The Clock is Ticking: A Multi-Maturity Clock Auction Design for LIBOR Transition

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Planning for the End of LIBOR

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Replacing LIBOR by new risk free rates (RFR)

[2] Developments regarding Interest Rate Benchmarks across Jurisdictions (five LIBOR currencies)

	US dollar	Sterling	Swiss Franc	Euro	Japanese Yen
IBOR	LIBOR (Possible discontinuance after end-2021)	LIBOR (Possible discontinuance after end-2021)	LIBOR (Possible discontinuance after end-2021)	LIBOR (Possible discontinuance after end-2021) EURIBOR (To be reformed by 2019 Q4)	LIBOR (Possible discontinuance after end-2021) TIBOR (Reform completed in July 2017)
RFR	Secured Overnight Financing Rate (SOFR)	Sterling Overnight Index Average (SONIA)	Swiss Average Rate Overnight (SARON)	Public consultation completed (Note 1)	Tokyo Overnight Average Rate (TONA)
Deliberating Body (Secretariat)	Alternative Reference Rates Committee (FRB&NY Fed)	Working Group on Sterling Risk-Free Reference Rates (BOE&FCA)	National Working Group on Swiss Franc Reference Rates (SNB)	Working Group on Euro Risk-Free Rates (ECB)	Cross-Industry Committee on Japanese Yen Interest Rate Benchmarks (Bank of Japan)

Source: Bank of Japan

Legal + economic solutions

- Legal & operational:
  - LIBOR fallback language
  - Getting the plumbing ready for new RFR contracts, e.g. clearing
- Economic:
  - Creating liquidity for new RFR (e.g. swaps and bonds + loans)
  - Moving legacy LIBOR contracts to new RFR
- Fallbacks do not solve the economic problems.
  - Value transfer
  - Tail wags the dog in pricing (historical fallback defines LIBOR)
  - Uncertainty about fallback timing is a risk itself

Insufficient liquidity for new RFR

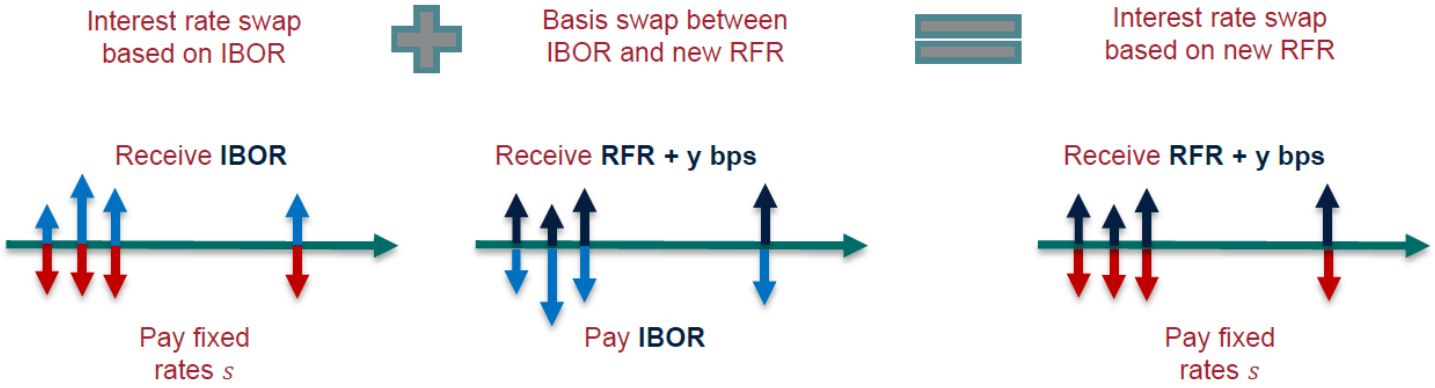
- SONIA is the most developed new RFR so far.
  - SONIA swaps are active to 10 year maturity and longer.
  - SONIA FRNs have maturities up to 7 years.
- SOFR liquidity is still in early stage.
  - SOFR futures have liquidity up to ~2 years. SOFR swaps have low volume.
  - SOFR FRNs have short maturities up to 3 years.
- I propose a clock auction design to replace legacy LIBOR contracts and help build liquidity for new RFR.
- I also suggest wider use of new RFR by the official sector.

A Clock Auction Design for LIBOR Transition

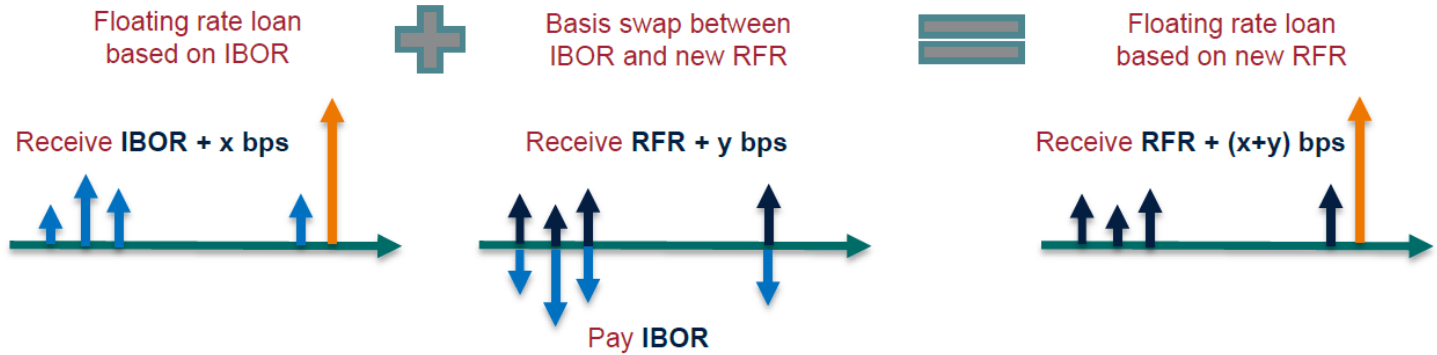
(using SOFR as example)

Multi-maturity clock auction

- This auction finds the spread adjustments to replace LIBOR cash flows to SOFR cash flows at various maturities.
- Adding the basis swap and clearing/compressing it together with the original swap ⇔ replacing IBOR in old contract by RFR + spread



- Cash product is similar, but loans/bonds and basis swaps are not cleared together. The auction does not eliminate LIBOR cash flows. It is more of a tool for hedging LIBOR exposure.



Multi-maturity clock auction
(1) Start

Maturity	2y	5y	7y	10y
Spread (bps)	0	0	0	0

- Various maturities open simultaneously.
- Example of a maturity grid: {0.25y, 0.5y, 0.75y, 1y, …, 30y}
  - Multiple maturities encourage arbitrage across maturities.
  - The grid could be made as dense or sparse as desired—driven by demand.
  - If a participant's favorite maturity is not there, pick the nearest one.
  - For simplicity of illustration, I only show a sparse grid of {2y, 5y, 7y, 10y}.
- LIBOR-SOFR spread on each maturity starts at zero. All spreads are displayed to all bidders—as if on digital clocks.
  - Transparency attracts liquidity providers.

Multi-maturity clock auction
(2) Bidding

Maturity	2y	5y	7y	10y
Spread (bps)	0	0	0	0

Demand ($b)	0	0	0	0
Supply ($b)	100	200	200	250

- If the current spread on maturity j is s_j, each participant submits a quantity q_j.
- $q_j > 0$ means demand: pay LIBOR, receive SOFR $+s_j$.
- $q_j < 0$ means supply: pay SOFR + s_j, receive LIBOR.
- The process allows limit orders and market orders—they are automatically translated into bids at each step.

Multi-maturity clock auction
(3) Price discovery

Maturity	2y	5y	7y	10y
Spread (bps)	20	20	20	20
Demand ($b)	0	0	0	0
Supply ($b)	100	200	200	250
Demand ($b)	75	120	150	150
Supply ($b)	80	180	180	200

- As long as Total Supply > Total Demand on a maturity, the auctioneer* raises the spread by a pre-defined increment.
- The new spreads will refresh the supply and demand.
- This iteration repeats.
- Since LIBOR > SOFR in the long run, s_j should come out positive.

Multi-maturity clock auction
(4) Closing

Maturity	2y	5y	7y	10y
Spread (bps)	25	30	32	35

Demand ($b)	77	160	169	178
Supply ($b)	78	158	170	180

- Once Demand and Supply are sufficiently balanced on all maturities (say within 5% of each other), the auction closes on all maturities simultaneously.
  - Spreads across maturities are linked by arbitrage relations.
- Heavy side is rationed (e.g. pro-rata or time priority).

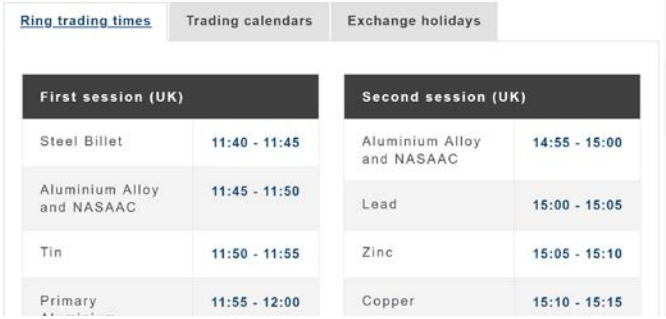
Multi-maturity clock auction
(5) Post auction

Maturity	2y	5y	7y	10y
Spread (bps)	25	30	32	35

- Compression
  - Legacy LIBOR cash flows and LIBOR-SOFR basis swap are compressed together, to eliminate the misalignment of cash flow dates.
  - Liquidity providers could end up with nonzero LIBOR-SOFR basis swap.
  - Compression services needs to be fairly priced (or subsidized).
- Voluntary conversion at the final auction spreads
  - After the auction, if two counterparties not in the auction both find the price acceptable, they can convert their legacy LIBOR contracts into SOFR ones at the market clearing price.

Core properties of the auction

- No arbitrage
  - Mispricing is corrected by liquidity providers due to transparency and simultaneity of auctions across maturities.
- Simplicity of strategies
  - Submit demand/supply at a given price, instead of coming up with prices.
- Coordination and flexibility
  - Start with short maturities, then extend to longer maturities



Clock auctions in practice

- Spectrum auctions since early 1990s
  - Bidders bid on multiple licenses that are substitutes or complements.
  - All prices are displayed and all licenses close simultaneously.
- Open and close auctions in equity markets are close to “multi-stock clock auctions”.
  - Before settlement prices are determined, indicative prices are shown to the market.
  - Market participants submit buy and sell orders in each stock into the respective auctions, given the indicative prices on all stocks. Then auctions closes at 4pm, simultaneously.
- Both auctions are transparent and simple to bid. They have been successful.

Compression auction vs clock auction

- The key feature in both designs is about sourcing liquidity across maturities.
- Duffie (2017/18) compression auction uses the existing compression algorithms to search for matching maturities, subject to tolerances.
  - Party A wants 9 year maturity, Party B wants 11 year → Algo says 10 year.
- Zhu (2018) clock auction relies on transparent prices to attract liquidity providers who meet supply-demand imbalances across maturities.
  - Party A puts the order at 9 year, Party B puts the order at 11 year
    → Liquidity provider meets both and takes the basis risk

Official Use of New RFR

FRNs linked to new RFRs

- The UK has issued debt linked to inflation since 1981.
- Maturities are long. But coupon and principal adjust to short-term inflation (retail price index, or RPI). There is 8-month lag in calculating RPI adjustment, so that coupons are predictable.
- Why not use a similar method to issue SONIA-linked gilts?
- Daily SONIA can be compounded to monthly figures, and apply the same method, say 6 month lag or shorter.
- Investors and dealers submit bids on the spread to SONIA.
- DMO could put on a cap on the FRN spread to limit funding risk.

- The same argument applies for US Treasuries.
- US Treasury started to issue 2-year FRNs (indexed to 13-week Treasury bill auction yield) in 2014.
- How about issuing SOFR-linked FRNs for longer maturities? 5-30 years.
- Auction variable is spread over (compounded) SOFR.
- An intermediary holding SOFR-linked Treasury FRNs receives SOFR + spread and expects to pay SOFR for financing. This structure hedges out fluctuations in repo rates and could improve the pricing of Treasuries.

Using new RFRs in monetary policy

- Pay new RFR as interest on excessive reserves (IOER)
- Target new RFR in monetary policy

Summary

- LIBOR cessation is a real risk.
- Legal/operational aspects of LIBOR transition is well underway.
- But liquidity in LIBOR replacement is not yet sufficient, and legacy contracts remain a challenge (especially cash products).
- I propose an auction design to help liquidity creation in new RFR and help LIBOR transition—contributing a small piece to a giant puzzle.
- The official sector holds very good cards to help liquidity creation in new RFRs; it just needs to be willing to use them.