

Credit/Rates Strategy

LIBOR-SOFR unlikely COVID-19 immune

COVID-19 likely to impact timing of LIBOR demise

The world has changed dramatically in the past 2 months due the COVID-19 pandemic. The global spread of the virus has forced human interaction and business practices to fundamentally change in a very short period of time. However, there is one major global financial initiative that appears on the surface to be immune to COVID-19: the global LIBOR transition. We are skeptical the global LIBOR transition remains immune from the virus and see increasing risks the end '21 deadline is extended.

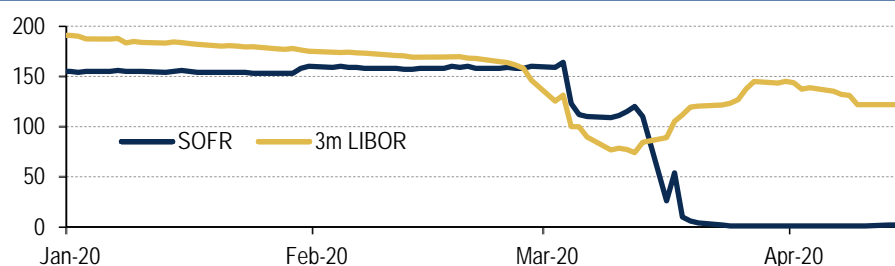
In the US, we see risks the transition is extended due to: (1) more pressing business needs in the current environment (2) a warming but still tepid embrace of SOFR in financial derivatives, debt, & loans (3) slower progress on finding a credit sensitive alternative to LIBOR. We believe the recent divergence between USD LIBOR & SOFR has strengthened the desire for lenders to retain a benchmark with dynamic credit sensitivity (Chart 1). However, COVID-19 disruptions have likely delayed some of the "credit sensitivity" workshops between US regional banks & US authorities.

Recent market stress has also seen a decrease in underlying 3m bank funding activity, especially in late March. This drop off in activity reminds of the challenges associated with finding a robust credit sensitive benchmark. Any credit sensitive alternative (1) must remain robust to underlying market stress, possibly via a commitment from banks to continue issuing in stressed times (2) may need to expand beyond banks.

LIBOR transition extension risk increasing

We would not be surprised to see the USD LIBOR to SOFR transition extended a number of months or quarters, even though the official sector has continued to resist this possibility. The continued insistence on transitioning away from by end '21 risks criticism that it is diverting resources away from more pressing business objectives and may appear out of touch with existing macroeconomic realities. A delay in the USD LIBOR transition would likely allow the market to more deeply explore options around a dynamic credit-sensitive alternative, including those robust to periods of acute market stress.

Chart 1: LIBOR and SOFR have diverged as the Fed cut rates (bps)



Source: Bloomberg

Trading ideas and investment strategies discussed herein may give rise to significant risk and are not suitable for all investors. Investors should have experience in FX markets and the financial resources to absorb any losses arising from applying these ideas or strategies.

BofA Securities does and seeks to do business with issuers covered in its research reports. As a result, investors should be aware that the firm may have a conflict of interest that could affect the objectivity of this report. Investors should consider this report as only a single factor in making their investment decision.

Refer to important disclosures on page 10 to 12.

12127795

Timestamp: 17 April 2020 08:45AM EDT

17 April 2020

Credit/Rates Strategy
United States

Table of Contents

Official sector guidance on LIBOR transition unchanged	2
Warming but still tepid embrace of SOFR in markets	3
LIBOR move boosts case for credit sensitive alternative	5
Credit sensitive rate needs to be robust in market stress	6
Market impact: wider LIBOR-FF, higher '22 ED rates	7
Conclusion: COVID-19 puts LIBOR deadline at risk	8

Mark Cabana, CFA

Rates Strategist
BofAS
+1 646 855 9591
mark.cabana@bofa.com

Neha Khoda

Credit Strategist
BofAS
+1 646 855 9656
neha.khoda@bofa.com

Ralph Axel

Rates Strategist
BofAS
+1 646 855 6226
ralph.axel@bofa.com

Bruno Braizinha, CFA

Rates Strategist
BofAS
+1 646 855 8949
bruno.braizinha@bofa.com

Olivia Lima

Rates Strategist
BofAS
+1 646 855 8742
olivia.lima@bofa.com

Angelina Xu

Credit Strategist
BofAS
+1 646 855 6274
angelina.xu@bofa.com

SOFR: Secured Overnight Financing
Rate

Official sector guidance on LIBOR transition unchanged

Official sector guidance on the ultimate global LIBOR transition deadline has held firm at the end of '21, although it has been acknowledged that some interim deadlines will be missed. The UK Financial Conduct Authority (FCA) is the most relevant authority to watch since they have ultimate jurisdiction over the global LIBOR transition. Below is the extent of official sector guidance on the LIBOR transition deadline:

UK Financial Conduct Authority (FCA): the UK FCA has provided the most concrete guidance on the broad LIBOR transition, which has suggested that end '21 should remain the target date though some interim milestones may be missed. Specific FCA guidance from March 25:

"The central assumption that firms cannot rely on LIBOR being published after the end of 2021 has not changed and should remain the target date for all firms to meet... There has, however, been an impact on the timing of some aspects of the transition programmes of many firms... [International authorities] will continue to monitor and assess the impact on transition timelines, and will update the market as soon as possible."

The FCA's position on the LIBOR transition deadline was recently strengthened with the ISDA communication on pre-cessation fallbacks. ISDA announced that a significant majority of market participants are in favor of including both pre-cessation fallbacks as standard language in the amended 2006 ISDA Definitions for LIBOR contracts. This will allow for the FCA's determination of LIBOR "non-representativeness" to trigger swaps to move off of LIBOR and to the preferred fallback rates. It increases the impact of the FCA's judgment in making a determination for the effective end of LIBOR.

Overall, it seems the FCA remains committed to the end '21 deadline but did suggest they are monitoring the impact on various deadlines to see if additional flexibility is needed. It is possible the UK FCA's focus on the end '21 deadline may be reflective of a focus around market regulation. We might expect more flexibility on the timing of LIBOR transition from the Fed & other central banks that consider macroeconomic stability.

Alternative Reference Rate Committee (ARRC): the Fed sponsored ARRC has not provided as explicit of guidance as the FCA but recent communications suggest limited flexibility around key deadlines. The most recent ARRC minutes from March 20 reflect that "it is important to preserve the momentum behind the ARRC's work despite evolving circumstances, particularly given that there has been no change to the existing timeline for the LIBOR transition." However, the ARRC legal group has acknowledged that the "legislative solution" amending New York state law to allow for a clearer LIBOR cessation fallback in certain financial contracts may be impacted due to challenges with the New York State Legislative session.

The ARRC appears committed to press ahead with existing deadlines even though some of their preferred fallback solutions appear challenged by COVID-19 disruptions.

Credit Sensitivity Group Workshops (CSG): US regulators also committed in February to discuss ways to support the transition of loans away from LIBOR. These included holding a series of working sessions to "explore methodologies to develop a robust lending framework that considers a credit sensitive rate element in the lending markets as a supplement to SOFR" (see [here for a discussion of credit sensitive alternatives to SOFR](#)). The discussions were slated to "be completed in the spring of 2020". However, there has been no public communication on any CSG workshops or public guidance on the timing of upcoming meetings / workshop minutes.

Federal Housing Finance Agency (FHFA) Guidance: FHFA has laid out a number of deadlines for the Federal Home Loan Banks (FHLBs) and Fannie / Freddie to transition away from LIBOR. While most of these deadlines have been held, FHFA did provide flexibility on the timing around which the FHLBs need to cease entering into LIBOR



based contracts that mature after Dec 31 '21. In mid-March FHFA extended this deadline from March 31 '20 to June 30 '20. We suspect FHFA granted this exemption due to operational issues + complications around COVID-19.

Main takeaway: end '21 remains surprisingly firm despite slipping deadlines

On the surface, regulators remain committed to the end '21 LIBOR transition deadline while acknowledging that interim deadlines are slipping. The end '21 deadline appears unchanged while working groups set to explore other credit-sensitive alternatives to SOFR have lost valuable time that they may be unable to recover.

We also find it striking that regulators still remain firm on the end '21 deadline in light of: (1) Fed relief measures that rely heavily on commercial banks, which will divert attention elsewhere (2) regulatory flexibility in other supervisory areas (3) potential bank willingness to provide LIBOR beyond end '21. A few thoughts on each:

- Fed COVID-19 relief measures have relied heavily on commercial bank participation, including the Paycheck Protection Program & Main Street Lending Facility. We expect that many banks have had to devote increasing resources to staffing these programs and fewer resources to the LIBOR transition.
- The Fed and other official agencies have shown increased [regulatory flexibility](#) around SLR, CECL, & capital relief for MMLF + PPP loans. Given that some [regulatory mountains have been moved](#) we would think it is possible the LIBOR transition deadlines could also be considered.
- At end '21 USD LIBOR *may* cease to exist but it also *may not* cease to exist. Some panel banks have indicated an intention to stop providing USD LIBOR submissions at end '21 but we don't know how many banks will remain willing providers. We suspect there may be enough USD LIBOR panel banks to continue a publication at 1- & 3-month tenors for a time. We also believe that the UK FCA determination of LIBOR "representativeness" is subjective and could be flexible to accommodate recent COVID-related disruptions.

If the official sector was willing to extend the LIBOR transition it would likely be useful to: (1) provide the FCA with more authority to compel LIBOR panel bank submissions (2) receive a firm commitment from enough banks to provide submissions for an extended period of time (3) loosen the relatively arbitrary assessment of LIBOR submission "representativeness", which the FCA has previously indicated could be breached if only one LIBOR panel bank ceased providing submissions.

COVID-19 has already changed the world dramatically and official sector actors have taken swift and meaningful action to ease its challenges. The LIBOR transition seems one area where there has been a lack of movement in the official sector thus far.

Warming but still tepid embrace of SOFR in markets

COVID-19 would offer a clear justification in our view if regulator wanted to be more flexible around the LIBOR transition deadline. The still tepid embrace of SOFR across markets further strengthens this case. The market appears to be slowly warming towards adopting SOFR in futures and derivatives but has yet to embrace SOFR in loan contracts. We update SOFR usage across markets below.

Financial markets SOFR adoption

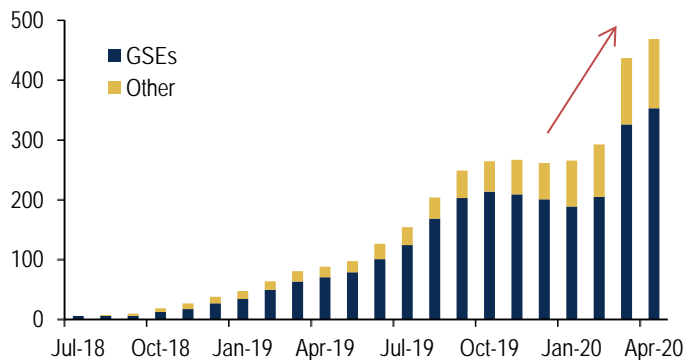
Issuance: in recent weeks SOFR market activity has increased, with a spike in SOFR issuance driven by higher cost of funding via LIBOR. The more attractive funding levels have likely led the FHLBs to use SOFR floaters for their increased member financing needs in the recent period of financial stress. Together, all GSEs issued \$140bn in SOFR linked debt in March and the GSEs remain the largest user of SOFR-linked floating rate debt. We expect to see heavy GSE issuance in coming months if LIBOR remains relatively elevated (Chart 2, Chart 3, Chart 4).



Futures: SOFR futures activity declined around year end, but has since returned to levels seen in November & December (Chart 5, Chart 6). Despite the recent increase in activity, SOFR open interest remain only at 30% of the fed funds markets and less than 5% of the Eurodollar market.

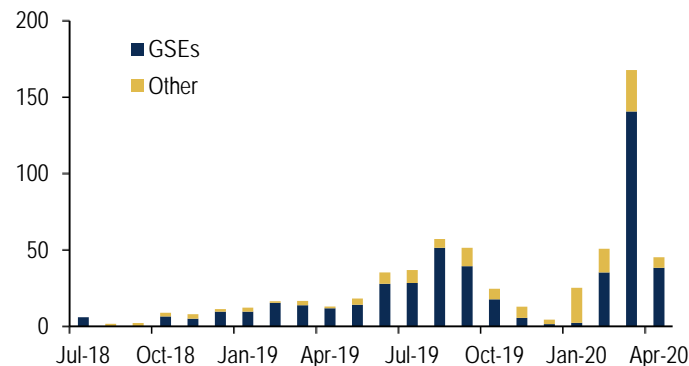
Swaps & swaptions: SOFR swap activity continues to gradually increase but there has been no material SOFR swaptions activity to date (Chart 7). Within the swaptions space, the most significant recent development on SOFR transition was an ISDA supplement from late March and allowance for an adoption of SOFR as a discount rate in swaption contracts with expiry date after the CCP transition date (Oct 16). The potential for a SOFR discount rate in existing contracts does not seem to have led to a material shift in hedging behavior.

Chart 2: SOFR linked debt outstanding (\$bn, as of Apr 13)



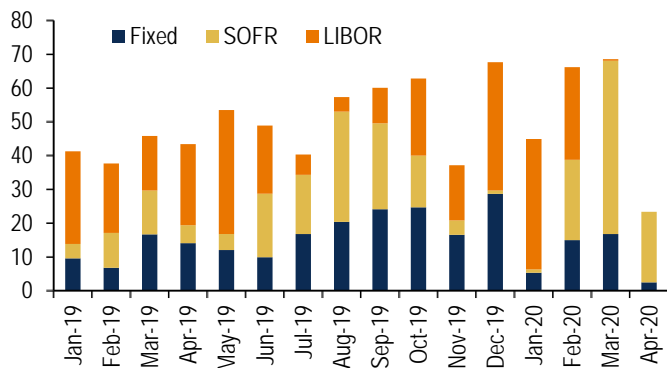
Source: Bloomberg; Note: GSEs include FHLBs, Fannie Mae, Freddie Mac, Farmer Mac, Federal Farm Credit Bank

Chart 3: SOFR linked FRN debt issuance by month (\$bn, as of Apr 13)



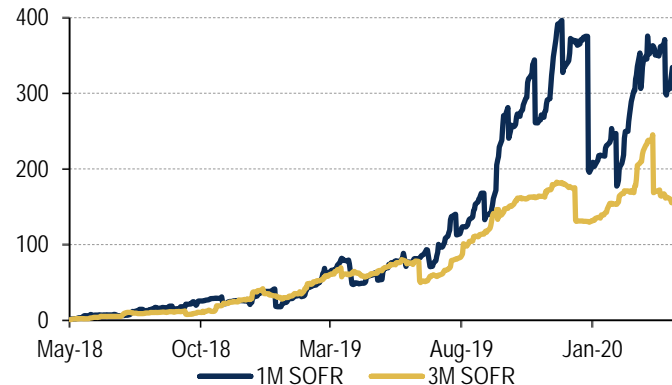
Source: Bloomberg; Note: GSEs include FHLBs, Fannie Mae, Freddie Mac, Farmer Mac, Federal Farm Credit Bank

Chart 4: FHLB debt issuance by month (\$bn)



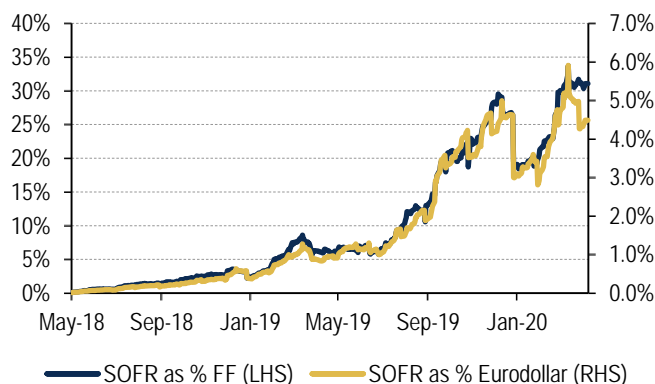
Source: Bloomberg

Chart 5: SOFR futures aggregate open interest (thousands of contracts)

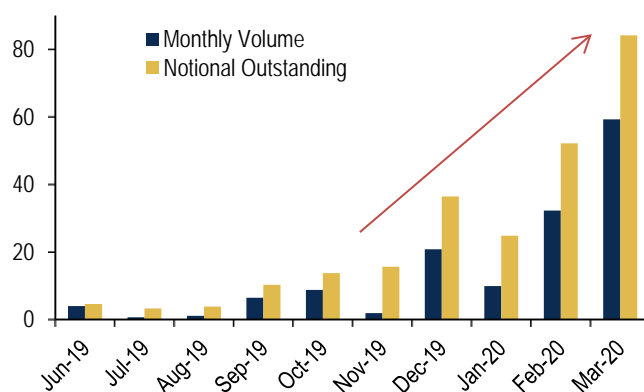


Source: Bloomberg, CME



Chart 6: Total SOFR open interest as % of FF & ED futures

Source: Bloomberg, CME

Chart 7: CME cleared SOFR swap activity (\$bn)

Source: CME

Loan market SOFR adoption

SOFR linked activity in the corporate loan market continues to be limited. While some bilateral bank loans have been priced off of the new benchmark, take up of the rate has been extremely low in the broadly syndicated and private lending markets. The loan market was already facing challenges in the LIBOR transition before the current downturn. Now with deterioration of economic activity, corporate priorities lie elsewhere. As companies rush to shore up their balance sheets and adapt operations to a new reality, transitioning to a new benchmark rate seems to have receded into the background. In our opinion, it seems likely that we will need to return to healthier markets, and likely a push from the Fed for this issue to become a C-suite priority.

We are skeptical that the inclusion of SOFR as the benchmark for the Fed's Main Street Lending Facility will materially increase adoption of the new benchmark unless terms of the program are adjusted. Recall, the [Main Street Lending Facility](#) offers loans to small/medium sized businesses off of SOFR. To the extent that the Main Street facility does well, it could help increase the amount of SOFR-linked assets on bank balance sheets. However, [after further analysis](#), we believe the utilization of these facilities is likely to be limited, as it's not evident who the target audience of this program is. 90% of the current loan issuers don't pass the stringent eligibility criteria set out by the facilities, while the program for new issuers, with its small loan sizes, is limited in scope.

Further, the economics of Main Street loans make it worthwhile to only be used as a lifeline of the last resort. We expect that issuers in dire need of funds will likely come wider than the 250-400bps range set out by the facilities. We also question the willingness of banks to take a stake, however small, in challenged situations. While the program is still in the comment phase and may be adapted to better fit needs of more borrowers, we think that the introduction of these facilities will only help SOFR adoption on the margin, likely in the bilateral bank loan market to the extent banks want to maintain some prized corporate relationships. We doubt this push is enough to jump start a broader SOFR wave in the broadly syndicated and private loan markets.

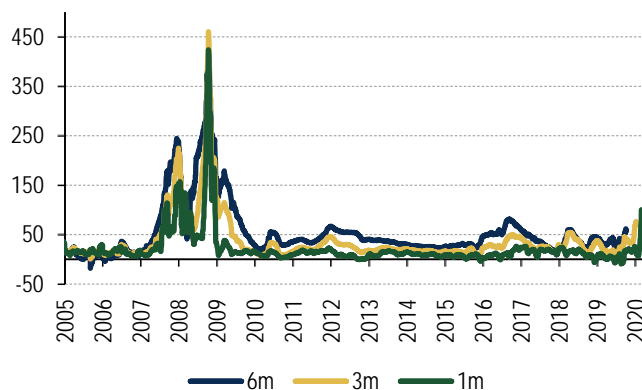
LIBOR move boosts case for credit sensitive alternative

USD LIBOR & SOFR have behaved very differently over recent weeks due to market liquidity deterioration, Fed balance sheet / reserve expansion, & increased perceptions of credit risk (Chart 1). The historic spread between USD LIBOR & compounded SOFR reached the widest levels since the '08 financial crisis; this has been a benefit to lenders that make floating rate LIBOR loans while serving as a cost to floating rate LIBOR borrowers. We expect the recent divergence between LIBOR & SOFR to further advocacy for a dynamic credit sensitive alternative to cushion bank lender NIM deterioration during credit events. The recent divergence between LIBOR & SOFR has already caused a modest increase in ISDA fallback levels, assuming USD LIBOR ceases at end '21 (Table 1).



Chart 8: Historical SOFR-LIBOR spread (bps)

SOFR compounded in arrears, historical SOFR uses PD survey GC repo rate



Note: NY Fed primary dealer GC repo rate used prior to SOFR data availability; source: BofA Global Research, Bloomberg

Table 1: 5y median SOFR-LIBOR spread (bps)

SOFR compounded in arrears, historical SOFR uses PD survey GC repo rate

	1m	3m	6m
Dec 2021 Lookback	16.4	28.5	42.4
Historical Data Only	10.1	24.7	35.4
Historical Data Only, as of Feb 3	9.5	23.8	33.8

Source: BofA Global Research, Bloomberg

We expect that banks making LIBOR based floating rate loans will see the recent price action as furthering the desire to have a dynamic credit sensitive alternative. These banks will likely not want to forgo the potential protection of having credit sensitive loans in future episodes of severe economic contraction. Loans that would otherwise float off SOFR would have re-priced lower and challenged NIMs for these lenders. Lenders are likely acutely aware of the Fed's desire to push SOFR to near zero while being perfectly content to allow USD LIBOR rates to remain nearly 100bps higher through their [control and pricing of money market liquidity facilities](#).

In contrast to the bank lenders, the Fed probably would like to see floating rate loans priced off of SOFR to provide a more immediate relief to borrowers. We believe this desire is one of the core reasons the Fed has staunchly advocated for and leaned on the ARRC to choose SOFR as the preferred alternative to LIBOR. However, any benefit that a SOFR floating rate loan might receive during times of market stress would likely be made up through higher loan pricing in periods of calm as [we argued here](#).

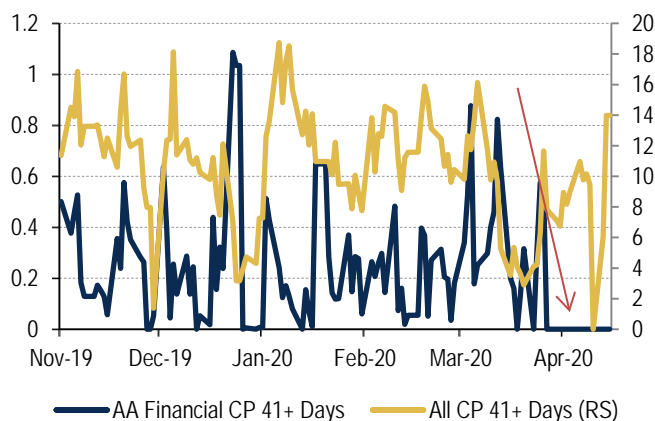
We expect that the desire from bank lenders to have dynamic credit protection will eventually be successful in creating an add-on rate to SOFR or standalone credit sensitive index. Recent price action has likely reinforced the necessity of having this dynamic credit sensitivity and further strengthened the desire for regional banks to work with the Fed on charting a path in this direction. If regional bank CSG workshop progress is materially delayed we expect opposition to the end '21 LIBOR deadline will increase.

Credit sensitive rate needs to be robust in market stress

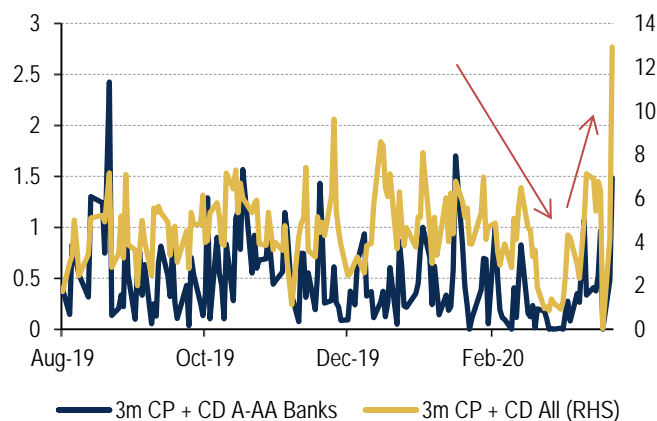
During recent market stress, 3m unsecured bank activity materially declined. This must be taken into consideration when developing a credit sensitive rate. To ensure robustness during market stress, a credit sensitive index may require a bank commitment to continue issuing at all times or it may need to expand beyond banks.

The extent of the drop off in 3m bank funding activity is striking, especially in the second half of March. According to the Fed's AA financial CP data, there was zero issuance activity for tenors of 41+ days from March 27 through today. This stands in contrast to all CP issuance at the same tenor which averaged \$9.4bn (Chart 9). Primary + secondary market transactions across 3m A & AA financial CP & CD also declined, according to DTCC. This data shows a decline in bank CP transactions in late March, but a material rebound over recent days. DTCC data also shows more widespread activity across all 3m CP & CD paper (Chart 10).



Chart 9: 41+ AA financial CP issuance has recently fallen off (\$bn)

Source: BofA Global Research, Federal Reserve

Chart 10: Some activity in primary + secondary mkt transactions (\$bn)

Source: DTCC

The sharp drop in bank funding activity at the 3m tenor highlights issues around the robustness of any credit sensitive index during periods of market stress. A credit sensitive index needs to ensure that it can be informative and reflective of market activity at all times. We believe that improved robustness could be achieved by requiring a commitment from banks that want a dynamic credit sensitive benchmark to issue at a minimum frequency even during stressed times. If banks are unwilling or unable to issue during such periods we think that it is worth expanding market activity outside of banks to include non-financial corporates or asset backed commercial paper. We hope that any future work on credit sensitive alternatives to SOFR can properly take into account the risks of reduction in activity during periods of market stress.

Market impact: wider LIBOR-FF, higher '22 ED rates

As we have [previously argued](#), a potential USD LIBOR transition extension beyond '21 would likely result in a LIBOR-FF spread widening in the 5-10Y sector or an increase in '22 Eurodollar rates. We see these positions as relatively low cost ways to position for a potential extension of the LIBOR transition.

Longer term LIBOR-FF spreads have recently converged to 24-26bps as market participants have broadly assumed that ISDA USD LIBOR fallback and spread adjustment conventions would be adopted (Chart 11). Assuming a new LIBOR transition date is announced, we would expect to see LIBOR-FF trade more freely in its historical range, which is on average higher than current levels (Table 2). We would also expect to see LIBOR trade higher in relation to SOFR than may be expected by the market today.

Similarly, we might expect Eurodollar contracts maturing in 2022 to price in more upside LIBOR risk than exists today given the possibility of a transition extension. The March '22 Eurodollar contracts implies a yield of 32 bps with FRA-OIS at 20 bps. This assumes very limited potential for the Fed to raise rates in the next 2Y and a credit spread that is below the average level that prevailed from the start of 2010 through the start of 2020.

Wider LIBOR-FF & higher '22 ED rates would likely benefit from any LIBOR transition extension given their potential to price more upside credit risk vs today.

Chart 11: Long term LIBOR-FF has converged to around 24-26 bp

Source: BofA Global Research, Bloomberg

Table 2: LIBOR-FF spreads, current level vs historical averages

	5y	10y	30y
Current	26.1	24.5	23.5
Avg since 2010	27.9	28.1	27.2
Avg since 2016	29.0	30.8	33.5

Source: BofA Global Research, Bloomberg

Conclusion: COVID-19 likely puts LIBOR deadline at risk

COVID-19 disruptions could pose a risk in delaying the USD LIBOR to SOFR transition deadline a number of months or quarters. The official sector appears to be very resistant to adjusting deadlines around the LIBOR transition date despite a material shift in business priorities stemming from the pandemic. A delay in the transition would allow market participants more time to prepare, allow for a further adoption of SOFR in both markets and loans, and develop credit sensitive options as the market moves away from LIBOR. Any USD LIBOR transition deadline would likely support wider LIBOR-FF & higher '22 ED rates.





Disclosures

Important Disclosures

Due to the nature of strategic analysis, the issuers or securities recommended or discussed in this report are not continuously followed. Accordingly, investors must regard this report as providing stand-alone analysis and should not expect continuing analysis or additional reports relating to such issuers and/or securities.

BofA Global Research personnel (including the analyst(s) responsible for this report) receive compensation based upon, among other factors, the overall profitability of Bank of America Corporation, including profits derived from investment banking. The analyst(s) responsible for this report may also receive compensation based upon, among other factors, the overall profitability of the Bank's sales and trading businesses relating to the class of securities or financial instruments for which such analyst is responsible.

BofA Securities fixed income analysts regularly interact with sales and trading desk personnel in connection with their research, including to ascertain pricing and liquidity in the fixed income markets.

Other Important Disclosures

Prices are indicative and for information purposes only. Except as otherwise stated in the report, for the purpose of any recommendation in relation to: (i) an equity security, the price referenced is the publicly traded price of the security as of close of business on the day prior to the date of the report or, if the report is published during intraday trading, the price referenced is indicative of the traded price as of the date and time of the report; or (ii) a debt security (including equity preferred and CDS), prices are indicative as of the date and time of the report and are from various sources including BofA Securities trading desks.

The date and time of completion of the production of any recommendation in this report shall be the date and time of dissemination of this report as recorded in the report timestamp.

This report may refer to fixed income securities or other financial instruments that may not be offered or sold in one or more states or jurisdictions, or to certain categories of investors, including retail investors. Readers of this report are advised that any discussion, recommendation or other mention of such instruments is not a solicitation or offer to transact in such instruments. Investors should contact their BofA Merrill Lynch representative or Merrill Lynch Global Wealth Management financial advisor for information relating to such instruments. Rule 144A securities may be offered or sold only to persons in the U.S. who are Qualified Institutional Buyers within the meaning of Rule 144A under the Securities Act of 1933, as amended. SECURITIES OR OTHER FINANCIAL INSTRUMENTS DISCUSSED HEREIN MAY BE RATED BELOW INVESTMENT GRADE AND SHOULD THEREFORE ONLY BE CONSIDERED FOR INCLUSION IN ACCOUNTS QUALIFIED FOR SPECULATIVE INVESTMENT.

Recipients who are not institutional investors or market professionals should seek the advice of their independent financial advisor before considering information in this report in connection with any investment decision, or for a necessary explanation of its contents.

The securities or other financial instruments discussed in this report may be traded over-the-counter. Retail sales and/or distribution of this report may be made only in states where these instruments are exempt from registration or have been qualified for sale.

Officers of BofAS or one or more of its affiliates (other than research analysts) may have a financial interest in securities of the issuer(s) or in related investments.

This report, and the securities or other financial instruments discussed herein, may not be eligible for distribution or sale in all countries or to certain categories of investors, including retail investors.

Information relating to Affiliates of BofAS, MLPF&S and Distribution of Affiliate Research Reports:

BofA Global Research policies relating to conflicts of interest are described at <https://rsch.baml.com/coi>

"BofA Securities" includes BofA Securities, Inc. ("BofAS") and its affiliates. Investors should contact their BofA Securities representative or Merrill Lynch Global Wealth Management financial advisor if they have questions concerning this report or concerning the appropriateness of any investment idea described herein for such investor. "BofA Securities" is a global brand for BofA Global Research.

BofAS and/or Merrill Lynch, Pierce, Fenner & Smith ("MLPF&S") may in the future distribute, information of the following non-US affiliates in the US (short name: legal name, regulator): Merrill Lynch (South Africa): Merrill Lynch South Africa (Pty) Ltd., regulated by The Financial Service Board; MLI (UK): Merrill Lynch International, regulated by the Financial Conduct Authority (FCA) and the Prudential Regulation Authority (PRA); BofASE (France): BofA Securities Europe SA is authorized by the Autorité de Contrôle Prudentiel et de Résolution (ACPR) and regulated by the ACPR and the Autorité des Marchés Financiers (AMF); BAMLI DAC (Milan): Bank of America Merrill Lynch International DAC, Milan Branch, regulated by the Bank of Italy, the European Central Bank (ECB) and the Central Bank of Ireland (CBI); BAMLI DAC (Frankfurt): Bank of America Merrill Lynch International DAC, Frankfurt Branch regulated by BaFin, the ECB and the CBI; Merrill Lynch (Australia): Merrill Lynch Equities (Australia) Limited, regulated by the Australian Securities and Investments Commission; Merrill Lynch (Hong Kong): Merrill Lynch (Asia Pacific) Limited, regulated by the Hong Kong Securities and Futures Commission (HKSF); Merrill Lynch (Singapore): Merrill Lynch (Singapore) Pte Ltd, regulated by the Monetary Authority of Singapore (MAS); Merrill Lynch (Canada): Merrill Lynch Canada Inc, regulated by the Investment Industry Regulatory Organization of Canada; Merrill Lynch (Mexico): Merrill Lynch Mexico, SA de CV, Casa de Bolsa, regulated by the Comisión Nacional Bancaria y de Valores; Merrill Lynch (Argentina): Merrill Lynch Argentina SA, regulated by Comisión Nacional de Valores; Merrill Lynch (Japan): Merrill Lynch Japan Securities Co., Ltd., regulated by the Financial Services Agency; Merrill Lynch (Seoul): Merrill Lynch International, LLC Seoul Branch, regulated by the Financial Supervisory Service; Merrill Lynch (Taiwan): Merrill Lynch Securities (Taiwan) Ltd., regulated by the Securities and Futures Bureau; DSP Merrill Lynch (India): DSP Merrill Lynch Limited, regulated by the Securities and Exchange Board of India; Merrill Lynch (Indonesia): PT Merrill Lynch Sekuritas Indonesia, regulated by Otoritas Jasa Keuangan (OJK); Merrill Lynch (Israel): Merrill Lynch Israel Limited, regulated by Israel Securities Authority; Merrill Lynch (Russia): OOO Merrill Lynch Securities, Moscow, regulated by the Central Bank of the Russian Federation; Merrill Lynch (DIFC): Merrill Lynch International (DIFC Branch), regulated by the Dubai Financial Services Authority (DFSA); Merrill Lynch (Spain): Merrill Lynch Capital Markets Espana, S.A.S.V., regulated by Comisión Nacional del Mercado de Valores; Merrill Lynch (Brazil): Merrill Lynch S.A. Corretora de Títulos e Valores Mobiliários, regulated by Comissão de Valores Mobiliários; Merrill Lynch KSA Company: Merrill Lynch Kingdom of Saudi Arabia Company, regulated by the Capital Market Authority.

This information: has been approved for publication and is distributed in the United Kingdom (UK) to professional clients and eligible counterparties (as each is defined in the rules of the FCA and the PRA) by MLI (UK), which is authorized by the PRA and regulated by the FCA and the PRA - details about the extent of our regulation by the FCA and PRA are available from us on request; has been approved for publication and is distributed in the European Economic Area (EEA) by BofASE (France), which is authorized by the ACPR and regulated by the ACPR and the AMF; has been considered and distributed in Japan by Merrill Lynch (Japan), a registered securities dealer under the Financial Instruments and Exchange Act in Japan, or its permitted affiliates; is issued and distributed in Hong Kong by Merrill Lynch (Hong Kong) which is regulated by HKSF; is issued and distributed in Taiwan by Merrill Lynch (Taiwan); is issued and distributed in India by DSP Merrill Lynch (India); and is issued and distributed in Singapore to institutional investors and/or accredited investors (each as defined under the Financial Advisers Regulations) by Merrill Lynch (Singapore) (Company Registration No 198602883D). Merrill Lynch (Singapore) is regulated by MAS. Merrill Lynch Equities (Australia) Limited (ABN 65 006 276 795), AFS License 235132 (MLEA) distribute this information in Australia only to 'Wholesale' clients as defined by s.761G of the Corporations Act 2001. With the exception of BANA Australia, neither MLEA nor any of its affiliates involved in preparing this information is an Authorised Deposit-Taking Institution under the Banking Act 1959 nor regulated by the Australian Prudential Regulation Authority. No approval is required for publication or distribution of this information in Brazil and its local distribution is by Merrill Lynch (Brazil) in accordance with applicable regulations. Merrill Lynch (DIFC) is authorized and regulated by the DFSA. Information prepared and issued by Merrill Lynch (DIFC) is done so in accordance with the requirements of the DFSA conduct of business rules. BAMLI DAC (Frankfurt) distributes this information in Germany and is regulated by BaFin, the ECB and the CBI. BofA Securities entities, including BAMLI DAC and BofASE (France), may outsource/delegate the marketing and/or provision of certain research services or aspects of research services to other branches or members of the BofA Securities group. You may be contacted by a different BofA Securities entity acting for and on behalf of your service provider where permitted by applicable law. This does not change your service provider. Please use this link <http://www.bankofamerica.com/emaildisclaimer> for further information

This information has been prepared and issued by BofAS and/or one or more of its non-US affiliates. The author(s) of this information may not be licensed to carry on regulated activities in your jurisdiction and, if not licensed, do not hold themselves out as being able to do so. BofAS and/or MLPF&S is the distributor of this information in the US and accepts full responsibility for



information distributed to BofAS and/or MLPF&S clients in the US by its non-US affiliates. Any US person receiving this information and wishing to effect any transaction in any security discussed herein should do so through BofAS and/or MLPF&S and not such foreign affiliates. Hong Kong recipients of this information should contact Merrill Lynch (Asia Pacific) Limited in respect of any matters relating to dealing in securities or provision of specific advice on securities or any other matters arising from, or in connection with, this information. Singapore recipients of this information should contact Merrill Lynch (Singapore) Pte Ltd in respect of any matters arising from, or in connection with, this information.

General Investment Related Disclosures:

Taiwan Readers: Neither the information nor any opinion expressed herein constitutes an offer or a solicitation of an offer to transact in any securities or other financial instrument. No part of this report may be used or reproduced or quoted in any manner whatsoever in Taiwan by the press or any other person without the express written consent of BofA Securities.

This document provides general information only, and has been prepared for, and is intended for general distribution to, BofA Securities clients. Neither the information nor any opinion expressed constitutes an offer or an invitation to make an offer, to buy or sell any securities or other financial instrument or any derivative related to such securities or instruments (e.g., options, futures, warrants, and contracts for differences). This document is not intended to provide personal investment advice and it does not take into account the specific investment objectives, financial situation and the particular needs of, and is not directed to, any specific person(s). This document and its content do not constitute, and should not be considered to constitute, investment advice for purposes of ERISA, the US tax code, the Investment Advisers Act or otherwise. Investors should seek financial advice regarding the appropriateness of investing in financial instruments and implementing investment strategies discussed or recommended in this document and should understand that statements regarding future prospects may not be realized. Any decision to purchase or subscribe for securities in any offering must be based solely on existing public information on such security or the information in the prospectus or other offering document issued in connection with such offering, and not on this document.

Securities and other financial instruments referred to herein, or recommended, offered or sold by BofA Securities, are not insured by the Federal Deposit Insurance Corporation and are not deposits or other obligations of any insured depository institution (including, Bank of America, N.A.). Investments in general and, derivatives, in particular, involve numerous risks, including, among others, market risk, counterparty default risk and liquidity risk. No security, financial instrument or derivative is suitable for all investors. In some cases, securities and other financial instruments may be difficult to value or sell and reliable information about the value or risks related to the security or financial instrument may be difficult to obtain. Investors should note that income from such securities and other financial instruments, if any, may fluctuate and that price or value of such securities and instruments may rise or fall and, in some cases, investors may lose their entire principal investment. Past performance is not necessarily a guide to future performance. Levels and basis for taxation may change.

Futures and options are not appropriate for all investors. Such financial instruments may expire worthless. Before investing in futures or options, clients must receive the appropriate risk disclosure documents. Investment strategies explained in this report may not be appropriate at all times. Costs of such strategies do not include commission or margin expenses.

BofA Securities is aware that the implementation of the ideas expressed in this report may depend upon an investor's ability to "short" securities or other financial instruments and that such action may be limited by regulations prohibiting or restricting "shortselling" in many jurisdictions. Investors are urged to seek advice regarding the applicability of such regulations prior to executing any short idea contained in this report.

This report may contain a trading idea or recommendation which highlights a specific identified near-term catalyst or event impacting a security, issuer, industry sector or the market generally that presents a transaction opportunity, but does not have any impact on the analyst's particular "Overweight" or "Underweight" rating (which is based on a three month trade horizon). Trading ideas and recommendations may differ directionally from the analyst's rating on a security or issuer because they reflect the impact of a near-term catalyst or event.

Foreign currency rates of exchange may adversely affect the value, price or income of any security or financial instrument mentioned in this report. Investors in such securities and instruments effectively assume currency risk.

UK Readers: The protections provided by the U.K. regulatory regime, including the Financial Services Scheme, do not apply in general to business coordinated by BofA Securities entities located outside of the United Kingdom.

BofAS or one of its affiliates is a regular issuer of traded financial instruments linked to securities that may have been recommended in this report. BofAS or one of its affiliates may, at any time, hold a trading position (long or short) in the securities and financial instruments discussed in this report.

BofA Securities, through business units other than BofA Global Research, may have issued and may in the future issue trading ideas or recommendations that are inconsistent with, and reach different conclusions from, the information presented herein. Such ideas or recommendations may reflect different time frames, assumptions, views and analytical methods of the persons who prepared them, and BofA Securities is under no obligation to ensure that such other trading ideas or recommendations are brought to the attention of any recipient of this information.

In the event that the recipient received this information pursuant to a contract between the recipient and BofAS for the provision of research services for a separate fee, and in connection therewith BofAS may be deemed to be acting as an investment adviser, such status relates, if at all, solely to the person with whom BofAS has contracted directly and does not extend beyond the delivery of this report (unless otherwise agreed specifically in writing by BofAS). If such recipient uses the services of BofAS in connection with the sale or purchase of a security referred to herein, BofAS may act as principal for its own account or as agent for another person. BofAS is and continues to act solely as a broker-dealer in connection with the execution of any transactions, including transactions in any securities referred to herein.

Copyright and General Information:

Copyright 2020 Bank of America Corporation. All rights reserved. iQprofileSM, iQmethodSM are service marks of Bank of America Corporation. iQdatabase[®] is a registered service mark of Bank of America Corporation. This information is prepared for the use of BofA Securities clients and may not be redistributed, retransmitted or disclosed, in whole or in part, or in any form or manner, without the express written consent of BofA Securities. BofA Global Research information is distributed simultaneously to internal and client websites and other portals by BofA Securities and is not publicly-available material. Any unauthorized use or disclosure is prohibited. Receipt and review of this information constitutes your agreement not to redistribute, retransmit, or disclose to others the contents, opinions, conclusion, or information contained herein (including any investment recommendations, estimates or price targets) without first obtaining express permission from an authorized officer of BofA Securities.

Materials prepared by BofA Global Research personnel are based on public information. Facts and views presented in this material have not been reviewed by, and may not reflect information known to, professionals in other business areas of BofA Securities, including investment banking personnel. BofA Securities has established information barriers between BofA Global Research and certain business groups. As a result, BofA Securities does not disclose certain client relationships with, or compensation received from, such issuers. To the extent this material discusses any legal proceeding or issues, it has not been prepared as nor is it intended to express any legal conclusion, opinion or advice. Investors should consult their own legal advisers as to issues of law relating to the subject matter of this material. BofA Global Research personnel's knowledge of legal proceedings in which any BofA Securities entity and/or its directors, officers and employees may be plaintiffs, defendants, co-defendants or co-plaintiffs with or involving issuers mentioned in this material is based on public information. Facts and views presented in this material that relate to any such proceedings have not been reviewed by, discussed with, and may not reflect information known to, professionals in other business areas of BofA Securities in connection with the legal proceedings or matters relevant to such proceedings.

This information has been prepared independently of any issuer of securities mentioned herein and not in connection with any proposed offering of securities or as agent of any issuer of any securities. None of BofAS or any of its affiliates or their research analysts has any authority whatsoever to make any representation or warranty on behalf of the issuer(s). BofA Global Research policy prohibits research personnel from disclosing a recommendation, investment rating, or investment thesis for review by an issuer prior to the publication of a research report containing such rating, recommendation or investment thesis.

Any information relating to the tax status of financial instruments discussed herein is not intended to provide tax advice or to be used by anyone to provide tax advice. Investors are urged to seek tax advice based on their particular circumstances from an independent tax professional.

The information herein (other than disclosure information relating to BofA Securities and its affiliates) was obtained from various sources and we do not guarantee its accuracy. This information may contain links to third-party websites. BofA Securities is not responsible for the content of any third-party website or any linked content contained in a third-party website. Content contained on such third-party websites is not part of this information and is not incorporated by reference. The inclusion of a link does not imply any endorsement by or any affiliation with BofA Securities. Access to any third-party website is at your own risk, and you should always review the terms and privacy policies at third-party websites before submitting any personal information to them. BofA Securities is not responsible for such terms and privacy policies and expressly disclaims any liability for them.

All opinions, projections and estimates constitute the judgment of the author as of the date of publication and are subject to change without notice. Prices also are subject to change without notice. BofA Securities is under no obligation to update this information and BofA Securities ability to publish information on the subject issuer(s) in the future is subject to applicable quiet periods. You should therefore assume that BofA Securities will not update any fact, circumstance or opinion contained herein.

Certain outstanding reports or investment opinions relating to securities, financial instruments and/or issuers may no longer be current. Always refer to the most recent research report relating to an issuer prior to making an investment decision.

In some cases, an issuer may be classified as Restricted or may be Under Review or Extended Review. In each case, investors should consider any investment opinion relating to such issuer (or its security and/or financial instruments) to be suspended or withdrawn and should not rely on the analyses and investment opinion(s) pertaining to such issuer (or its securities and/or financial

instruments) nor should the analyses or opinion(s) be considered a solicitation of any kind. Sales persons and financial advisors affiliated with BofAS or any of its affiliates may not solicit purchases of securities or financial instruments that are Restricted or Under Review and may only solicit securities under Extended Review in accordance with firm policies. Neither BofA Securities nor any officer or employee of BofA Securities accepts any liability whatsoever for any direct, indirect or consequential damages or losses arising from any use of this information.

