

The logo for the Alternative Reference Rates Committee (ARRC) features the acronym "ARRC" in a white, serif font centered within a dark blue rectangular field. The bottom edge of this field is curved upwards, creating a white, semi-circular shape at the bottom of the logo.

ARRC

A solid blue rectangular banner with white text. The text is arranged in two lines, with the first line being "Insights from National" and the second line being "Working Group Chairs".

Insights from National
Working Group Chairs

Tom Wipf, ARRC Chairman and Vice Chairman of Institutional Securities
at Morgan Stanley

Tushar Morzaria, Chair of the Sterling Working Group on Risk-Free
Reference Rates and Group Finance Director at Barclays

This information is provided for illustrative and educational purposes only. The views expressed in this presentation are solely those of the author and do not necessarily represent those of the Federal Reserve, the Alternative Reference Rates Committee or its members or ex officio members.

Progress with Legacy Products

The ARRC now estimates that there will be roughly \$74 trillion in legacy USD LIBOR outstanding at the end of June 2023.

- **ISDA Protocol:** Adherence has been good and will help to address most legacy derivatives exposures, although we need to see continued uptake in order to ensure complete coverage.
- **ARRC fallback language:** We are seeing increasing use of ARRC hardwired language in loan markets, and have seen ARRC language used in FRNs and consumer loans for some time.
- **The ARRC’s legislative proposal** is being seriously considered in the State of New York, and we remain hopeful that it will be taken up.

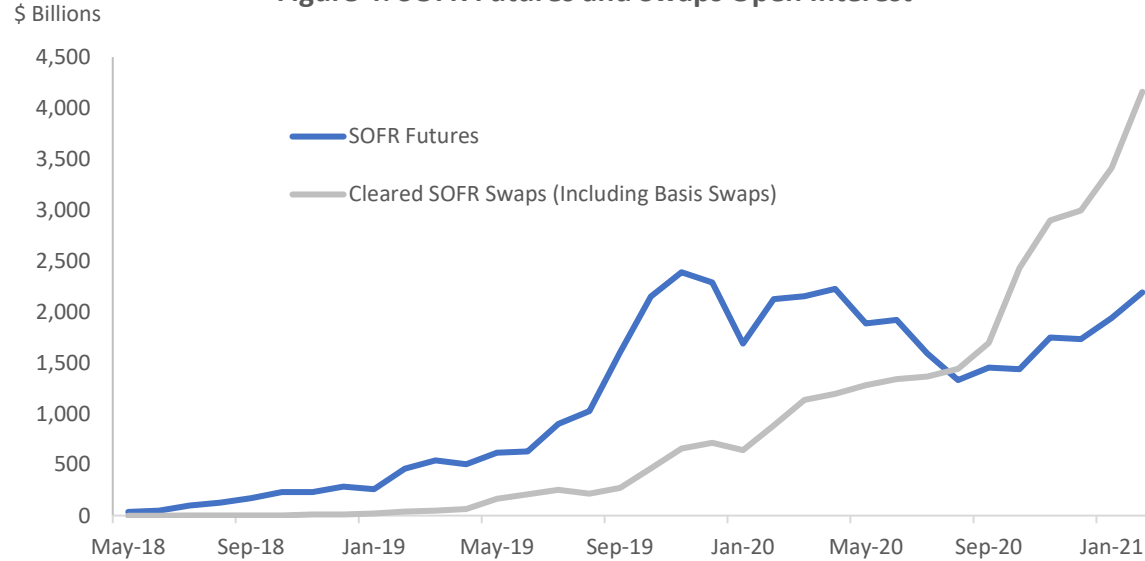
Table 1: USD LIBOR Market Footprint by Asset Class¹

		Currently Outstanding (\$TN)	Maturing After June 2023 (\$TN)
Over-the-Counter Derivatives	Interest rate swaps	81	46
	Forward rate agreements	47	0
	Interest rate options	20	12
	Cross currency swaps	23	8
Exchange Traded Derivatives	Interest rate options	32	0
	Interest rate futures	11	2
Business Loans	Syndicated loans ²	2.0	1.1
	Nonsyndicated business loans	1.3	0.4
	Nonsyndicated CRE/Commercial mortgages	1.5	0.8
Consumer Loans	Retail mortgages ³	1.3	0.8
	Other Consumer loans	0.1	0.1
Bonds	Floating/Variable Rate Notes	1.1	0.3
Securitizations³	Mortgage-backed Securites (incl. CMOs)	0.8	0.8
	Collateralized loan obligations	0.5	0.5
	Asset-backed securities	0.2	0.2
	Collateralized debt obligations	0.1	0.1
Total USD LIBOR Exposure:		223	74

¹ Source: Federal Reserve staff calculations, BIS, Bloomberg, CME, DTCC, Federal Reserve Financial Accounts of the United States, G.19, Shared National Credit, and Y-14 data. Data are gross notional exposures as of 2020Q4. ² The figures for syndicated and nonsyndicated business loans do not include undrawn lines. Nonsyndicated business loans exclude CRE/commercial mortgage loans. ³ Estimated amounts maturing after June 2023 based on historical pre-payment rates

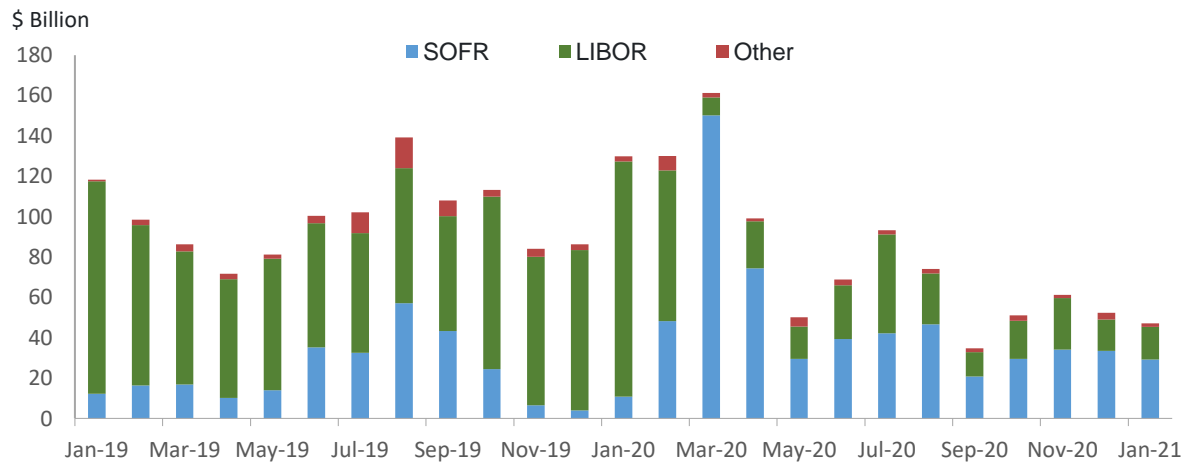
Areas of Progress

Figure 4: SOFR Futures and Swaps Open Interest



Source: CFTC

Figure 5: Private Sector FRN Issuance by Reference Rate



Note: Excludes issuance by U.S. Treasury. Source: Bloomberg

- SOFR derivatives markets are established. We've seen a strong pickup on growth of SOFR swaps since the move to SOFR PAI and discounting in October 2020.

- The majority of floating rate debt issuance has been based on SOFR over the last year. There is strong demand and conventions have been successfully established.

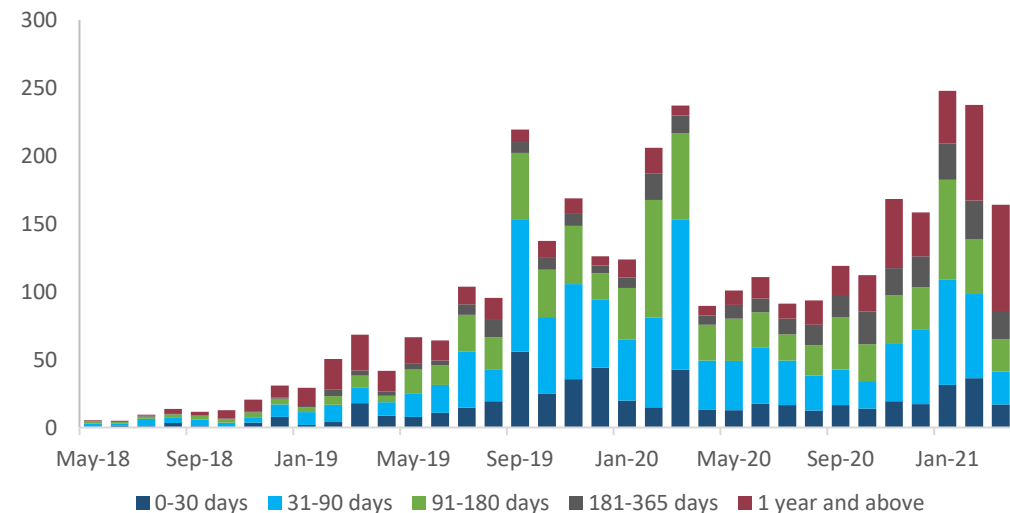
Table 3: SOFR Derivatives Open Interest Compared to LIBOR and Fed Funds

	Percent of LIBOR	Percent of Fed Funds
Cleared Swaps		
Maturity:		
0-3 Months	5.8%	7.0%
3-12 Months	0.9%	8.3%
1-3 Years	2.6%	14.1%
3-5 Years	1.9%	25.2%
5-7 Years	1.7%	19.1%
7-10 Years	1.6%	29.3%
10-15 Years	1.0%	50.0%
15-25 Years	1.0%	47.9%
25 Years +	0.4%	25.0%
Futures		
Maturity:		
0-3 Months	67.0%	45.5%
3-12 Months	27.0%	24.7%
1-3 Years	4.6%	37.7%
3-5 Years	0.2%	---

Where Progress is Still Slow

- **Business Loans**: With a few key exceptions, most lenders appear to be waiting on the sidelines and still offering LIBOR as the option. Borrowers are reporting a lack of communication.
- **Securitizations**: Again, with a few exceptions, issuers are still using LIBOR despite the sense that investors would like SOFR offerings.
- **Derivatives**: Despite the strong growth we've seen in SOFR recently, LIBOR is still dominant. Most of the growth has been at longer maturities, which is vital, but growth at the short end has been stalled for the last year, making it difficult to recommend a term rate.

Figure 10: Average Daily CME SOFR Futures Trading Volumes by Maturity



Source: CME Group

Target milestones: product class breakdown

In support of the RFRWG's objectives to establish clear frameworks to cease trading of new LIBOR-linked products and manage transition of legacy LIBOR products, the table below provides a product-by-product view of the steps needed to meet the key milestones established by the RFRWG.

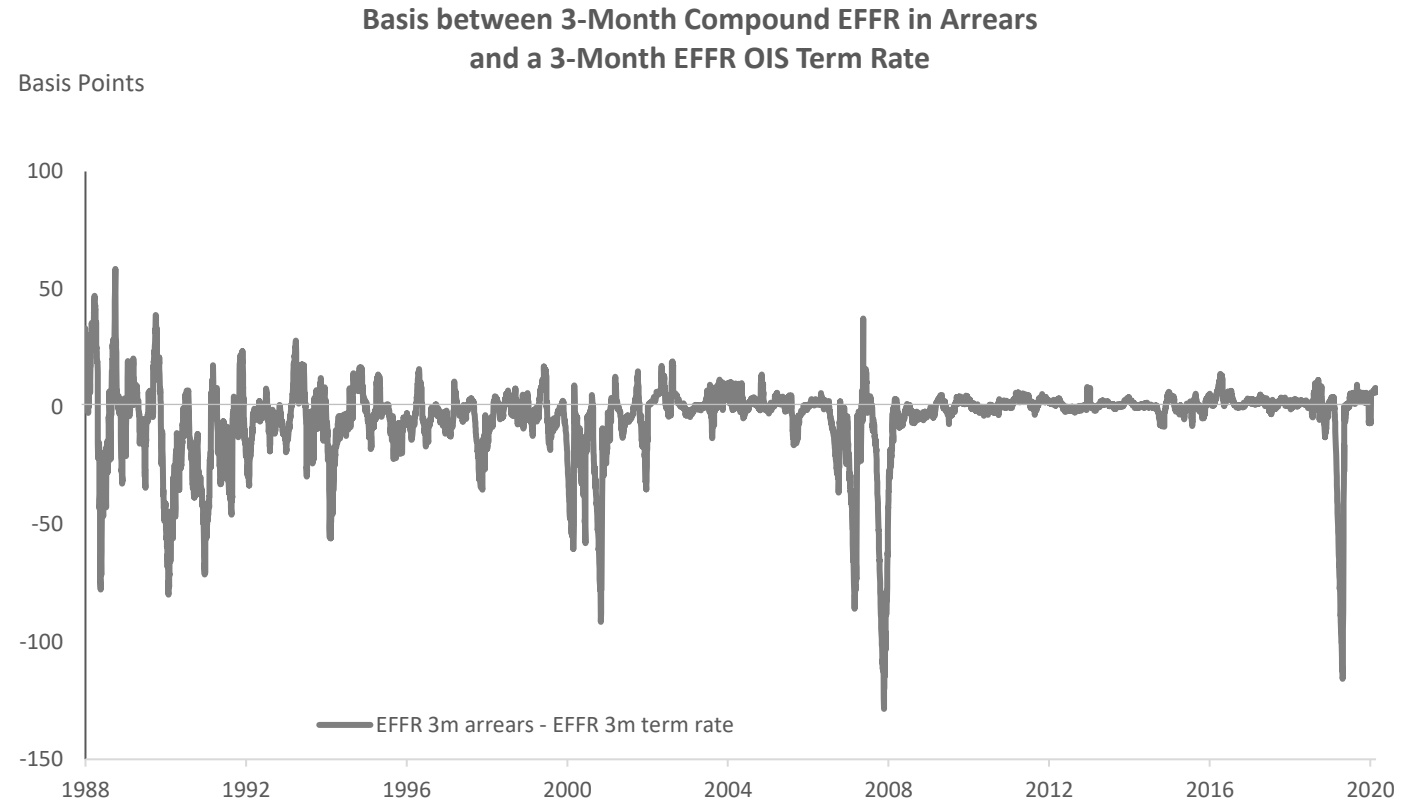
By end of:	Q1 2021	Q2 2021	Q3 2021	Q4 2021
Derivatives	<ul style="list-style-type: none"> • Cease initiation of new GBP LIBOR-linked linear derivatives that expire after the end of 2021, except for risk management of existing positions* • Complete identification of all legacy LIBOR contracts expiring after end 2021 that can be actively converted • Accelerate active conversion where viable (e.g. compression/renegotiation) to reduce legacy volume • Widespread sign-up to the ISDA protocol ahead of effective date** 	<ul style="list-style-type: none"> • By end-Q2, cease initiation of new GBP LIBOR non-linear derivatives that expire after the end of 2021, except for risk management of existing positions* • By end-Q2, cease initiation of new GBP LIBOR-linked exchange traded futures and options that expire after the end of 2021, except for risk management of existing positions* • During Q2/Q3, cease initiation of cross-currency derivatives with a LIBOR-linked sterling leg, expiring after 2021, except for risk management of existing positions* • Complete active conversion across linear and non-linear derivatives where viable, and if not viable, ensure robust fallbacks are adopted where possible 		<ul style="list-style-type: none"> • Be fully prepared for the end of GBP LIBOR
Bonds and securitisations	<ul style="list-style-type: none"> • Cease new issuance of GBP LIBOR-referencing products maturing after 2021 • Complete identification of all legacy LIBOR contracts expiring after end 2021 that can be actively converted • Accelerate active conversion where viable (e.g. consent solicitation mechanisms) to reduce legacy volume 	<ul style="list-style-type: none"> • Complete active conversion where viable 		
Loans	<ul style="list-style-type: none"> • Cease new issuance of GBP LIBOR-referencing products maturing after 2021 • Complete identification of all legacy LIBOR contracts expiring after end 2021 that can be actively converted • Accelerate active conversion where viable (e.g. at renewal, proactive negotiation, or using pre-agreed terms) to reduce legacy volume 	<ul style="list-style-type: none"> • Complete active conversion where viable • Where active conversion is not viable, ensure robust fallbacks are adopted where possible 		

ARRC

*Perspectives on Issuing
and Implementing SOFR-
Based Loans*

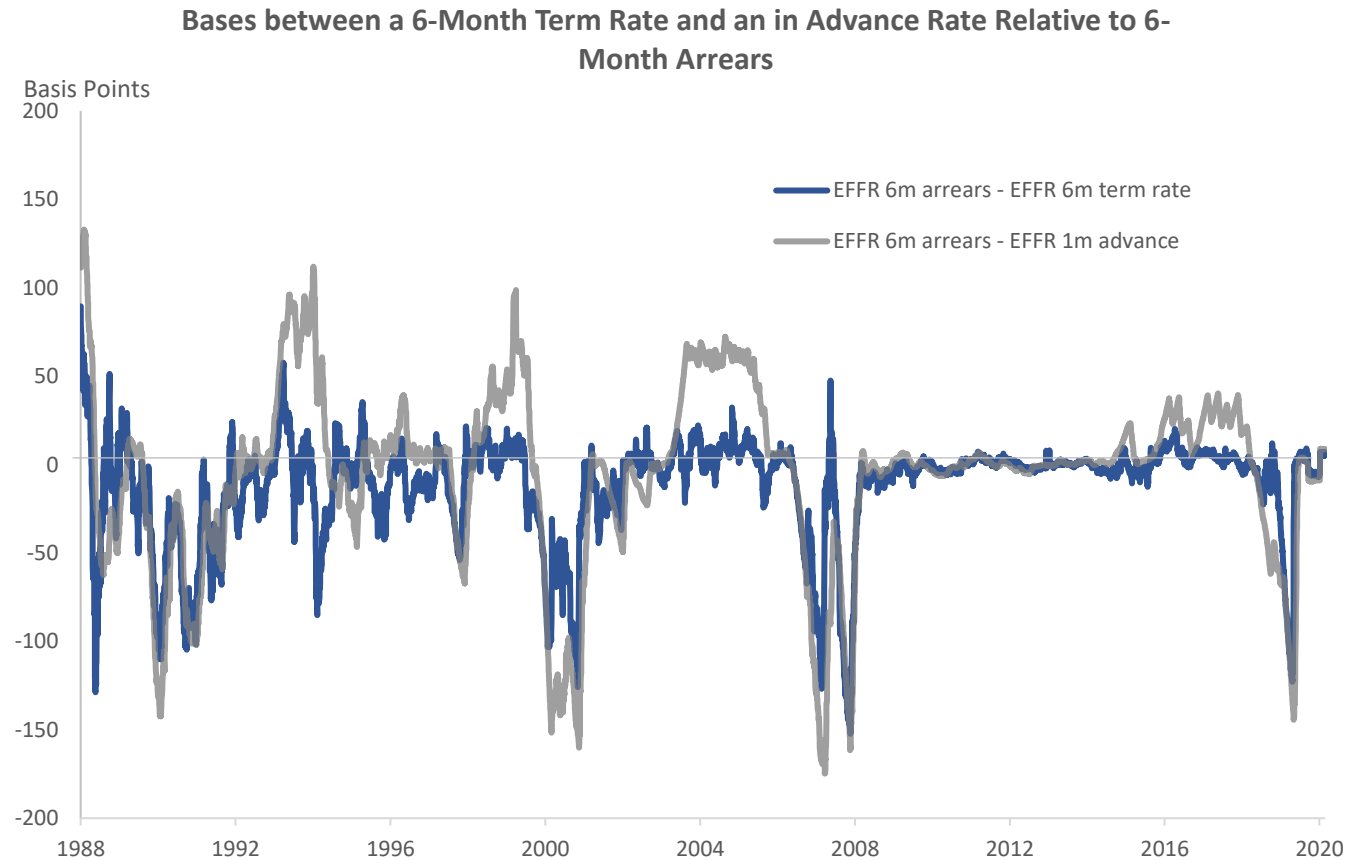
**David Bowman, Senior Associate Director
Board of Governors of the Federal Reserve**

- Any term rate would need to be based on SOFR futures or swaps, and it would reflect market expectations about what will happen to SOFR.
- Much of the time, what people will expect to happen is what will happen, but not always.
- The chart shows the difference between a 3-month fed funds effective term rate and 3-month compound average of the overnight fed funds rate in arrears
- The amounts that term rates have missed in the past have sometimes been considerable.

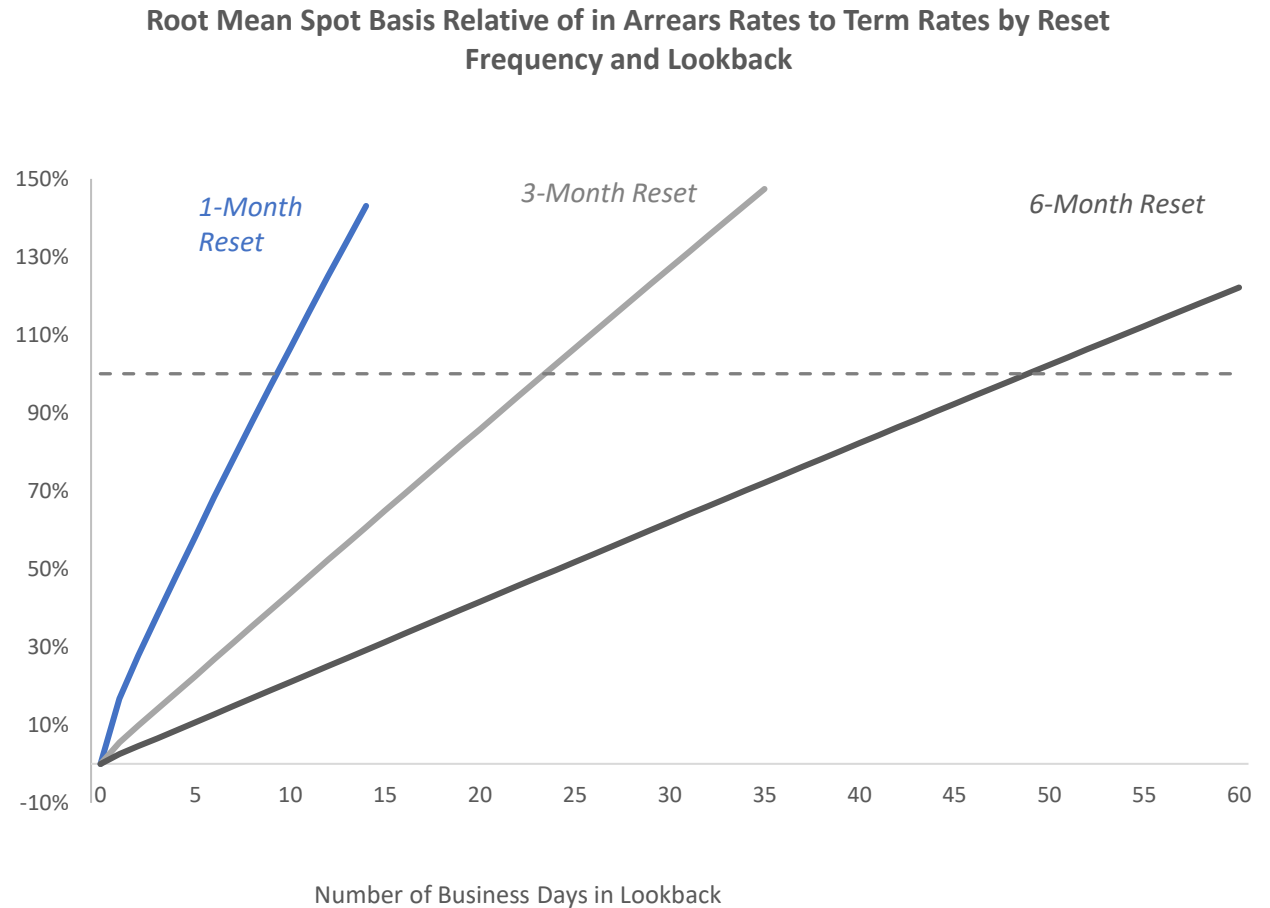


Source: Federal Reserve Bank of New York; Refinitiv; Federal Reserve Board staff calculations

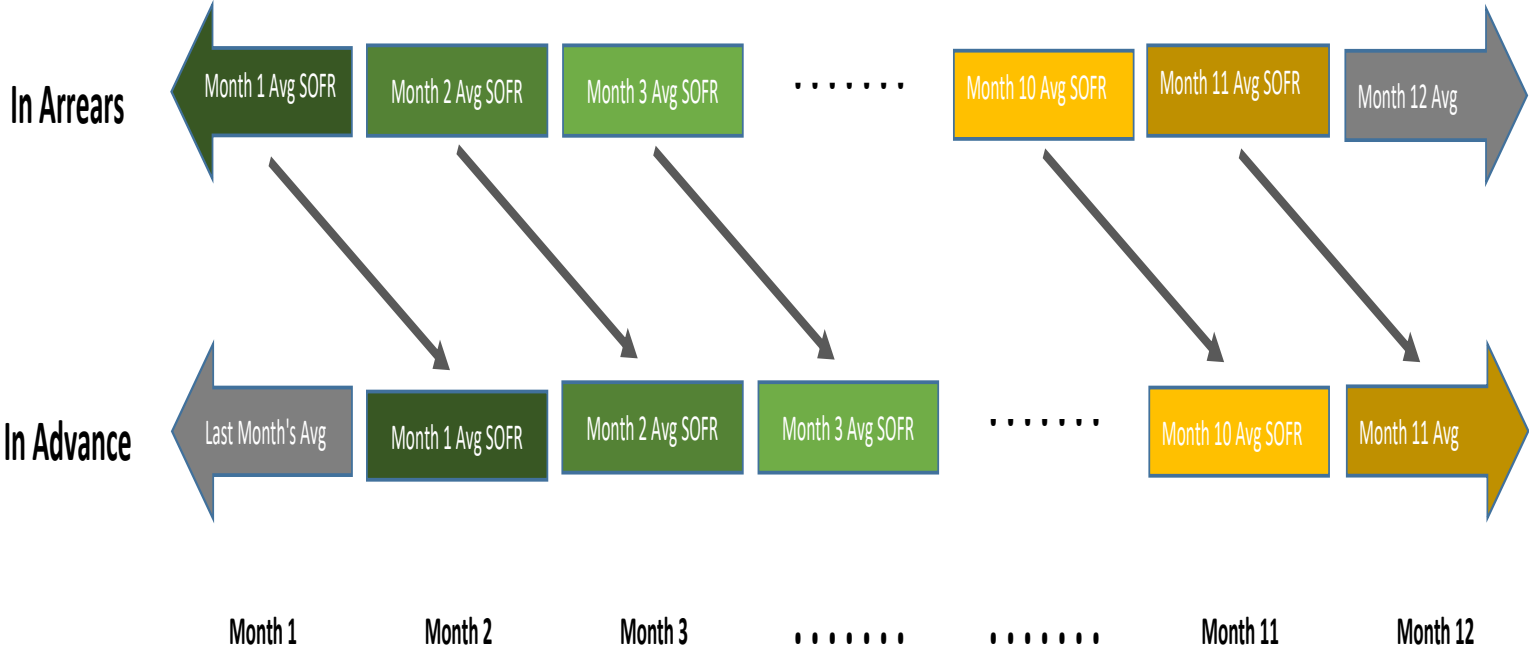
- Some people argue that a term rate is particularly needed for longer interest periods because rates can move more over longer periods of time, and that it is therefore important to reflect market expectations about what will happen to rates over the period.
- However, term rates become less accurate over longer period. As shown in the second chart, a 6-month term rate isn't all that much better than a 1-month average in advance.



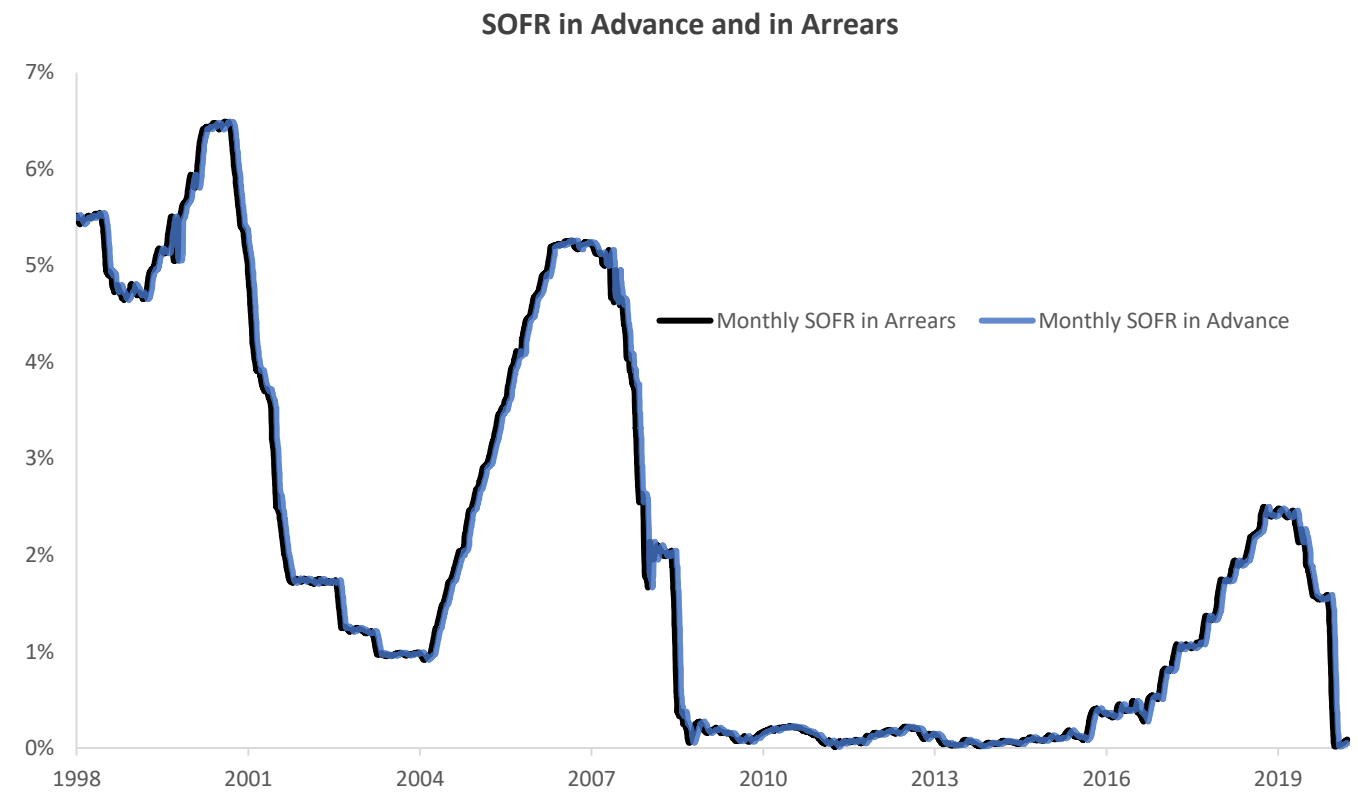
- In contrast, compound averages of SOFR reflect what actually happened to rates, not just people's expectations, and is therefore the baseline in terms of hedging rate movements.
- We will hear that borrowers would like to have a range of SOFR options, and that they want some of those options to be in advance.
- Lookbacks and Lockouts are designed to give some amount of advance notice. FRNs have settled on a 2-3 day lookback, business loans may adopt a 5-day lookback, but you can have even longer lookback structures and still maintain greater accuracy than a term rate.
- With a one-month reset, you can have a lookback as long as 9-10 days and still be as accurate as a 1-month term rate. With a three month reset, you could have a 1-month lookback.



The last graph helps to show that there are a range of options between a full in arrears and in advance. The longer the lookback, the closer one comes to an in advance rate. Once you understand that, you see that in advance is just in arrears with a longer lookback.

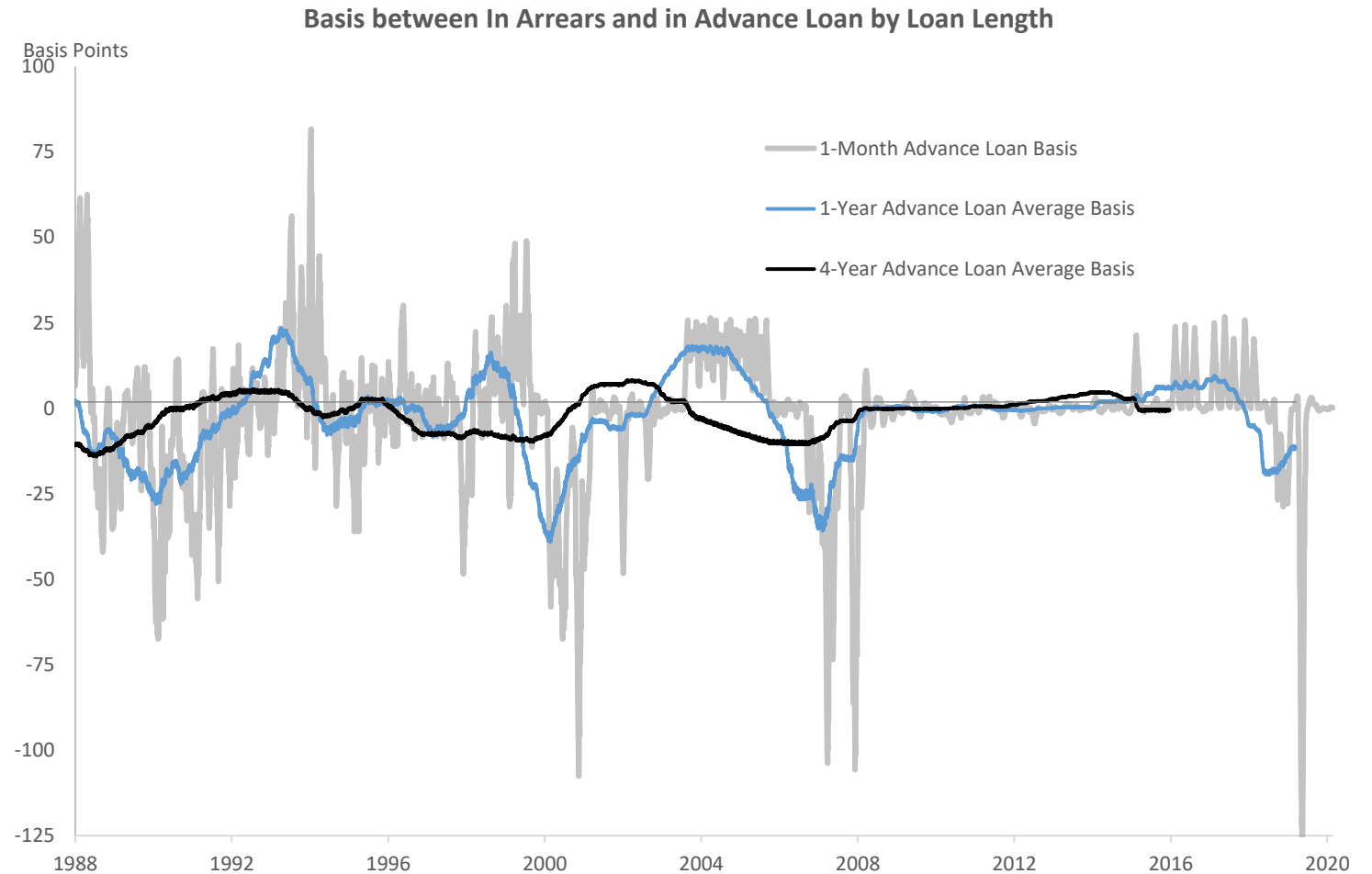


As a result, an in advance structure will hedge the same fluctuations in interest rates that we've seen over history, just with a lag in payment. The two types of rates move very closely together over time.



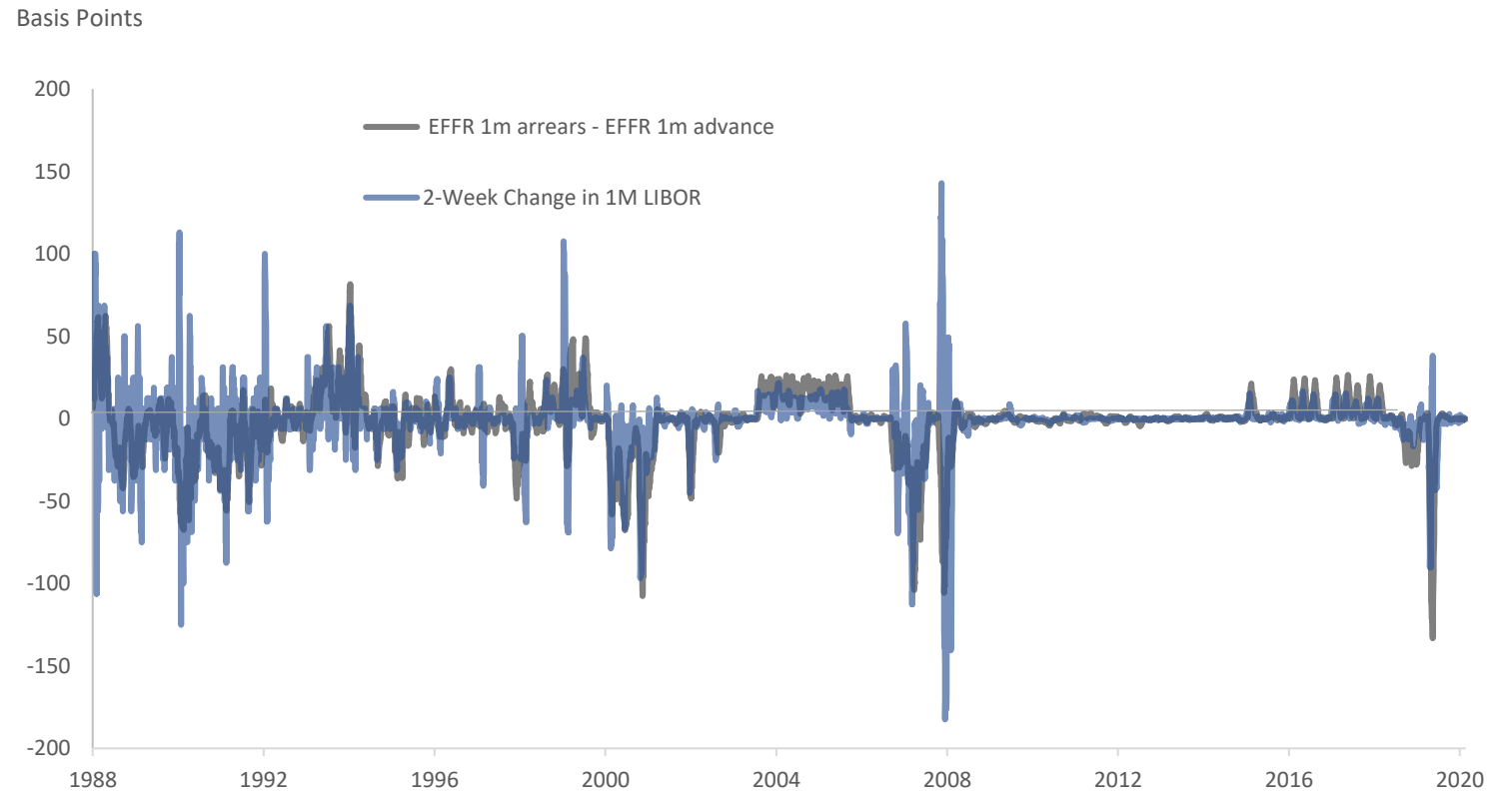
Source: Federal Reserve Bank of New York; Federal Reserve Board staff calculations. Data from August 2014 to March 2018 represent modeled, pre-production estimates of SOFR.

- In advance rates do create a basis, but any basis created by an in advance rate will tend to average out.
- Over a single month, of course, there is basis,
- But over a loan lasting 1-year with a monthly reset, the basis will be cut by $\frac{3}{4}$
- Over a longer loan, the basis will be close to the basis between simple and compound interest at a handful of basis points.



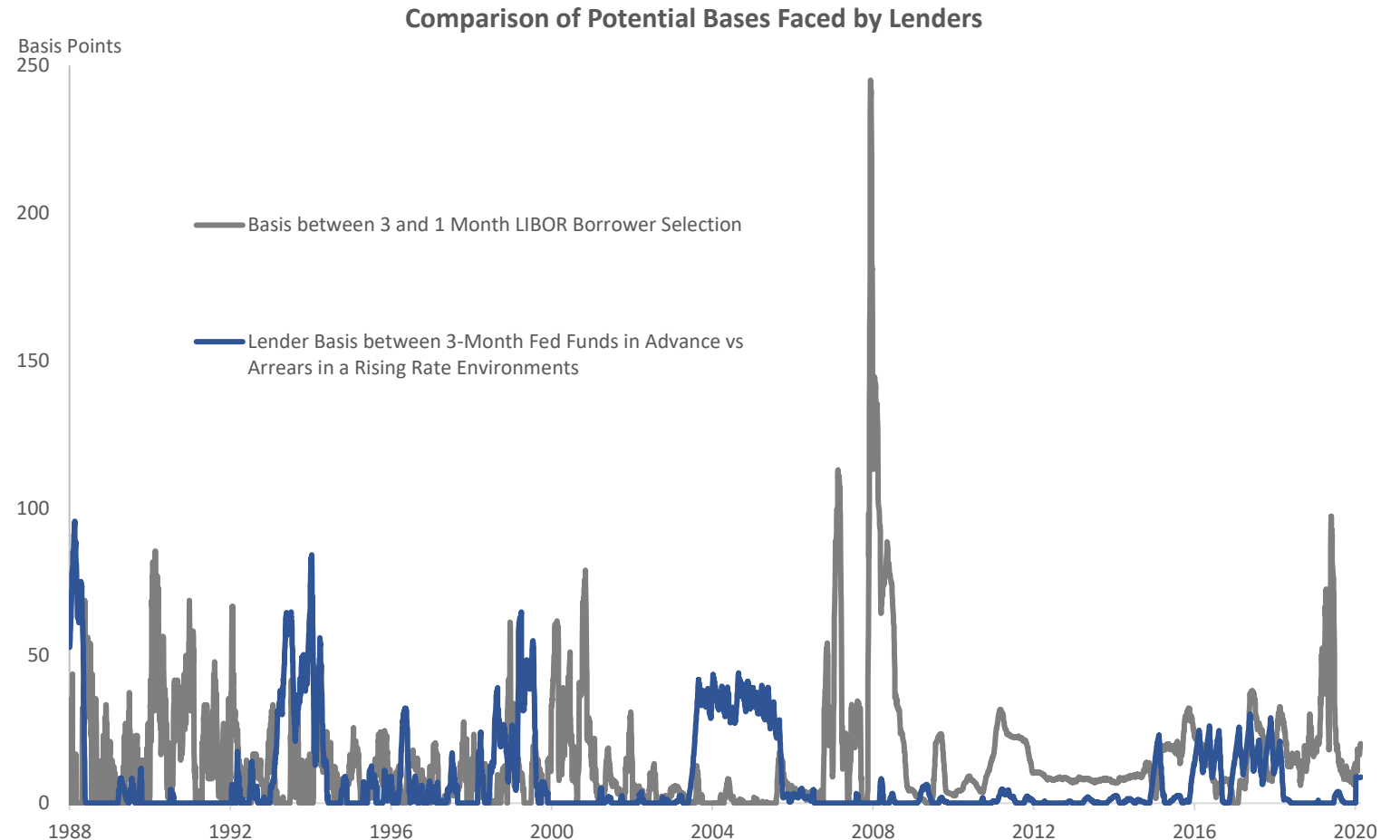
- As noted before, term rates introduce basis also.
- For example, in bilateral loans, it is fairly common to set 1-month LIBOR and to allow the borrower to draw at any time over the month at that rate.
- LIBOR is a forward-looking term rate, but even over short periods of time term rates can change more than people are aware of.
- As shown here, the basis from the term rate is again fairly large (the basis of a fed funds term or SOFR rate would be about the same) and is comparable to the basis from a basic in-advance structure

2-Week Change in Monthly LIBOR versus the Difference between EFR in Arrears and in Advance

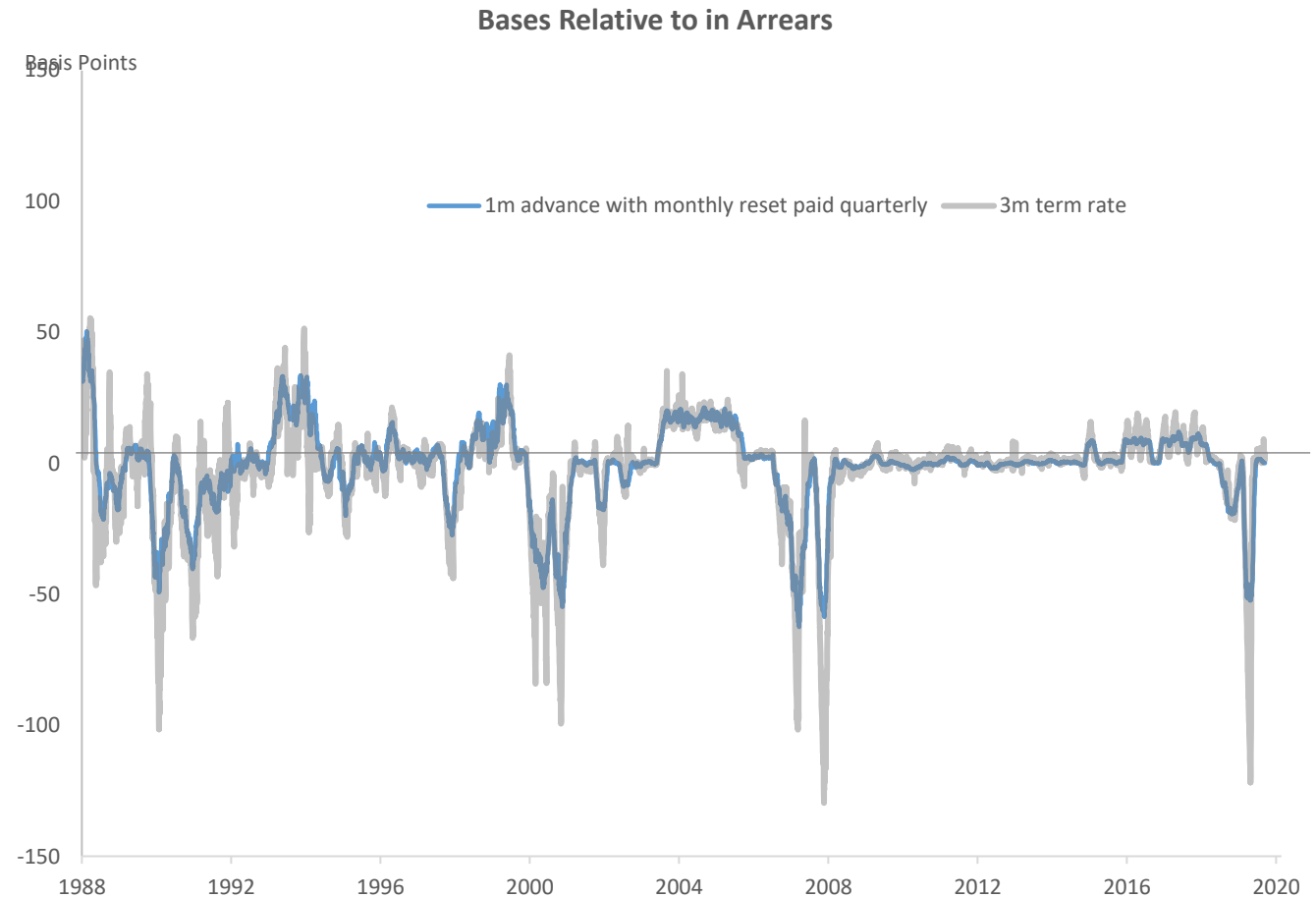


Source: Federal Reserve Bank of New York, ICE Benchmarks Administration; Federal Reserve Board staff calculations.

- Banks also deal with similar or larger basis all the time. For example, banks often allow borrowers the right to choose between 1-month, 3-month, and 6-month LIBOR at any given loan reset.
- As shown, the amount of the basis is quite large – larger than the basis that they would take on using in advance, and the basis with in-advance is two-sided, not the one-sided basis they take on with LIBOR



- You can also use SOFR averages in more creative ways that reduce basis.
- For example, you can use 30-day SOFR with monthly resets in a quarterly payment restructure, and that will be more accurate than a 3-month term rate.



The User's Guide to SOFR also discussed hybrids models of using SOFR averages:

- *Interest Rollover*: Payments are set *in advance* and any missed interest relative to *in arrears* is rolled over into the payment for the next period.

In this hybrid model, the payment for the period is set using an average of SOFR calculated at the start of the interest period; however the amount of interest due is calculated based on the average of SOFR over the interest period (*in arrears*), and any difference between the amount of interest paid and the interest accrued is simply rolled over into the payment for the next interest period.

Table 1: Example of Interest Rollover approach on a 1-year loan over the steep drop in rates in 2007-08

Interest Determination Date	SOFR in Arrears	SOFR in Advance	Rollover Adjustment (bp)	Interest Rollover Hybrid
				Monthly Rate (SOFR in Advance + True Up)
4/26/2007	5.12%	5.21%	-9	5.21%
5/28/2007	5.10%	5.12%	-2	5.03%
6/27/2007	5.04%	5.10%	-6	5.08%
7/27/2007	4.67%	5.04%	-37	4.98%
8/28/2007	4.94%	4.67%	27	4.30%
9/27/2007	4.60%	4.94%	-34	5.21%
10/29/2007	4.25%	4.60%	-35	4.26%
11/28/2007	3.90%	4.25%	-35	3.90%
12/28/2007	3.45%	3.90%	-45	3.55%
1/29/2008	2.59%	3.45%	-86	3.00%
2/28/2008	1.78%	2.59%	-81	1.73%
3/31/2008	2.12%	1.78%	34	0.97%
Annualized Rate of Return	3.96%	4.22%		3.94%
Basis to in Arrears (bp)	---	-26		2

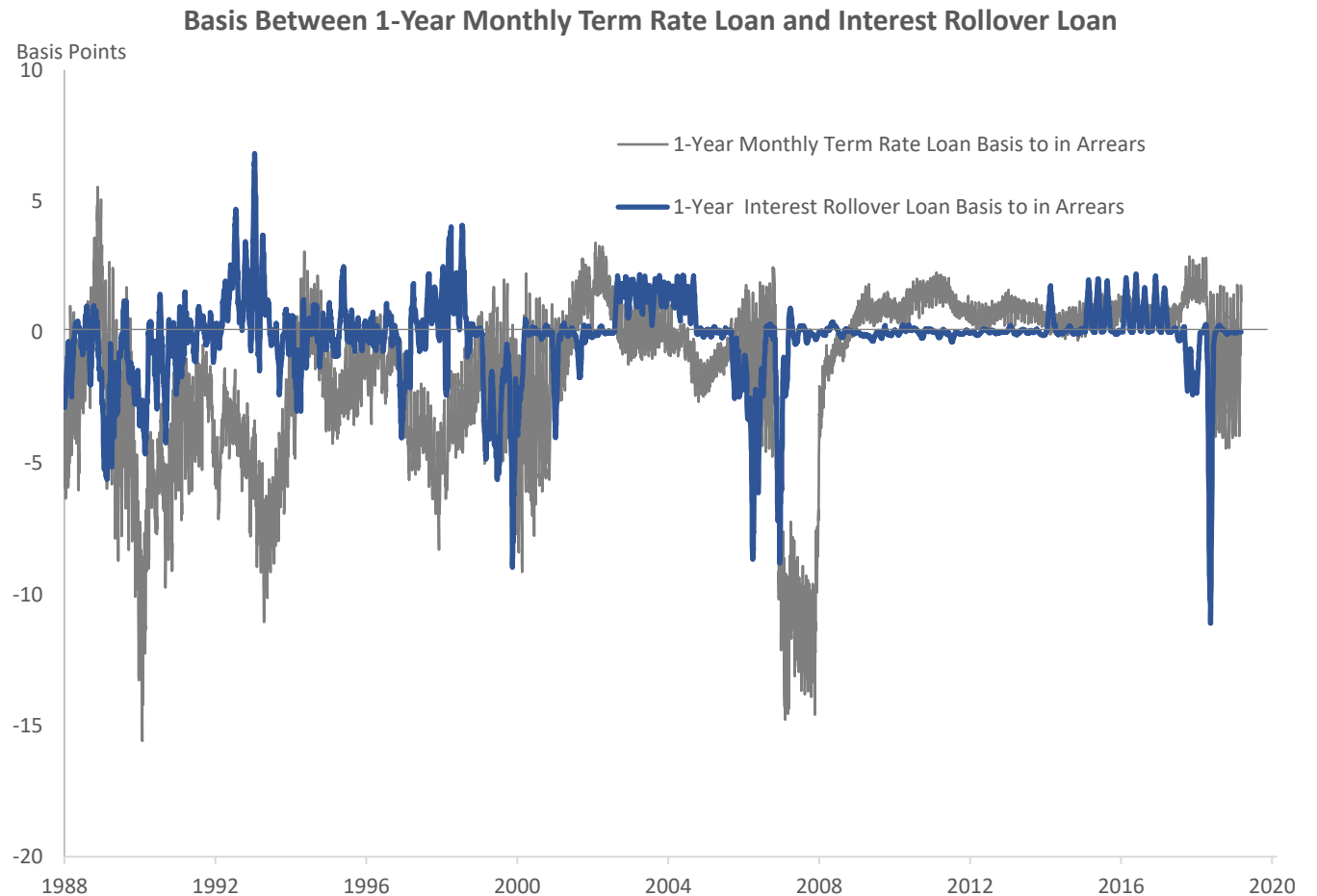
- *Principal Adjustment*: Payments are set *in advance*, but principal and interest accrue *in arrears*.

In this hybrid model, the payment for the period is set using an average of SOFR calculated at the start of the interest period (*in advance*); however the amount of that set payment that is applied to interest will be based on the average of SOFR over the interest period (*in arrears*).

Table 2: Example of Hybrid Principal Adjustment approach on a 1-year loan over the steep drop in rates in 2007-08

Interest Determination Date	SOFR in Arrears	SOFR in Advance	Difference (bp)	Principal Adjustment Hybrid	
				Monthly Rate (SOFR in Advance)	Principal (Diff. Applied to Principal)
4/26/2007	5.12%	5.21%	-9	5.21%	\$1,000,000.00
5/28/2007	5.10%	5.12%	-2	5.12%	\$999,925.00
6/27/2007	5.04%	5.10%	-6	5.10%	\$999,908.33
7/27/2007	4.67%	5.04%	-37	5.04%	\$999,858.34
8/28/2007	4.94%	4.67%	27	4.67%	\$999,550.05
9/27/2007	4.60%	4.94%	-34	4.94%	\$999,774.95
10/29/2007	4.25%	4.60%	-35	4.60%	\$999,491.68
11/28/2007	3.90%	4.25%	-35	4.25%	\$999,200.16
12/28/2007	3.45%	3.90%	-45	3.90%	\$998,908.73
1/29/2008	2.59%	3.45%	-86	3.45%	\$998,534.14
2/28/2008	1.78%	2.59%	-81	2.59%	\$997,818.52
3/31/2008	2.12%	1.78%	34	1.78%	\$997,144.99
Annualized Rate of Return	3.96%	4.22%		3.93%	
Basis to in Arrears (bp)	---	-26		3	

As shown, hybrids can potentially minimize the basis faced by investors while at the same time structuring payments in a way that borrowers should feel comfortable with. And in fact, as shown, they can have a smaller basis return relative to in arrears than even a forward-looking term rate might



Hedging a Quarterly Term Rate Loan

- Step 1: Enter into a 12-month SOFR OIS contract at the start of the year to pay the fixed-leg rate $OIS_{12m}(t)$ and receive quarterly compound SOFR payments.
- **Step 2: At the start of each quarter**, enter into a 3-month SOFR OIS contract to receive the fixed-leg term rate, OIS_{3m} and pay compound SOFR over that quarter. Use the quarterly floating-rate SOFR payment from the 12-month OIS in Step 1 to pay the floating-rate leg of Step 2 and use the fixed rate payment of this swap to pay the quarterly term-rate owed.

→ If you are interested in hedging a loan or other product, it will be easier and cheaper to use SOFR directly rather than a SOFR term rate. Dealers may offer term SOFR derivatives, but they will have to take more steps behind the scenes to hedge it, and the costs will have to be passed on.

Hedging a Quarterly SOFR Loan

- Step 1: Enter into a 12-month SOFR OIS contract at the start of the year to pay the fixed-leg rate $OIS_{12m}(t)$ and receive quarterly compound SOFR payments.

SOFR in advance rates can also be hedged, either through a swap with lagged payments embedded into it, or more directly,

Hybrids could also be hedged (Principal Adjustment could be directly hedged with a basic SOFR OIS swap).

Hedging a SOFR in Advance Loan

- Step 1: Enter into a 12-month SOFR OIS contract at the start of the year to pay the fixed-leg rate and receive quarterly compound SOFR payments based on SOFR in advance

Or

- Step 1: Enter into a 9-month SOFR OIS contract at the start of the year to pay the fixed-leg rate $OIS_{9m}(t)$ and receive quarterly compound SOFR payments, saving each payment until the next quarter when it is due on the loan.

Looking at the pros and cons of each alternative, while term rates do have pros, they don't particularly stand out as better than the other options.

In particular, for any hedged loan (or other product) or any longer-lasting loan, using SOFR directly will be easier

	Next Payment Known at Start of Interest Period	Requires System Changes for Borrowers	Reflects Expected and Unexpected Changes in Rates	Payments Delayed Relative to Interest Period in which Rate Changes Occurred	Hedge Effectiveness for Borrower relative to standard SOFR OIS Derivatives Hedge
Compound SOFR in Arrears with Lookback	No	Yes	Yes	No	Very Likely Effective (Full hedge can be obtained if there is no lookback)
Simple SOFR in Arrears with Lookback	No	No, if systems already allow Prime Loans or other overnight borrowing structures	Yes	No	Very Likely Effective (diminuous basis between simple and compound interest)
SOFR in Advance	Yes	No	Yes	Yes	Very Likely Effective (payments from OIS hedge would be received prior to loan payment date)
SOFR in Advance Interest Rollover	Yes	No	Yes	Yes	Very Likely Effective (although hedging requires entering in to a set of standard OIS swaps and hedge payments would be received prior to loan payment date)
SOFR in Advance Principal Adjustment	Yes	Some Changes May be Required?	Yes	No	Full (Relative to both Interest and Principal)
Term SOFR	Yes	No	Expected Rate Changes Only	No	Will not effectively hedge unexpected rate changes and is not included in FASB's hedge accounting benchmarks. Can be hedged more fully through a series of short OIS transactions, but hedging in arrears would be less expensive

ARRC

*Perspectives on Issuing
and Implementing SOFR-
Based Loans*

**Moderator: Brian Smith, Deputy Assistant Secretary for Federal
Finance at U.S. Department of the Treasury**

First Session: Borrower Perspectives

Tom Deas, National Association of Corporate Treasurers and co-chair of the ARRC Nonfinancial Corporate Working Group

Tom Hunt, who also co-chairs the working group and is a Director with the Association of Financial Professionals

Jason Behnke, Assistant Treasurer for the Ford Motor Company

Jenifer Herdin, Vice President Corporate Treasury for PVH Corporation

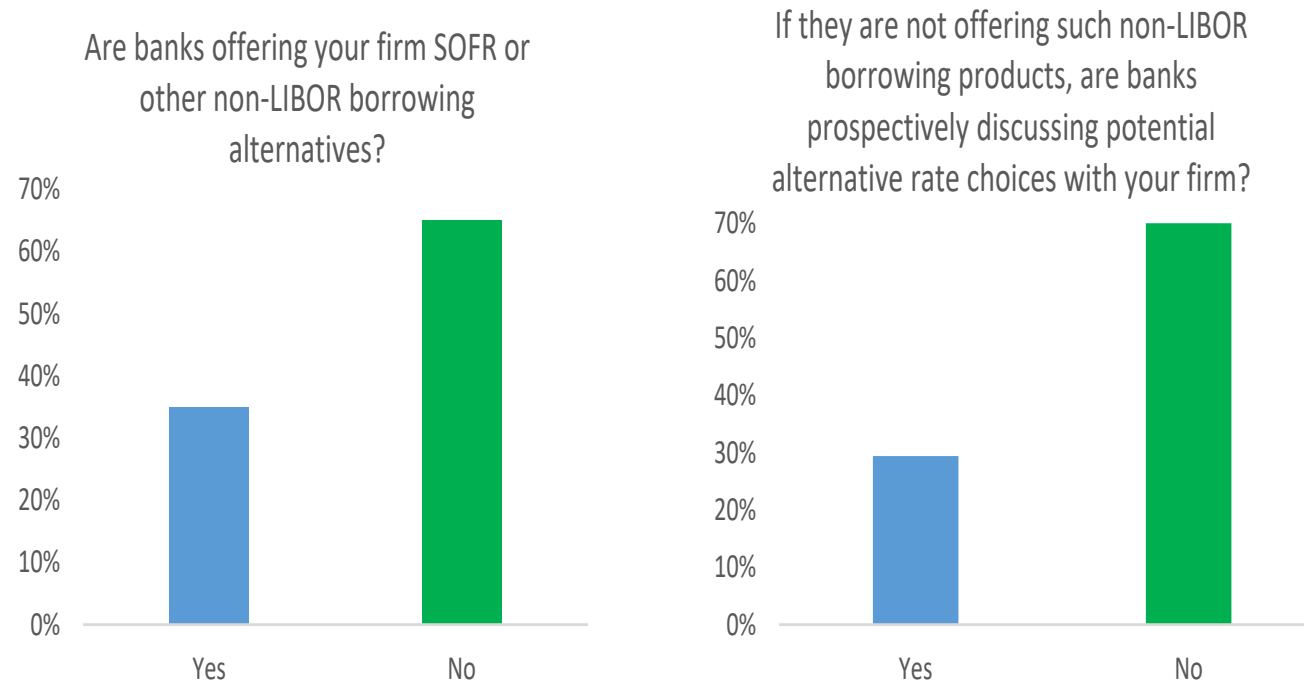
Bjork Hupfield, the Global Treasurer of The Hershey Company

Matt Johnson, the Treasurer of Genesco

Mack Makode, Vice President and Treasurer of Under Armor

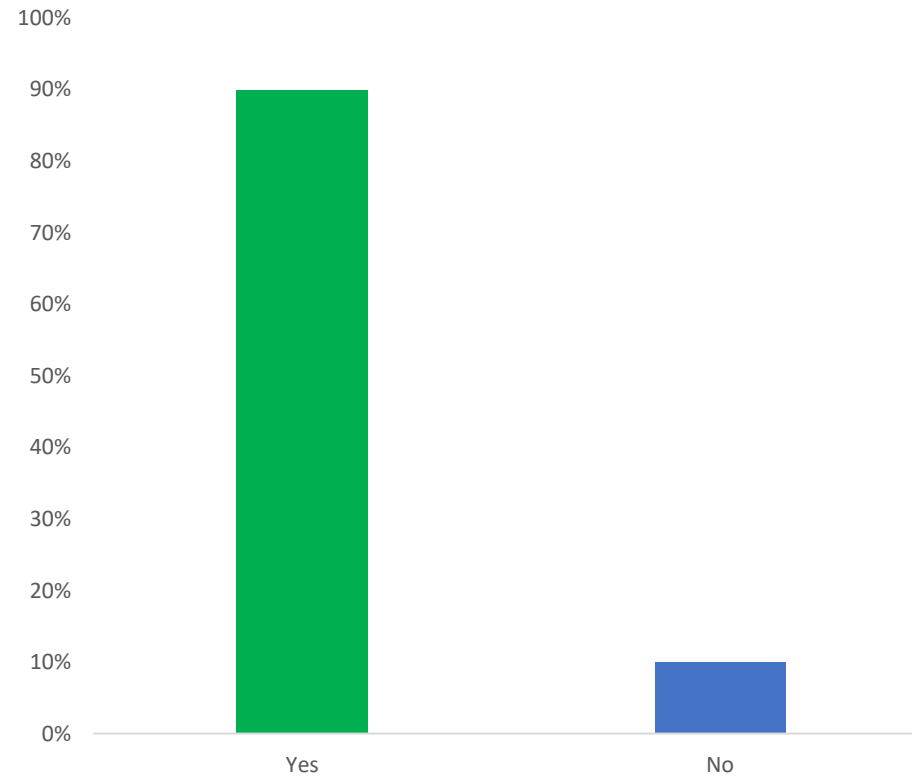
Rich Moore, the Treasurer of Caterpillar

Figure 8: Survey of Nonfinancial Corporate Views of Lender Communication



Source: March 2020 Survey of ARRC Nonfinancial Corporate Working Group

Does your firm wish to be offered a range of SOFR-based rate choices, including both in arrears and in advance options?



Source: March 2020 Survey of ARRC Nonfinancial Corporate Working Group

Second Session: Lenders

Tony Bulic, KeyBank

Andrew Lucca, KeyBank

Alexis Pederson, Wells Fargo

Doug Laurie, Barclays

David McNally, Deutsche Bank