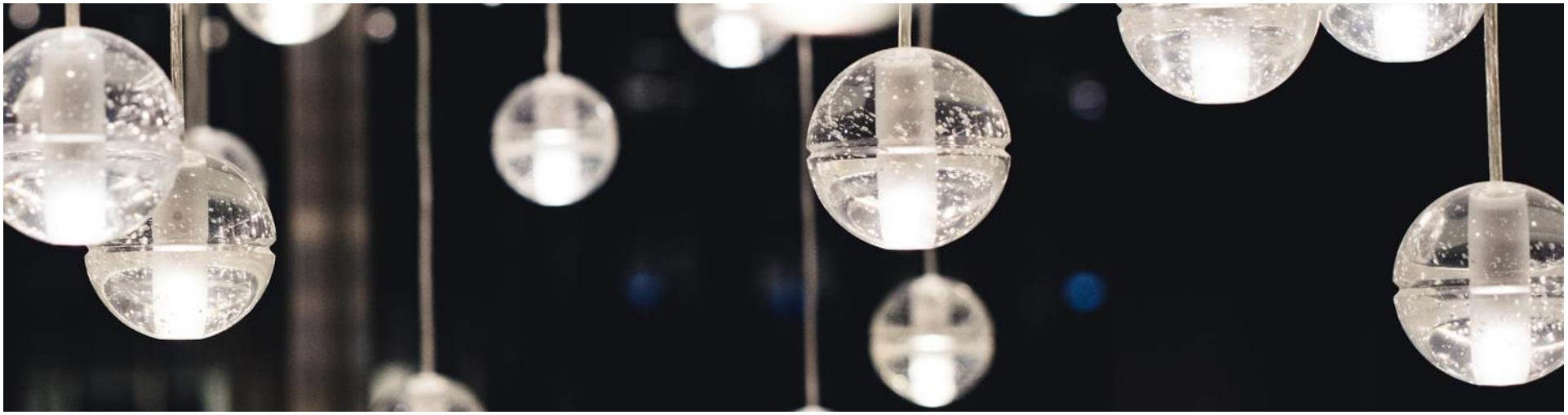

IBOR and Benchmark reform discussion

October 2019

J.P.Morgan

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Executive summary

- As unsecured borrowing transactions between banks declined in the aftermath of the global financial crisis in 2008-09, reducing the size of the underlying market feeding into London Interbank Offered Rate (LIBOR) submissions, the Financial Stability Board (FSB) concluded that there were structural weaknesses in the calculation of benchmark rates that play a crucial role in various financial markets and that unreliable interest rate benchmarks are a financial stability issue.
- In 2014, the Financial Stability Board (FSB) published a set of recommendations to replace major interest rate benchmarks, such as EURIBOR, LIBOR and TIBOR, with more reliable indices, based on nearly risk-free rates (RFRs) that are anchored in actual transactions in deep and liquid markets, and are compliant with the International Organization of Securities Commission's (IOSCO) principles.
- Since then interest rate benchmark reforms have been advancing globally, motivated by the warning in 2017 from the Financial Conduct Authority (FCA) - which is tasked with overseeing LIBOR - that it will no longer compel LIBOR panel banks to provide quotes beyond 2022.
- This change is a considerable challenge for the industry as it will impact a wide range of financial contracts referencing interbank offered rates (IBORs), such as derivatives, loans, mortgages and securities.
  - The BIS estimates that "as of mid-2018, about $400 trillion worth of financial contracts referenced London interbank offered rates (LIBORs) in one of the major currencies" (BIS Quarterly Review, March 2019, *"Beyond LIBOR: a primer on the new reference rates"* [1])
- Market participants are highly encouraged to undertake a comprehensive risk assessment of the potential impact of the changes ahead, actively prepare for the transition and take action where needed:
  - "Let me emphasise some points again. The base case assumption should be that there will be no LIBOR publication after end-2021. Even if LIBOR does continue for a further period after end-2021, it would have changed. There is a high probability it will no longer pass regulatory tests of representativeness. Markets for LIBOR-related contracts are likely to have become highly illiquid. It may not be usable in new contracts. The ability to hedge outstanding LIBOR obligations and claims is likely to have been impaired. The future for those still on LIBOR will be more uncertain than ever. **Transition – and transition comfortably before end-2021 – is a better choice**." (Andrew Bailey, CEO of the UK FCA, 15th July 2019 [2])
- In this presentation, we outline the current state of play for interest rate benchmark reform across different jurisdictions and the progress in the adoption of alternative RFRs, with a greater focus on USD, GBP and EUR. We will also highlight some of the anticipated consequences, market reactions and key challenges of this change, with the aim to help clients navigate this transition in an orderly manner.

Source:
[1] https://www.bis.org/publ/qtrpdf/r_qt1903e.pdf
[2] https://www.fca.org.uk/news/speeches/libor-preparing-end

Agenda

Brief summary of changes for the main currencies

- Different countries are at different stages of the process and have opted for different alternative rates (e.g. secured vs unsecured) – below is a summary of what is happening across currencies:

Currency	"RFR" Pre-reform	Administrator	Current "IBOR"(s)	Administrator	New "RFR"	Administrator	Type	Publication Timing
USD	**USD Fed Funds**	Federal Reserve Bank of New York	**USD Libor**	ICE Benchmark Administration	**SOFR** *(Secured Overnight Financing Rate)*	Federal Reserve Bank of New York	Secured	At 10 am the next business day
EUR	**EONIA**	European Money Markets Institute	**Euribor**	European Money Markets Institute	**€STR** *(Euro Short-Term Rate)*	European Central Bank	Unsecured	At 8 am the next business day
GBP	**SONIA**	Wholesale Markets Brokers' Association Ltd *(up to April 2018)*	**GBP Libor**	ICE Benchmark Administration	**Reformed SONIA** *(Sterling Overnight Index Average)*	Bank of England	Unsecured	At 9 am the next business day
JPY	**TONAR**	Bank of Japan	**JPY Libor** **JBA TIBOR; Euroyen TIBOR**	ICE Benchmark Administration JBA TIBOR Administration	**TONAR** *(Tokyo Unsecured O/N Average Rate)*	Bank of Japan	Unsecured	By 9 am the next business day
CHF	**TOIS**	ACI Suisse	**CHF Libor**	ICE Benchmark Administration	**SARON** *(Swiss Average Rate O/N)*	Swiss National Bank and SIX Swiss Exchange	Secured	At 6 pm the same business day

- Market participants should be prepared for IBOR indices to cease to exist (or at least for its use to be significantly reduced) post 2021
  - This creates a clear risk of a market segmentation, as while the new Indices gets developed and their liquidity improves, it is unclear whether clients will switch their current trades to Overnight Index Swaps (OIS) or keep IBOR based legacy transactions for some time
  - The different regions are at different stages of the reform, which adds a level of complexity for this transition
- Based on the likely treatment of IBOR products traded pre 2018, pre 2020, post 2020, and post 2021, and on the liquidity of the new indices, the recommended timing and strategy for switching out of IBOR products should be discussed

US timeline overview

- The US is transitioning to the Secured Overnight Financing Rate (SOFR), a benchmark that references secured transactions in the US treasury repo market.
- SOFR is made up of GC trades[1], GCF trades[2] and cleared bilateral trades[3]. It does not include bonds on special or those with low trading volumes.

November 2016
The Alternative Reference Rate Committee (ARRC) announced the formation of an advisory group to develop an alternative reference rate

April 2018
The Fed started to publish the SOFR rate on 3rd April

July 2018
- The first OTC SOFR-linked swaps[4] traded on 16th July by J.P. Morgan, Goldman Sachs and Credit Suisse
- Fannie Mae issues first floating-rate note (FRN) linked to SOFR

May 2019
On 16th May 2019, ISDA published two consultations on fallbacks for derivatives referencing Libors in USD, CAD and HKD, with a deadline of 12th July 2019

August 2019
On 1st August, ISDA published preliminary results on the May consultations

June 2017
After a consultation period, the ARRC announced the selection of the Secured Overnight Financing Rate (SOFR) as its preferred alternative reference rate

May 2018
CME launched monthly and quarterly SOFR futures on 8th May

October 2018
CME began clearing SOFR swaps using SOFR PAI[5] and discounting

April 2019
ARRC final recommendations for fallback language for FRNs, business loans, syndicated loans and securitizations

July 2019
On 15th July, CME released a high-level proposal for PAI and discounting switch from Fed Funds to SOFR for USD cleared swaps with an implementation date of 17th July 2020

2020-2021
- The expectation is that a forward-looking SOFR term rate will be introduced by EOY 2021
- In 2Q20, expectation that LCH and CME will change PAI and discounting to SOFR

[1] Market investors lending cash to securities dealers
[2] Dealers lending cash to other dealers
[3] Dealers lending cash to bond investors
[4] These trades were two SOFR/Fed Funds basis swaps and a SOFR OIS swap (i.e. fixed vs SOFR), had a notional of $50m and a one-year maturity. The trades cleared through the LCH and bilaterally.
[5] Price Alignment Interest is the overnight cost of funding collateral

Historical comparison of SOFR vs Fed Funds and USD LIBOR

- In the US, the NY Fed's back testing of SOFR using historical data from August 2014 to October 2017 shows that SOFR is much closer to the current OIS (i.e. Fed Funds effective rate) than to the USD-LIBOR, as indicated in the table on the right-hand side

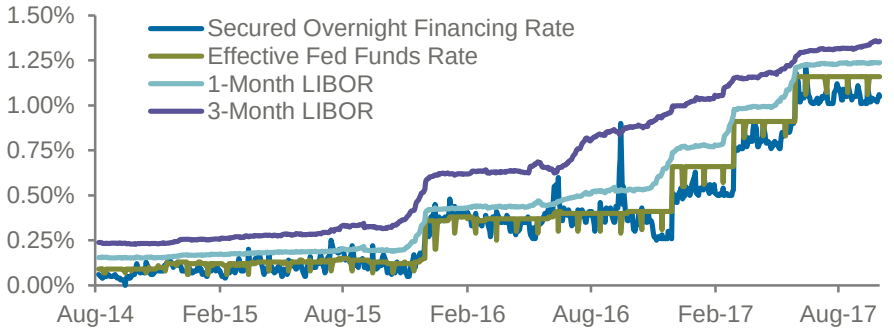
Basis	Average from Aug-14 to Oct-17
FedFunds – SOFR	3.9 bps
1m LIBOR – SOFR	12.5 bps
3m LIBOR – SOFR	28.8 bps

Source: NY Fed
Note: According to Bloomberg, it appears that the NY Fed mistakenly included forward-settling treasury repo transactions in the historical data, www.bloomberg.com/news/articles/2018-04-16/u-s-LIBOR-replacement-two-weeks-after-debut-has-some-issues

- Since the start of the SOFR publication on 3rd Apr. 2018, the average SOFR is 2.18%, and turns out to be greater than the average level of the Effective Fed Funds rate of 2.14% over the same period (as of 4th Oct. 2019)
  - This is partially explained by the occurrence of spikes in repo rates (hence in SOFR) towards month-end and year-end
  - These increases the US Treasury repo volatility inherited by the new benchmark rate can be attributed to a combination of factors such as:
    - the monetary policy framework (e.g. issuance of US Treasuries)
    - the reduction of balance-sheet intensive activities like repo from global systemically important banks (GSIB)
    - high collateral holdings among dealers going into year-end 2018
    - Daily fluctuations in supply and demand
- In mid-Sept. 2019, repo rates surged as the combination of corporate tax day and a large Treasury coupon settlement prompted severe funding pressures and disruptions in the repo market, driving SOFR to jump to 5.25% on 17/9/19, from 2.43% the day prior. The Fed was able to stabilize the situation but only with large injection of reserves and intervention in the repo market.
- However, as stated by the NY Fed in its publication of "A User's Guide to SOFR" in April 2019, it is important to keep in mind that "an average overnight rate smooths out idiosyncratic, day-to-day fluctuations in market rates, making it more appropriate for use."
- Furthermore, when comparing historical levels between August 2014 and March 2018 based on pre-production estimates of SOFR, it appeared that "a three-month average of SOFR is less volatile than 3-month LIBOR".

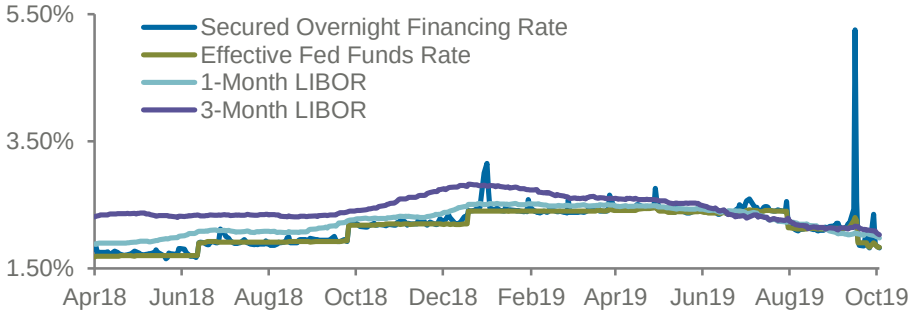
Source: NY Fed "A User's Guide to SOFR" published in April 2019
https://www.newyorkfed.org/medialibrary/Microsites/arrc/files/2019/Users_Guide_to_SOFR.pdf

Historical comparison of SOFR vs. Fed Funds and 1m & 3m LIBOR



Source: NY Fed historical analysis (data from August 2014 to October 2017)

Comparison of SOFR vs. Fed Funds and 1m & 3m LIBOR since SOFR started to be published



Source: JP Morgan DataQuery, as of 4th October 2019

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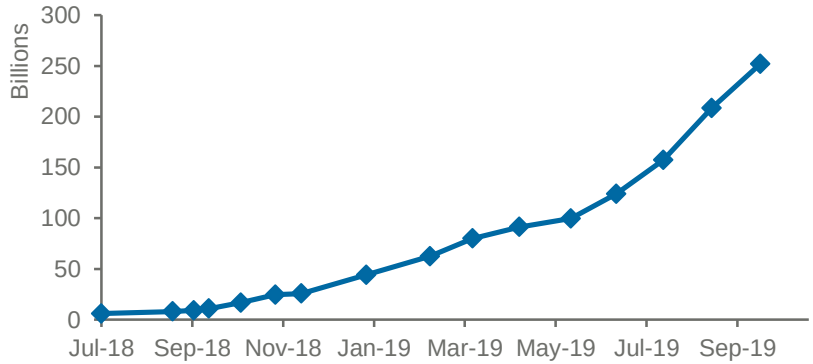
SOFR Floating Rate Note Issuances and Conventions

- On 26th July 2018, Fannie Mae (FNMA) launched a $6 billion three-tranche offering in the first-ever SOFR floating rate securities transaction
- Since then the number and volume of Floating Rate Notes linked to SOFR have increased steadily as shown in the chart on the right-hand side
- There have been different conventions adopted by issuers when defining the terms of the Floating Rate Notes
  - On 1st August 2019, the ARRC published a comparison table outlining the differences in the adopted conventions

Total Outstanding Notional of SOFR FRNs ($)



Source: Bloomberg as of 4th October 2019

ARRC's Comparison Table of SOFR FRNs Conventions

	Multiple FRNs (2018-2019)	Goldman Sachs FRNs (May 2019)	EIB FRNs (June 2019); World Bank FRNs (July 2019)	Morgan Stanley FRNs (June 2019); Bank of America FRNs (July 2019)	Standard Overnight Index Swap (OIS)
Averaging Method	Simple Average	Daily Compounding	Daily Compounding	Daily Compounding	Daily Compounding
Payment Date	On the interest period end date	On the interest period end date	On the interest period end date	2 business days following the interest period end date	2 business days following the interest period end date
Lookback [1]	1 business day	2 business days	5 business days [3]	No lookback	No lookback
Lockout [2]	Generally 2 business days	None	None	Only applicable on final interest period: 2 business days	None
Day Count Convention	Actual/360	Actual/360	Actual/360	Actual/360	Actual/360

[1] For example, a 2 business days lookback means that the observation period starts and ends two business days prior to the interest period start and end dates.
[2] A lockout period is typically applied at the end of an interest period where one fixing of SOFR is repeated for several days.
[3] This is the standard convention in the SONIA FRN market.

Source: ARRC as of 1st August 2019, https://www.newyorkfed.org/medialibrary/Microsites/arrc/files/2019/FRN_Conventions_Press_Release.pdf

SOFR-Based Cash Instruments

- Below is an overview of some of the SOFR-based USD cash instruments available in the market, as of 4th October 2019
- On 24th July 2019, JP Morgan issued a $2.25bn PerpNC5 fixed-to-float note which resets into 3M Term SOFR, *the first ever instrument to reference a term SOFR*

Total issuances

Total number of issuers	Number of issuances	Total outstanding USD notional
36	**252**	**251,844,470,000**

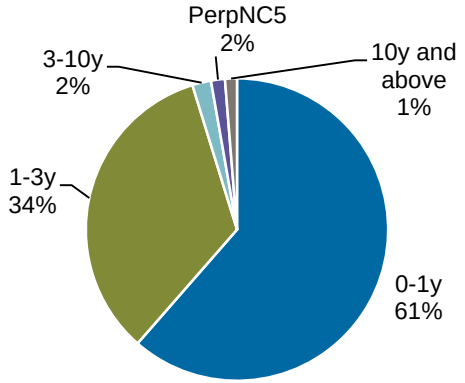
Top 10 issuers by notional

Issuer Name	Sum of outstanding USD notional	Sum of outstanding USD notional (%)
Federal Home Loan Banks	127,550,000,000	51%
Federal Home Loan Mortgage Corp	56,757,000,000	23%
Federal National Mortgage Association	15,000,000,000	6%
Credit Suisse AG/New York NY	10,689,500,000	4%
JPMorgan Chase & Co	6,300,000,000	3%
Federal Farm Credit Banks Funding Corp	5,174,000,000	2%
Goldman Sachs Bank USA/New York NY	3,953,470,000	2%
Bank of Montreal/Chicago IL	2,902,500,000	1%
Morgan Stanley	2,751,000,000	1%
Metropolitan Life Global Funding I	2,515,000,000	1%
TOTAL (Top 10)	**233,592,470,000**	**93%**

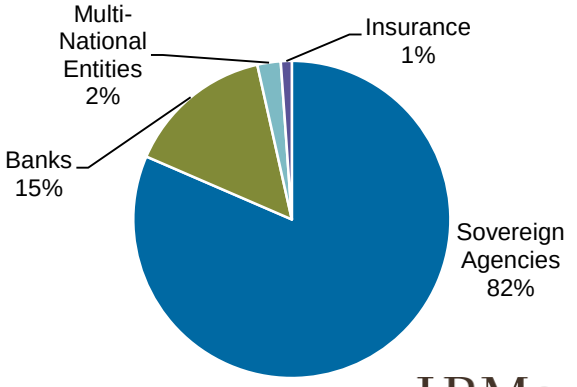
Top 10 issuers by number of issuance

Issuer Name	Number of issuances	Nb of issuance (%)
Federal Home Loan Banks	45	18%
Federal Home Loan Mortgage Corp	43	17%
Credit Suisse AG/New York NY	31	12%
Goldman Sachs Bank USA/New York NY	20	8%
Federal Agricultural Mortgage Corp	18	7%
Federal Farm Credit Banks Funding Corp	13	5%
Bank of Montreal/Chicago IL	11	4%
Royal Bank of Canada/New York NY	9	4%
Federal National Mortgage Association	8	3%
Natixis SA/New York NY	7	3%
TOTAL (Top 10)	**205**	**81%**

Maturity split (as % of outstanding notional)



Issuer's industry group split (as % of outstanding notional)



Source: Bloomberg as of 4th October 2019

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UK timeline overview

- The BoE has been working on an RFR reform by concentrating its efforts on:
  - Modifying how the rate is set
  - Promoting the use of SONIA as the near Risk-Free Rate for GBP derivative markets
- SONIA was confirmed as the new Benchmark Rate in April 2017 and the reformed rate was first published on the 23rd April 2018

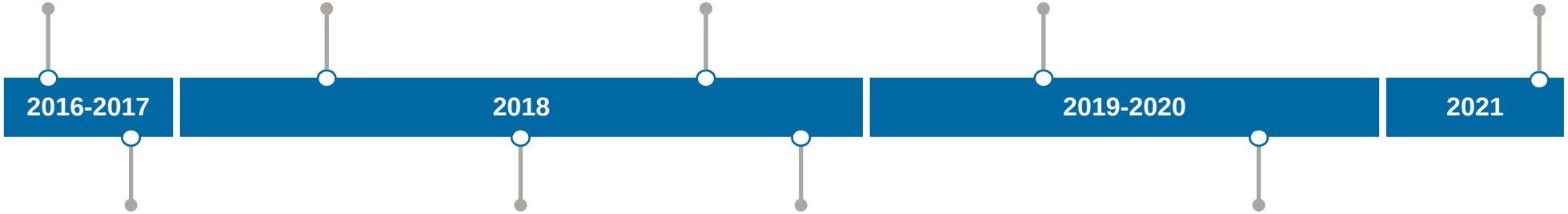
April 2016
Bank of England became the administrator of the SONIA interest rate benchmark

April 2018
SONIA reform implemented and first published on 23rd April 2018

September 2018
FCA asking firms' preparations for transition from LIBOR to risk-free rates ("Dear CEO letter")

2019
FCA asking panellists banks what their intentions about post-2021 submissions are

End of 2021
LIBOR production no longer guaranteed by the FCA



April 2017
SONIA announced as the preferred near risk-free interest (RFR) benchmark

June 2018
First SONIA floating rate note was issued (5y EIB bond at SONIA+35bps) since 2010

December 2018
On 20th December 2018, ISDA published final results of a consultation on a fallback mechanism for derivatives contracts

2019-2020
Term benchmark rate produced (subject to outcome of the consultation) and fallback language agreed and implemented

Source: Bank of England website http://www.bankofengland.co.uk/markets/Pages/benchmarks/default.aspx
Notes: More details around the reformed methodology can be found in the "Key SONIA Features and Policies" document http://www.bankofengland.co.uk/markets/Documents/soniafeaturespolicies.pdf

Transitioning from current to new benchmark rate

How was the SONIA benchmark reformed?

- The Bank of England took over the end to end administration of the SONIA benchmark from WMBA. In practice, **here are the changes to the SONIA index:**
  - the data publication moved to 9:00am on the London business day following that to which the rate pertains
  - the coverage of data was broadened to include overnight unsecured transactions (bilateral and arranged via brokers)
  - the averaging methodology changed to a "volume-weighted trimmed mean"

Reformed SONIA Definition

- *"SONIA is a measure of the rate at which interest is paid on sterling short-term wholesale funds in circumstances where credit, liquidity and other risks are minimal."*
- *"On each London business day, SONIA is measured as the trimmed mean, rounded to four decimal places, of interest rates paid on eligible sterling denominated deposit transactions.*

  The trimmed mean is calculated as the volume-weighted mean rate, based on the central 50% of the volume-weighted distribution of rates.

  Eligible transactions are:
  - *reported to the Bank's Sterling Money Market daily data collection, in accordance with the effective version of the 'Reporting Instructions for Form SMMD';*
  - *unsecured and of one business day maturity;*
  - *executed between 00:00 hours and 18:00 hours UK time and settled that same-day; and*
  - *greater than or equal to £25 million in value."*

Comparison between previous SONIA and reformed SONIA

- The Bank of England has published a statistical analysis to allow for the indicative comparison of the reformed and previous SONIA
- Based on the latest update published on 23rd April 2018, the analysis shows that over the six months prior to 28th February 2018, reformed SONIA would have been 1.3bps lower than previous SONIA, with a very low volatility of this spread
  - The minimum spread over this period is -2.15bps and the maximum spread is 1.37bps
- The reformed SONIA was calculated based on average daily volumes of around £50bn, which is **over three times larger than those underlying previous SONIA**

Summary Statistics		Reformed SONIA	Previous SONIA
Average spread to SONIA (bps)	Since July 2016	-1.37	
	Past six months	-1.34	
Correlation of daily changes with daily changes in SONIA	Since July 2016	0.96	
	Past six months	0.96	
Mean daily volumes (£ billions)	Since July 2016	43.3	13.6
	Past six months	49.8	16.3
Mean daily number of trades	Since July 2016	351	72
	Past six months	375	80

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Source: Bank of England statistics on reformed SONIA on 23rd April 2018, www.bankofengland.co.uk/news/2018/march/update-on-statistical-characteristics-of-reformed-sonia
Bank of England "SONIA Key features and policies" published in November 2018, https://www.bankofengland.co.uk/-/media/boe/files/markets/benchmarks/sonia-key-features-and-policies.pdf?la=en&hash=A11D3AE9E5A070702AE4F777A70C258E871E49B7

SONIA-Based Cash Instruments

- Following EIB's issuance of a GBP 1 billion SONIA floating rate note, Lloyds Bank and the Royal Bank of Canada issued floating-rate notes based on SONIA. Below is an overview of some of the SONIA-based cash instruments available in the market, as of 4th October 2019:

Issuer Name	Number of SONIA bonds issued	Sum of outstanding GBP notional	Date of the first SONIA FRN issued	Tenors	Maturity types
ABP Finance PLC	1	65,000,000	21-Dec-12*	10y*	BULLET
Asian Development Bank	3	2,300,000,000	12-Oct-18	3y, 5y	BULLET
Australia & New Zealand Banking Group Ltd	3	1,150,000,000	24-Jan-19	1y, 3y	BULLET
Barclays Bank UK PLC	2	1,750,000,000	15-May-19	4y, 5y	BULLET
BMW International Investment BV	1	250,000,000	02-Sep-19	1y	BULLET
Canadian Imperial Bank of Commerce	1	200,000,000	14-Aug-19	1y	BULLET
Commonwealth Bank of Australia	6	1,285,000,000	10-Dec-18	1y	BULLET
Coventry Building Society	1	600,000,000	13-Nov-18	5y	BULLET
DBS Bank Ltd	2	600,000,000	18-Sep-19	1y	BULLET
European Bank for Reconstruction & Development	2	1,500,000,000	18-Jan-19	3y, 5y	BULLET
European Investment Bank	3	3,250,000,000	29-Jun-18	3y, 5y, 7y	BULLET
Export Development Canada	3	1,800,000,000	31-Jan-19	1y, 3y, 5y	BULLET
FMS Wertmanagement	1	500,000,000	14-Jan-19	3y	BULLET
HSBC UK Bank PLC	2	750,000,000	09-Sep-19	1y	BULLET
International Bank for Reconstruction & Development	3	3,000,000,000	04-Oct-18	5y, 3.5y	BULLET
International Finance Corp	1	500,000,000	18-Jan-19	3y	BULLET
Leeds Building Society	1	600,000,000	09-Apr-19	4y	BULLET
Lloyds Bank PLC	4	2,775,000,000	13-Sep-18	2y, 3y, 5y	BULLET
National Westminster Bank PLC	1	750,000,000	22-Mar-19	4y	BULLET
Nationwide Building Society	3	2,008,000,000	10-Jan-19	5y, 3y	BULLET
NRW Bank	1	300,000,000	09-Oct-19	5y	BULLET
Royal Bank of Canada	6	2,880,000,000	13-Sep-18	1y, 5y	BULLET
Santander UK PLC	2	2,000,000,000	20-Sep-18	3y, 5y	BULLET
Skipton Building Society	1	600,000,000	27-Mar-19	5y	BULLET
State of Saxony-Anhalt	3	300,000,000	25-Oct-18	1y	BULLET
Svensk Exportkredit AB	1	100,000,000	17-Apr-19	1y	BULLET
Toronto-Dominion Bank/The	3	2,500,000,000	24-Jun-19	1y, 3y	BULLET
TSB Bank PLC/United Kingdom	1	750,000,000	15-Feb-19	5y	BULLET
Virgin Money PLC	1	600,000,000	28-Mar-19	5y	BULLET
Westpac Banking Corp	7	1,475,000,000	15-Jul-19	1y	BULLET
Yorkshire Building Society	1	500,000,000	19-Nov-18	5y	BULLET
Grand Total (31 issuers)	**71**	**37,638,000,000**	**29-Jun-18**		

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Source: Bloomberg, as of 4th October 2019

* On 11th June 2019, Associated British Ports have amended their FRN index from LIBOR-Sonia, the first change in the market. This note expires on 26th December 2022.

Euro Area timeline overview

- There are two parallel work streams in the Euro Area:
  - European Money Markets Institute (EMMI) towards hybrid EURIBOR ("EURIBOR+")
  - ECB towards a new euro risk free rate

May 2017
EMMI announced plans to look into a hybrid quotation/transaction fixing for EURIBOR

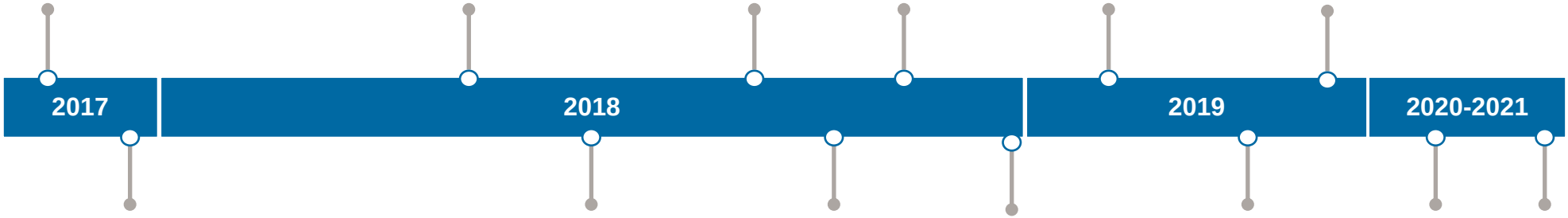
May 2018
EMMI published its first Consultation Paper on a Hybrid Methodology for EURIBOR

August 2018
Results of public consultation on the assessment of candidate euro risk-free rate: 88% of responses viewed €STR as the most appropriate future euro risk-free rate

October 2018
Second Consultation on a Hybrid Methodology for EURIBOR

May 2019
Results of a consultation on the EONIA to €STR transition:
EONIA to be calculated as €STR + 8.5bp, from 2nd October 2019 until the end of 2021

October 2019
- ECB started publishing €STR on 2nd October 2019, and EONIA's calculation changed to €STR + 8.5bp
- LCH and Eurex to clear €STR swaps starting respectively 21st October 2019 and 18th November 2019



September 2017
ECB announced that it will develop a new euro unsecured overnight interest rate

June 2018
- ECB announces methodology for new unsecured overnight interest rate "€STR"
- Public consultation on the assessment of candidate euro risk-free rate; there are three candidates (two are secured and one is unsecured)
- EMMI publishes the consultation results and market feedback

September 2018
ECB announces that banks chose €STR as risk-free rate to replace EONIA

December 2018
Cessation of the 2w, 2m and 9m EURIBOR tenors

July 2019
The Belgian FSMA[1] approved Hybrid Euribor as an acceptable benchmark, compliant with the EU BMR[2]. Implementation of Hybrid Euribor is expected by end of 2019.

June 2020
LCH to switch PAI and discounting on all EUR-denominated products from EONIA to €STR flat around 22nd June 2020. Similarly, Eurex plans a switch to €STR flat for 2Q20. Both opted for a PV cash compensation scheme.

End of 2021
Potential deadline: current EONIA no longer EU BMR compliant

[1] Financial Services and Markets Authority
[2] EU Benchmarks Regulation

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Summary of final RFR candidates' attributes compared to EONIA

- Note that the table below shows the characteristics of EONIA before the 2nd October 2019 change in EONIA's calculation

	€STR	GC Pooling Deferred Rate	RepoFunds Rate	EONIA (before 2nd October 2019)
Economic interest of index	Wholesale unsecured borrowing rate	Borrowing rate secured by general collateral	Borrowing rate secured by general and specific collateral	Interbank unsecured lending rate
Representativeness of index	Non panel-based bank borrowing	Could be influenced by regulatory and collateral factors unrelated to bank borrowing	Could be influenced by regulatory and collateral factors unrelated to bank borrowing	Panel-based bank lending
Familiarity with economic interest of index	May be easier to understand for most users	May be more difficult to understand for some market participants	May be more difficult to understand for some market participants	Existing benchmark
Average daily volume*	€29.8 bn	€8.9 bn	€200.6 bn	€7.7 bn
Lowest daily volume*	€6.8 bn	€2.8 bn	€131.5 bn	€0.8 bn
Number of participants	52	104	~80	28
Average number of banks reporting daily volume	31	25	N/A **	12
Average number of countries represented	10	9	11	6
Performance during periods of market stress	Potentially less resilient	Potentially more robust	Potentially more robust	Known to market participants
Volatility	Generally stable during reporting periods	More volatile, particularly at quarter-end and year-end	More volatile, particularly at quarter-end and year-end	Known to market participants
Publication day	Next day by 08:00 CET	Same day at 18:00 CET	Same day at 19:35 CET	Same day by 19:00 CET
Nature of administrator	Central bank – data to be freely available	Private sector – no current licence fees	Private sector – licence fees apply for non-delayed data	Not-for-profit association; fees apply to non-panel banks
Administrator compliant with the EU Benchmarks Regulation?	Exempt	Intends to apply for authorisation during transitional period	Authorised for use in EU	Intends to apply for authorisation during the transitional period***
Historical data timing	Since August 2016	Since January 2010	Since January 2006	Since January 1999

Source: ECB Consultation Paper https://www.ecb.europa.eu/paym/pdf/cons/euro_risk-free_rates/consultation_details_201806.en.pdf

* From 01 August 2016 to 15 January 2018

** Contributions are made by trading venues and not individual banks. The volume of an individual bank is not disclosed

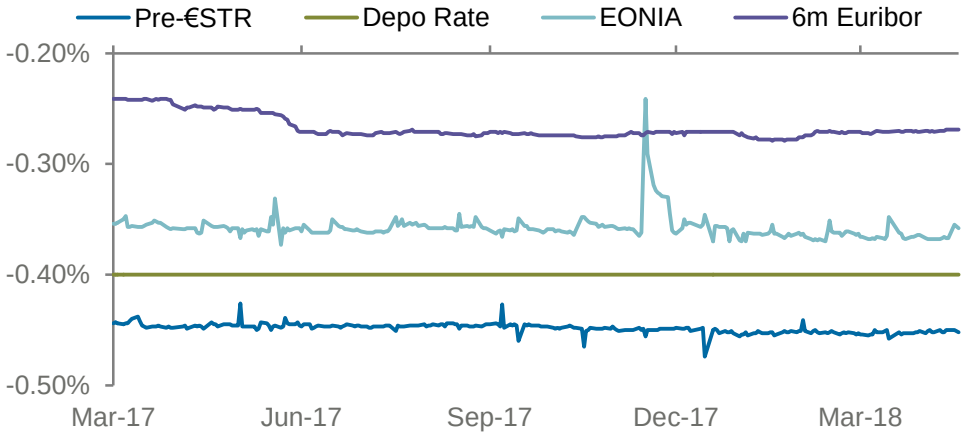
*** The application will only pertain to the administration of EURIBOR; EONIA will not be compliant with the EU benchmarks Regulation after 2019

Update on €STR

The new ECB rate will be structurally different from EONIA (before the 2nd October 2019 change in EONIA's calculation)

	New ECB benchmark rate - €STR	EONIA (before the 2nd October 2019 change)
Type	Borrowing cost	Lending cost
Methodology	Volume weighted mean trimmed at 25%; could exclude certain transactions from the same counterparty, if it is outside of the 25% trim level	Weighted average calculated using one aggregate rate and volume per bank; in the trimming process the entire input from a bank is either included or excluded
Counter-parties	Banks and other deposit taking institutions, including central banks	Eligible banks in the panel
Level	Initial tests shows to be few bps below the depo rate	Depo rate is the lower bound
Publication day	Next day by 08:00 CET	Same day by 19:00 CET

- The ECB has also provided the calculated benchmark data ("pre-€STR") from 15 March 2017 until 2nd May 2018
- Pre-€STR has **averaged around -0.45% over the year up to 2nd May 2018; 9bp below EONIA fixings but have lower volatility** (less than 50% of EONIA fixings' volatility)



	€STR	EONIA	Spread
Average	-44.8	-35.8	9.1
Max	-42.6	-24.1	21.5
Min	-47.4	-37.3	5.9
SD	0.4	1.1	1.2
Avg volume (€ bn)	31.6*	6.3	

- Based on the above data, €STR proved to be more stable and robust as index compared to EONIA. Additionally, **the average daily volume of transactions for €STR is almost five times than those used for EONIA over the sample period.**

Source: ECB website http://www.ecb.europa.eu/paym/pdf/cons/euro_risk-free_rates/consultation_details_201806.en.pdf,
* Pre-trimmed average

Transition from EONIA to €STR

Reformed EONIA calculated as €STR + 8.5bp

EMMI launched a public consultation on the proposed EONIA to €STR transition

- The consultation period ended on 15th April 2019, with the summary of consultation and final details on the implementation plan announced on 31st May 2019
  - Starting 2nd October 2019 (when €STR was first published), **EONIA has been derived directly from €STR + spread and will continue to be until at least the end of 2021**
  - The ECB supports this change in the EONIA methodology and has provided in a press release a one-off **spread of 8.5bp**

"As an €STR-dependent rate, EONIA would draw on a more representative and stable set of input data than currently provided by a panel of banks and would continue to represent the euro overnight unsecured market. A spread would be added to smooth out any perceived valuation transfer and balance sheet impact. The working group also believes that the evolved EONIA should be authorised under the EU Benchmarks Regulation until the end of 2021."

ECB website
https://www.ecb.europa.eu/paym/initiatives/interest_rate_benchmarks/WG_euro_risk-free_rates/html/index.en.html

The corollary is that all EONIA risk beyond October 2019 should really be thought of as €STR risk

How was the spread calculated?

Based on at least 12 months of collected data

- Spread calculated as 15% trimmed mean of observation, based on pre-€STR data
- Based on the ECB calculation from 17 April 2018 to 16 April 2019, the calculated one-off spread is at **8.5bp**

Moving EONIA's publication from T to T+1

- By definition, current EONIA's publication day is on the same day (by 19:00 CET) and €STR's is on the next day (by 09:15 CET)
- Hence the change in the EONIA methodology would require EMMI to defer the publication of EONIA until after the €STR has been published

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Source: ECB website https://www.ecb.europa.eu/press/pr/date/2019/html/ecb.pr190531~a3788de8f8.en.html;
EMMI statement https://www.emmi-benchmarks.eu/assets/files/D0194C-2019%20EONIA_consultation_feedback_press_release.pdf

€STR-Based Cash Instruments

- The first two ever €STR-Based Floating-Rate Notes were issued respectively by Landeskreditbank and European Investment Bank and amount to a total notional of €1.25bn as shown in the table below:

Issuer Name	Nb of €STR bonds issued	Sum of outstanding EUR notional	Date of the first €STR FRN issued	Announcement Date	Tenors	Maturity types
Landeskreditbank Baden-Wuerttemberg Foerderbank	1	250,000,000	08-Oct-19	19-Sep-19	2y	BULLET
European Investment Bank	1	1,000,000,000	10-Oct-19	01-Oct-19	3y	BULLET
Grand Total (2 issuers)	**2**	**1,250,000,000**	**08-Oct-19**			

- On the derivatives side, JPMorgan and HSBC have traded the first €STR-Based interest rate swap on 30th September 2019, with a €100m notional and a one-week tenor. This allowed both parties to test their execution capabilities in €STR.
  - This trade was done bilaterally as €STR swaps clearing is expected to be available at LCH clearing house starting 21st October 2019 and at Eurex Clearing starting 18th November 2019
- JP Morgan can provide similar liquidity in €STR derivatives that it can provide in EONIA, and volumes are expected to build up with the start of clearing and as more €STR-Based FRNs issuances could generate some hedging flows

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Source: Bloomberg, as of 4th October 2019

Update on EMMI EURIBOR reform

- The reform of the Euribor benchmark is a process conducted by the EMMI, that started in 2014 and is expected to be implemented by end of 2019:
  - An analysis from the EMMI in 2017 concluded that "under the current market conditions it will not be feasible to evolve the current Euribor methodology to a fully transaction-based methodology following a seamless transition path" (EMMI - 4th May 2017). The EMMI announced its plans to look into a **hybrid quotation/transaction fixing for EURIBOR** (i.e. a model that is supported by transactions whenever available, and relies on other sources when necessary).
  - After two consultations around the hybrid methodology, a blueprint of the methodology was published on 12th February 2019:
    - Transactions including non-financial corporates are to be excluded from the set of eligible transactions. This is in line with that used for the calculation of €STR by the ECB.
    - Historical data from the EMMI for the May to July 2018 period indicate that the new Euribor averages **2-3bp below** the current quote-based Euribor
  - The reform is now in its final stage, as the Belgian FSMA[1] has approved the reformed Euribor on 3rd July 2019 as an acceptable and compliant benchmark with the EU BMR[2], and started transitioning panel banks from the current Euribor methodology to the new hybrid methodology
- On 10th September 2019, ISDA published an FAQ on the implementation of the Euribor reform (https://www.isda.org/2019/09/10/euribor-reform-faqs/)

1 New EURIBOR Definition

- The new proposed definitions will try to separate the **underlying interest rate** from the **determination methodology**

	Current	Proposed
Methodology	Quote based	Hybrid
Definition	"…rate at which Euro interbank term deposits are being offered within the EMU zone by one prime bank to another…"	"…rate at which wholesale funds in euro could be obtained by credit institutions in the EU and EFTA countries in the unsecured money markets"
Underlying Rate	Vague - refers to "deposits" that are "being offered"	Explicitly refer to being a "borrowing rate" for credit institutions
Type of transactions	Interbank loans	Wholesale funding rate
Concept of Prime bank	Referred to both the borrower and supplier	Borrower intact in terms of credit institution; supplier list expanded to include other sources of bank funding (unsecured cash deposits from insurance companies, pension funds, etc.)

2 New calculation method: hybrid methodology

- EMMI stopped publishing some EURIBOR fixings starting from 3rd December 2018, due to a lack of effective transactions for these tenor

Current Index	1W	2W	1M	2M	3M	6M	9M	12M
New Index	1W	-	1M	-	3M	6M	-	12M

- The EMMI is proposing a **hierarchical approach of three levels**, which is followed each day, by each individual bank and for each defined tenor. EMMI will be responsible for the determination of submissions under the Level 1 and Level 2 methodologies, using the input of Panel Banks' transactions, whereas each Panel Bank will be responsible for determining their individual Level 3 submission:
  - **Level 1:** transaction-based framework centred on fixed rate Euro area deposits for selected counterparties or fixed rate term securities for specific tenors (irrespective of geographical locations of counterparty)
  - **Level 2:** applies when there are not enough transactions in a given tenor but enough transactions in nearby maturities or recently
  - **Level 3:** relies on alternative cost of funding based on modelling technique and/or the judgement of the Panel Bank

Source: JP Morgan, EMMI website https://www.emmi-benchmarks.eu/euribor-org/about-euribor.html

[1] Financial Services and Markets Authority

[2] EU Benchmark Regulation

Switzerland pioneering the change in the OIS benchmark in 2017

- The National Working Group on CHF Reference Rates (NWG) has been tasked with the reform of the overnight rate and CHF LIBOR
- The NWG has recommended SARON (Swiss Average Rate Overnight) as the alternative to CHF LIBOR, and a term rate based on a compounded SARON (i.e. backward-looking term rate) is currently being developed

What is SARON?

- SARON (Swiss Average Rate Overnight) was introduced in August 2009 to replace the repo overnight index (SNB). This new reference rate is based on data from the Swiss franc repo market and is part of a larger set of Swiss Reference Rates comprised of 32 benchmark rates.
- SARON is based on concluded transactions and binding quotes of the underlying Swiss repo market (where cross-market bonds are eligible as collateral) and is administered by SIX

Adoption of SARON: a secured and transaction-based replacement of TOIS (unsecured and panel-based)

- As a consequence of the decline in the number of banks participating in the TOIS panel, ACI Suisse (the administrator of TOIS fixing) announced the termination of the TOIS fixing with an effective date of 29 December 2017
- TOIS has been substituted by SARON, and discontinued effective 29 December 2017, fixing about 20 bps lower than TOIS
- SARON effectively started being used as a reference rate for new OIS swaps around September 2017
- LCH and EUREX have removed cleared TOIS contracts in October 2017 and introduced a new discounting methodology referring to SARON-based instruments
- For most of the contracts, zero compensation payments have been agreed among market participants

"For all TOIS with a maturity date beyond the discontinuation date of the TOIS fixing, the NWG recommends that TOIS be restricken to reference SARON from January 1, 2018, leaving all other terms (spread, maturity, fixed rate) unchanged."

"The NWG supports the rationale of a compensation payment of zero between counterparties for cash collateralized trades in which the rate for the calculation of the PAI [1] will be altered."

12th October 2017, NWG

A compounded SARON as a replacement for CHF Libor

- On 31st October 2018, the NWG recommended using a compounded SARON wherever possible as a term rate alternative, as it considers it unlikely that a robust term rate based on SARON derivatives will be feasible
- As a first step, SIX started publishing compounded SARON rates for illustrative purposes, following prior clarification on the calculation formula and date definitions. This should facilitate the development of an FRN market

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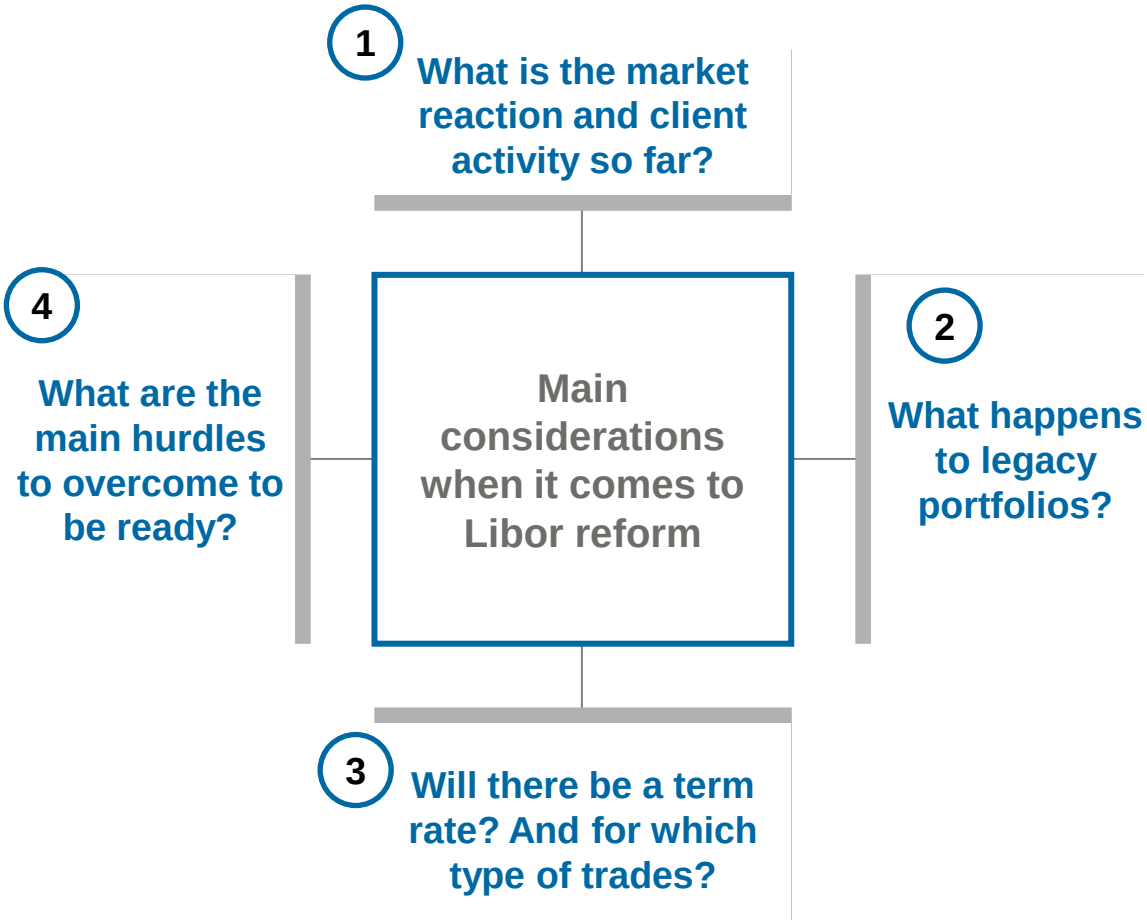
Source: Swiss National Bank website (https://www.snb.ch/en/ifor/finmkt/fnmkt_benchm/id/finmkt_reformrates)
Notes:1. Price Alignment Interest (PAI) is the overnight cost of funding for collateral

Agenda

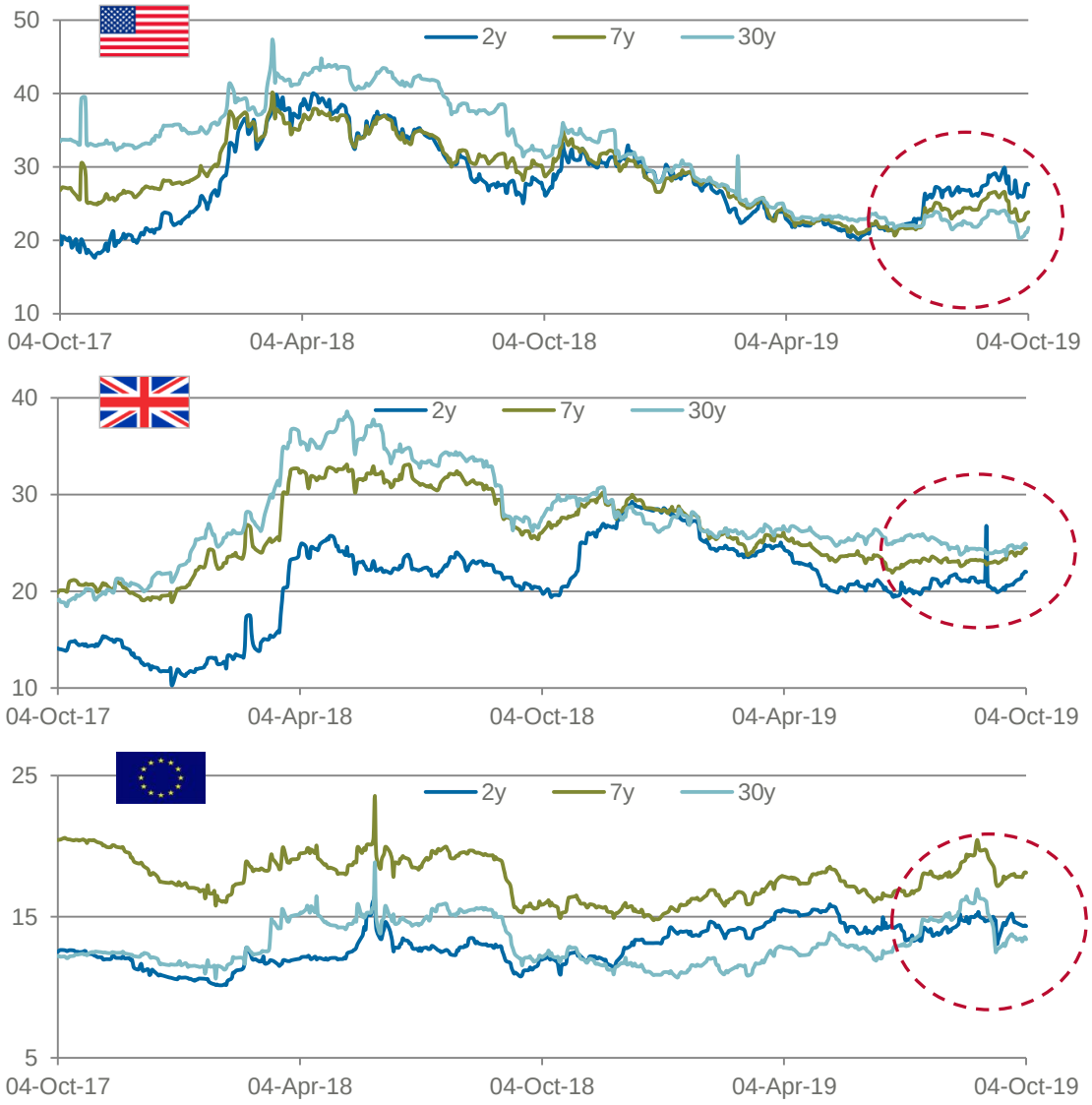
What does this reform mean in practice?



Market reaction

- Some market participants have already started to shift their hedging methodology from IBOR to OIS instruments
- Most of these participants have been banks/insurance ALM desks and corporate treasuries, as they typically all have less velocity in their portfolios and want an index which will stay in the long run
- These market participants are therefore fixed rate receivers, given they typically have longer liabilities than assets
- Some of the OIS/IBOR widening we saw in the market during the new RFR implementation phase (towards the beginning of 2018) may have been explained by these trades, especially in the US and in the UK where there is more clarity than in the Euro zone for the benchmark reform
- The OIS/IBOR basis may also become more volatile if the IBOR is used less going forward and/or if a lot of IBOR submitters decide to no longer participate in the panel
- On the other side, some of the tightening we saw more recently may have been driven by the result of the ISDA fallback, with some expectation that the fallback will be using the historical methodology for the spread calculation

OIS/IBOR basis in different countries (in bps) for the past 2 years



Source: JP Morgan DataQuery; the above charts show Fed Funds vs 3M USD LIBOR basis, SONIA vs 6m GBP LIBOR basis and EONIA vs 6M EURIBOR basis

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Example of recent client discussion

LDI funds

- In the UK, Liability-Driven Investment (LDI) funds were one of the first movers, given the nature of their long-dated investment and hedges. Efforts to adapt with the changes ahead were noticed, notably after the speech of Andrew Bailey in 2017:
  - Some LDI funds avoid entering into new IRS linked to IBORs and enter into OIS swaps instead, which resulted in the steepening of the SONIA-LIBOR basis, as they are typically receiving fix and paying floating in forward starting IRS
  - Other UK market participants are changing their rates hedging methodology to use more cash instruments rather than derivative
- In Europe, we have seen some legacy Euribor portfolio restructuring towards EONIA by some Pension Funds

ALM teams

- Certain Asset-Liability Management (ALM) teams have shifted from IBOR-based hedging towards OIS-based hedging
- This is particularly relevant to ALM desks of large European banks as they have started to manage both their assets and liabilities with a OIS benchmark (rather than a term rate)
- This change was possible due to the improved liquidity of OIS products (e.g. Eonia and Euribor offer similar liquidity / bid-offers)

Banks & SSA

- With the increase of issuances of RFR-based FRNs by SSAs and Banks in the UK and the US, there are a lot of discussions around the market norms and conventions for these instruments across different jurisdictions
- Considerations around the potential use of term rate in cash contracts and ways of hedging with derivatives instruments
- Implementation of fallbacks language in new Libor-linked issuances

Corporates

- Corporates are also starting to change their hedging methodology. We have seen several corporates take the strategic decision to enter into new issue swaps based on RFRs or OIS rates going forward.
- The fact that these trades are very often designated as hedge accounting items pushes corporates to enter into trade with terms which will hold for the long run

Fast money accounts

- Fast money accounts have been at the forefront of the reform in term of actual positioning
- Several clients have positioned themselves for OIS/LIBOR wideners or flatteners based on their views of the benchmark reform in various regions

Banks CVA desks

- Banks CVA desks have been traditional market participants of basis when they hedge the differential discounting positions
- Their activity is fundamentally linked to the movement of the rates, FX and cross-currency basis
- These desks will also manage the change in discounting when the clearing houses (e.g. LCH and CME) will change their discounting methodology in 2020

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ISDA published a consultation on benchmark fallbacks

- ISDA has been working on market-wide consultations for a fallback mechanism for derivative contracts in the event that LIBOR permanent cessation
- The fallbacks will be defined in a "Supplement" to the original ISDA 2006 Definitions, and fallback rates will be based on "adjusted RFRs" and "spread adjustments"
  - On 12th July 2018, ISDA launched a consultation for a fallback mechanism for derivative contracts referencing Libors in **GBP, JPY, CHF and AUD** (excluding USD and EUR). The consultation required responses to be submitted by 22th October 2018.

    On 20th December 2018, ISDA published final results of the consultation stating that "the overwhelming majority of respondents preferred the 'compounded setting in arrears rate' for the adjusted risk-free rate, and a significant majority across different types of market participants preferred the 'historical mean/median approach' for the spread adjustment".
  - On 16th May 2019, ISDA published two consultations on fallbacks for derivatives referencing Libors in **USD, CAD and HKD**, with a 12th July 2019 deadline

    On 1st August 2019, ISDA published the preliminary results for the spread and term adjustment for fallback derivatives which led to the same preferences as the previous consultation.
  - Finally, "ISDA expects to launch a supplemental consultation at the end of 2019 or in early 2020" for **EUR Libor and Euribor**

Adjusted RFRs – the below approaches were under consideration

Approach	Description
Spot Overnight Rate (SORf)	RFR rate that sets on the date that is one or two business days prior to the beginning of the relevant IBOR tenor
Convexity-adjusted Overnight Rate (CORf)	Daily compounded RFR rate over the IBOR's term, "achieved by using an approximation in which "today's" overnight RFR is assumed to hold constant at "today's" value on each day during the relevant IBOR's tenor"
Compounded Setting in Arrears Rate (ARRf)	Based on "relevant RFR observed over the relevant IBOR tenor and compounded daily during that period"
Compounded Setting in Advance Rate (ADRf)	Similar to compounded setting in arrears approach, "but the observation period would end immediately prior to the start of the relevant IBOR tenor so that the rate would be available at the beginning of that period"

Spread Adjustment - the below methodologies were under consideration

Approach	Description
Forward Approach	IBOR and RFR curves are bootstrapped and the spread at every single date in the future is calculated. "The forward approach is not compatible with the spot overnight rate approach or the convexity-adjusted overnight rate approach".
Historical Mean/Median Approach	"…based on the mean or median spot spread between the IBOR and the adjusted RFR calculated over a significant, static lookback period (e.g. 5 years, 10 years)" prior to the fallback trigger date. "This spread adjustment could then be used from the end of a one-year transitional period after the fallback takes effect", to prevent a disparity between spot spread and where this historic spread is calibrated. During the transitional period, the spread would be linearly interpolated between the spot spread at the time the fallback takes effect and the historical mean spread.
Spot-Spread Approach	Similar approach to the historic mean/median approach but for a very short time (e.g. 5 trading days, 10 trading days or 1 month) and without the transitional period

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Source: ISDA website https://www.isda.org/2018/07/12/isda-publishes-consultation-on-benchmark-fallbacks/; preliminary results of the consultations https://www.isda.org/a/tzAEE/Preliminary-Results-of-ISDA-Derivatives-Fallbacks-Consultation.pdf and https://www.isda.org/a/lRqME/Preliminary-Results-of-May-2019-Supplemental-Consultation.pdf ; two consultations for USD, CAD and HKD https://www.isda.org/a/w0tME/ISDA-Publishes-Two-Consultations-on-Benchmark-Fallbacks.pdf

ISDA fallback – application GBP OIS/Libor basis

- As a result of the publication of the preliminary ISDA consultation results on 27th November 2018, the market priced a flattening of the GBP Libor-OIS basis which is consistent with the consultation preference of using the "historical mean/median approach" for the spread adjustment calculation
  - The below charts compare the **basis across different tenors between 6m Libor swap rates and OIS swap rates** as of **29-Nov-18** and **29-May-18**
- However the exact methodology to be used in calculating this spread adjustment is still being discussed:
  1. The length of the lookback period to be used for calculating the historical mean/median (5-year or 10-year as mentioned by ISDA)
  2. Whether to use the mean or the median for historical spread calculation
  3. The point at which the lookback starts at the time the fallback is triggered
  4. The approach used to calculate the OIS rate for the spread adjustment. There is some uncertainty among market participants as to whether a market SONIA OIS swap rate (Chart 1) or a compounded in arrears SONIA O/N rate (Chart 2) should be used in calculating the historic LIBOR/OIS spread
- The market reaction to the preliminary results of the ISDA consultations can be observed in the charts below. We also computed the GBP 6M Libor / 6M adjusted RFR spread using different versions of the "historical mean/median approach"

Chart 1 – Historic GBP Libor/OIS spread using market SONIA OIS swap rates for 6m tenor

Calculated using 6m Libor rates and SONIA OIS swap rates for 6m tenor

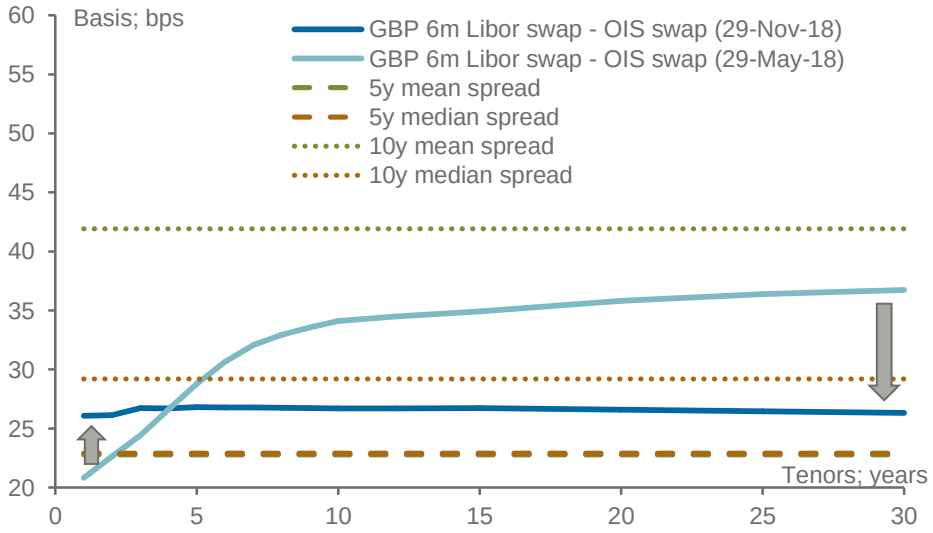
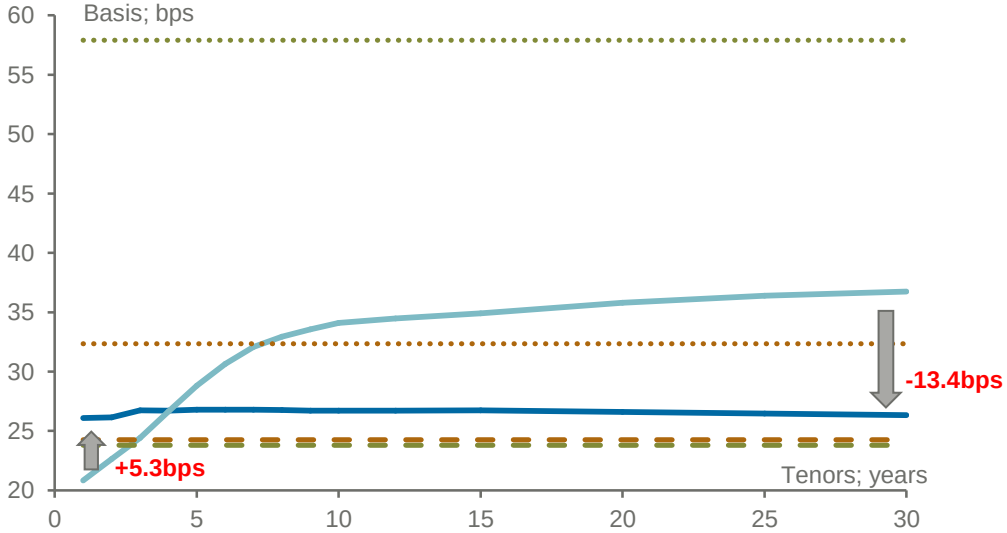


Chart 2 – Historic GBP Libor/OIS spread using 6m compounded SONIA overnight rates *

*Calculated using 6m Libor rates and 6m compounded SONIA O/N rates **



* We use historical overnight SONIA fixings to calculate a 6 months compounded SONIA rate using the "in arrears" methodology as specified in the ISDA consultation. This compounded rate is compared to the observed 6m Libor swap rate, and then this spread is averaged over 5y or 10y periods. Due to the "in arrears" approach, the averaging periods differ from the averaging periods assuming market SONIA OIS rates in Chart 1

Source for both graphs: JP Morgan DataQuery

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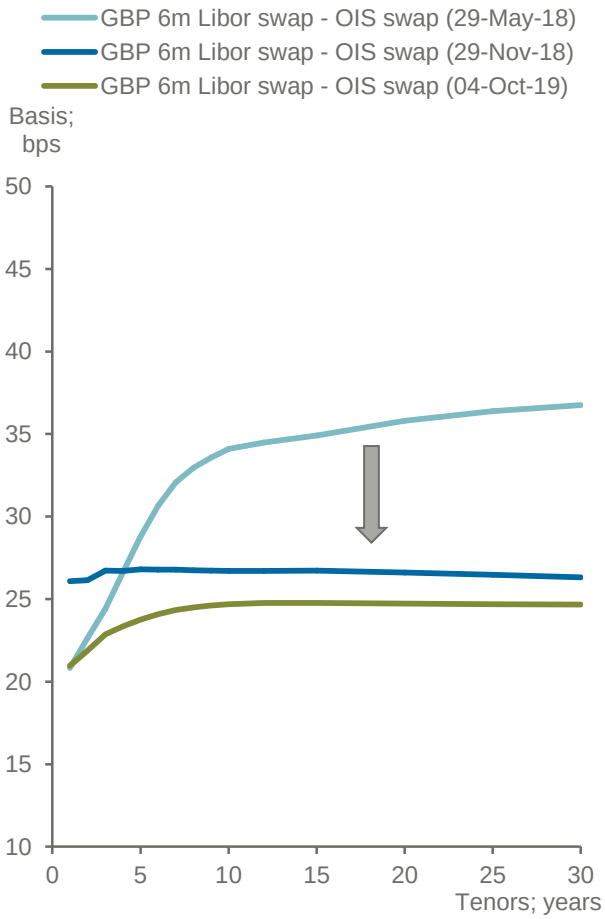
ISDA fallback – application
GBP Libor – OIS basis

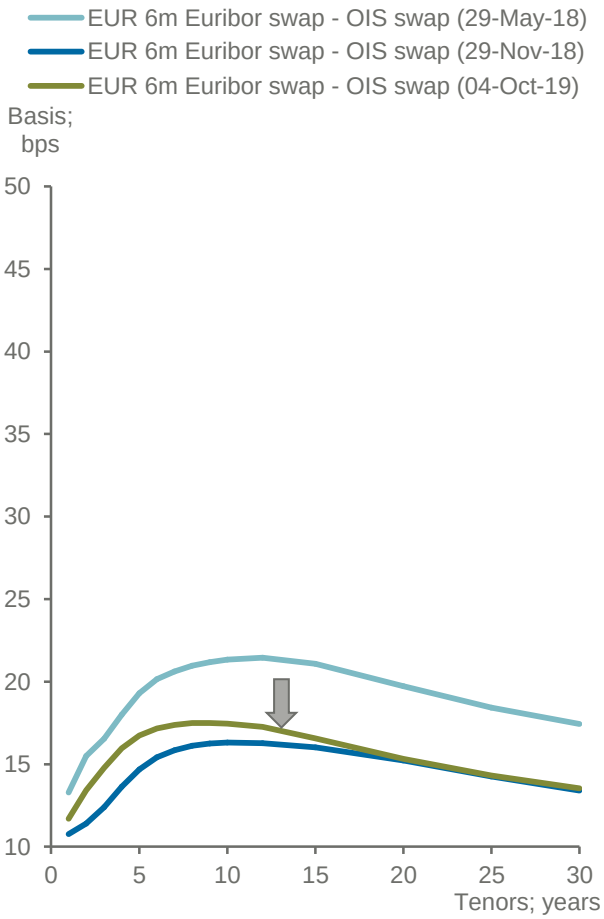
GBP Libor/OIS basis

Calculated using GBP 6m Libor swap rates and SONIA OIS swap rates



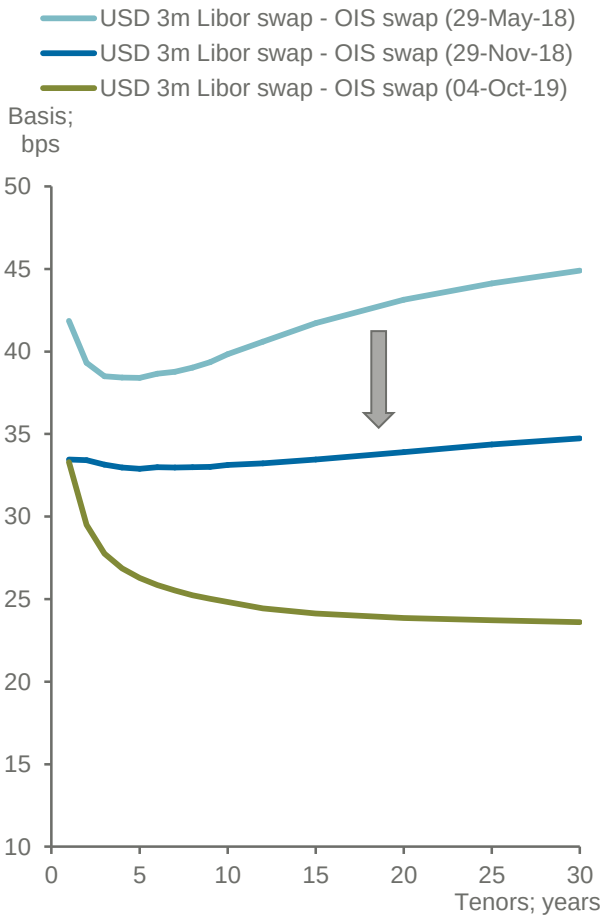
EUR Libor/OIS basis

Calculated using EUR 6m Euribor swap rates and EONIA OIS swap rates



USD Libor/OIS basis

Calculated using USD 3m Libor swap rates and Fed Funds OIS swap rates



Source: JP Morgan DataQuery as of 4th October 2019

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RFR term rates – what, why and how (1/2)

What's the difference between IBORs and RFR term rates?

Let's compare an IBOR rate to a RFR term rate:

- A 3-month IBOR rate is a rate at which one bank can borrow/lend to another bank on an unsecured basis for 3 months in a certain currency.
  - As a result, an IBOR index takes into account both an interest rate component and a credit risk component: if the borrowing bank defaults within this 3-month period, the lender will only recoup the recovery value of the amount lent. During the 2008 financial crisis, the credit risk component was crucial and got more significant than the rates component
- A 3-month Term RFR is the expectation of the daily compounded RFR rate over a 3-month period
  - Given it is the compounded version of an overnight rate (which therefore has very little credit risk), it is dominated by the interest rate component and should therefore trade below the currency-equivalent Libor

Is there a need for a term rate?

Term rates don't seem to be a necessity in the derivatives market…

- "There is substantial consensus that the largest part of the market therefore not "need" a term rate. that is the bulk of interest rate derivatives – does not need term rates." - *Andrew Bailey, CEO of the UK FCA in July 2018*

…and overnight rates started being adopted in some cash market instruments…

- Andrew Bailey emphasized in another speech in July 2019 that both the sterling bond market and the securitization market "have now moved to overnight SONIA, compounded in arrears".

…however there is still a need for some borrowers to have cash flow certainty months in advance, hence regulators in the UK, US and Europe are determined to produce RFR term rates…

- "In the United Kingdom, we are therefore determined to push forward the production of a term rate based on SONIA. The ARRC is seeking the production of a SOFR-based term rate for similar reasons. This forward-looking term version of SONIA should be useful to some niche users in cash markets." - *Andrew Bailey in July 2019*

…but RFR term rates are not expected to be the norm !

- "Indeed I think the prevailing view on our Risk Free Rate Working Group – the UK equivalent of the ARRC in the United States – is that overnight SONIA, compounded in arrears will and should become the norm in bilateral and syndicated loan markets too." - *Andrew Bailey in July 2019*
- "But the use of these forward-looking term rates is meant to be limited. These term rates cannot and will not be the primary avenue to transition. The risk-free rates themselves, SONIA and SOFR, should serve that purpose." - *Andrew Bailey in July 2019*

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RFR term rates – what, why and how (2/2)

How to construct a term rate?

- In order to avoid going back to previous Libor issues, the two main possibilities are to use the futures market or to rely on the OIS OTC market

There are working groups for each main currency on term rates and several consultations have been issued. Each of them is currently looking for candidates to select a provider of the RFR term rates.

- The ECB working group recommended in March 2019 *"a methodology based on (tradeable) OIS quotes for calculating a €STR-based forward-looking term structure and is now inviting benchmark administrators to express their interest in producing such a term structure."*
- *"The working group invites interested benchmark administrators to present their proposal for a €STR-based forward-looking term structure that could be used as a fallback in EURIBOR-linked contracts at the working group meeting of 16 October 2019."* [1]

- The working group on Sterling Risk-Free Reference Rates (RFRWG) issued a consultation in July 2018 on forward-looking Term Sonia Reference Rates (TSRR) which ran until 26 October 2018
- In the BoE Minutes in May 2019, the Working Group *"re-iterated its support for development of a term benchmark based on the sterling risk-free rate, known as a Term SONIA Reference Rate. The FCA announced three potential providers had expressed an interest in developing a forward looking term rate – FTSE Russell, ICE Benchmark Administration and Refinitiv – and were invited to present their work to the Working Group."* [2]

- The creation of a forward-looking term rate based on SOFR-linked derivative markets was included as part of the ARRC Paced Transition Plan FAQ published in September 2018, and the anticipated completion of the creation of a term SOFR rate is by end of 2021
- In April 2019, the NY Fed published a high-level approach to calculate indicative forward-looking term rates derived from the SOFR futures market and Indicative levels are being published on the NY Fed website [3]
- "The ARRC has set a goal of seeing a robust, IOSCO-compliant forward-looking term rate produced by a private administrator that could be used in commercial contracts once the SOFR derivatives markets that the term rate would be based on have grown to sufficient depth." [4]

Source:
1. ECB website https://www.ecb.europa.eu/paym/initiatives/interest_rate_benchmarks/WG_euro_risk-free_rates/html/index.en.html
2. BoE Minutes in May 2019 https://www.bankofengland.co.uk/minutes/2019/rfr-may-2019
3. NY Fed website https://www.federalreserve.gov/econres/notes/feds-notes/indicative-forward-looking-sofr-term-rates-20190419.htm
4. NY Fed website https://www.newyorkfed.org/arrc/sofr-transition

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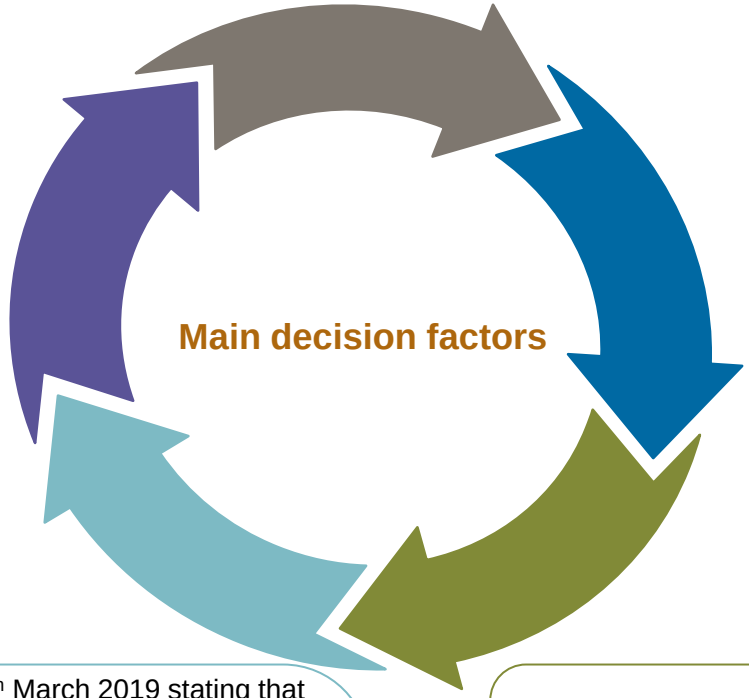
Considerations around change in Index



NCMR: BCBS/IOSCO issued a press statement on 5th March 2019 stating that "amendments to legacy derivative contracts pursued solely for the purpose of addressing interest rate benchmark reforms do not require the application of the margin requirements for the purposes of the BCBS/IOSCO framework, although the position may be different under relevant implementing laws." – source: https://www.iosco.org/news/pdf/IOSCONEWS526.pdf

Hedge Accounting: IASB has amended on 26th September 2019, some of its requirements for hedge accounting under IFRS 9, IAS 39 and IFRS 7, by providing "relief from potential effects of the uncertainty caused by the IBOR reform". "These amendments come into effect from 1st January 2020, but companies may choose to apply them earlier". – source: https://www.ifrs.org/news-and-events/2019/09/iasb-amends-ifrs-standards-in-response-to-the-ibor-reform/

Even if one assumes that in a few years time, the derivative market will be dominated by OIS trades, the unknown will still be the pace at which OIS products will ramp up

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How to prepare for the global benchmark reforms?

How is J.P. Morgan set up to manage these reforms?

- Regulators in the US, UK and Europe have reached out to CEOs of significant institutions such as banks and insurance companies to ensure that "firms' senior managers and boards understand the risks associated with this transition and are taking appropriate action" (ECB's letter to CEOs).
- In early 2018, J.P. Morgan has appointed a dedicated Firmwide Program Team (LIBOR.Transition.Program@jpmorgan.com) and has established a detailed plan to manage the transition. The program will deliver across 5 workstreams ensuring that our clients and the firm are prepared for the transition through to the end of 2021 and beyond:

		Partnership with:
1 **Implementation of New Reference Rates**	Successfully build out the capability to deal in Alternative Reference Rates for all lines of business globally while supporting the reduction of LIBOR related products	*Quant & IT*
2 **Legal & Documentation**	Identify all templates and executed documentation referencing IBOR's / Alternative Reference Rates for assessment of contractual robustness and enact appropriate remediation where necessary	*Legal*
3 **Risk Measurement & Reporting**	Produce a complete inventory of Firmwide IBOR / Alternative Reference Rates referencing positions via a repeatable, automated process at product/LOB/client-level. Build out quantitative scenario analysis to enable comprehensive and timely risk management decisions to be made	*Market Risk*
4 **Risk Management & Reduction**	Develop a Firmwide strategic plan to convert LIBOR referencing trades to Alternative Reference Rates and partner with our clients through their transition to Alternative Reference Rates	*Trading*
5 **Client Education & Communication**	Develop a targeted Firmwide LIBOR transition education and communication plan for our staff and clients	*Sales*

What are the guidelines for clients' preparation ahead of these reforms?

- Clients are highly encouraged to undertake a comprehensive risk assessment of the potential impact of the changes ahead.
  - Defining a firm-specific plan and workstreams could be a way to ensure all the hurdles and challenges to overcome are being addressed and monitored
- J.P. Morgan have been engaging with a wide range of clients as they prepare for the transition and is committed to help with the implementation of the transition:
  - by providing insights on market timing, updates on the state of the reforms in different jurisdictions, optimal hedging strategies, etc.
  - By assisting clients in the identification and measurement of existing IBORs risks – J.P. Morgan can perform a risk analysis, help define a hedging strategy and offer an execution framework based on fundamental analysis as well as market timing.
- Please reach out to your J.P. Morgan point of contact for any enquiries

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J.P. Morgan capabilities in Risk Free Rates per currency

Currency	Alternative Rate	Timing	Type	Liquidity	J.P. Morgan Capabilities
	**SOFR** *Secured Overnight Financing Rate*	✓ *Apr. 2018 (New)*	Secured	Activity in SOFR futures and floating rate notes (FRNs) continues to build, facilitating the growth of OTC swap markets.	J.P. Morgan can quote on SOFR swaps up to 30y. However the liquidity remains in the 1y & 2y tenors with the 30y being illiquid. Alternatively, J.P. Morgan can provide proxy hedges where client can switch from Libor to Fed Funds as a first step, then switch to SOFR once liquidity conditions improve.
	Reformed **SONIA** *Sterling Overnight Index Average*	✓ *Apr. 2018*	Unsecured	Established OIS market with clear and steady increase in trading activity since Apr. 2018, both in OTC derivatives, exchange traded futures and FRNs issuance.	Just over a year since the adoption of Sonia, the BoE highlighted that "[in] the derivative markets, the share of swaps traded using SONIA is already broadly equivalent to that linked to LIBOR." J.P. Morgan has helped clients in restructuring large Libor-linked portfolios into SONIA (e.g. UK LDI managers, pension funds, etc.)
	**€STR** *Euro Short Term Rate*	✓ *Oct. 2019 (New)*	Unsecured	€STR swaps volumes are expected to build quickly and may overtake EONIA in the interdealer market before the end of 2019.	JPMorgan and HSBC have traded the first €STR-Based interest rate swap on 30th September 2019, with a €100m notional and a one-week tenor. JP Morgan can provide similar liquidity in €STR derivatives that it can provide in EONIA, and volumes are expected to build up with the start of clearing and as more €STR-Based FRNs issuances could generate some hedging flows. We expect to be quoting and trading €STR derivatives with equivalent liquidity to Euribor before the end of 2019.
	**SARON** *Swiss Average Rate Overnight*	✓ *Sep. 2017*	Secured	SARON OIS swaps have been trading since 2017	J.P. Morgan can trade SARON across the curve, with main liquidity focus up to 10Y
	**TONAR** *Tokyo Overnight Average Rate*	✓ 2H19	Unsecured	TONAR-based derivatives still need to be developed	Early stages of the reform, liquidity currently developing

Note: J.P. Morgan rates trading has capabilities in other currencies such as BRL, ILS, NOK, SEK, ZAR etc.

Agenda

Background: ICE LIBOR and EURIBOR

- **ICE LIBOR**: benchmark rate produced for five currencies (USD, GBP, EUR, JPY and CHF) with seven maturities quoted for each, ranging from overnight to 12 months, producing 35 rates each business day
  - Every ICE LIBOR rate is calculated using a trimmed arithmetic mean (highest and lowest 25% of submissions are excluded)
  - Each contributor is asked the following question "At what rate could you borrow funds, were you to do so by asking for and then accepting interbank offers in a reasonable market size just prior to 11 am London time?". Submissions are based on the lowest perceived rate at which a bank could go into the London interbank money market and obtain funding in reasonable market size, for a given maturity and currency
  - Note that "Reasonable market size" is intentionally unquantified (would have to be constantly monitored and in the current conditions would have to be changed very frequently)

ICE LIBOR panel	USD	GBP	EUR	CHF	JPY
Lloyds Bank plc	✓	✓	✓	✓	✓
Bank of Tokyo-Mitsubishi UFJ Ltd	✓	✓	✓	✓	✓
Barclays Bank plc	✓	✓	✓	✓	✓
Mizuho Bank, Ltd.		✓	✓		✓
Citibank N.A. (London Branch)	✓	✓	✓	✓	
Cooperatieve Rabobank U.A.	✓	✓	✓		
Credit Suisse AG (London Branch)	✓		✓	✓	
Royal Bank of Canada	✓	✓	✓		
HSBC Bank plc	✓	✓	✓	✓	✓
Santander UK Plc		✓	✓		
Bank of America N.A. (London Branch)	✓				
BNP Paribas SA, London Branch		✓			
CACIB	✓	✓			
Deutsche Bank AG (London Branch)	✓	✓	✓	✓	✓
JPMorgan Chase Bank N.A. London Branch	✓	✓	✓	✓	✓
Société Générale (London Branch)		✓	✓	✓	✓
Sumitomo Mitsui Banking Corporation Ltd.	✓				✓
The Norinchukin Bank	✓				✓
The Royal Bank of Scotland plc	✓	✓	✓	✓	✓
UBS AG	✓	✓	✓	✓	✓

Source: https://www.theice.com/publicdocs/ICE_LIBOR_Evolution_Report_25_April_2018.pdf

- **EMMI EURIBOR (Pre-reform):** benchmark rate produced daily which corresponds to the rate at which euro interbank term deposits are being offered by one prime bank to another within the EMU zone
  - A representative panel of banks provides daily quotes of the rate (rounded to three decimal places) that each panel bank believes one prime bank is quoting to another prime bank for interbank term deposits within the euro zone
  - 20 European banks currently constitute the panel: Banco Santander, Barclays, BBVA, BCEE, Belfius, BNPP, Caixa Geral De Depósitos, CaixaBank, CECABANK, Crédit Agricole, Deutsche Bank, DZ Bank, HSBC France, ING Bank, Intesa Sanpaolo, Monte dei Paschi di Siena, National Bank of Greece, Natixis, Société Générale, UniCredit