

February 2021

## TBAC Charge

*Discuss the movements in swap spreads in both recent months as well as the long-term. What are the benefits and limitations of comparing fixed rates on fixed-to-float interest rates swaps to interest rates on Treasury securities? To what extent can swap spreads provide relevant context for understanding government borrowing costs? What types of interest rate swaps are most relevant for comparison across Treasury maturities and security types? How do the demand dynamics for interest rate swaps differ from that of Treasury securities and what are the differences in the investor base for each product? How does the transition away from LIBOR affect the information content derived from swap spreads?*

# Introduction

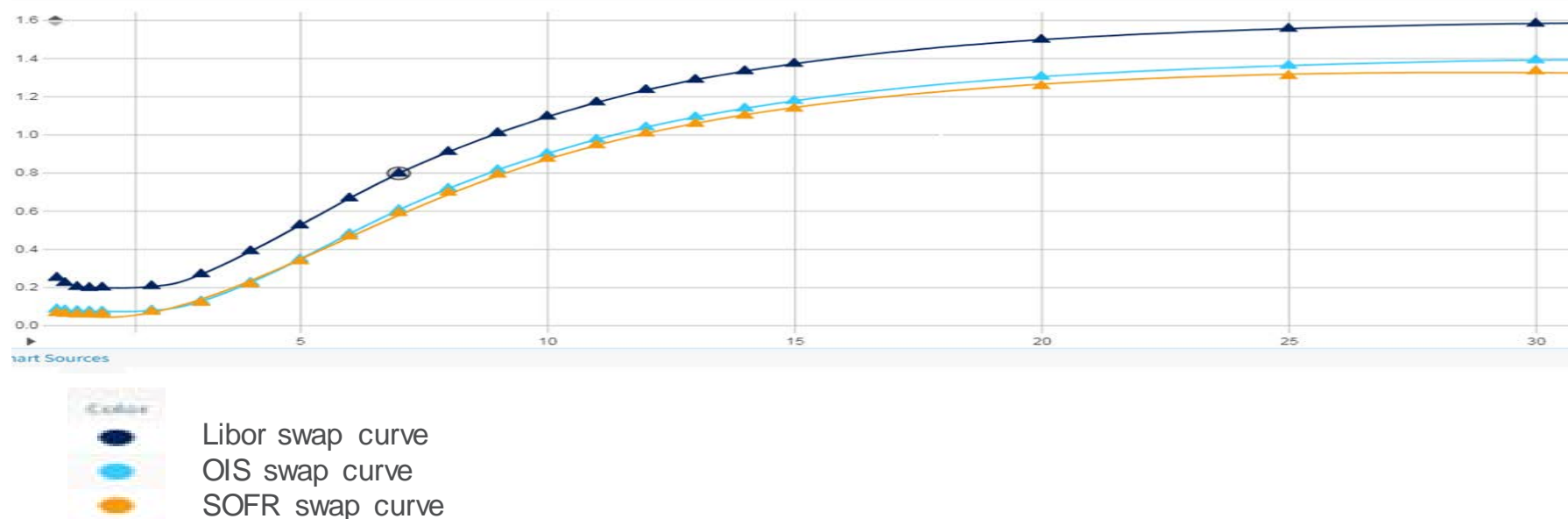
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- Swap spreads are influenced by a number of factors, and the importance of those factors varies across the maturity of the instruments.
  - At the short end, expected conditions in funding markets are important factors, with spreads being very responsive to increases in bank funding costs during periods of market stress or changes in repo pricing. Front end swap spreads have some sensitivity to changes in Treasury supply, but less so than longer maturities because the front end market is very deep and mark-to-market volatility per unit of carry is low.
  - Across a broader set of maturities, existing and expected future Treasury supply as well as thematic changes in secondary market flows can be important factors. In addition, regulatory changes, balance sheet cost and availability, and the idiosyncratic behavior of certain cohorts of swaps users can each dominate at different times.
- Swap spreads can therefore provide information about the effects of Treasury supply on the pricing of those instruments. However, spreads are not a straightforward measure of those effects, as one has to take into account the potential influence of all the other factors that affect swap spreads.
- There are advantages to using OIS or SOFR-based swap spreads rather than Libor-based swap spreads for deriving information about Treasury supply effects, as using Libor-spreads introduces a significant bank credit component. The only advantage of using Libor-based spreads has been the deeper liquidity of those swaps historically.

Which swap spreads are we talking about?  
Comparison of LIBOR, SOFR, and OIS swap spreads

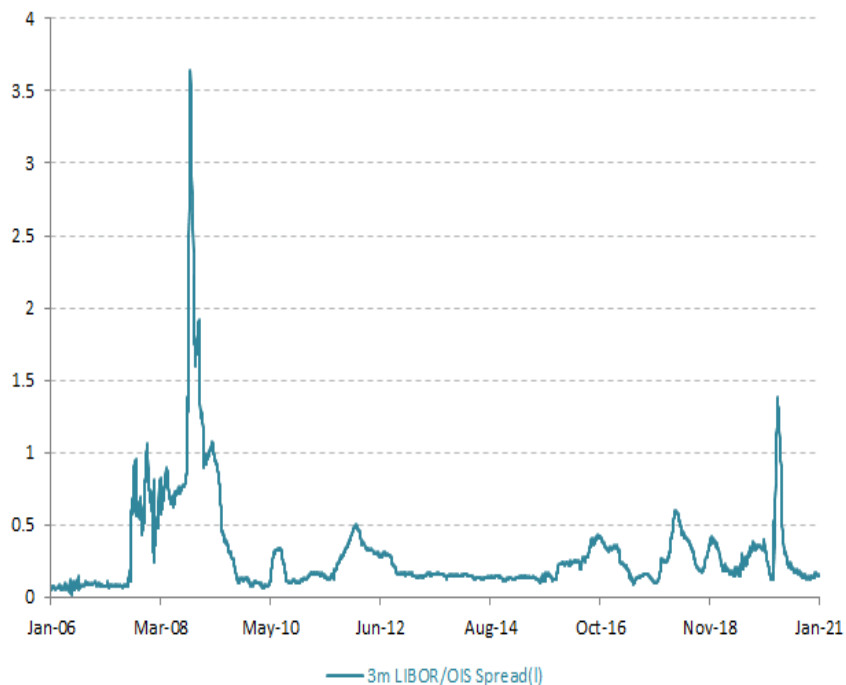
# Which swap spreads are we talking about?

Type	Index	Description	Liquidity	Comments
Libor	3m Libor	Unsecured term funding rate for banks	Longest history, deep liquidity, even out to longer tenors	Index spikes during stress, rate sourced from survey rather than transactions; publication to cease by June 2023
OIS	Fed funds effective	Overnight unsecured bank lending rate	Long history, good liquidity in short tenors	Transaction based rate with smaller volumes than repo
SOFR	Adjusted SOFR	Treasury repo rate	Short history, liquidity still building	Most aligned with Treasuries; reflects repo market capacity

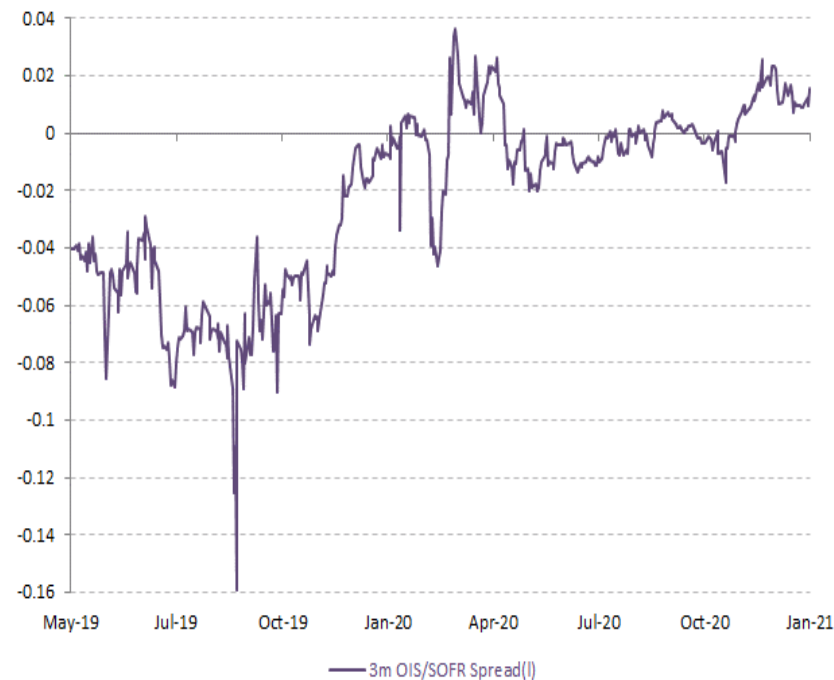


Source: Barclays Research. Note: Libor is a survey-based measure

# Libor vs. OIS and OIS vs. SOFR swaps



Historically, the LIBOR - OIS spread has been a barometer of credit risk and market stress. LIBOR-OIS spikes occurred in 2008, 2011, and 2020.



The OIS - SOFR spread reflects the abundance/ scarcity of repo balance sheet capacity. The September 2019 repo shock is an example of SOFR trading at much higher levels than OIS.

## Comparison of UST investors and swap investors

# The investor base in Treasuries...

Table in \$B

	Q4 2006	Q3 2020	Change	CAGR
Households	149	1,712	1,563	19%
State and Local Governments	597	1,086	489	4%
Federal Reserve	779	5,056	4,277	15%
Banks (including broker/dealers)	46	1,385	1,339	28%
Insurers	202	436	234	6%
Pension Funds	1,284	2,907	1,623	6%
Private pensions	132	482	350	10%
Federal government retirement funds	995	2,204	1,209	6%
State and local pensions	157	222	65	3%
Money-Market Funds	84	2,275	2,191	27%
Other Asset Managers	194	1,496	1,303	16%
GSEs	14	272	258	24%
Foreigners	2,126	7,063	4,937	9%
Others	157	338	182	6%
Total	5,632	24,027	18,395	11%

- The largest holders of Treasuries include overseas official buyers, the Fed, insurers, banks and MMFs. For various regulatory or other reasons, many of these holdings can't be converted into swaps, regardless of price.
- Price sensitive buyers like households (includes hedge funds), banks, and asset managers have grown Treasury holdings at a faster pace than the 11% CAGR of the UST market, absorbing a larger percentage of Treasury issuance at narrower spreads (higher yields) relative to swaps.
- Buyers who use Treasuries for ALM or to invest FX reserves exhibit more inelastic demand and have grown their holdings at a rate slower than the growth of the market.

## ...and in swaps. Select investors toggle between both.

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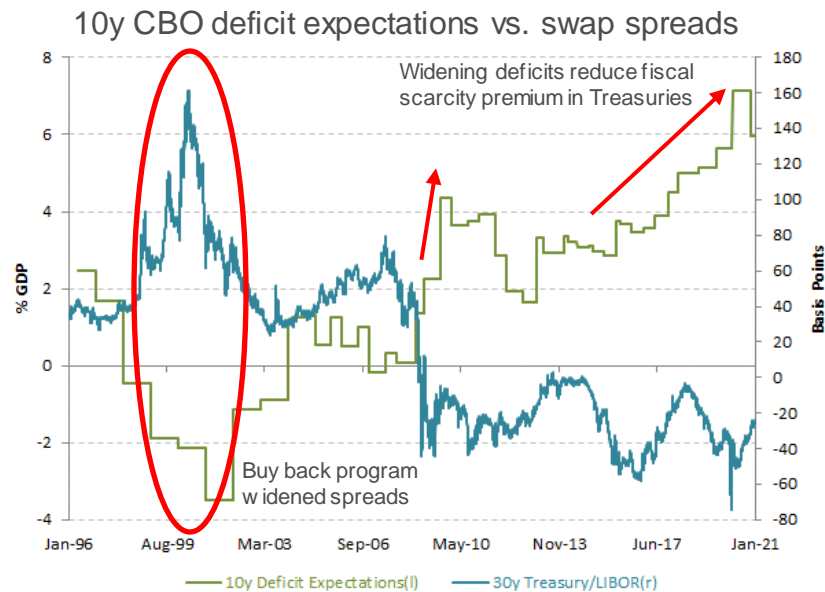
Entity type	Net position	Notes
Banks	Receive	Large gross positions, many purposes
Hedge Funds	Pay	Hedging duration; swap spread trades
Asset Managers	Pay	Hedging duration; swap spread trades
Insurance	Receive	ALM, VA hedging
Pensions	Receive	ALM, preserving balance sheet for other investments
Corporates	Receive	Swapping fixed rate debt issuance to floating
Government	Pay	Various
Others	Pay	Various

- The largest net 'receive fixed' positions in the swaps market include banks, insurers, and pensions. There is limited flexibility for most of these positions.
  - Insurers or pension funds often prefer swaps because they want to use their balance sheets for other less liquid or higher expected return investments. Swaps allow them to manage the duration of their liabilities without using balance sheet.
  - Insurers, pensions, banks, VA hedgers, and MBS servicers are all net receivers, and in most cases their receiving needs have been increasing as rates have rallied, causing liabilities to extend or assets to shorten in duration.
  - Mortgage hedgers historically are payers, but the decline of the GSE portfolios and the Fed's QE in the mortgage market have significantly reduced the need for mortgage investors to pay, creating an imbalance in the swap market.
- The result is that net demand to receive swaps has increased, putting downward pressure on spreads to entice the investors (hedge funds, banks, dealers) who can toggle between Treasuries and swaps, or explicitly enter swap spread positions to offset the organic net receiving demand.



Rising deficits and increasing Treasury supply have driven the downward trend in spreads over the last two decades, but other factors are bigger drivers from time to time

# Treasury supply has been a big driver of swap spreads in US...

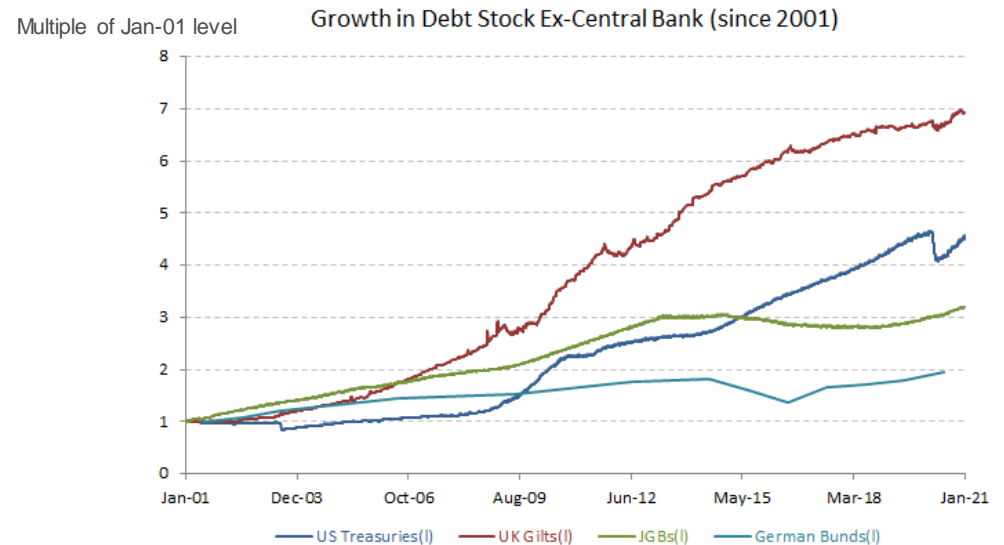
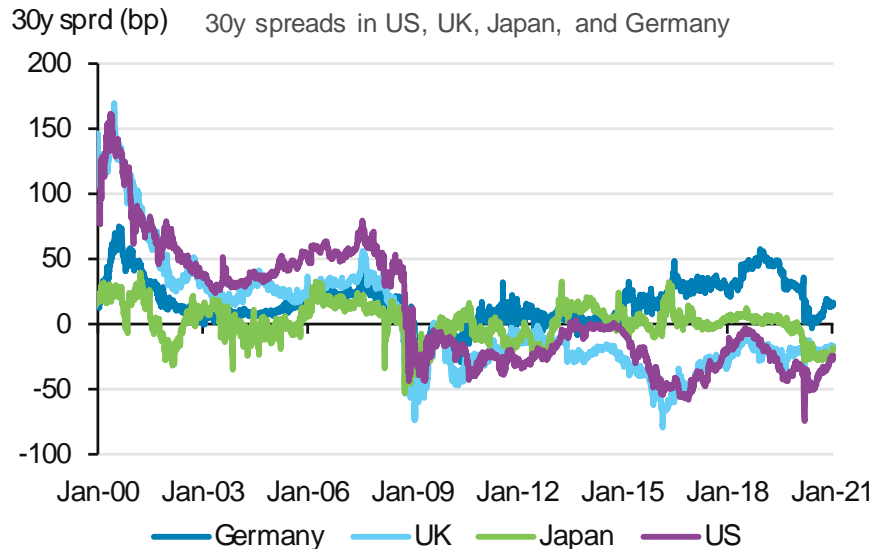


- Changes in the actual and prospective supply of Treasury securities have driven substantial and sustained changes in swap spreads.

- Expectations of declining Treasury supply drove swap spreads wider from 1999 to 2001...
- ...but a large increase in supply post GFC has helped drive spreads into negative territory over the last 12 years.

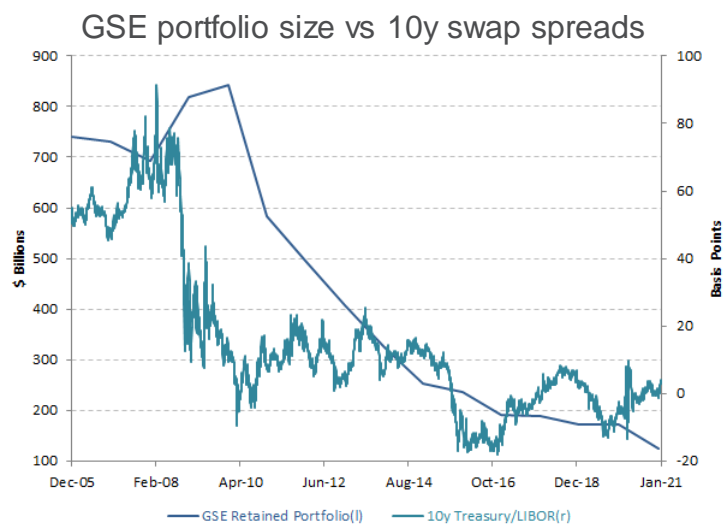
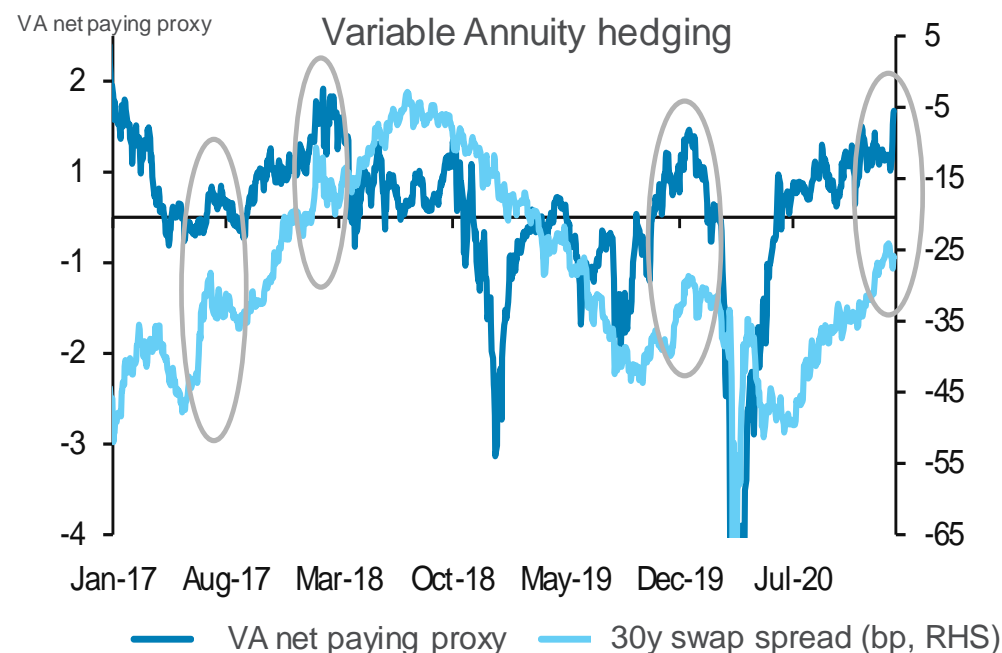
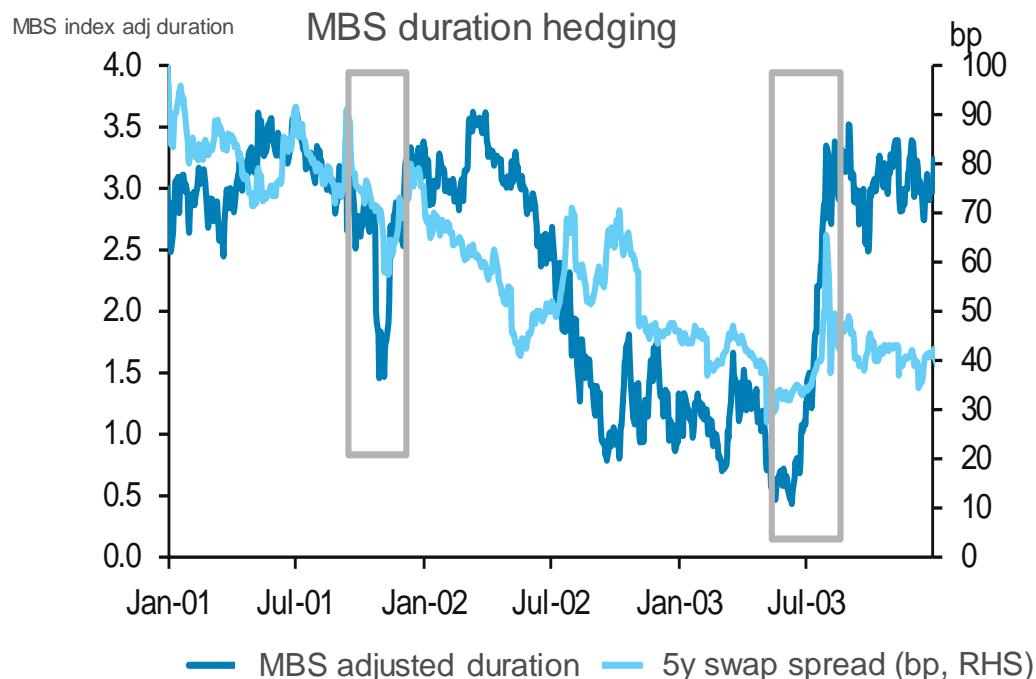


## ...and in other major G7 countries



- Over the past 20 years, debt stocks have increased in the US, UK, Japan and Germany. Swap spreads have tightened in all 4 markets.
  - Germany's debt stock exhibited the slowest growth, and has had the smallest decline in swap spreads
  - Japan's swap spreads correlate with medium term deficits net of central bank purchases

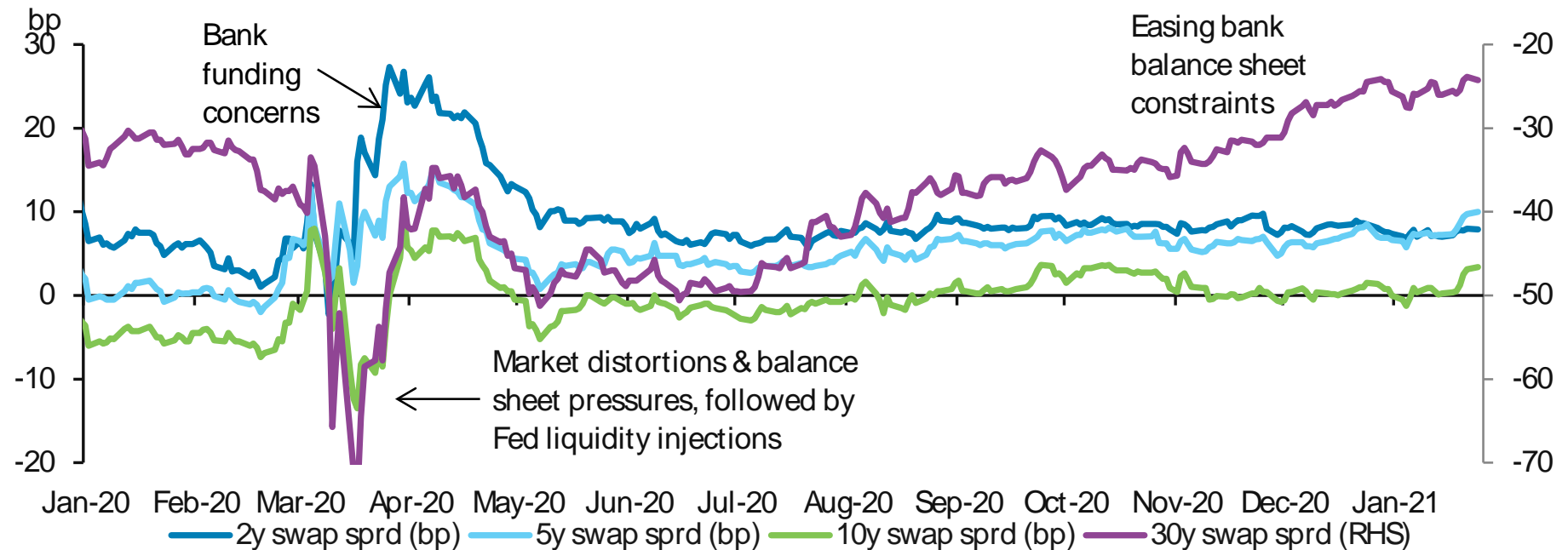
# Other factors driving swap spreads: Hedging needs



- MBS hedging needs can drive swap spreads in either direction, most famously in summer 2003.
- Post GFC, GSE portfolios shrank and the Fed bought MBS, causing net mortgage hedger paying to decline significantly.
- Variable annuity hedging has become a more important factor in recent years.

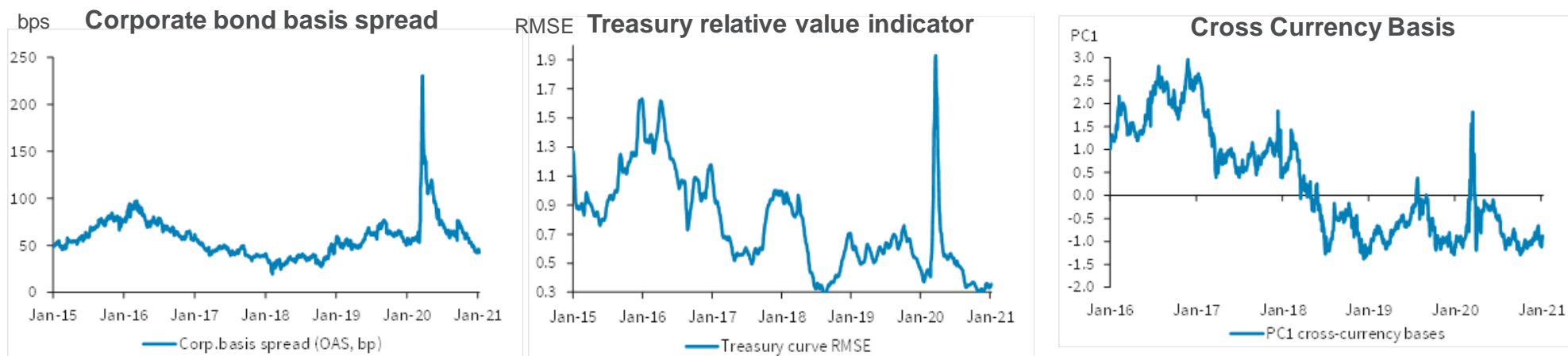
Source: Barclays Research, Fannie Mae, Freddie Mac, FHFA

# Other factors: Bank funding concerns, regulatory changes, balance sheet availability



- In March 2020, long end spreads temporarily collapsed due to market distortions and balance sheet pressures. Following a rebound in spread as the market stabilized, long end spreads again narrowed in April/May on expectations of increased Treasury issuance.
- Short end spreads initially widened on bank funding concerns, but then receded as the Fed flooded the market with ample liquidity.
- Long end spreads widened across the rest of 2020, as balance sheet availability improved, helped by both Fed LSAPs and the SLR exemption – a significant regulatory change.

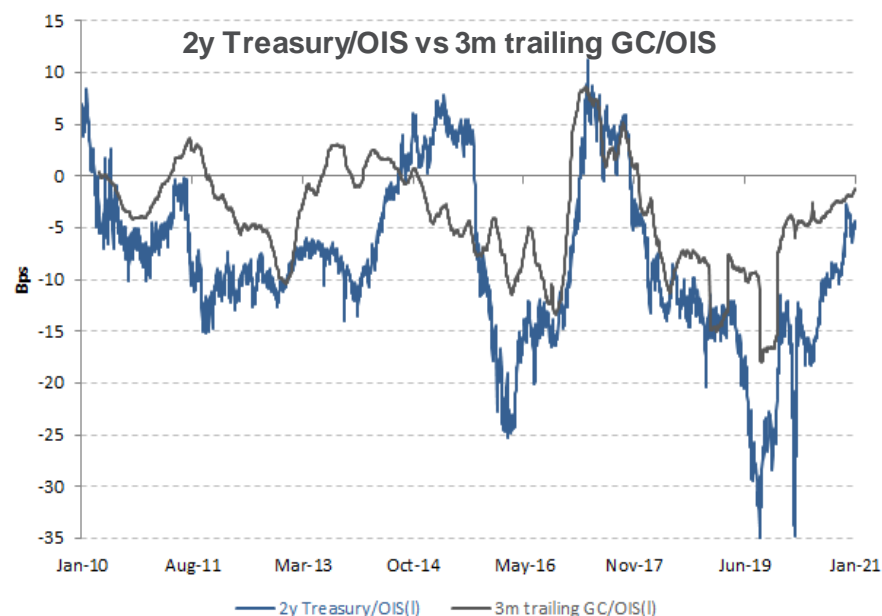
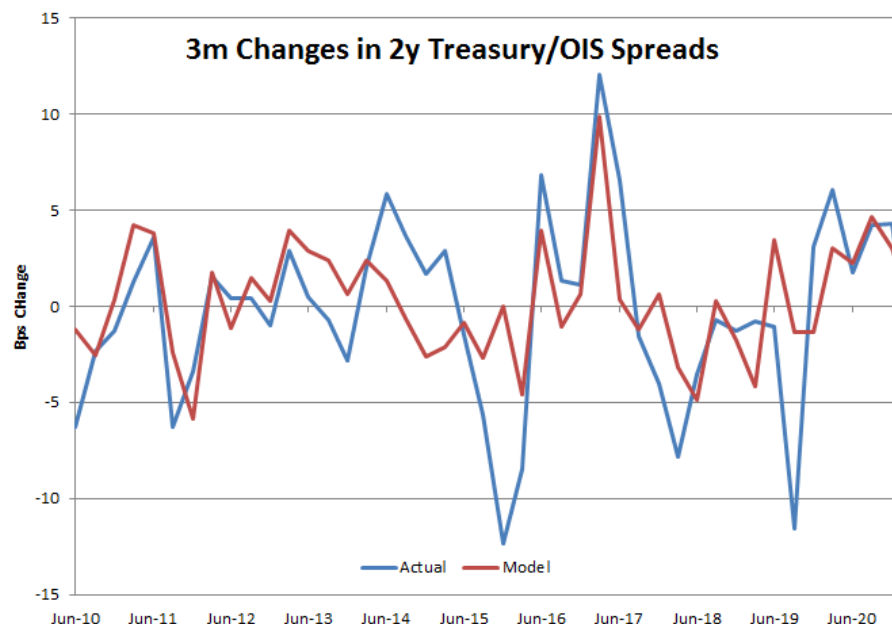
## Other factors: Importance of bank balance sheet availability



- Balance sheet availability has improved as seen in the lack of arbitrage opportunities in each of:
  - The CDS-cash basis in corporates / Deviations from Treasury spline / Covered interest parity
- As balance sheet becomes more available, banks and hedge funds may deploy capital to buy Treasuries and pay fixed, pushing spreads wider.
- Spread levels and leverage ratios drive this analysis.
- The importance of leverage ratios: At what level of spreads is this spread trade economically attractive to banks?
  - Cash flow buying Treasury on asset swap:  $\sum -(swap\ spread) + (Libor - repo)$ .
  - Consider after-tax Return on Equity (assuming x% leverage ratio).
  - Hypothetically, assuming Libor-repo = 15bp, 20% tax rate.
  - Targeting 5% leverage ratio and >12% RoE, swap spread needs to be <-60bp.

Modeling swap spreads:  
Repo drives shorter spreads, deficits drive longer spreads

# What do the models say? 2y swap spreads

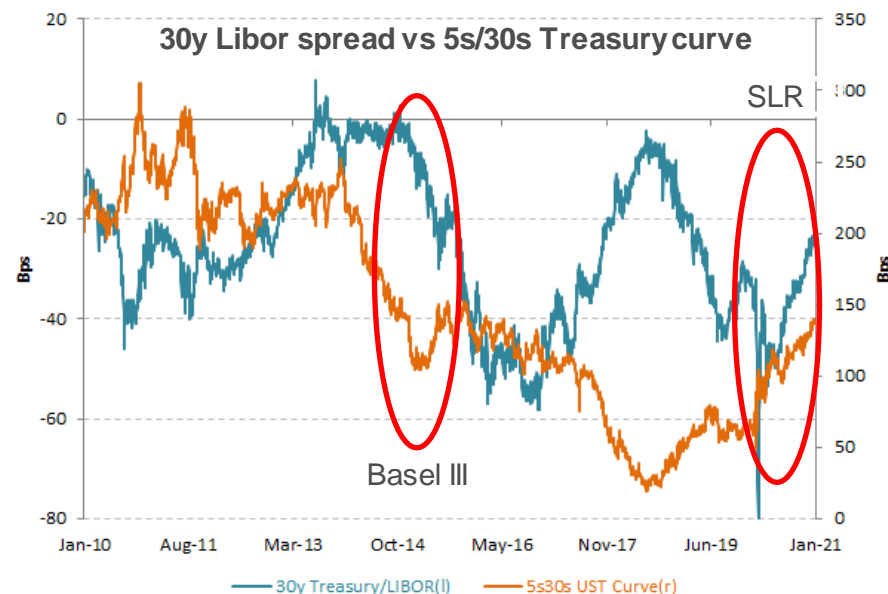
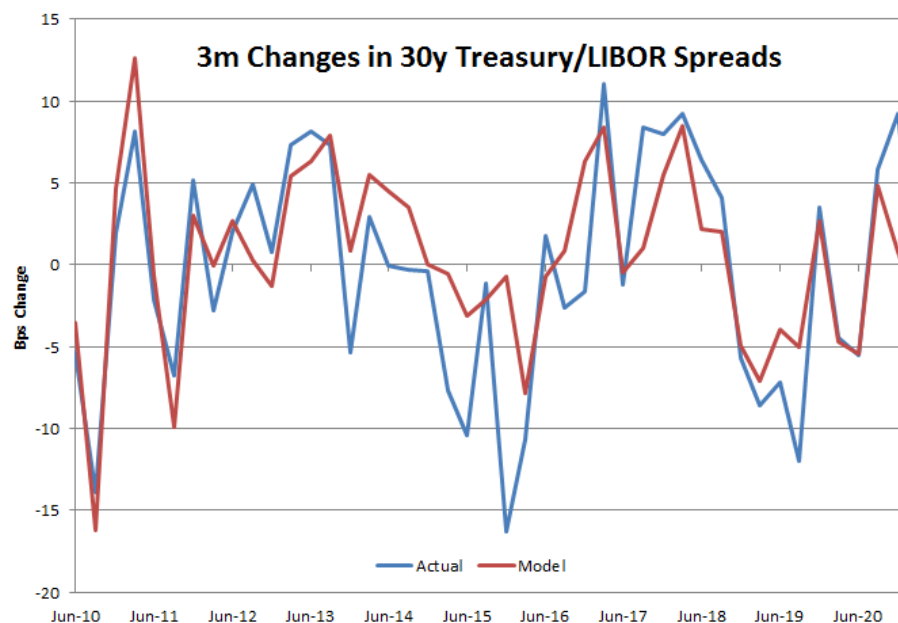


- When we model 2y OIS spreads, we find that GC/OIS is a natural anchor for front-end spreads and is the dominant driver of spread changes. Since 2010, 2y OIS spreads have averaged ~4.5 bps tighter than GC/OIS, with investors requiring a premium to extend from GC to 2y Treasuries.
- In addition, our model includes IG corporate debt spreads as a proxy for market liquidity, and Excess Reserves as an additional driver of funding availability. Our model has an  $R^2$  of 39%. While adding a supply variable would have increased the  $R^2$  incrementally, it would not have been statistically significant, so we omitted it.
- 2y OIS spreads have notably diverged from GC in periods of balance sheet scarcity like Sep-2019 and Mar-2020, and also in the run up to money market reform in 2016.

	3m Trailing GC/OIS	IG OAS	Excess Reserves
Coefficient	(53.51)	(9.02)	7.39
T-Stat	(3.47)	(2.78)	1.57



# What do the models say? 30y swap spreads



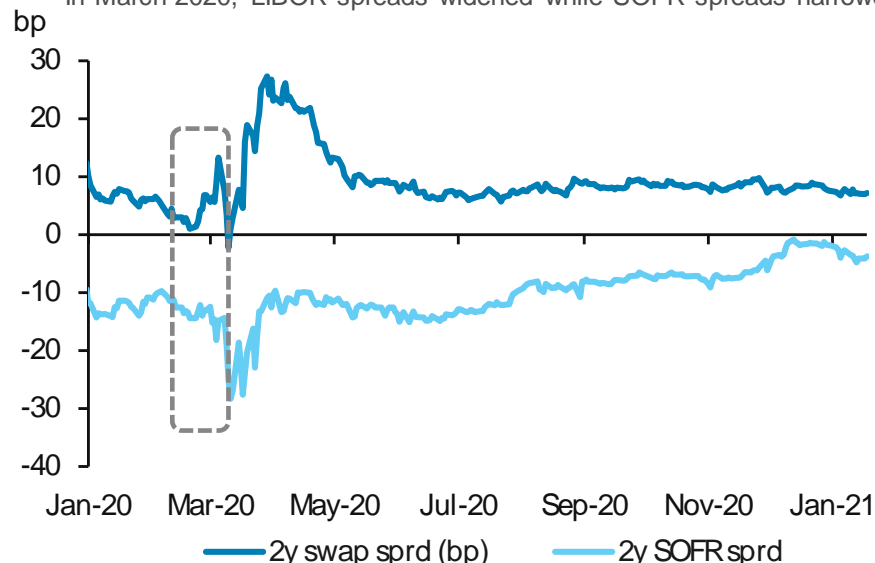
- When we model changes in 30y Libor spreads, there isn't one dominant driver: Treasury debt stock, Yield curve steepness, S&P 500, and MBS duration all impact spreads.
- While the current Treasury debt stock registers at a touch below statistical significance, future issuance expectations are likely at least in part driving the clear significance of the yield curve steepness variable.
- S&P 500 reflects market stress or stability, and is also a proxy for VA hedging activity. MBS duration is a proxy for mortgage hedging flows.
- This model has an  $R^2$  of 61% and finds that since YE-2019 30y spreads have widened by 16bps more than expected. This 2020 residual and also the large 2015 residual both coincide with regulatory changes -SLR-exemption and Basel III introduction - suggesting the impact of regulatory change on spreads.

	5s30s UST Curve	Duration Stock Ex-Fed	S&P 500	MBS Duration
Coefficient	(15.93)	(51.60)	49.46	5.11
T-Stat	(3.90)	(1.81)	2.73	4.33

# LIBOR transition to SOFR

# Despite transition to SOFR and OIS, Libor swaps still relevant

In March-2020, LIBOR spreads widened while SOFR spreads narrowed:



- Floating rate moving from LIBOR (includes bank credit risk component) → adjusted SOFR (secured, no credit risk) at a fixed adjustment spread.
- Mid-2023: Libor-SOFR “frozen.” Changes in bank credit risk will no longer directly translate into changes in swap rate, reducing spread volatility.
- As transition date approaches, expect liquidity to migrate from LIBOR swaps to SOFR and OIS swaps.
- In the 1y-2y maturity buckets, OIS swaps trade almost 2x the duration of LIBOR. At the 10y maturity, 28x more duration trades in LIBOR; 30y it's 51x.

	2020 Aggregate Volumes			
	LIBOR Swaps		Fed Funds / SOFR Swaps	
Maturity	Notional (bn)	Duration (mm/01)	Notional (bn)	Duration (mm/01)
0.25	131,736	3,293		
1	8,162	816	38,120	3,812
2	10,316	2,063	5,422	1,084
3	4,582	1,375	740	222
5	15,248	7,624	1,316	658
7	3,402	2,381	582	407
10	12,612	12,612	444	444
30	5,864	17,592	114	342
Total	191,922	47,757	46,738	6,970

Source: Bloomberg, Barclays Research, SDR. Methodological note: Sizes displayed are 2x SDR, to reflect estimated 50% of trades that are unreported.

In conclusion...

# What can we learn from each interest rate curve?

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	Swaps	Treasuries
Supply	No issuance constraints, any point on curve can grow or shrink.	Controlled by US Treasury, focus on regular and predictable issuance is important.
Financing	Off balance sheet, no funding of longs or borrowing of shorts necessary. Implicit funding is LIBOR, OIS or SOFR rate.	Longs must be financed, shorts must be borrowed and are limited by repo availability. Repo markets can be opaque, especially for term repo.
Fungibility	Swap cash flows of like tenor are perfectly fungible.	Distinct as a function of CUSIP, also distinctions like Coups vs. Ps of same maturity not fungible.
Technicals	Smaller number of participants, especially in the long end can make swaps very technical. Lopsided flows can cause long term dislocations.	Idiosyncratic issues and on-the-run vs. off-the-run, but curve sectors tend to be less technical.
Market Efficiency	There are limits to the amount of capital that RV investors, banks etc. will commit to arbitrage away mispricings.	Most liquid risk-free market in all of global finance. RV opportunities exist, but tend to be eventually arbitrated away.

- Swaps provide a useful comparison point for the Treasury curve, but they also have their own factors that influence swap spread dynamics.

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Note: Fungibility only for cleared instruments

# Why should the US Treasury care about swap spreads?

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- Swap spreads can provide insight into Treasury relative value, but with caveats. Dislocations can exist due to:
  - Regulatory constraints and impact of regulatory change
  - Funding imbalances, balance sheet scarcity, and cost of funding
  - Duration needs of large investors or hedgers who can't or choose not to use Treasuries
  - Other factors that could be relevant from an issuance or macro-prudential standpoint
- The successful transition from LIBOR to SOFR and OIS swaps should reduce the credit related volatility in swap spreads, making it easier to distill out other more nuanced factors.
- The fact that swap spreads are narrower at longer maturities could be interpreted as longer maturity Treasuries being somewhat expensive to issue, but it could also suggest that there is structural excess demand to receive longer maturity swaps.
  - The lower level of swap spreads reflects regulation constraining arbitrage activity and a reduced need to hedge mortgages with swaps.
  - Spreads have moved higher since mid-year, despite the outlook for increasing Treasury supply, implying that any supply effects have been outweighed by regulatory changes or other developments.