

LIBOR TRANSITION



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Executive Summary

- There is a need for planning for LIBOR transition because regulators have decided that it is fundamentally flawed to be used as a reference rate.
- There are key differences between LIBOR and the selected alternative reference rates.
- The markets for financial instruments referencing alternative reference rates is small but growing.
- The transition to alternative reference rates goes beyond derivatives.
- Transition requires a plan.

Overview of the LIBOR Transition

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The regulator of LIBOR, the Financial Conduct Authority (FCA), indicated in 2017 that it will no longer require banks to participate in the LIBOR rate setting process after 2021.



London Interbank Offered Rate (LIBOR)

LIBOR is the most common reference rate in the global financial markets, underpinning more than \$400 trillion of transactions globally.



Opaque Nature of LIBOR

LIBOR is based on “expert judgement” rather than actual market transactions, making it opaque and disconnected to actual market activities.



LIBOR manipulation scandals in 2008

The LIBOR manipulation scandals have led regulators to conclude that LIBOR is fundamentally flawed and can no longer serve as a suitable reference rate.



Moving away from LIBOR after 2021

In July 2017 UK’s Financial Conduct Authority announced that it will no longer require the panel banks to participate in the LIBOR rate setting process after 2021.



Proposed Alternative Reference Rates

Alternative rates to LIBOR have been identified for USD, GBP, CHF, and JPY. EURIBOR is currently being reformed with ESTR being the potential alternative reference rate.



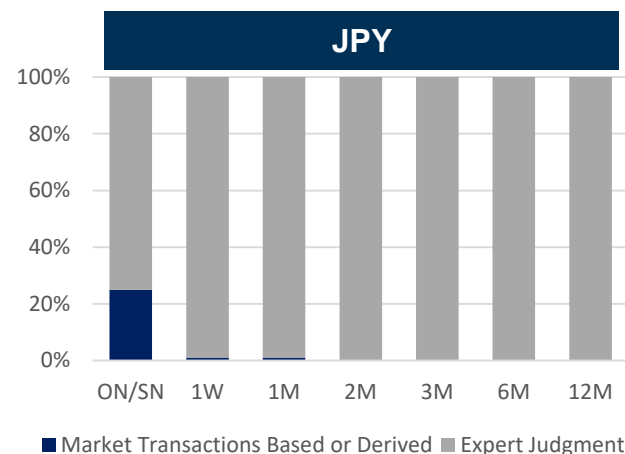
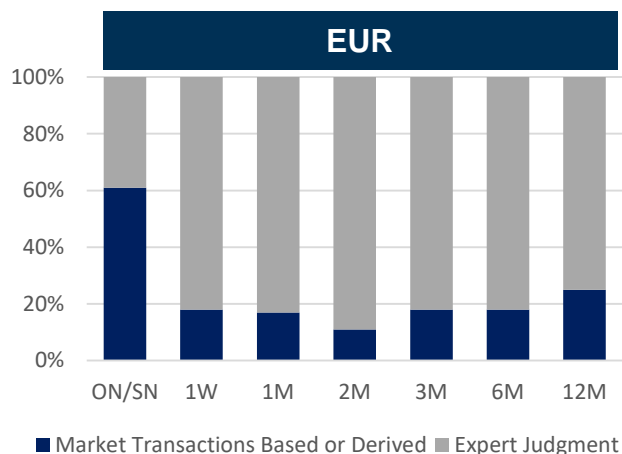
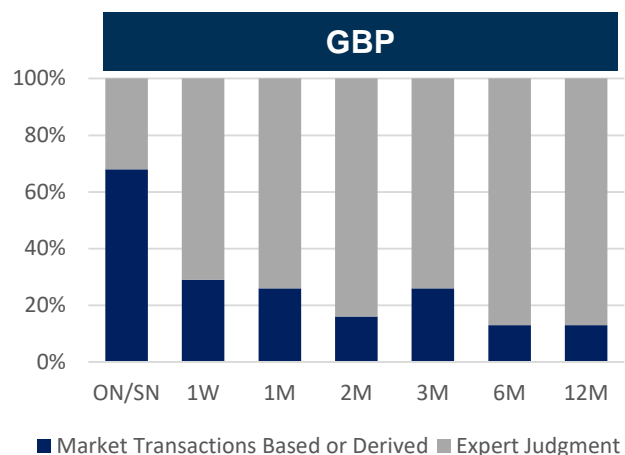
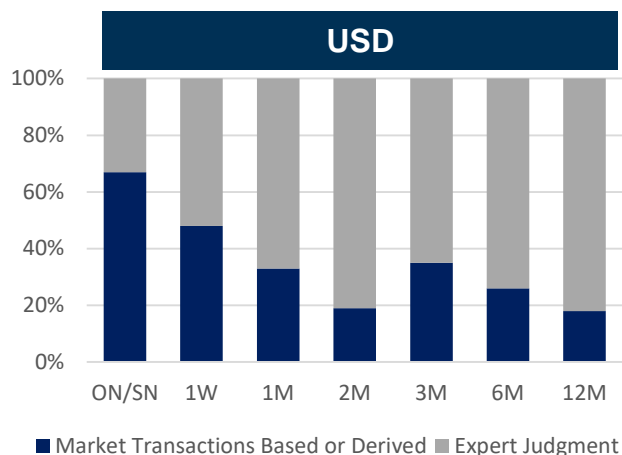
Uncertainty of the Transition and its Implications

There is still much uncertainty about the final outcome of the efforts to develop alternative reference rates, adding complexities and challenges to an orderly transition.

LIBOR “Expert Judgment” vs Market Transactions

As of Q1 2018






The grey sections below represent the percentage of submissions based on “expert judgment” and not actual transactions (navy sections).



Source: Intercontinental Exchange (ICE)

Alternative Reference Rates

Alternative rates to LIBOR have been identified for LIBOR in USD, GBP, CHF, and JPY. The European Central Bank has identified a potential candidate, Euro Short-Term Rate (€STR), but it is unclear if €STR will be used as an alternative to EURIBOR.

| Country | Currency | Current Benchmark Rate | Proposed Alternative Reference Rate | Nature of Transition |
|---|----------|------------------------------------|---|----------------------|
|  | USD | USD LIBOR | Secured Overnight Financing Rate (SOFR) | Replacement by 2021 |
|  | EUR | EONIA | Euro Short-Term Rate (€STR) | Reform |
| | | EURIBOR | EURIBOR | Reform |
|  | GBP | GBP LIBOR | Reformed Sterling Overnight Index Average (SONIA) | Replacement by 2021 |
|  | JPY | JPY LIBOR, JPY TIBOR, EUROYENTIBOR | Tokyo Overnight Average Rate (TONA) | Replacement by 2021 |
|  | CHF | CHF LIBOR | Swiss Average Rate Overnight (SARON) | Replacement by 2021 |

Key differences in Alternative Reference Rates and LIBOR

The preferred alternative reference rates differ from LIBOR in a number of significant ways.

| | LIBOR | Alternative Reference Rate | Potential Issues |
|----------------|--|--|---|
| Transparency | <u>Lack Transparency</u> Based on “expert judgment” | <u>Transparent</u> Based on market transactions | Trading volumes and unique market factors will influence the alternative reference rate setting, <u>making the alternative reference rates more volatile</u> |
| Liquidity | <u>High liquidity</u> | <u>Low liquidity</u> | Expected <u>Volatility in the spread</u> between LIBOR and alternative reference rates |
| Term Structure | <u>Forward-looking with well defined term structure</u> | <u>Backward-looking with no term structure</u> | Cash flows are known <u>in advance for LIBOR</u> |
| Credit Risk | <u>Unsecured</u> | <u>CHF and USD are secured</u> (but most alternative reference rates are unsecured) | The transition will <u>require calculating and applying a credit adjustment for CHF and USD</u> |

Key differences in Alternative Reference Rates and LIBOR

Market liquidity is still heavily skewed towards LIBOR

Interest Rate Benchmarks Traded Notional and Trade Count

| | Q2 2019 | | YTD Q2 2019 | |
|---------------------|------------------------------------|----------------|------------------------------------|----------------|
| | Traded Notional (US\$ billions) | Trade Count | Traded Notional (US\$ billions) | Trade Count |
| USD LIBOR | 32,351.0 | 177,357 | 67,115.3 | 348,687 |
| SOFR | 66.6 | 135 | 86.3 | 181 |
| Basis Swaps: SOFR | 18.1 | 53 | 21.1 | 76 |
| GBP LIBOR | 2,373.9 | 20,753 | 5,817.4 | 45,324 |
| SONIA | 1,669.0 | 2,385 | 3,341.5 | 4,965 |
| Basis Swaps: SONIA | 34.2 | 271 | 75.2 | 571 |
| CHF LIBOR | 143.4 | 2,013 | 331.3 | 4,475 |
| SARON | 2.8 | 11 | 3.9 | 19 |
| Basis Swaps: SARON | 0.0 | 0 | 0.0 | 0 |
| JPY LIBOR | 1,072.2 | 10,326 | 2,309.4 | 21,543 |
| TIBOR/Euroyen TIBOR | 5.1 | 34 | 6.0 | 55 |
| TONA | 27.9 | 79 | 68.9 | 208 |
| Basis Swaps: TONA | 0.0 | 0 | 1.0 | 1 |
| EUR LIBOR | 0.0 | 2 | 0.0 | 3 |
| EURIBOR | 5,708.1 | 45,280 | 12,743.6 | 95,375 |
| €STR | 0.0 | 0 | 0.0 | 0 |
| Other* | 24,588.2 | 110,880 | 46,084.1 | 225,600 |
| Total** | 68,060.6 | 369,579 | 138,005.0 | 747,083 |

*Other includes IRD with other reference rates and IBOR/non-RFR basis swaps

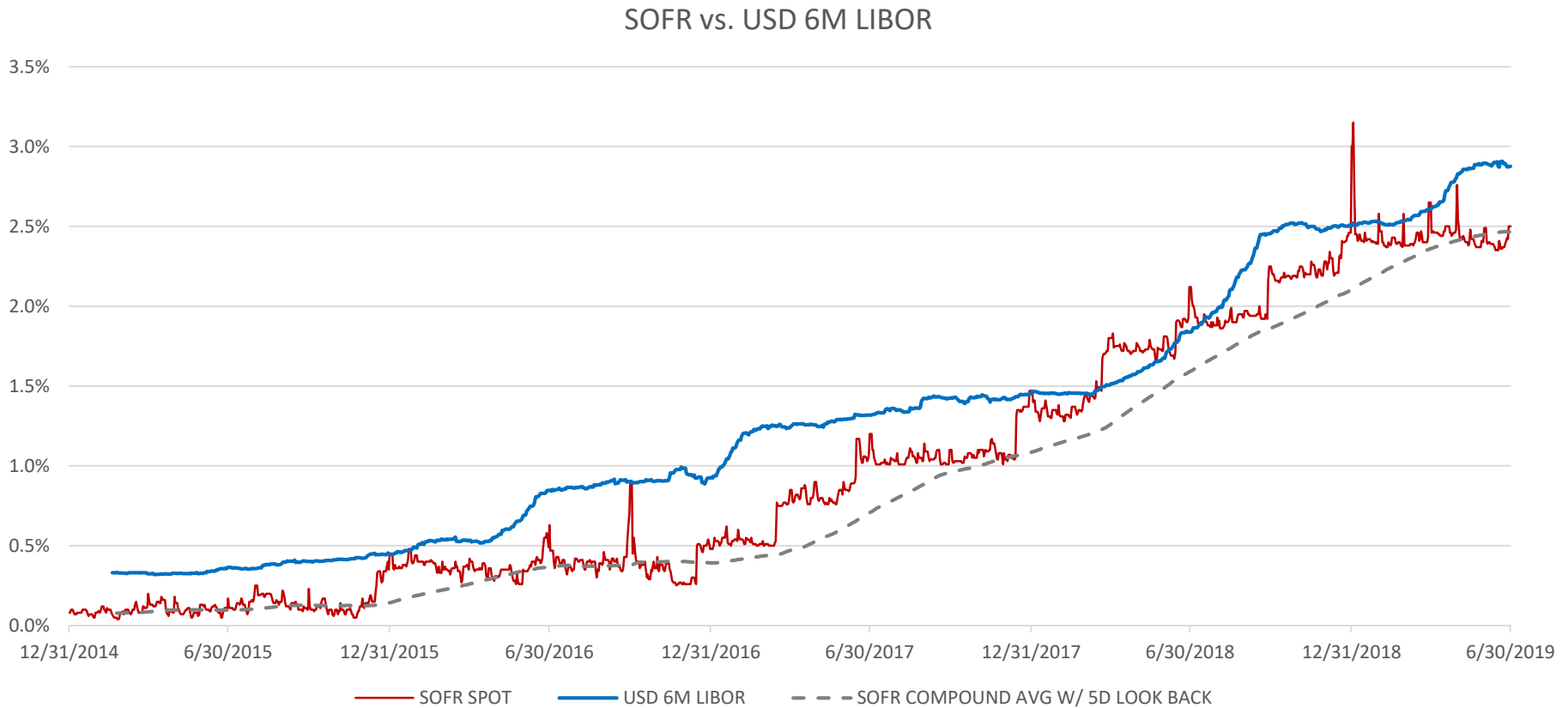
**This data includes only the transactions required to be disclosed under US regulations and does not include any exchange-traded derivatives (futures)

Source: DTCC, SDR, ISDA

Spread between LIBOR and Alternative Reference Rate

December 2014 to June 2019

Additional spreads between LIBOR and alternative reference rates will exist as there are some key differences between the two.



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LIBOR to SOFR spread using available history (bps)

| | 1-month | 3-month | 6-month |
|-----------|---------|---------|---------|
| SOFR Only | 10.8 | 25.5 | 40.0 |
| 5-year | 10.8 | 25.2 | 38.8 |
| 10-year | 10.9 | 23.7 | 43.2 |
| 15-year | 21.2 | 36.4 | 52.7 |
| Max | 21.1 | 34.3 | 49.4 |

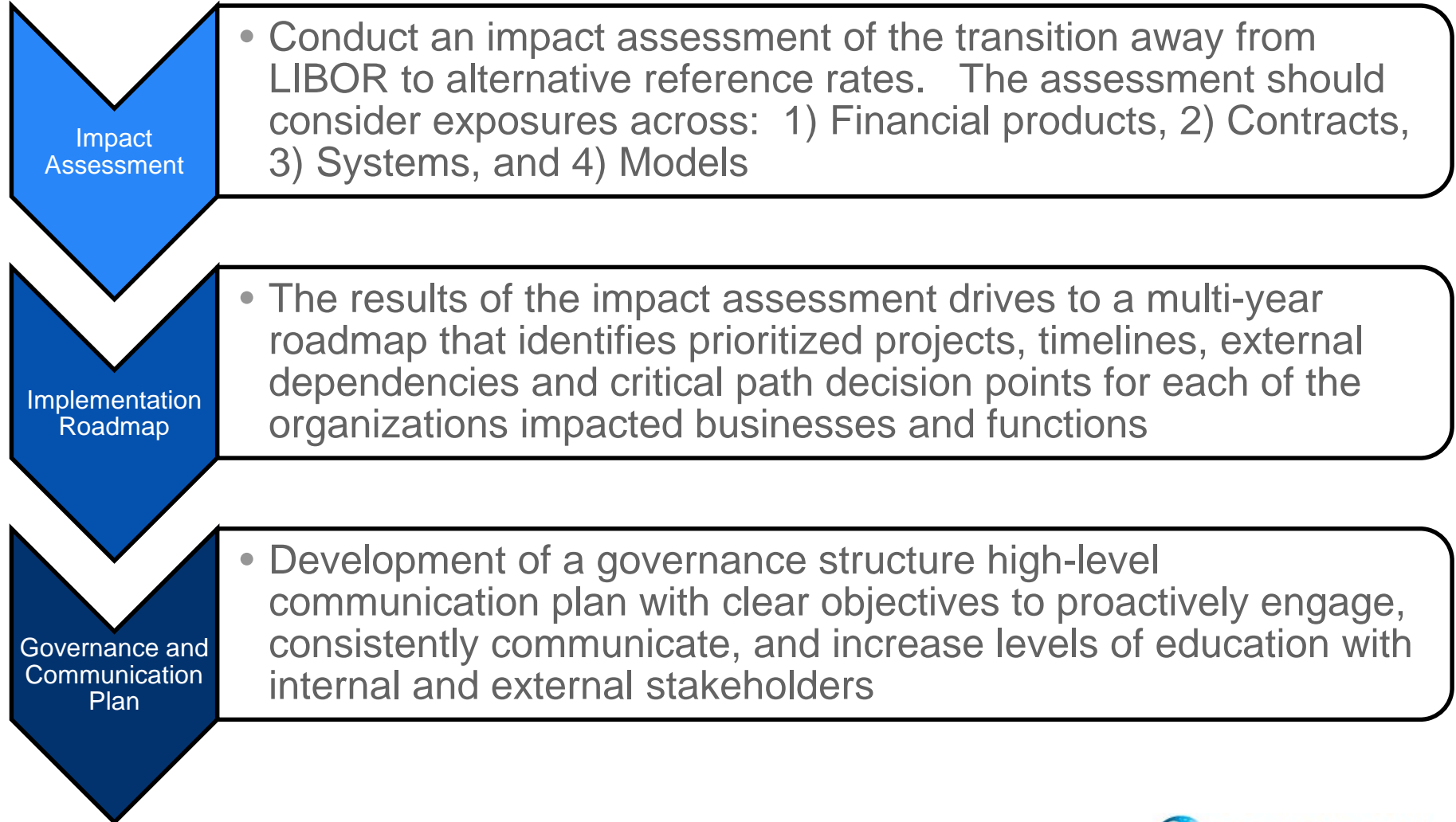
Note: calculated using compound average including weekends.

Source: New York Fed, BofA Merrill, Bloomberg

Transition Framework and Considerations

Transition Framework

Organizational adoption of alternative reference rates requires a well thought out process



Impact assessment

The impact assessment is meant to capture the interconnected impacts of LIBOR transition



Financial products exposure forecast

Quantify LIBOR linked financial product exposure (key trade characteristics including: gross notional balances, maturity profile, currency benchmark, commitments, projected exposure 2021)



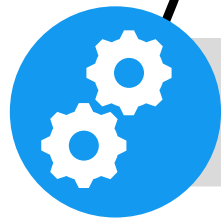
Contracts

Assess the strength of fallback language in LIBOR-linked legal contracts



Systems

Create and assess an inventory of the impacted internal and external technology systems (including anticipated functional changes/level of impact)



Models

Create and assess an inventory of impacted model (including ranking for direct and indirect change)

Elements of a roadmap

A smooth transition requires a plan

