



BANKING | ASSET MANAGEMENT | HEDGE FUNDS | INSURANCE

The Impact of New Alternative Reference Rates on Curve Instruments and Curve Modelling

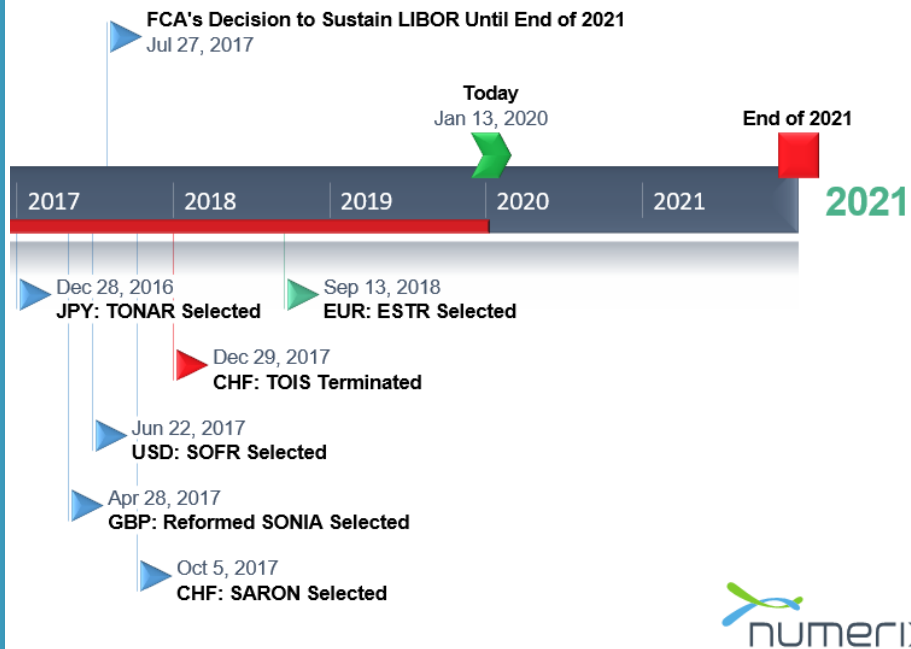
AGENDA

1. What is the LIBOR Transition?
 - a. What is timeline and the milestones?
 - b. What are the new instruments available?
 - c. What are the difficulties for the new Alternative Reference Rate (ARR) curves?
2. What are the impacts of the LIBOR Transition on portfolios?
 - a. What is the LIBOR fallback and how does it work?
 - b. How does the LIBOR Transition affect hedging?
3. What else should financial institutions be prepared for?
 - a. Is there a volatility market for ARR?





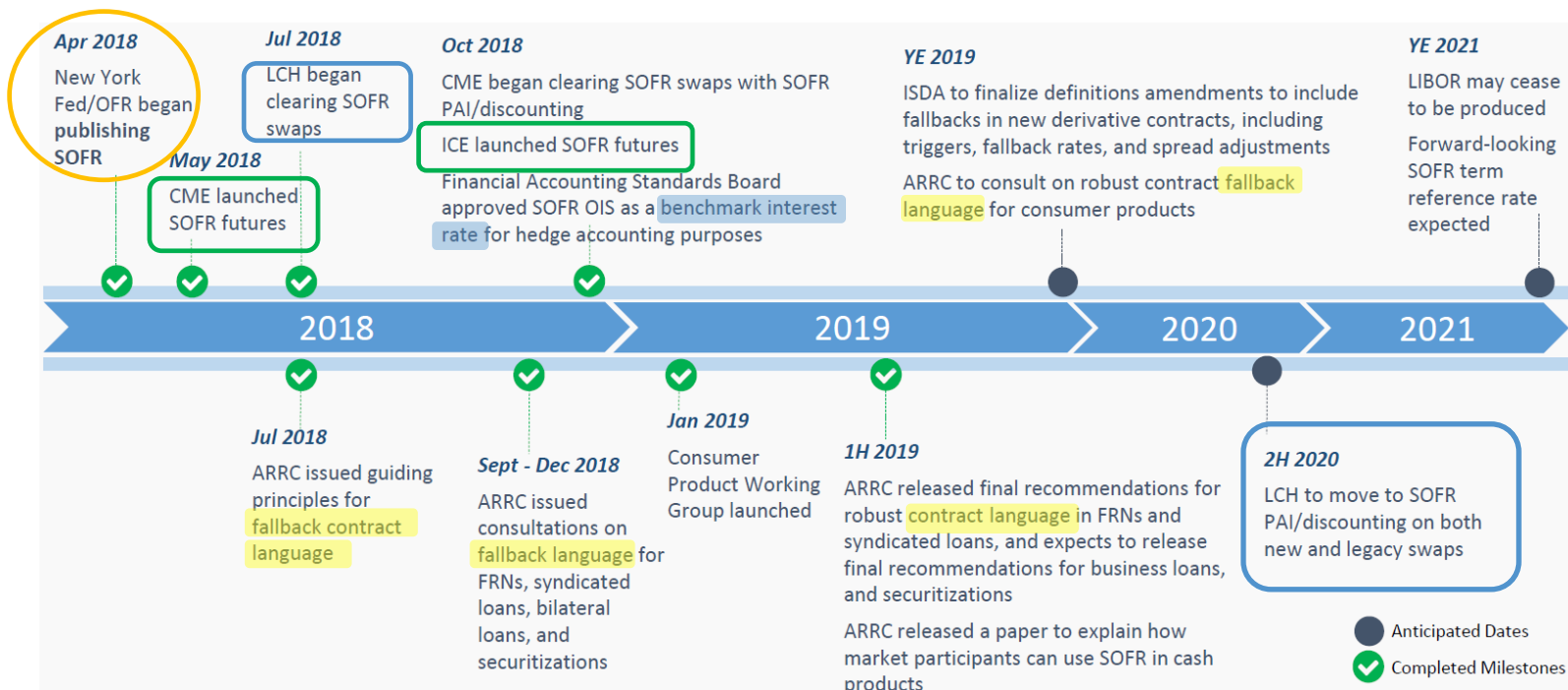
What is the LIBOR Transition?



TIMELINE AND MILESTONES



TIMELINE & KEY MILESTONES



Source: ARRC Apr, 2019

KEY TASKS IN MIGRATION



CONTRACT NOVATION

Change fallback language on LIBOR related contracts. Major focus on non-ISDA format contracts.



MARKET DATA

SOFR curve/volatility construction in corresponding systems for Front Office, Risk and Settlement.



TRADE MIGRATION

Identify trades based on LIBOR and change them to link to SOFR plus spread. Special arrangement may be required for exotic trades such as Range Accrual.



HEDGING REBALANCED

Open, consistent change to hedge with SOFR instruments. Use SOFR-OIS, or SOFR-LIBOR basis swaps to switch the hedging.



AMORTIZATION/ RESERVE OF P&L IMPACT

Risk policy for reserve of P&L incremental recognition

Special Handling Outside Treasury

- Funding curve on Certificate of Deposit
- LIBOR based Loan

Instrument	Key Description	Payment Frequency
SOFR 1M Futures	Daily Averaged	Settlement Day
SOFR 3M Futures	Daily Compounded	Settlement Day
SOFR OIS Swaps	Fixed vs. Daily Compounded	Annual Pay
SOFR-FF Basis Swaps	SOFR + Spread vs. FF Flat, both Daily Compounded	Quarterly Pay
SOFR-LIBOR Basis Swaps	Daily Compounded SOFR + Spread vs. LIBOR Flat	Quarterly Pay

SOFR Derivatives Product

SOFR INSTRUMENTS



SOFR PRODUCTS

Basis Swap
SOFR vs. Fed
Funds

Basis Swap
SOFR vs. LIBOR

Cross Currency
Basis Swaps

Option on
SOFR Futures

Overnight Index Swap

1M
Futures

3M
Futures

Secured Overnight Financing Rate (SOFR)

RATE AND VOLUME

CME SONIA Futures See Week 1 Volume of 15,000 contracts

SONIA futures launched Oct 1, bringing CME Group's leading innovation and efficiency to the overnight sterling market.

- Week 1 volume of 14,960 contracts, including 11.3K contracts traded between Oct 3 and 4
- Over 7.4K contracts traded on Oct 9
- Markets are trading between 0.5 and 1 basis points wide across the front four expiries in both the **MPC** and **Quarterly IMM** contracts.
- Bloomberg codes: ONS and MPC
- Trade with precision around BOE Monetary Policy Committee meetings with MPC SONIA futures
- Benefit from margin offsets with other STIR futures, including up to 50% offsets against Eurodollar futures

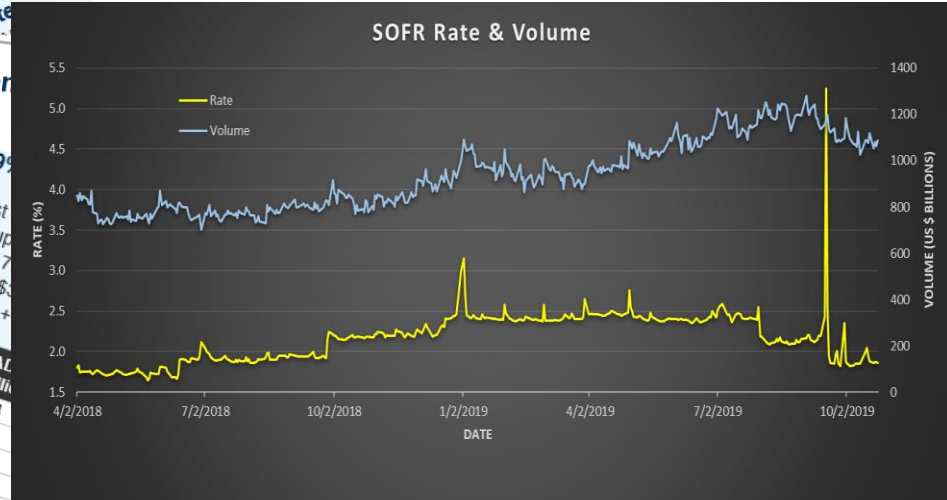
→ View Specs, Vendor Codes, Margins and More

More on Our Site

Interest Rate Futures Volume +19% YoY in 2018

Through the first 2018, CME Group futures averaged 7 per day, equaling \$ DV01 risk transfer, +

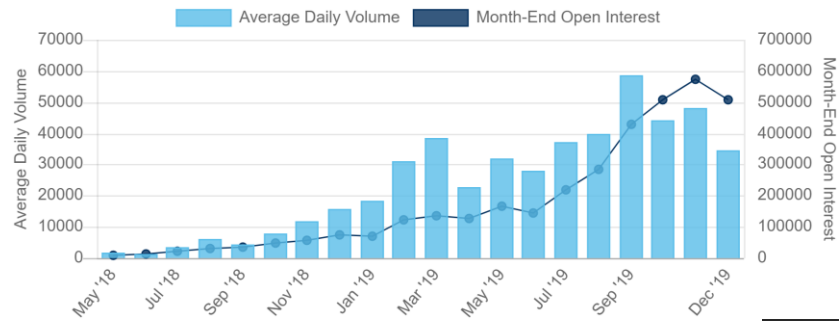
	YTD AL (DV01 million)	%
FF	\$10.04	17%
ED	\$74.66	67%
2-Yr	\$18.08	20%
5-Yr	\$47.38	37%
10-Yr	\$122.17	
Ultra 10	\$18.33	
T-Bond	\$58.38	
Ultra Bond	\$43.40	



Data Source: Federal Reserve Bank of New York

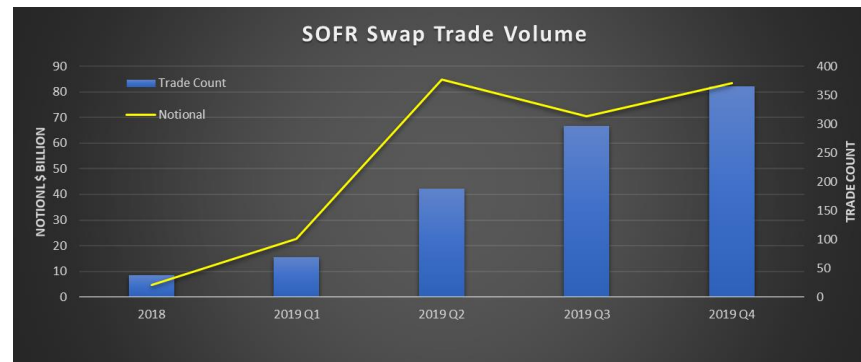
DERIVATIVES TRADE VOLUME

CME SOFR FUTURES



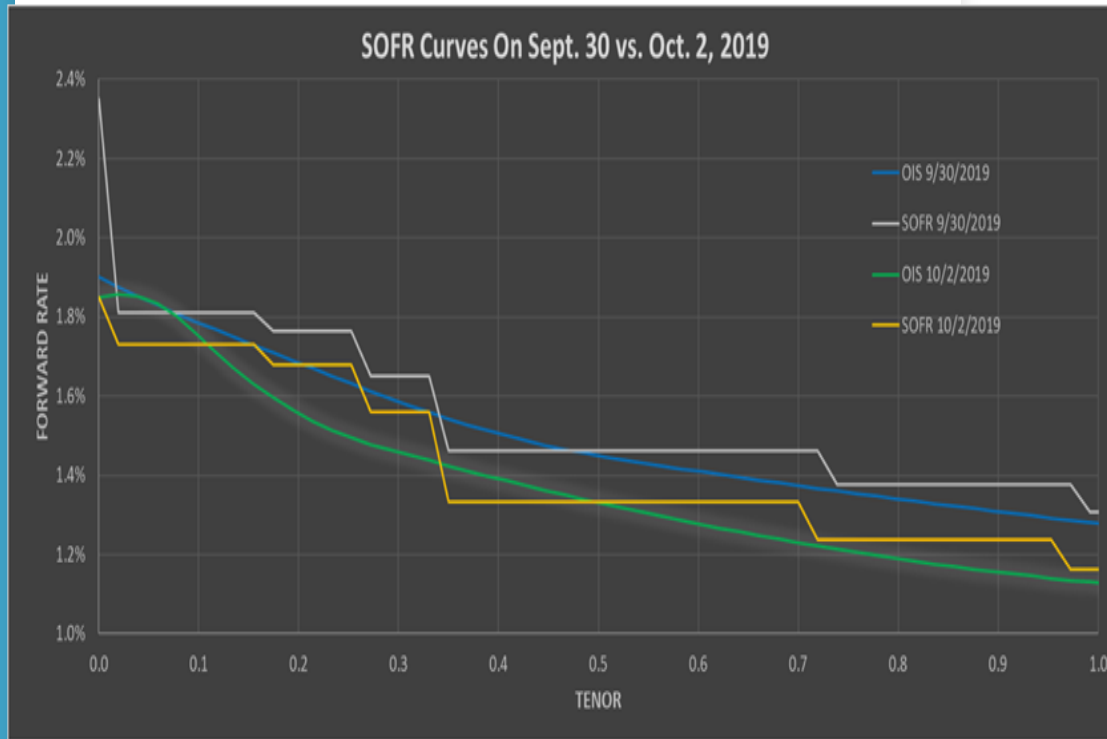
Source: CME

SOFR SWAP TRADE VOLUME



Data Source: ISDA





CHALLENGES FOR CURVE BUILDING



KEY DIFFICULTIES



PRODUCT
VALUATION

CURVE
CONSTRUCTION

DATES EFFECT

CURVE
DEFINITION

SOFR CURVE CONSTRUCTION

General Market Selection on Curve Instruments

Tenor < 2 Years

Tenor \geq 2 Years

SOFR
Cash

SOFR 1M
Futures

SOFR 3M
Futures

SOFR –
Fed Funds
Basis Swap

SOFR –
LIBOR
Basis Swap

SOFR OIS

DIFFERENCE IN PRODUCTS

Underlying

- Different underlying with different conventions
- Different currencies with different conventions

Instruments

- Different leg based on different reference index
- CME & LCH Cleared SOFR OIS Swaps Daily Compounded
- 1M Future Daily Averaged v.s. 3M Future Daily Compounded
- Convexity adjustment on Futures

GLOBAL SOLVER



GLOBAL SOLVER

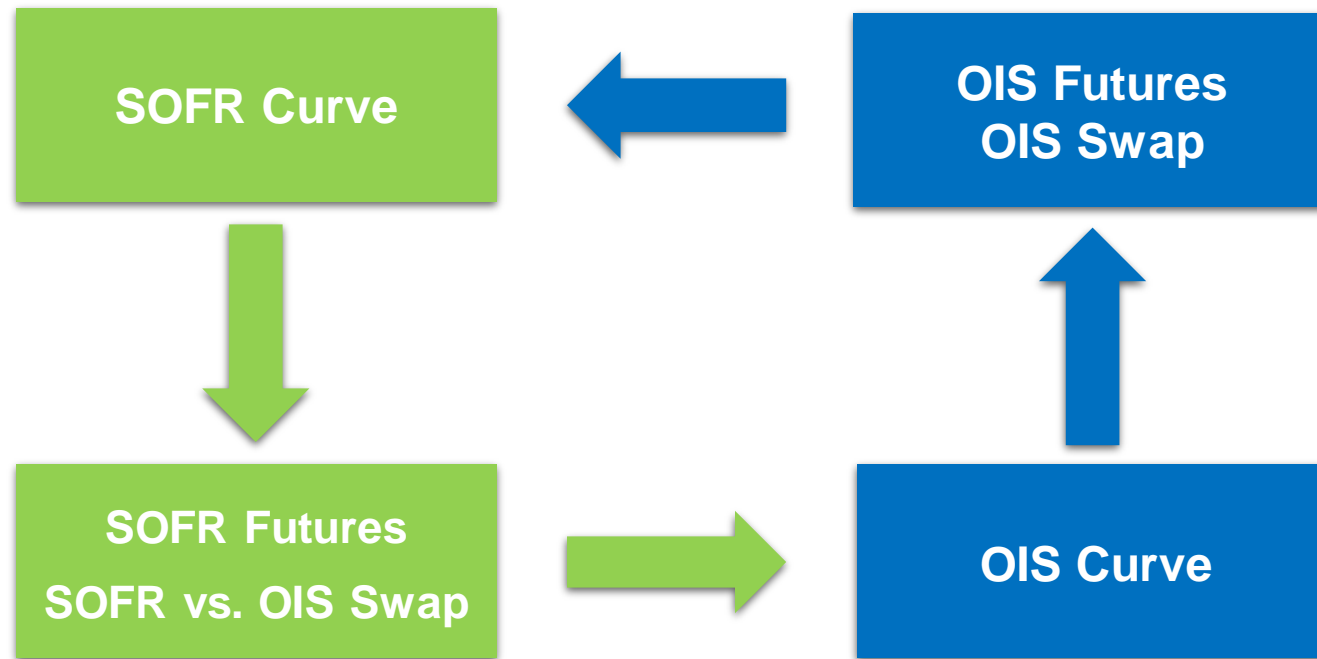
Bootstrapping

Construct a single curve	Start from the shortest tenor, obtaining the DF successively longer tenor	Example: Old LIBOR curve
--------------------------	---	--------------------------

Global Solving

Construct two or more curves that are mutually dependent on each other	Solve the DF at pillar point on all the curves simultaneously	Example: SOFR
--	---	---------------

GLOBAL SOLVER



CURVE STRIPPING MARKET PRACTICE

Multi-Curve & Multi-Currency

— Solving multiple interrelated curves

Central Bank Meeting Dates

Allow interest rate jump on meeting dates

Turn Effects

Due to month-, quarter- & year- end liquidity

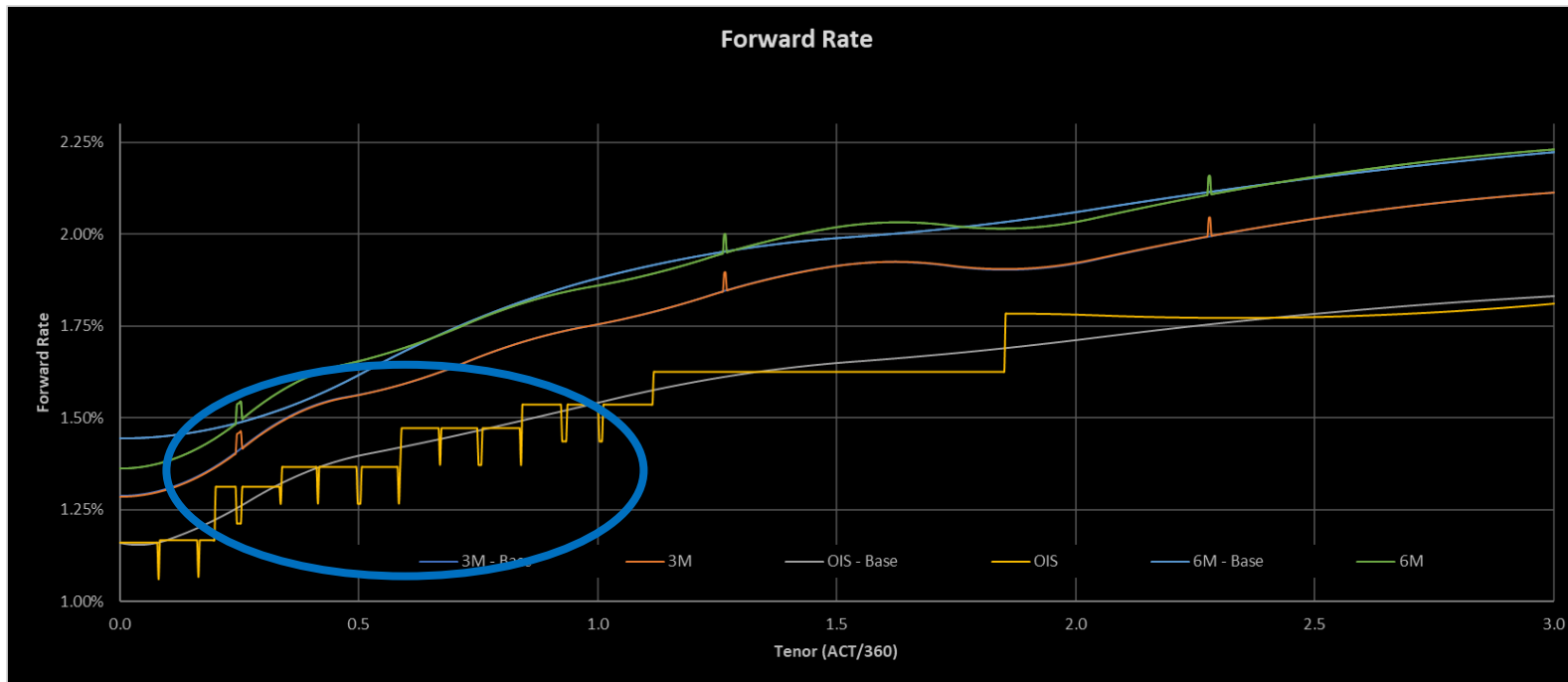
Interpolation

Different Interpolation method at different time horizon

Spread Curves

Curve defined via spread with respect to another curve

CURVE STRIPPING MARKET PRACTICE



Curve Analytics: Numerix; Data Source: Bloomberg

Source: Numerix



SOFR CURVE MEMBERS

General Market Selection on Curve Instruments

Tenor < 2 Years

Tenor \geq 2 Years

SOFR
Cash

SOFR 1M
Futures

SOFR 3M
Futures

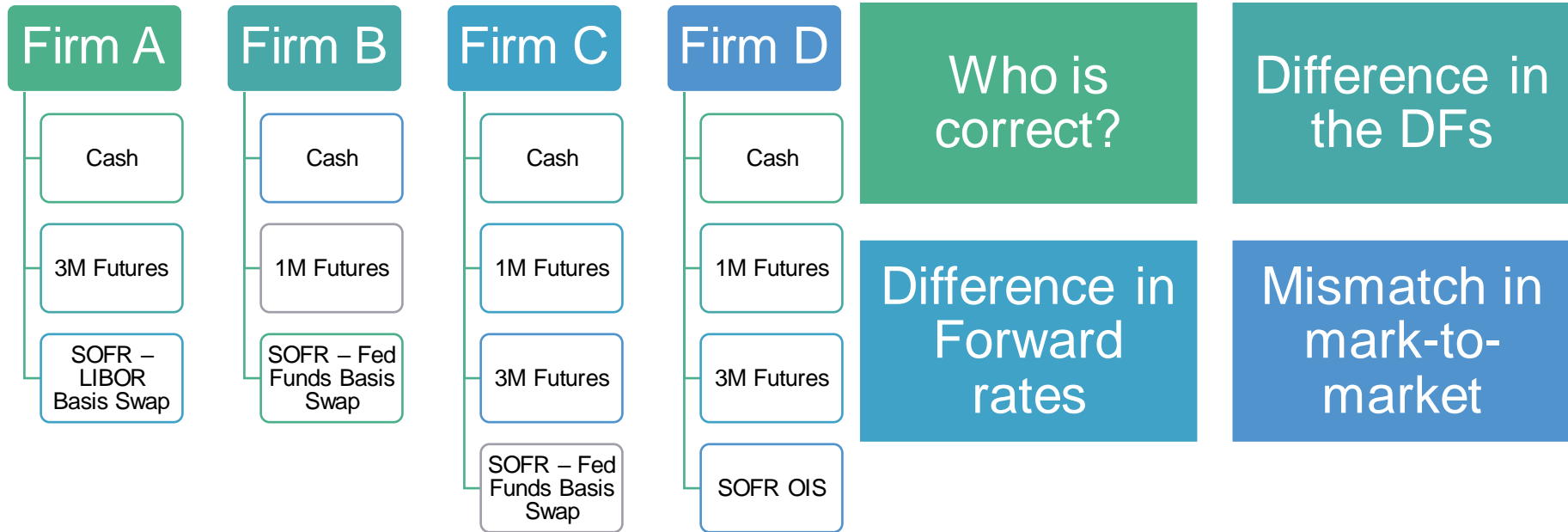
SOFR –
Fed Funds
Basis Swap

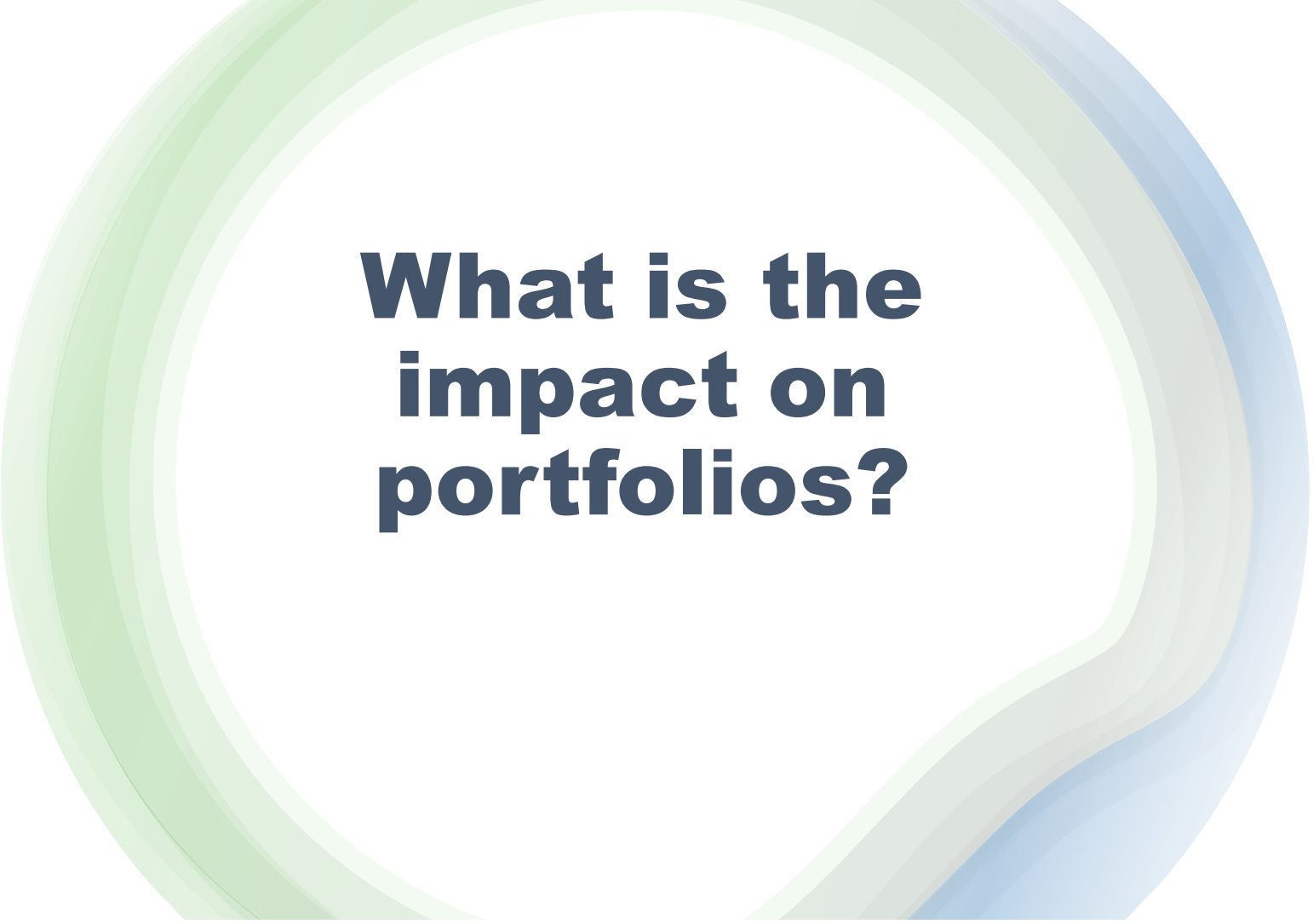
SOFR –
LIBOR
Basis Swap

SOFR OIS



SOFR CURVE MEMBERS





**What is the
impact on
portfolios?**

KEY IMPACTS



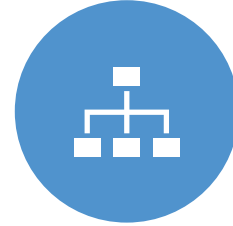
CURVE
CONSTRUCTION



MODEL
CALIBRATION



PORTFOLIO
VALUATION



PORTFOLIO
MANAGEMENT

IMPACTS ON IR PRODUCTS

Linear and Non-Linear Products

Range Accrual

Target
Redemption

Option

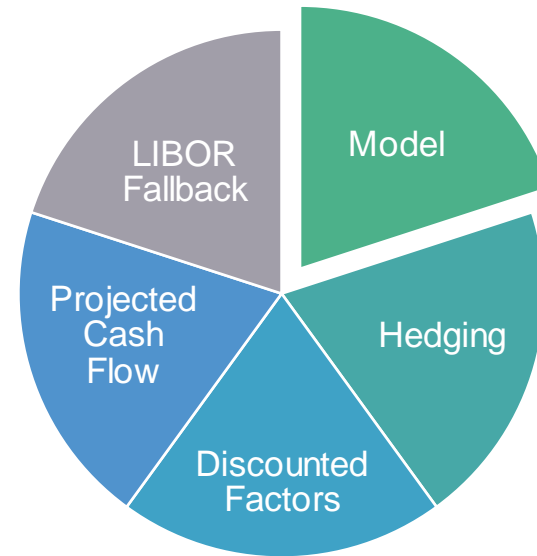
Bond/Swap

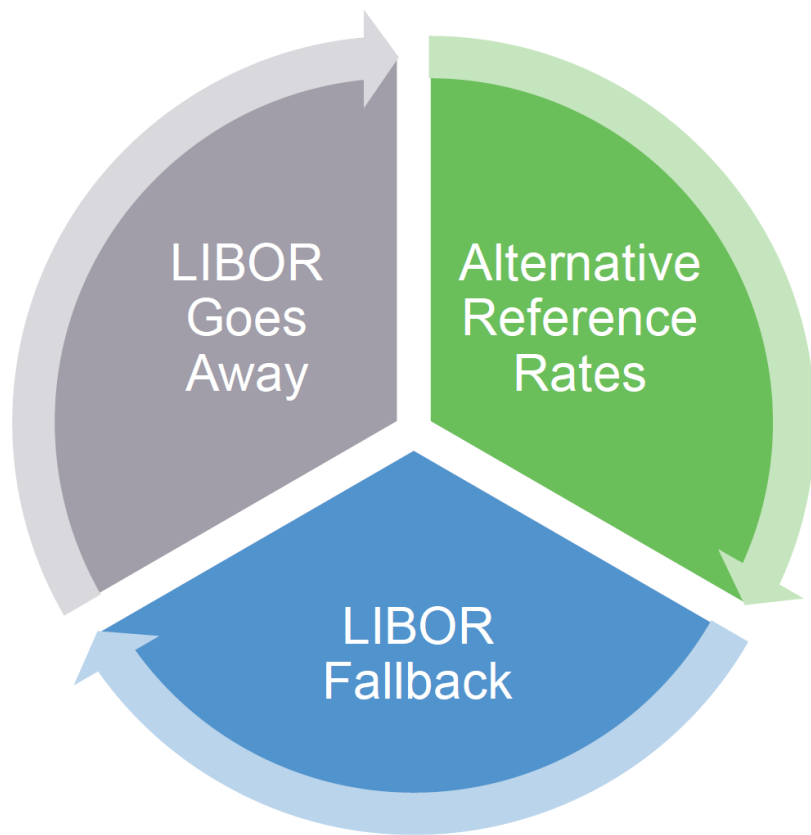
Forward/Future

Cash

LIBOR
Transition

Impacts on Curve/Model



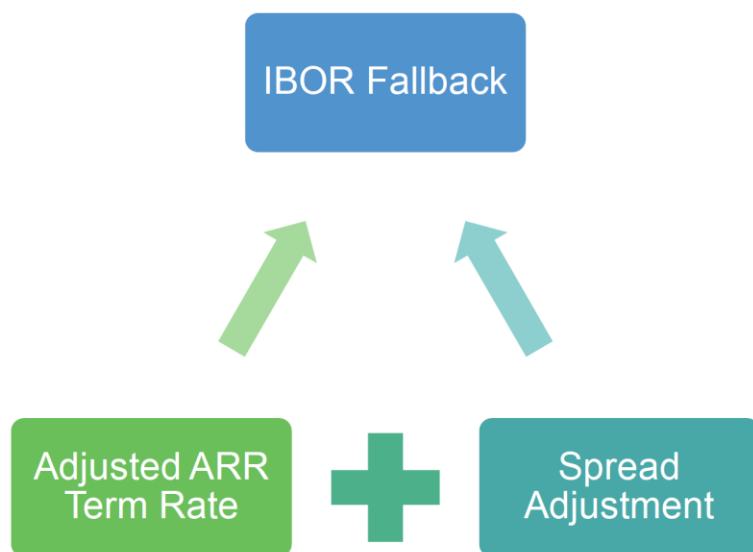


THE IBOR FALLBACK



THE IBOR FALLBACK

What is it?

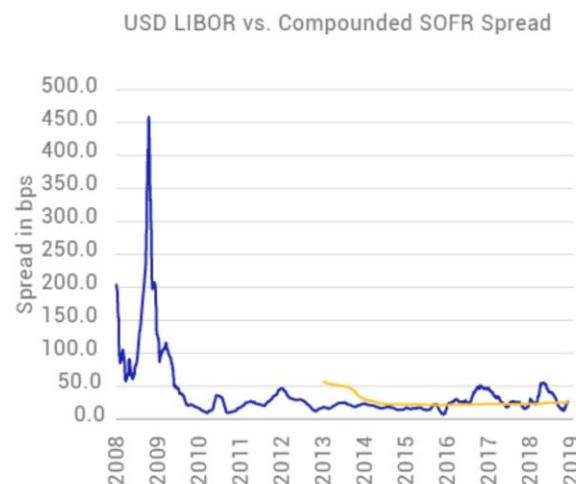


Which IBORs are Covered?

Currency	IBOR	ARR	IBOR Tenors
USD	LIBOR	SOFR	O/N, 1W, 1M, 2M, 3M, 6M, 12M
GBP	LIBOR	SONIA	O/N, 1W, 1M, 2M, 3M, 6M, 12M
JPY	LIBOR	TONA	S/N, 1W, 1M, 2M, 3M, 6M, 12M
CHF	LIBOR	SARON	S/N, 1W, 1M, 2M, 3M, 6M, 12M
EUR	LIBOR	€STR	O/N, 1W, 1M, 2M, 3M, 6M, 12M
JPY	TIBOR	TONA	1W, 1M, 3M, 6M, 12M
JPY	Euroyen TIBOR	TONA	1W, 1M, 3M, 6M, 12M
EUR	EURIBOR	€STR	1W, 1M, 3M, 6M, 12M
AUD	BBSW	RBA Cash Rate	1M, 2M, 3M, 4M, 5M, 6M
CAD	CDOR	CORRA	1M, 2M, 3M, 6M, 12M
HKD	HIBOR	Adjusted HONIA	O/N, 1W, 2W, 1M, 2M, 3M, 6M, 12M

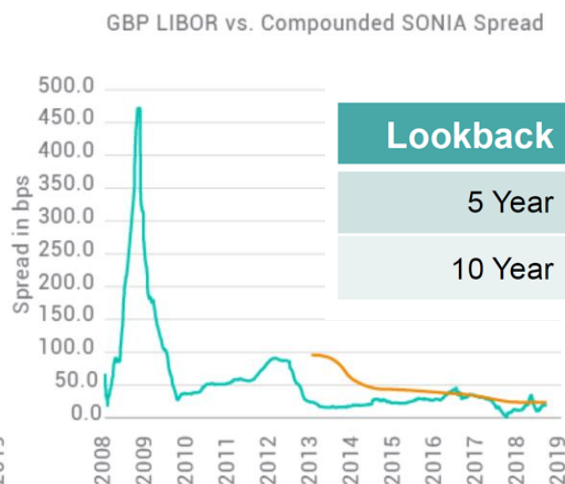
Source: ISDA, Feb 4, 2020

HISTORICAL SPREADS



— 3M LIBOR/SOFR Spread

— 3M LIBOR/SOFR Spread 5Y rolling mean



— 6M LIBOR/SONIA Spread

— 6M LIBOR/SONIA Spread 5Y rolling mean

Lookback	Median	Mean
5 Year	22.629 bps	24.936 bps
10 Year	21.513 bps	24.760 bps

Historical spreads between the most liquid LIBOR tenor and corresponding alternative risk-free rate for USD and GBP. Risk-free-rates were computed using compounded setting-in-arrears methodology. For the period prior to 2014, when the SOFR rate is not available, we used the general collateral financing repo rate as a proxy for SOFR. Means are calculated over a preceding five-year period.

Source: MSCI, Apr 3, 2019



THE IBOR FALLBACK ADJUSTMENTS



Analysis - Fed Funds \Rightarrow SOFR Discounting



IMPACT ON HEDGING



IMPACT ON DISCOUNT FACTOR AND FUTURE CASHFLOW

	1 Day Forward Rate			Discount Factor		
Tenor	OIS	SOFR	Difference (Bps)	OIS	SOFR	Difference (bps)
1Y	1.391%	1.428%	-3.72	0.98606	0.98569	3.67
2Y	1.230%	1.284%	-5.38	0.97564	0.97460	10.38
5Y	1.166%	1.200%	-3.44	0.94415	0.94260	15.52
15Y	1.512%	1.513%	-0.15	0.81297	0.81282	1.50
20Y	1.649%	1.639%	1.08	0.74924	0.75047	-12.28
25Y	1.748%	1.722%	2.51	0.69286	0.69594	-30.76
30Y	1.830%	1.796%	3.38	0.64226	0.64653	-42.73

Curve Analytics: Numerix; Data Source: Bloomberg

Source: Numerix



HEDGING DISCOUNTING IMPACT

OIS
Discounting



OIS Risk Profile



Hedge Notional

SOFR
Discounting



SOFR Risk Profile

+



Hedge Basis Swap Risk Profile

=



Net Risk Profile



HEDGING DISCOUNTING IMPACT



UNDERSTANDING
THE FULL EFFECT
OF SOFR
DISCOUNTING



IMPACT ON THE
PROJECTION OF
FUTURE
CASHFLOW



MARKET RISK
DEPENDS ON SOFR
WITH COMPLETELY
DIFFERENT
HEDGING
VEHICLES

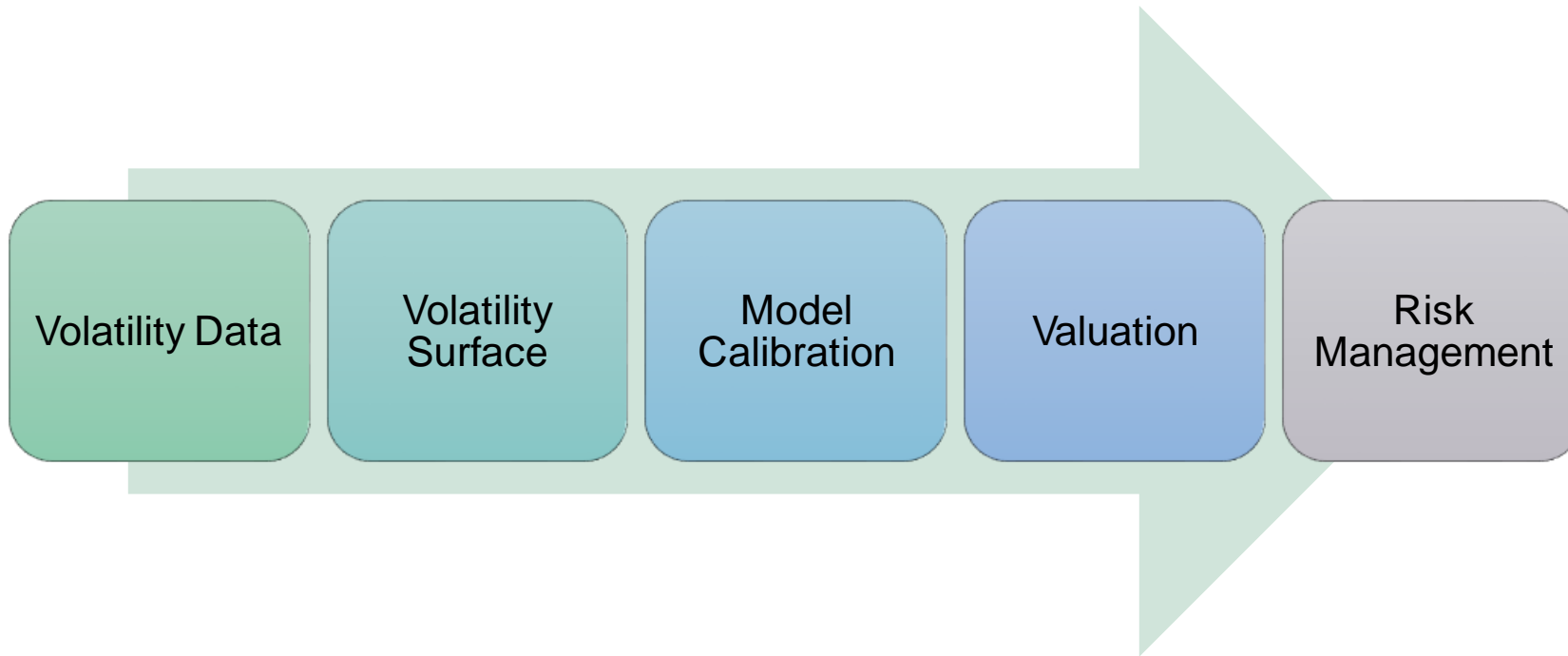


AS A HEDGE
INSTRUMENT, THE
SOFR-FED FUNDS/
SOFR-LIBOR BASIS
SWAP MAY BE
MORE USEFUL

**What else should
financial
institutions be
prepared for?**



IMPORTANCE OF VOLATILITY



ILLIQUID VOLATILITY MARKET



Swaption/Cap/Floor

- Not well developed
- Not liquid

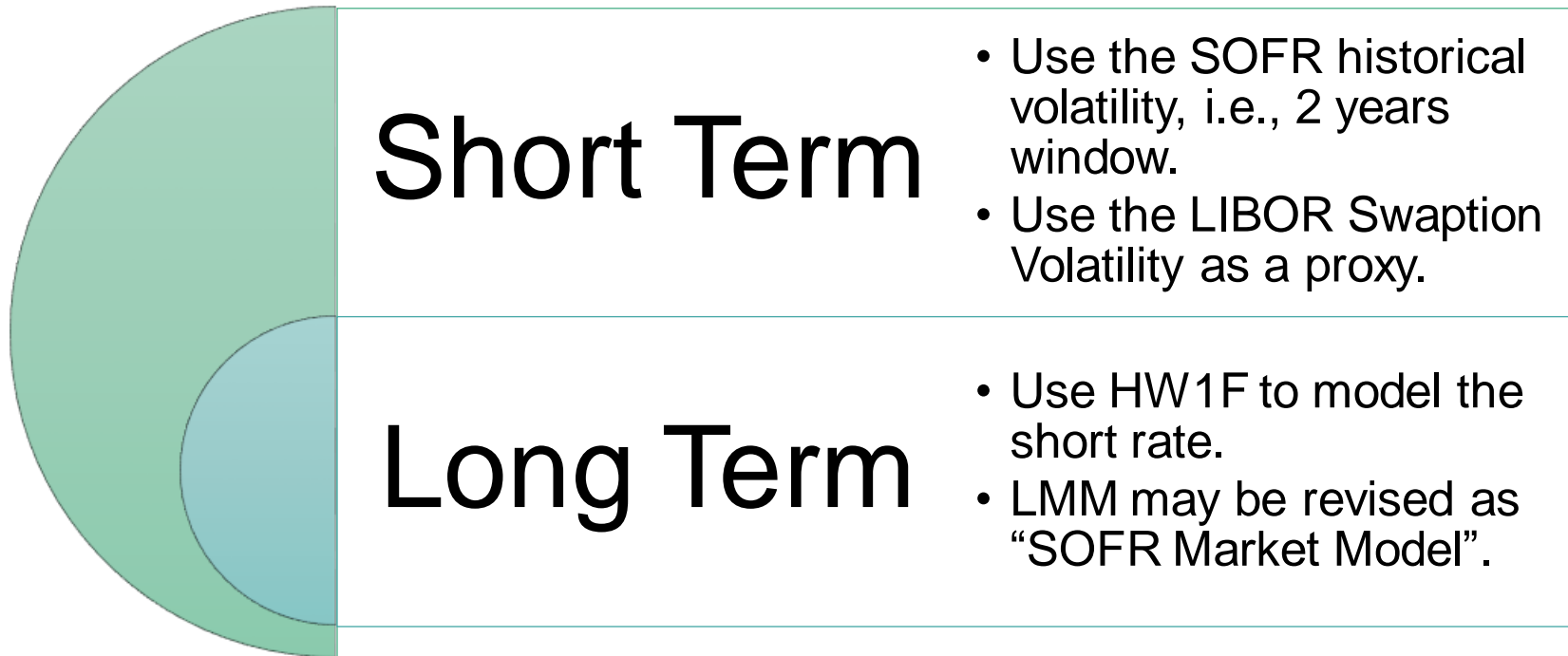
Goldman, JPM kick off SOFR swaps

US dealers spearhead non-linear trading but patchy liquidity weighs on vol market ambitions



News Source: Risk.net

IR MODEL VISION



ABOUT OUR PRESENTER



Thomas Chan
Director, Financial Engineering, Hong Kong
tchan@numerix.com

Follow Numerix:



[@nxanalytics](https://twitter.com/nxanalytics)



[Numerix](#)
[NEXT 365 User Group](#)





BANKING | ASSET MANAGEMENT | HEDGE FUNDS | INSURANCE