



Global Investment Research

The Goldman Sachs Group, Inc.

Taking stock of the LIBOR-SOFR transition

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Q. What is the current state of play in the LIBOR phase-out?

A. The multi-year, globally coordinated, effort to transition away from LIBOR is still in process. Some key dates are available below.

Key upcoming dates regarding the LIBOR transition plans

Date	Most recent proposal / plan
January 25, 2021	ISDA derivatives protocol becomes effective, and IBA consultation period ends
December 31, 2021	GBP, EUR, CHF and JPY LIBOR expected to cease publication; One week and two month USD LIBOR expected to cease publication
June 30, 2023	Overnight, and one, three, six and 12 month USD LIBOR expected to cease publication

Q. How will SOFR differ from LIBOR?

A. SOFR is a secured, fully transaction-based, and nearly risk-free rate. USD LIBOR is an unsecured, bank lending rate with credit risk.

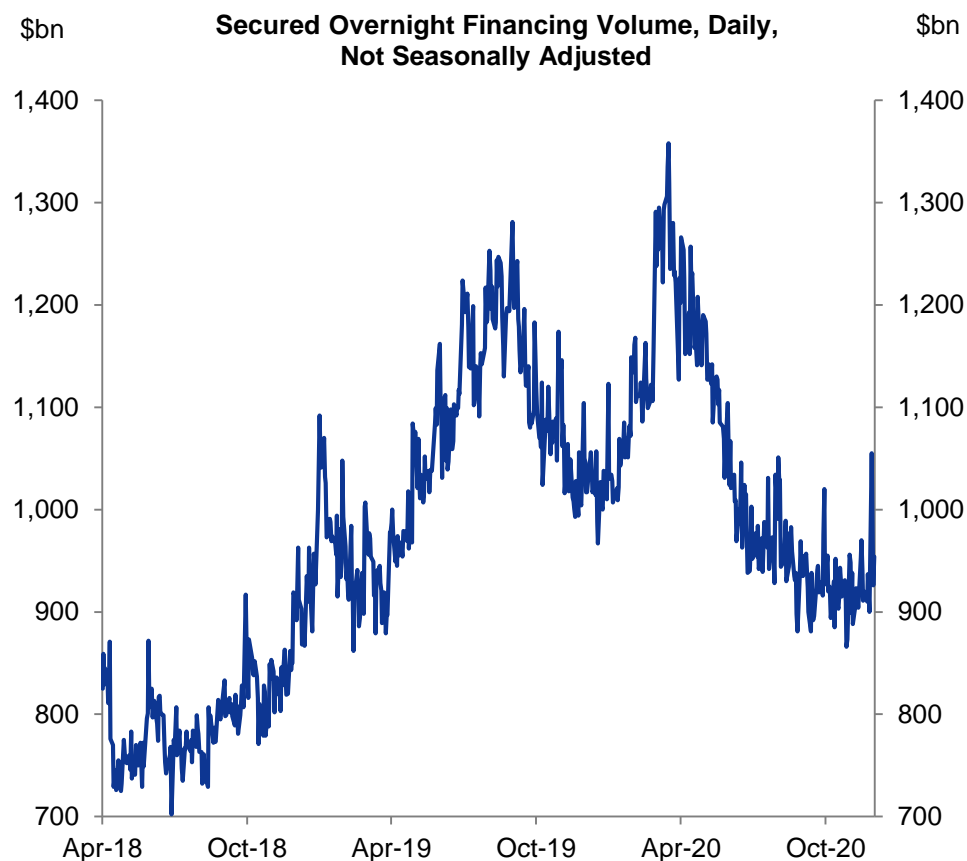
Key differences between SOFR and LIBOR

SOFR	LIBOR
Risk free rate (no credit risk)	Bank lending rate (includes credit risk)
Secured (collateralized)	Unsecured (uncollateralized)
Calculated & published daily by the NY Fed	Calculated & published daily by ICE Benchmark Administration
Transaction based	Based on LIBOR bank submissions & expert judgement
Based on ~\$1 trillion transactions per day (repo markets)	Based on ~\$1 billion transactions per day (3-month LIBOR)
Overnight; Forward-looking SOFR fixings still in development	Term structure

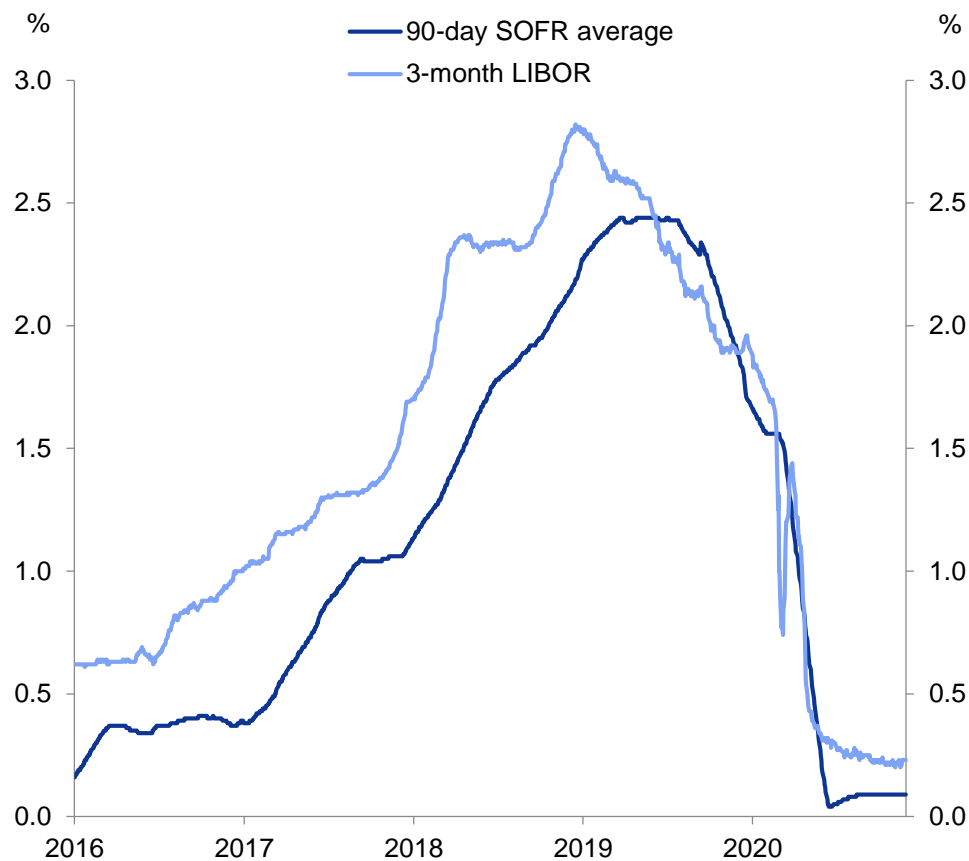
Q. How will SOFR differ from LIBOR?

A. Most contracts referencing SOFR will rely on averages of daily rates; a three-month average of SOFR has been less volatile than the three month USD LIBOR over the past few years.

Since SOFR was first published in April 2018, daily transaction volumes have averaged nearly \$1trillion



A 90-day average of SOFR rates has been less volatile than the 3-month LIBOR over the past few years



Q. How will legacy instruments be treated after LIBOR is phased out?

A. “Fallback” rates to replace LIBOR have been identified across regions, based on risk-free rates such as SOFR that will be incorporated into legacy products.

BOR market footprint by asset class

OTC Derivatives (notional outstanding as of June 2020)	\$ billion
USD Interest Rate Swaps	\$109,716
USD FX Outright Forwards and Forex Swaps	\$49,589
USD Interest Rate FRAs	\$46,503
USD FX Currency Swaps	\$22,752
USD Interest Rate Options	\$19,930
USD FX Options	\$10,259
subtotal	\$258,749
Exchange Traded Derivatives (open interest, notional principal as of June 2020)	
USD ST Interest Rate Options	\$40,618
USD ST Interest Rate Futures	\$20,542
USD LT Interest Rate Futures	\$1,453
USD LT Interest Rate Options	\$396
USD Foreign Exchange Futures	\$234
USD Foreign Exchange Options	\$128
subtotal	\$63,371
Floating/Variable Rate Bonds and Leveraged Loans (notional outstanding as of December 2020)	
Corporate and Govt Bonds (LIBOR linked)	\$1,190
Leveraged Loans	\$1,193
subtotal	\$2,383
Structured Credit (Current LIBOR-Linked Tranche Balance)	
MBS/CMO	\$1,100
CLO	\$625
Student Loans	\$115
Agency CMBS	\$83
Single Borrower CMBS	\$82
Agency CRT	\$75
CRE CLO	\$38
subtotal	\$2,118
Total USD LIBOR exposure	\$326,621

Q. How will legacy instruments be treated after LIBOR is phased out?

A. The ARRC and ISDA have released new, and similar, “fallback” provision guidance detailed below.

Recommended ARRC Best Practices for USD LIBOR fallbacks across asset classes, as of the September 2020 publication

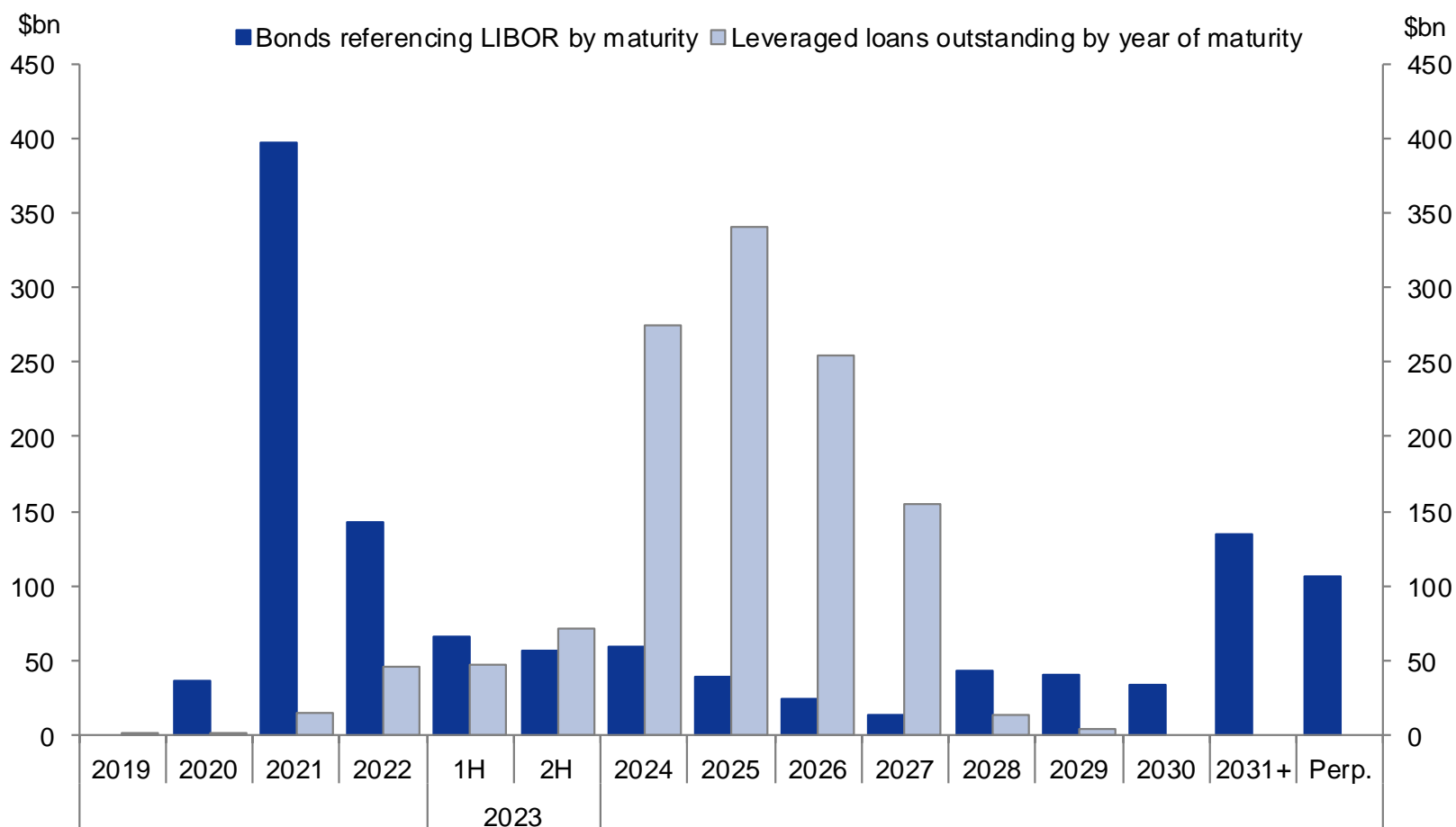
Product	Hardwired fallbacks incorporated by:	Tech/Ops vendor readiness by:	Target for cessation of new use of USD LIBOR by:	Anticipated fallback rates to be identified by:
Floating Rate Notes	6/30/2020	6/30/2020	12/31/2020	6 months prior to reset after LIBOR's end
Business Loans	Syndicated Loans: 9/30/2020 Bilateral Loans: 10/31/2020	9/30/2020	6/30/2021	6 months prior to reset after LIBOR's end
Consumer Loans	Mortgages: 6/30/2020 Student Loans: 9/30/2020	Mortgages 9/30/2020	Mortgages 9/30/2020*	In accordance with relevant consumer regulations
Securitizations	6/30/2020	12/31/2020	CLOs: 9/30/2021 Other: 6/30/2021	6 months prior to reset after LIBOR's end
Derivatives	Not later than 3-4 months after the Amendments to ISDA 2006 Definitions are published	Dealers to take steps to provide liquid SOFR derivatives markets to clients	6/30/2021	

Note: The September 30, 2020 date for consumer loans refers to new applications for closed-end residential mortgages using USD LIBOR and maturing after 2021.

Q. How will legacy instruments be treated after LIBOR is phased out?

A. Leveraged loans are not covered by standardized documentation. As a result, changing contract language in these products will require bilateral negotiations.

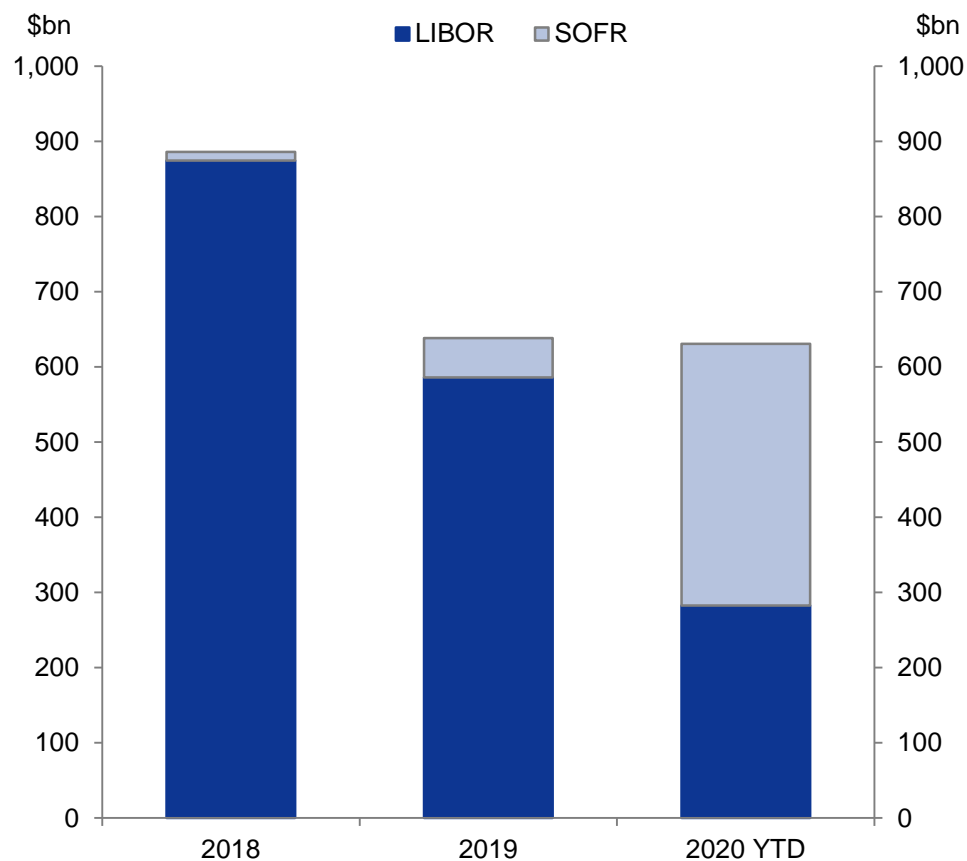
Most of the outstanding leveraged loans mature after the latest proposed deadline of June 2023, while a large portion of the LIBOR-linked floating rate bond market matures in 2021



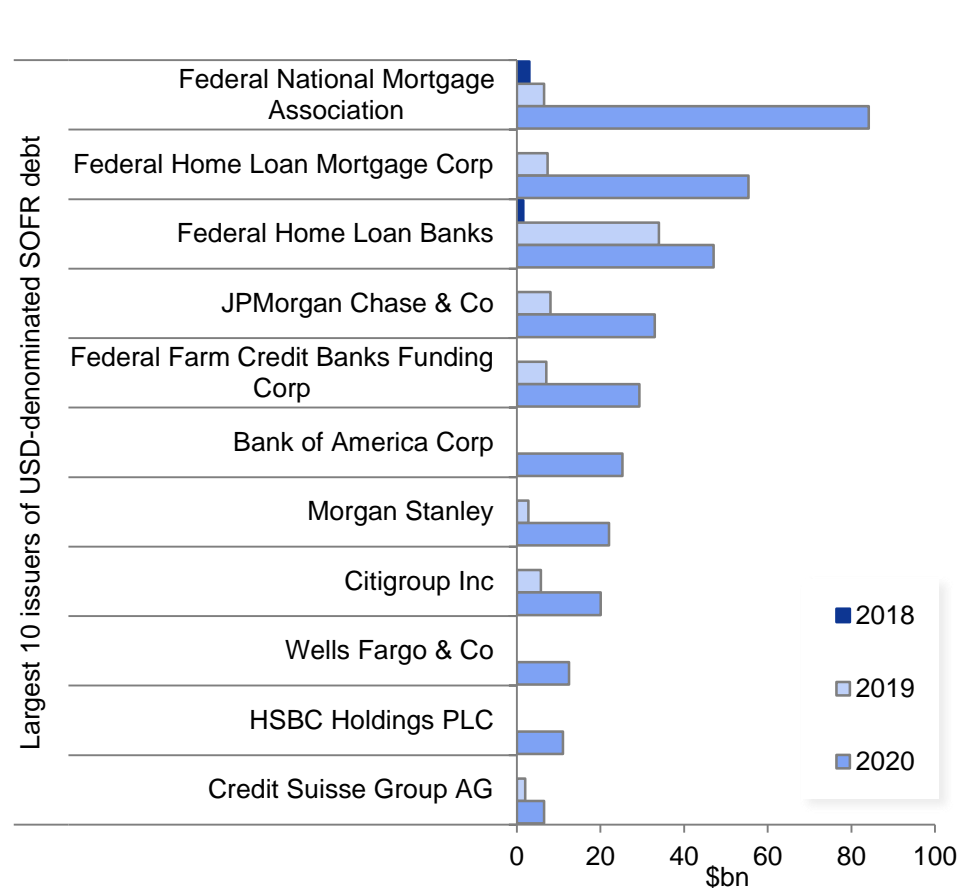
Q. How have market participants adapted to the upcoming phase-out?

A. Beyond incorporating fallback rates, another key trend has been the increase of agency and corporate bond issuance incorporating alternative reference rates.

2020 was a notable year for SOFR-linked debt issuance in the agency and corporate bond market



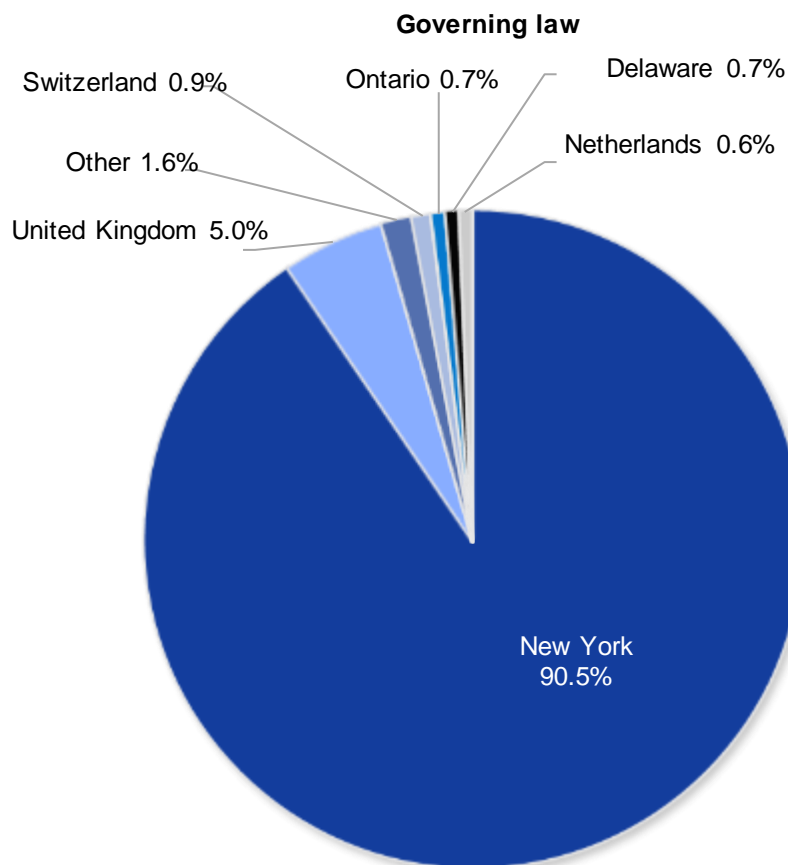
...But remains heavily concentrated: the 10 largest issuers of USD-denominated SOFR debt represent 85% of total 2020 YTD supply



Q. What risks are outstanding, related to the remaining phase of the LIBOR transition?

A. Failure to incorporate fallback language is the main risk. The State of New York has proposed a legislative solution to minimize legal uncertainty associated with the LIBOR transition.

We estimate that over 90% of LIBOR-linked USD-denominated bonds reference New York governing law



For purposes of this exercise, we exclude the portion of LIBOR-linked USD denominated bonds where the governing law is not defined, per Bloomberg.

Q. What are the specific risks associated with the LIBOR transition for US CLOs?

A. Unlike leveraged loans, amendments to CLO contracts are a less established and more complex process involving multiple investor counterparties.

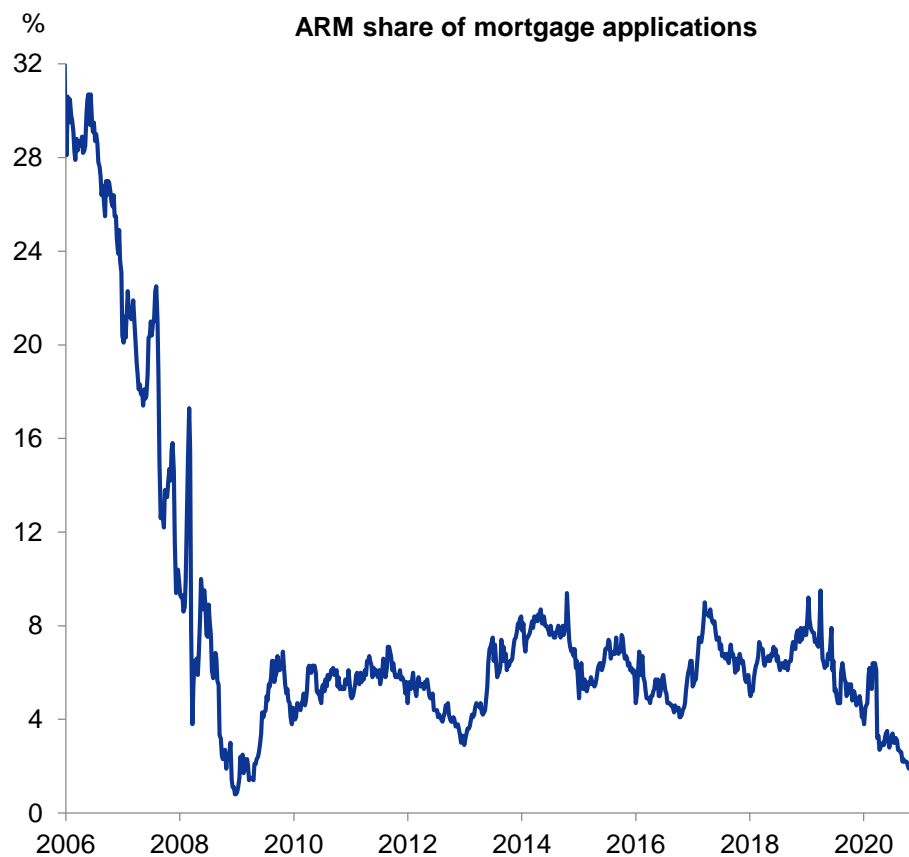
CLO transactions issued before 2018 may have less robust LIBOR fallback language

Vintage	Sample CLO Prospectus Language
2015	If LIBOR is unavailable at the time LIBOR is to be determined, LIBOR will be determined on the basis of the rates at which deposits in U.S. Dollars are offered by four major banks in the London market selected by the Calculation Agent after consultation with the Collateral Manager (the "Reference Banks") at approximately 11:00 am London time, on the Interest Determination Date to prime banks in the London interbank market for a period approximately equal to such Interest Accrual Period and an amount approximately equal to the amount of the Aggregate Principal Amount of the Secured Debt. The Calculation Agent will request the principal London office of each Reference Bank to provide a quotation of its rate.
2016	If, on any LIBOR Determination Date, such rate may not be obtained as described above, the Calculation Agent shall determine the arithmetic mean of the offered quotations of the Reference Banks to leading banks in the London interbank market for three-month U.S. dollar deposits in the London interbank market in an amount determined by the Calculation Agent by reference to requests for quotations as of approximately 11:00 am (London time) on the LIBOR Determination Date made by the Calculation Agent to the Reference Agent.
2017	In the event that (a) LIBOR is no longer reported or updated on the Reuters screen, or a material disruption to LIBOR or a change in the methodology of calculating LIBOR has occurred or is reasonably likely to occur, or (b) at least a majority (based on the par amount) of (i) quarterly pay Floating Rate Obligations or (ii) floating rate notes issued in the preceding month in new issue collateralized loan obligation transactions rely on reference rates other than LIBOR , in each case, determined as of the first day of the Periodic Interest Accrual Period during which the Reference Rate Amendment is proposed, the Collateral Manager may change the Reference Rate to a Designated Reference Rate.
2018	Notwithstanding the foregoing, if at any time while any Secured Notes are outstanding (x) there has been (i) a material disruption to LIBOR or (ii) a change in the methodology of calculating LIBOR or (y) LIBOR has ceased to exist as a reference rate (or the Collateral Manager has a reasonable expectation that any of the events specified in clauses (x) or (y) will occur), the Collateral Manager (on behalf of the Issuer) may select (with notice to the Trustee, the Calculation Agent and the Collateral Administrator) an alternative rate, including any applicable spread adjustments thereto (the "Alternative Rate") that in its commercially reasonable judgment is consistent with the successor for LIBOR , including any applicable spread adjustments thereto, generally being used in the quarterly pay Floating Rate Obligations included in the Collateral or the new issue collateralized loan obligation market to replace LIBOR and all references herein to " LIBOR " will mean such Alternative Rate selected by the Collateral Manager.
2019	The Issuer (or the Collateral Manager on behalf of the Issuer) (i) shall propose a Reference Rate Amendment if LIBOR is no longer reported (or actively updated) on the Reuters Screen or may propose a Reference Rate Amendment if the administrator for LIBOR has publicly announced that the foregoing will occur within the next six months or (ii) may propose a Reference Rate Amendment if the Collateral Manager (on behalf of the Issuer) determines (in its commercially reasonable judgment) that (A) there has been a material disruption to LIBOR , (B) LIBOR is no longer reported or updated on the Reuters Screen or a change in the methodology of calculating LIBOR has occurred, or (C) at least 50% (by par amount) of (1) quarterly pay Floating Rate Obligations or (2) floating rate collateralized loan obligation notes issued in the preceding three months rely on reference rates other than LIBOR , in each case, to apply as of the first day of the Periodic Interest Accrual Period set forth in the proposed Reference Rate Amendment.
2020	Notwithstanding Section 8.2(a), the Collateral Manager (i) shall propose a Reference Rate Amendment if (A) LIBOR is no longer reported (or actively updated) on the Reuters Screen or the administrator for LIBOR has publicly announced that the foregoing will occur within the next six months or (B) the regulatory supervisor or the administrator of LIBOR or the Federal Reserve makes a public statement or publishes information announcing that LIBOR is no longer representative; and (ii) may propose a Reference Rate Amendment if it determines (in its commercially reasonable judgment) that: (A) LIBOR is no longer reported or updated on the Reuters Screen, a material disruption to LIBOR or a change in the methodology of calculating LIBOR has occurred, or (B) at least 50% (by par amount) of (1) Floating Rate Obligations or (2) floating rate notes issued by collateralized loan obligation issuers that are collateralized primarily by broadly syndicated loans to U.S. borrowers issued in the preceding three months rely on reference rates other than LIBOR , in each case, determined as of the first day of the Periodic Interest Accrual Period during which the Reference Rate Amendment is proposed.

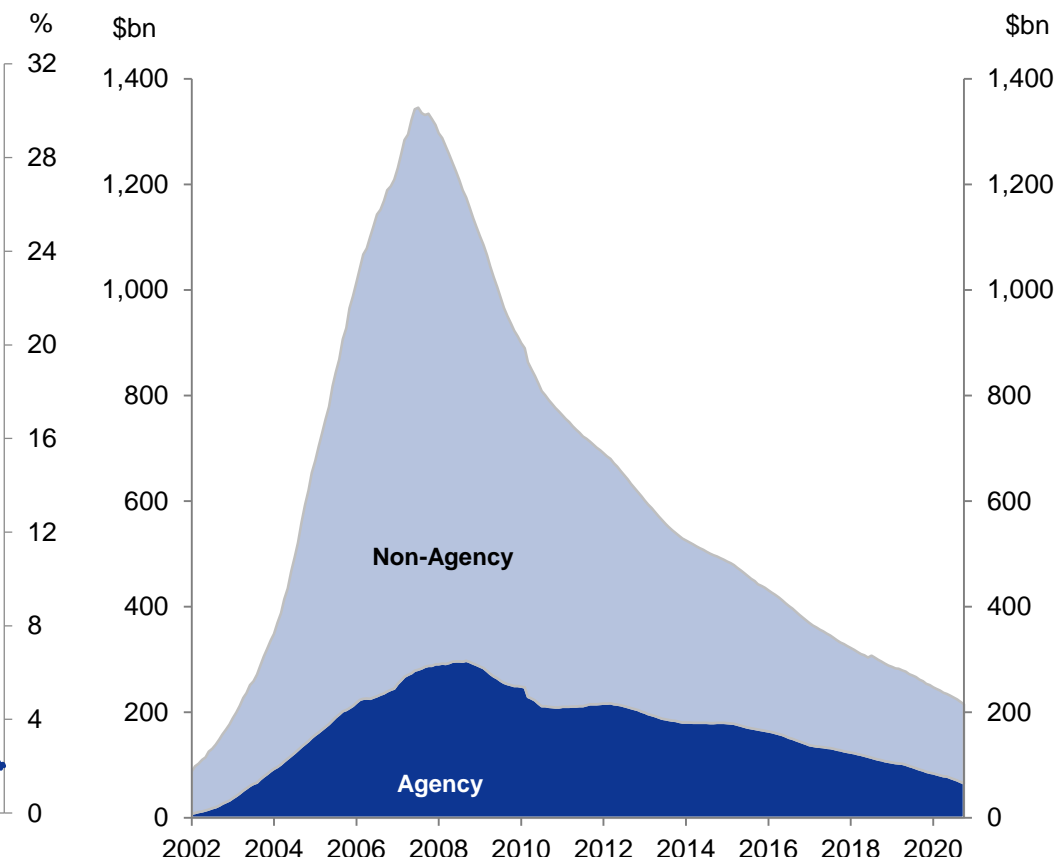
Q. What are the risks associated with adjustable rate mortgages?

A. Three key risks: 1) LIBOR fallback language may not be robust for legacy RMBS; 2) exposures can extend beyond 2023 for 30-year mortgages; and 3) contract changes must be compliant with Regulation Z and other consumer regulations.

ARMs have become a relatively small share of total mortgage applications and originations



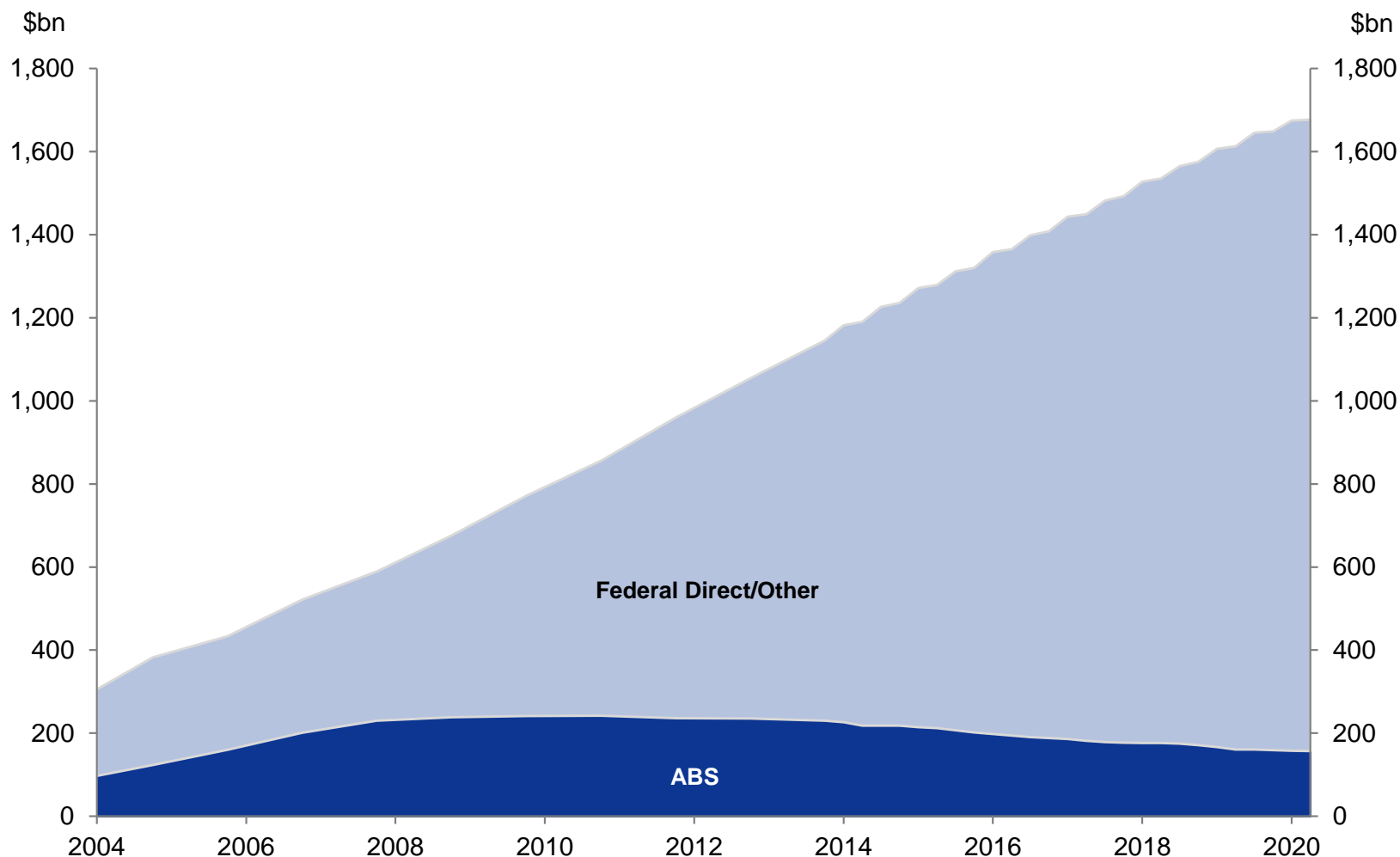
Adjustable rate mortgages have become less common since the financial crisis period



Q. How disruptive is the LIBOR transition to the US student loan market and what are the risks for ABS investors?

A. The reference rate fallback language in the deal prospectuses may in many cases not be robust for SLABS.

Most of the growth in student debt outstanding has been in fixed rate, unsecuritized loans



Disclosure Appendix

November 19, 2020

Reg AC

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