be an asset on the bank's balance sheet. The bank will acquire the capital to fund the loan by using deposits, advances or wholesale funding, which are its liabilities. Back on the asset side, the bank can hedge the duration risk of the loan by executing an interest rate swap for 1 year. The bank will receive a fixed rate equal to the rate of the business loan and pay a floating benchmark rate on the swap. From a duration standpoint the bank is immunized. In an ideal scenario, the floating rate on the hedging instrument and the funding cost for an investor will rise and fall together.

In general, the cost of funding or hedging between secured and unsecured loans stays relatively constant. However, during a financial shock, we could easily see unsecured funding costs widen out relative to secured overnight lending. The chart below is the spread between 3-month USD LIBOR and 3-month compounded SOFR (ex-post). We can see that in stressful markets, the spread between the two rates does increase sharply as unsecured funding/hedging costs rise (LIBOR) and/or treasury repo rates fall in a flight to quality (SOFR).

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<sup>10</sup> Liu and Bai, "Forward-looking Forward Rates: An Indicative SOFR Paradox", *FactSet Research Systems*, Chicago, IL, USA, March 2021, p.14

<sup>11</sup> Bowman, "Perspectives on Issuing and Implementing SOFR-Based Loans", *Board of Governors of the Federal Reserve System*, Washington, D.C., March 2021



Source: Bloomberg, SECOR

This is potentially problematic if financing costs are closely associated with LIBOR, while the hedging is based on SOFR. Historical data on the behavior of the LIBOR-SOFR spread may provide good evidence on lending and borrowing costs under different regimes. We have seen various periods of widening during concerns about funding stress (1998, 2001, 2008, 2011, 2016, 2020).

When lending or borrowing, investors should account for how their costs change under different regimes. They could run a scenario analysis and stress test assets and liabilities under different phases in the cycle while also accounting for the potential behavior of the central banks and the Treasury to determine an appropriate spread to SOFR. Moreover, an analysis of the existing SOFR-based loans could give market participants a good indication of the types of credit spread adjustments to apply vs. various types of counterparties and instruments. This could help create a spot credit spread matrix, however, not necessarily a forward spread adjustment. A careful analysis may be prudent based on the types of spreads that were issued on these loans.

An important consideration to understand is the relationship between LIBOR and liabilities. The Federal Reserve has presented research that since the Global Financial Crisis (GFC) short-term wholesale unsecured funding (i.e. LIBOR) has decreased while deposits have increased as a percentage of bank liabilities (8% to <3% for Global Systemically Important Banks (GSIBs) and 9% to <4% for non-GSIBs). Based on the Fed's research, 3-Month USD LIBOR appears to be less correlated to funding costs than 3-Month SOFR in Arrears or 3-Month Federal Funds rate post the GFC. The data below seems to suggest that to some extent SOFR or Overnight Index Swap (OIS) swaps may provide a reasonable hedge to shorter-term liabilities.

### Average Correlation with Changes in Bank Funding Costs, 5-year windows

	3-Month LIBOR	3-Month SOFR in Advance	3-Month SOFR in Arrears	3-Month EFFR OIS*
<b>Global Systemically Important Banks (GSIBs)</b>				
Pre-crisis (2001: Q3 – 2006: Q2)	0.89	0.82	0.87	<b>0.90</b>
Crisis (2006: Q3 – 2011: Q2)	0.58	<b>0.69</b>	0.35	0.61
Post-Crisis (2014: Q3 – 2019: Q2)	0.58	0.47	0.71	<b>0.73</b>
<b>Non-Global Systemically Important Banks (Non-GSIBs)</b>				
Pre-crisis (2001: Q3 – 2006: Q2)	0.77	0.76	0.77	<b>0.78</b>
Crisis (2006: Q3 – 2011: Q2)	0.38	<b>0.54</b>	0.36	0.49
Post-Crisis (2014: Q3 – 2019: Q2)	0.13	<b>0.47</b>	0.30	0.29

Source: Bowman et. al (2020), “How Correlated is LIBOR with Bank Funding Costs?”, *Board of Governors of the Federal Reserve System*, Washington, D.C., June 2020

\*EFFR OIS = Effective Federal Funds Rate to Overnight Index Swap

It is important to note that the credit risk imbedded in funding/hedging costs are not universal and may differ across all market participants. Investors should understand their own costs/liabilities before deciding to borrow, lend or hedge. Unfortunately, there may not be a uniform solution to replace LIBOR. In 2019 The Bank for International Settlements (BIS) concluded that there is no perfect replacement rate that achieves the desired profile of being a robust and accurate reflection of core money markets, a reference rate for financial contracts extending beyond money markets, and a benchmark for term lending and funding<sup>12</sup>.

Hence, a possible outcome may be a bifurcated benchmark world where multiple indices are used for various purposes. Even the Credit Sensitivity Group (CSG), which was set up in February 2020 to research dynamic credit spreads, recently mentioned that it does not plan on recommending a credit sensitive rate for use in commercial lending products<sup>13</sup>. However, it does plan on having additional workshops to highlight the latest developments in credit-sensitive rates and assist with overcoming implementation hurdles in transitioning commercial loans away from LIBOR.

#### **Potential Alternative Rates**

As noted earlier, under economically stressful conditions, rates on SOFR-linked loans may decrease while unsecured borrowing/hedging costs may increase. This may end up leaving some market participants with lower assets and higher liabilities which could be challenging. Given that we are unlikely to see a credit-based version of a forward-looking term SOFR in the near future (if at all), various parties such as Bloomberg, Intercontinental Exchange (ICE), American Financial Exchange (AFX), Information Handling Services (IHS) Markit and Across the Curve Index (AXI, proposed by Professor Darrell Duffie and team) are working on potential indices/spreads to help address the lack of unsecured funding/hedging cost in SOFR. The table below provides a brief overview of some candidates:

<sup>12</sup> Schrimpf and Sushko, “Beyond LIBOR: a primer on the new reference rates”, *Bank for International Settlements*, Basel, Switzerland, 2019, p. 50

<sup>13</sup> Mnuchin, Powell et. al, Letter to bank representatives, *Federal Reserve, SEC, OCC, FDIC, US Treasury*, March 2021

Alternative Reference Rates	Description	Inputs	Index Tenors	Calculation	Underlying Volume	Data Observation Window
Across the Curve Index (AXI) by trio of academics (Berndt, Duffie, Zhu)	Measure of debt funding for publicly listed U.S. bank holding companies and their commercial subsidiaries	Credit spreads for unsecured debt instruments with maturities ranging from overnight to 5yrs	N/A	Index of weighted (transactions and issuance) average credit spreads	\$10 - \$35 Bn/month	N/A
Ameribor by the American Financial Exchange (AFX)	Reflects unsecured borrowing costs of thousands of small regional banks across the US	Overnight unsecured loans transacted on the AFX	O/N, 1M, 3M	Volume-weighted average	\$2 Bn/day across 180 participants	One Day
ICE Bank Yield Index (BYI)	Reflects investment of USD funds on a wholesale, senior unsecured basis in large, international bank	Primary wholesale funding transactions (LIBOR panel banks); secondary corporate bond trades	1M, 3M, 6M	Weighted regression construction	\$15 Bn/day	Rolling 5 day (generally)
Bloomberg Short-Term Bank Yield Index (BSBY)	Reflects the average yields at which large global banks access US dollar senior unsecured marginal wholesale funding	CP, CD and bank deposits on Bloomberg's electronic trading solutions & corporate bonds trade data from TRACE	O/N, 1M, 3M, 6M, 12M	Volume weighted linear regression accounting for term structure	\$60Bn: O/N, \$10Bn: 1M, 3M, 6M, \$9Bn: 12M	Rolling 3 day (generally)
IHS Markit USD Credit Spread Adjustment	Designed to be a measure of average marginal funding spreads for banks in USD on a senior unsecured basis	CP and CD, secondary market bank bond transactions and indicative price quotes for bank bonds.	1M, 3M, 6M, 12M	Linear weighted average	\$5 - \$10 Bn/day	Rolling 5 day

Source: ARRC, ISDA, Barclays, Citi, Bank of America, Federal Reserve

Some observations are that the rates seek to include both an implied forward rate and credit spread which should help issuers with cash flow forecasting and asset-liability mismatches in uncertain markets. However, most methodologies above require a rolling window to help increase the robustness of the indices as their underlying volumes tend to be significantly smaller than the overnight repo market used to derive SOFR. A rolling window is generally okay but could potentially be problematic since it may not immediately capture sharp spread moves during a credit crunch. An important similarity between each index is that they are all based on observable transaction data. Also, although their correlation to LIBOR will be different, they will all tend to widen out under economic stress. Hence, these indices should directionally move like LIBOR (in spirit) in uncertain markets. For example, the chart below shows that Bloomberg Short-Term Bank Yield Index (BSBY) and LIBOR have remained well correlated, even in stressful times.



Source: Bloomberg, SECOR

Issuing loans linked to these indices and subsequently hedging with these indices may be a viable option for certain institutions because of their term and unsecured components. However, to become more prevalent the benchmarks will need to ensure compliance with IOSCO Principles for Financial Benchmarks; therefore underlying volumes will need to remain robust and waterfall structures very secure. The indices will also need wide market support from increased cash issuance, broker-dealers and a liquid futures and derivatives market. Thus far, Ameribor, which may be a good reflection of the funding/hedging costs of smaller investors, is the only index that has printed a swap and a cash bond, has a futures market and adheres to IOSCO's Principles.

One index that has recently gained a lot of attention recently is Bloomberg's BSBY index. Because BSBY may be a good representation of unsecured term funding costs for large banks, it may be a reasonable proxy for LIBOR. Bloomberg is likely the largest and most widely used financial technology platform and can potentially reach out to many different market participants to help the index gain more traction. At the same time, ISDA is already finalizing guidance for BSBY derivatives. In April 2021, Bloomberg noted that the index is IOSCO compliant based on an independent assurance review while S&P announced that BSBY is consistent with their funds rating criteria. As the market shifts away from LIBOR, there may be a natural opportunity for term credit-based hedging, which can be done through BSBY basis swaps and futures since they may be more closely correlated to LIBOR swaps and Eurodollar futures. There is also a possibility that the market gravitates towards BSBY because of the larger underlying volumes compared to other credit alternatives.

### **Final Thoughts**

We attempted to point out some considerations for market participants to use in a post-LIBOR world. Overall, we do not think there is a one-size-fits-all solution to the LIBOR transition today. We would recommend considering many different approaches when analyzing assets and liabilities. It is important for market participants to understand their specific funding/hedging costs under different regimes. They should also have a good understanding of potential cash flow mismatches when using a multi-benchmark approach.

We believe that banks, asset managers, pensions, insurers, hedge funds and the clearinghouses have all been preparing their trading, valuation, risk and back-office systems to handle SOFR-based derivatives for the past 2 to 3 years. With support from regulators, it is likely that SOFR will be one of the main benchmark reference rates in the market going forward. We think that a SOFR market should develop organically as Government-Sponsored Enterprises (GSEs) and other large institutions continue to issue SOFR-based debt. SOFR derivatives also have a lot of support from dealers who are prepared to make markets and provide liquidity in them. Prior to or at the applicable cessation dates, bilateral and cleared derivatives will also automatically “convert” to SOFR plus a spread. Some market participants may also opt to switch to SOFR derivatives well before the cessation dates. This activity should also increase the depth of the SOFR market.

However, since SOFR may not meet all the needs of market participants, we may end up in a bifurcated situation with many different “representative” and “compliant” rates. In this case, market participants need to be ready to use different benchmarks for different purposes, or potentially a combination of them. In this case, cash markets may use credit-adjusted benchmarks while hedging is done through SOFR and basis swaps. With officials encouraging market participants to prepare for the end of LIBOR, it is essential that investors are ready to support other types of floating rate instruments as soon as possible.

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Parth Purohit

*Parth is a portfolio manager at SECOR, responsible for managing various derivative overlay portfolios, hedging strategy design and portfolio construction for clients. He has over 10 years of investment management industry experience.*

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