

Dynamics of FRNs linked to RFRs versus FRNs linked to LIBOR

- Should risk premiums be equal?

24. March 2021

Agenda

- Background
- The structure of ARR
- Hypothesis and method
- Price development
- Effect on coupons
- Conclusion

Background – The LIBOR Scandal

The scandal that sparked the development of alternative reference rates



With arrogant disregard for the rules, traders colluded for years to rig Libor, the banks' lending rate. But after the crash, the regulators were on their trail
by [Liam Vaughan](#) and [Gavin Finch](#)



LIBOR fix – huge scandal in the financial market



LIBOR is based on estimates rather than actual transactions



Member banks found guilty of manipulating LIBOR in 2012



The scandal becomes the catalysator for developing alternative reference rates (ARRs)

Characteristics of the ARR



Only overnight (no term structure)



Backward looking and based on actual transactions



Near-risk free, without credit risk element from xIBOR

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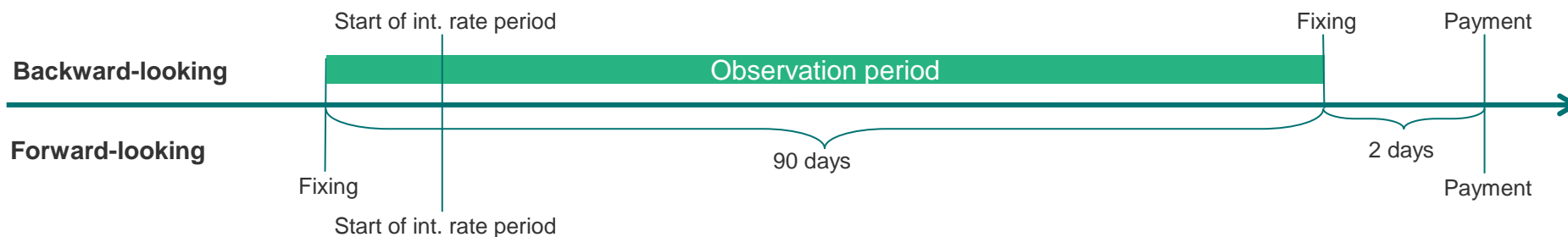
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Two ways of determining the coupon payment

The backward-looking method is used to create term rates out of O/N rates

...ARRC is still evaluating the limited set of cases in which it believes a term rate could be used.

- ARRC Newsletter 23 Mar 2021



Backward-looking

- Based on realised O/N rates.
- Determined at the end of the interest rate period, and can make liquidity management more challenging.
- Slower to reflect events in the market, such as changes to the key policy rate or external shocks.
- All contracts referencing RFRs until now are based on this methodology as there is no forward term rate available and a RFRWG study shows that 90% of all cash contracts can use it.

Forward-looking

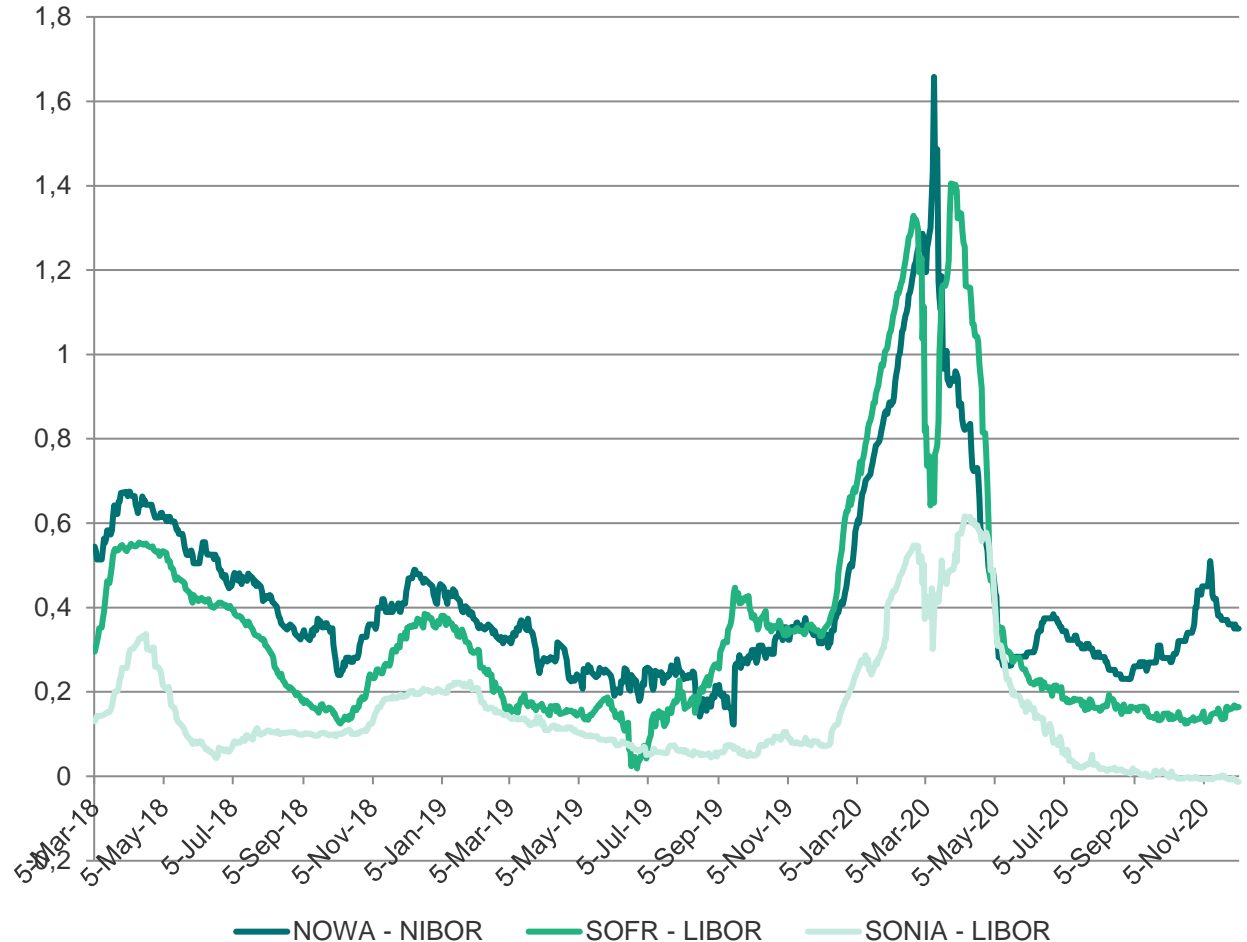
- Similar to IBOR rates.
- Payments are known in advance of the interest rate period, simplifying liquidity management.
- Represents market expectations and therefore reflects changes in market outlook instantly.
- RFRWG works on a forward term rate based on derivatives for SONIA. Three vendors publish SONIA term rates as of Q1 2021
- ARRC works on a forward term rate for SOFR based on derivatives. Possible results end of 2021.

The difference between 3M IBOR rates and ON rates

The OIS-LIBOR spread

- The spread between RFRs and LIBOR is not static.
- The spread is a reflection of the risk premium in the money market
- Average differences for the last 3 years are:
 - GBP: 15bps
 - USD: 36bps
 - NOK: 43bps
- Many contracts base their fallback language on the historic difference between the IBOR and RFR rate.

Historic differences in GBP, USD and NOK



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Hypothesis and method

Background and hypothesis

- The RFRs are all overnight rates. They are expected to follow the central bank policy rate closely.
- LIBOR is a fixed rate for a given tenor and is therefore the expected money market rate until maturity.
- LIBOR is supposed to measure the rate at which a bank can borrow money unsecured at a fixed rate for the tenor of the loan, normally 3 or 6 months.
- Since the lender faces a possible default on the borrower during the tenor of the loan, the LIBOR rate not only measures the expected money market rate but also the credit risk of the borrower.
- Because LIBOR is the average borrowing cost across banks, the incorporated credit or risk premium in the rate also measures the average risk premium lenders require to lend unsecured to banks.
- During market turbulence the risk premium in LIBOR will rise and vice versa

- In the following we will explore:
 - How is the price behavior in FRNs linked to RFR versus FRNs linked to LIBOR?
 - How does interest accrue in FRNs linked to RFR versus FRNs linked to LIBOR?
 - If there is a difference will investors require a premium to be indifferent between investing in a RFR FRN and a LIBOR FRN?

Method

1

We chose a selection of bonds linked to SOFR in USD and SONIA in GBP.

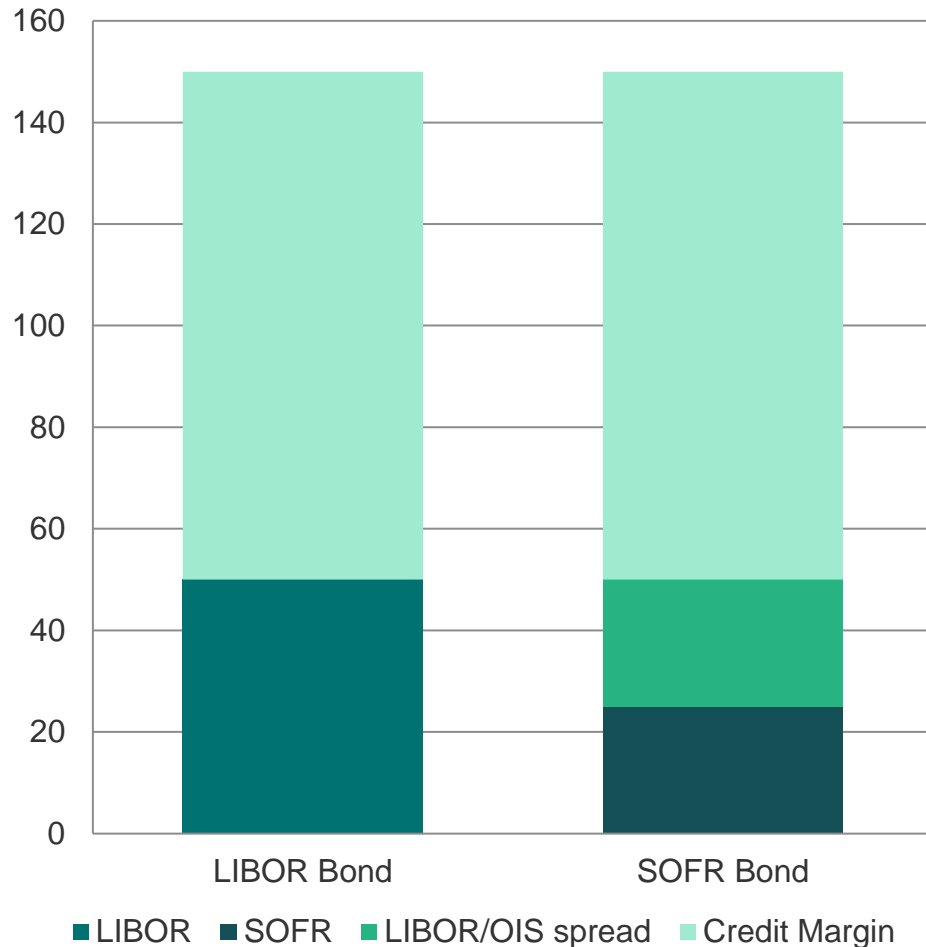
2

Comparable bonds were found based on the following criteria:

- Same issuer
- Same seniority
- Approximately the same maturity/call date
- FRNs linked to LIBOR rates

The difference between SOFR and LIBOR coupon payments

From LIBOR to SOFR



RFR FRN with constant risk premium

- In order to be indifferent between a bond linked to LIBOR and a bond linked to SOFR, the bondholder must receive the same compensation.
- The additional element of credit in LIBOR must be compensated for in the SOFR-bond by the spread between LIBOR and SOFR.
- In this way, the bondholder receives approximately the expected equal sum of coupons, indifferent of which bond he holds.

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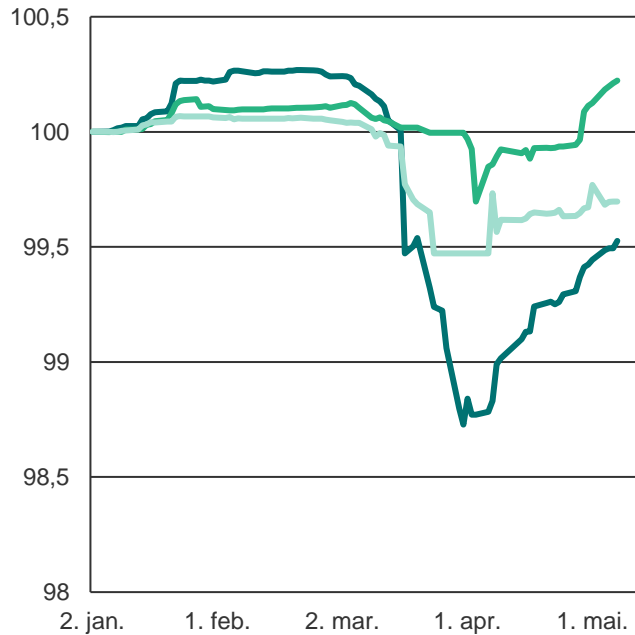
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GBP SONIA Bonds

Toronto-Dominion Bank Jun. 22

Bond Price

Indexed to 100 at 2. Jan 2020
Covered Bond

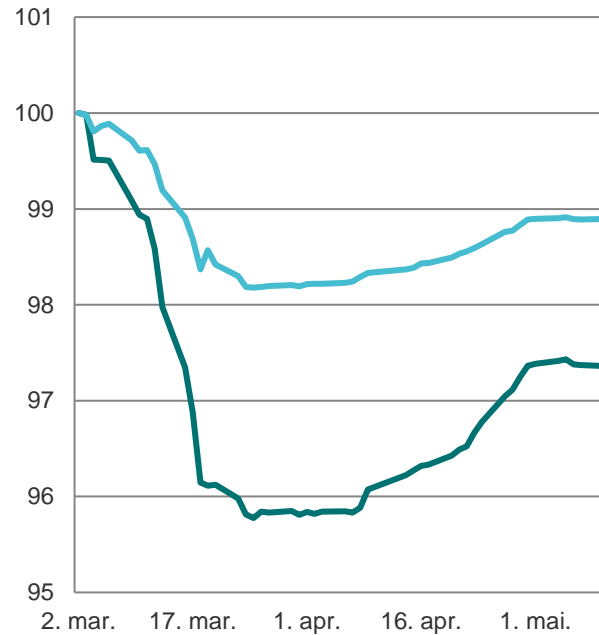


— SON+47, Jun. 22 — LIB+22, Jan. 23
— LIB+27, Jun. 21

BMW Mar. 22

Bond Price

Indexed to 100 at 2. Mar 2020
Senior Unsecured



— SON+51, Mar. 22 — LIB+26, Feb. 21

Comments

- Prices on bonds linked to SONIA have fallen more than the bonds linked to LIBOR.
- As markets have recovered, prices on both SONIA- and LIBOR-linked bonds have also recovered.
- However, because of the deep initial fall, prices on bonds linked to SONIA are still well below their levels going into the observation period.

USD Senior Unsecured Bank Bonds

Bank of Montreal Mar. 23

Toronto-Dominion Bank Jan. 23

Comments

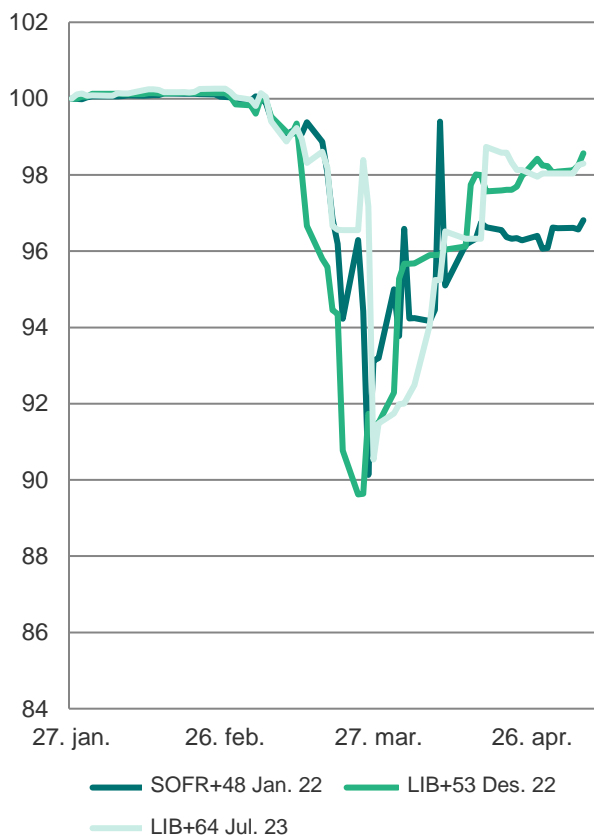
Bond Price

Indexed to 100 at 10. Mar 2020



Bond Price

Indexed to 100 at 27. Jan 2020



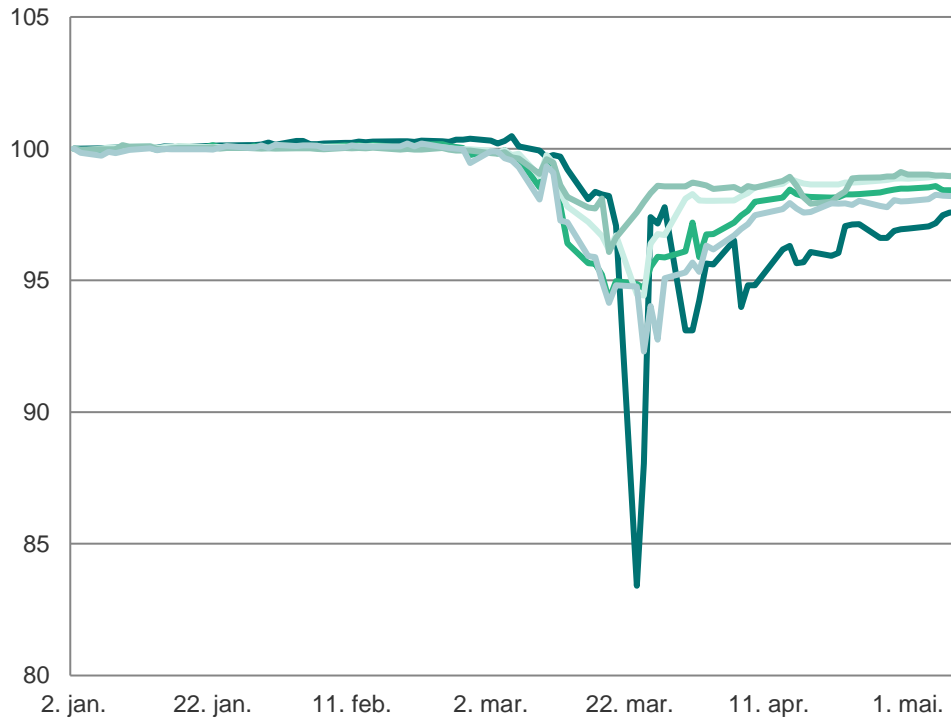
- In the USD market, prices on LIBOR bonds started to fall earlier than their comparable SOFR-linked bonds.
- However, SOFR bonds fell by at least the same amount once they started to fall.
- There has been a considerable rebound for both groups. Nevertheless, prices for bonds linked to LIBOR are still significantly closer to their pre-crisis levels.

USD Senior Unsecured Bank Bonds

Citibank Nov. 21

Bond Price

Indexed to 100 at 2. Jan 2020

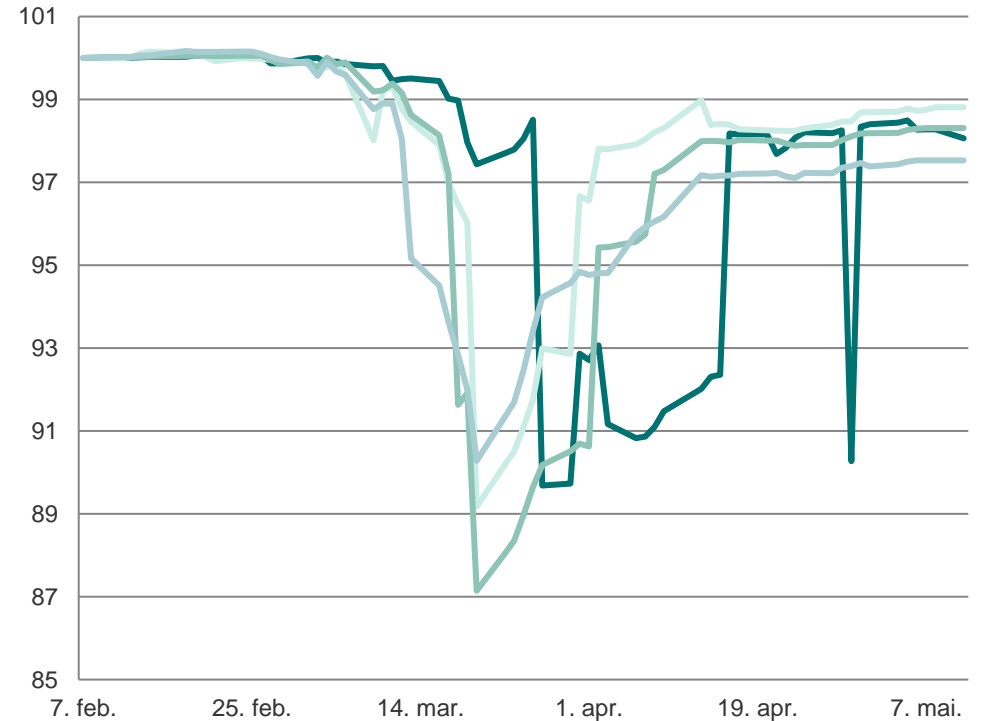


— SOFR+87 Nov. 21
 — LIB+107 Nov. 21
 — LIB+119 Aug. 21
— LIB+138 Mar. 21
 — LIB+96 Mar. 22

Royal Bank of Canada Aug. 22

Bond Price

Indexed to 100 at 7. Feb 2020

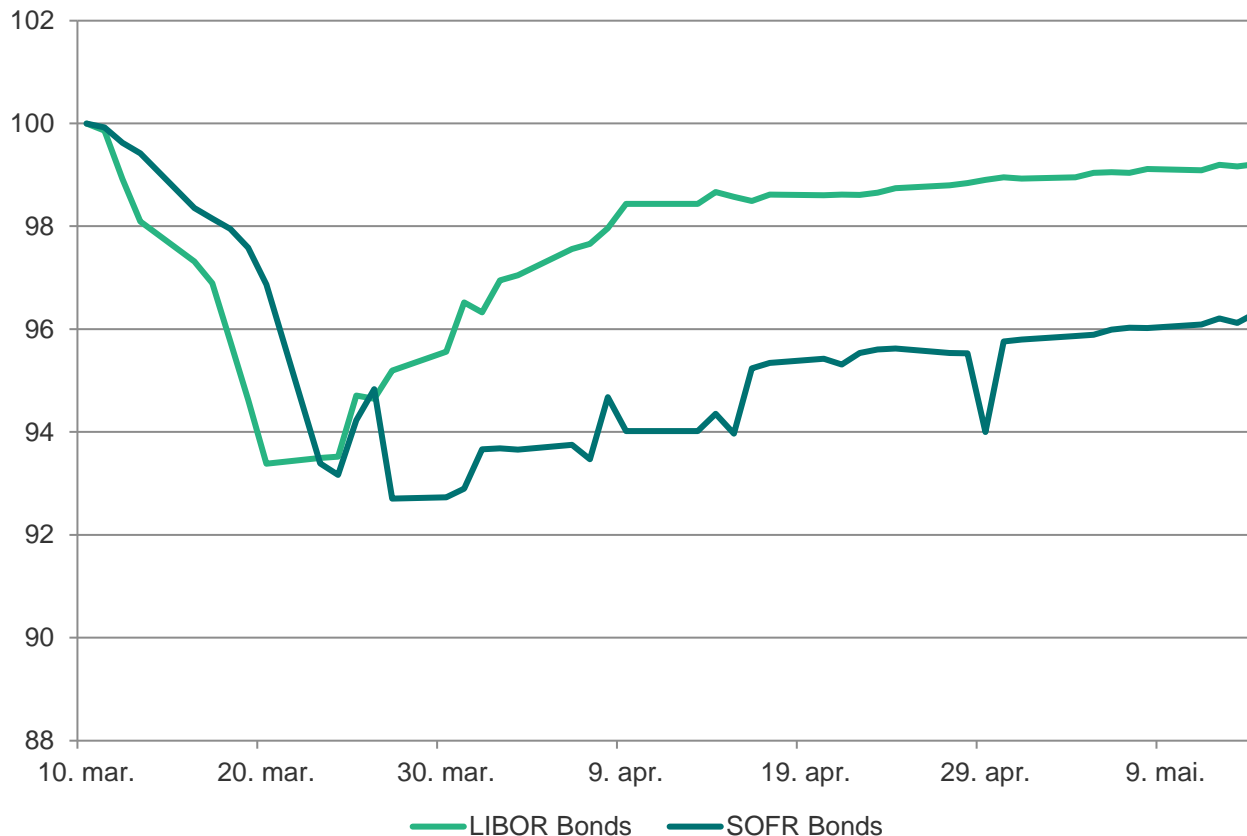


— SOFR+40 Aug. 22
 — LIB+73 Feb. 22
 — LIB+47 Apr. 22
 — LIB+36 Jan. 22

Prices of SOFR bonds have recovered less

Bond Proxys

Bond Proxy Prices*
Indexed to 100 at 10 March 2020



Comments

- The Proxy is made up of SOFR-linked senior unsecured bonds and comparable bonds linked to LIBOR.
- The graph shows price development since 10 March.
- Prices on LIBOR Bonds fell more in the beginning (to 93.4), but the majority of the fall has since been recovered.
- SOFR Bonds prices fell later, but harder, to a low of 92.7. The recovery has also been slower, and less than 50% of the fall has since been recovered.

*The proxies are made up of bonds from Bank of Montreal, the Toronto-Dominion Bank, Citigroup, Morgan Stanley and Royal Bank of Canada
All bonds are equally weighted in the proxy

Volatility in Bond Prices

Bond Prices with RFRs more volatile

- The volatility numbers in the table are volatility in absolute prices and the volatility in relative prices respectively.
- For USD the volatilities are calculated on the «Market Proxy», all senior unsecured bonds with an average maturity of 2.1 years.
- For GBP the volatilities are based on only two names; BMW for the senior unsecured bond and TD Covered.
 - Maturities are 1.3 and 1.9 years respectively.
- Both the graphs on the previous slides and the volatility numbers confirm our hypothesis that FRN prices linked to RFRs will be more volatile than comparable FRNs linked to LIBOR.
 - The RFR-LIBOR spread is fixed in a RFR FRN. If risk premiums in the market rise, prices fall and vice versa.

Proxy volatilities

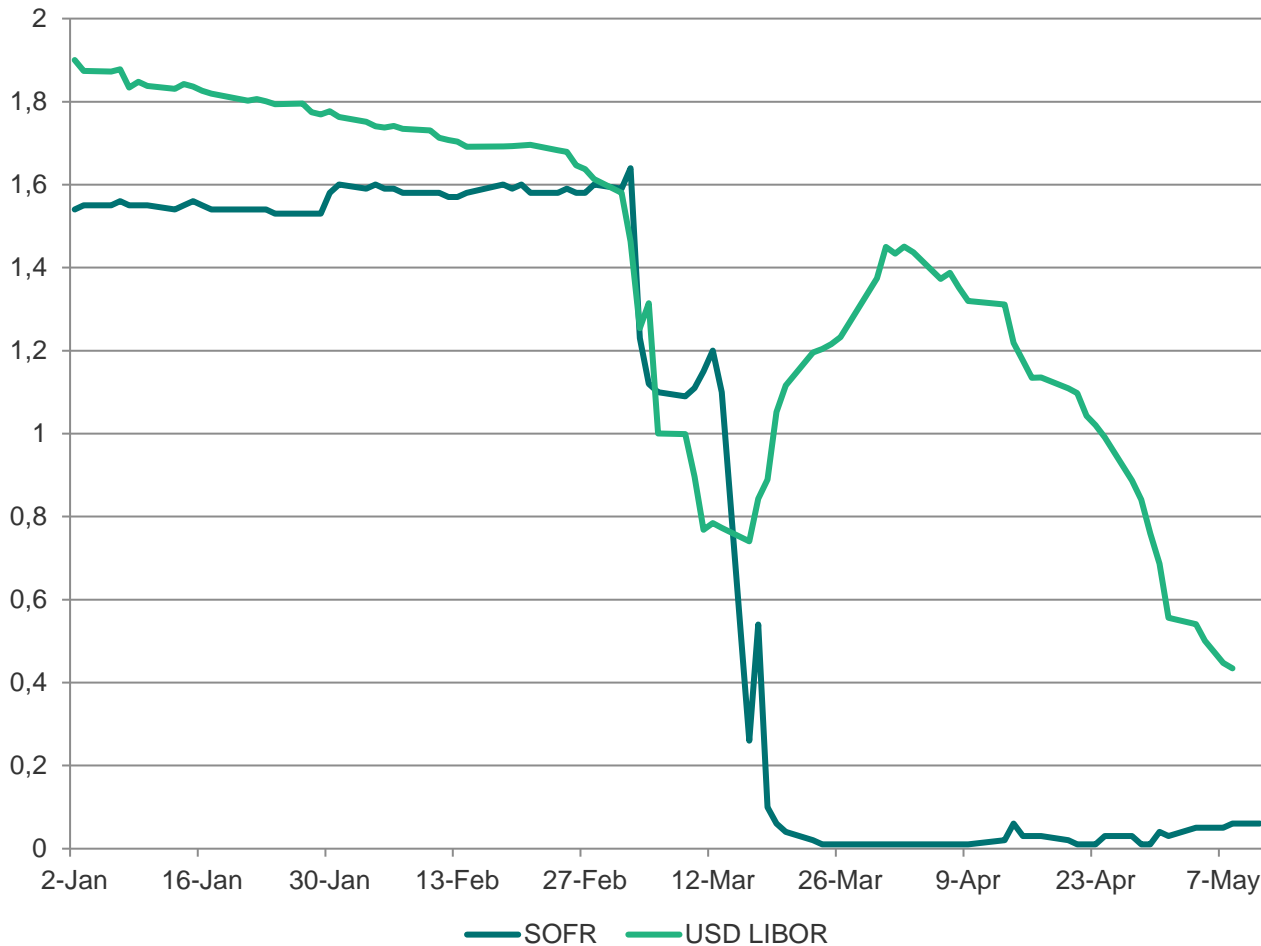
	Yearly standard deviation
SOFR Proxy	13.30%
LIBOR Proxy	7.74%
SONIA Covered	1.77%
LIBOR Covered	0.66%
SONIA Senior	3.30%
LIBOR Senior	1.60%

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The recent development in SOFR and USD LIBOR

SOFR and USD LIBOR development YTD



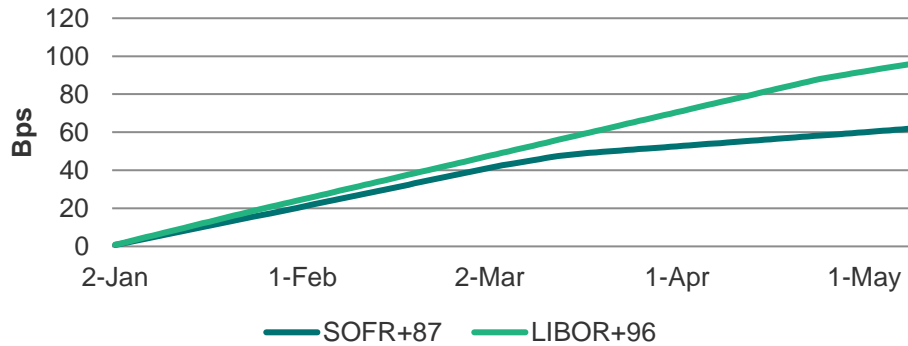
Comments

- When the Fed cut rates in early March, SOFR fell immediately.
- The LIBOR, however, fell more after the first cut on expectations of further rate cuts, but rose thereafter. This is due to the credit premium that is embedded in the reference rate.
- Therefore, the holder of a SOFR-linked bond would:
 - Be immediately penalized by the rate cut because of daily compounding rates.
 - Lose out on the credit premium embedded in LIBOR.
- Note, however, that the coupon of LIBOR linked bonds is determined by the fixing 3 months in advance.

Accumulated coupon payments from SOFR linked bonds are considerably lower

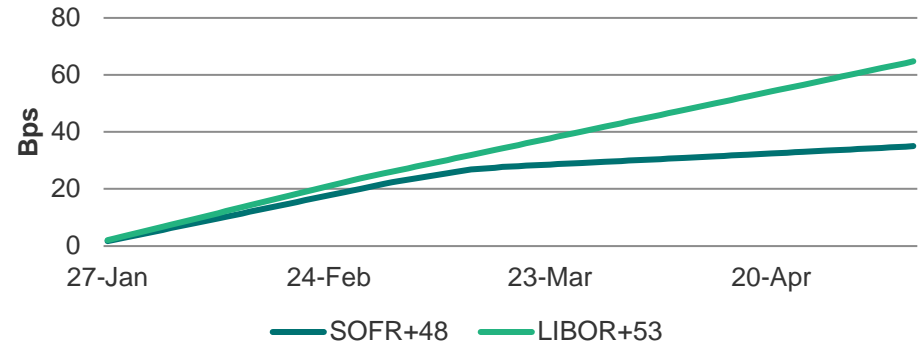
Citibank

Accumulated payoff from 1. Jan 2020



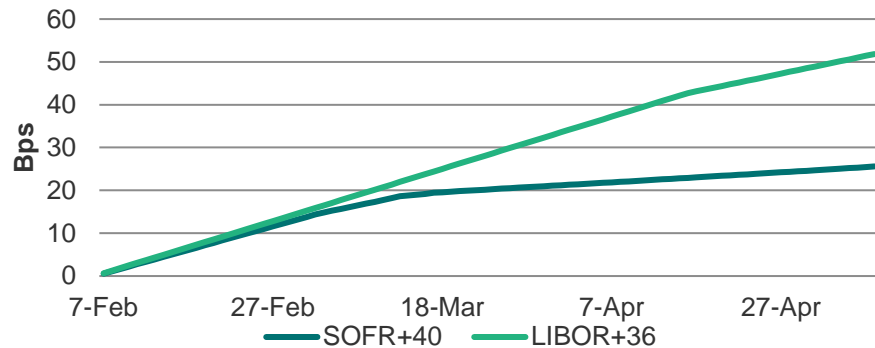
Toronto-Dominion Bank

Accumulated payoff from 27. Jan 2020



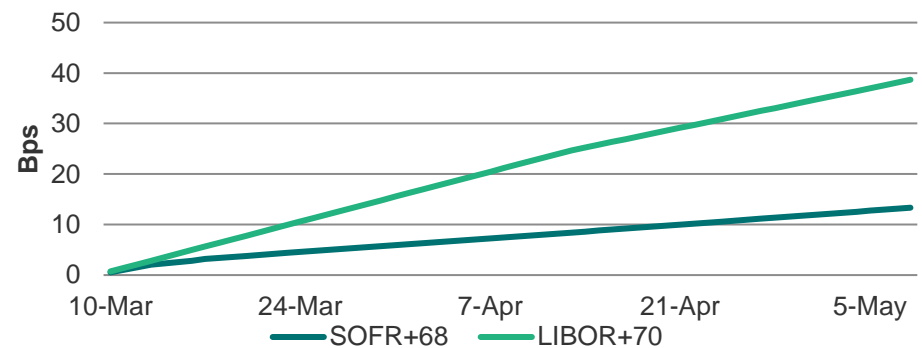
Royal Bank of Canada

Accumulated payoff from 7. Feb 2020



Bank of Montreal

Accumulated payoff from 10. Mar 2020



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Conclusion

What is the preferred interest rate?

- The study showed the following:
 - Price volatility in FRNs with SOFR or SONIA as reference rates is higher than similar FRNs with LIBOR as reference rate. In volatile markets, investors do not get compensated for increased risk premiums.
 - Accrued interest react immediately to changes in the policy rate. When central banks cut rates investors receive lower coupon with RFRs while LIBOR is fixed for a longer maturity and may also not react 100% to a cut in the policy rate
- Should the higher volatility in prices and accrued interest be reflected in the pricing of RFR linked FRNs versus an FRN linked to LIBOR?
- One very simple approach could be to look at the sharpe ratio of two comparable FRNs:
 - **To obtain the same Sharpe ratio of two comparable bonds with different volatility, the expected returns need to be different**
 - A simplistic example is shown to the right

Sharpe ratio

- $Sharpe\ ratio = \frac{E[R_p - R_f]}{\sigma_p}$
- For SOFR proxy:
 - $Ratio = \frac{1.82\% - 0.975\%}{13.30\%} = 0.06$
- For LIBOR proxy:
 - $Ratio = \frac{1.527\% - 0.975\%}{7.74\%} = 0.07$
- If they were to have the same Sharpe, SOFR should yield 1.92%
- Covered GBP SONIA:
 - $Ratio = \frac{1.063\% - 0.165\%}{1.77\%} = 0.51$
- Covered GBP LIBOR:
 - $Ratio = \frac{0.824\% - 0.165\%}{0.66\%} = 1.00$
- If they were to have the same Sharpe, SONIA should yield 1.93%

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