Treasury Presentation to TBAC

Office of Debt Management

Fiscal Year 2021 Q1 Report

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Section I:
Executive Summary

Highlights of Treasury's February 2021 Quarterly Refunding Presentation to the Treasury Borrowing Advisory Committee (TBAC)

Receipts and Outlays through Q1 FY2021

- In Q1 FY2021, overall receipts totaled $803 billion, reflecting a decrease of $3 billion (-0.4%) compared to the same period last year. Corporate refunds were $7 billion (53%) higher, primarily because of CARES Act provisions that expand allowances for net operation losses. Individual refunds were $4 billion (18%) higher. Withheld and FICA taxes declined $20 billion (-3%), and gross excise taxes declined $5 billion (-23%) primarily due to the economic impact of the COVID-19 pandemic and deferral of employment taxes authorized in the CARES Act and other actions. Partially offsetting the decreases, non-withheld and SECA taxes increased $13 billion (24%). Federal Reserve earnings were $8 billion (54%) higher reflecting greater holdings and lower interest rates paid on reserves. Corporate taxes were $10 billion (13%) higher through the first three months of the fiscal year, including the first major due date in December. Q1 FY2021 receipts were 15.0% of GDP, compared to 14.8% of GDP for the same period last year.

- In Q1 FY2021, calendar adjusted overall outlays were $1,332 billion, reflecting an increase of $190 billion (17%) over the comparable period last year. Department of Labor outlays were $74 billion (1,450%) higher due to increased unemployment costs attributable to the COVID-19 pandemic. Health and Human Services spending was $47 billion (15%) higher mainly due to the COVID-19 pandemic as well as overall increases to Medicare and Medicaid. Department of Agriculture outlays were $19 billion (37%) higher due to increases in food stamp program payments and financial assistance payments to agricultural producers that are authorized in COVID-19 pandemic related legislation. Somewhat offsetting these, Department of Treasury outlays were $18 billion lower mainly due to lower interest expense. Q1 FY2021 outlays were 25.7% of GDP, compared to 21.4% of GDP for the same period last year. This is an increase compared to the 20-year average from 2000 to 2019 of 20.8%.

Projected Net Marketable Borrowing (FY2021)

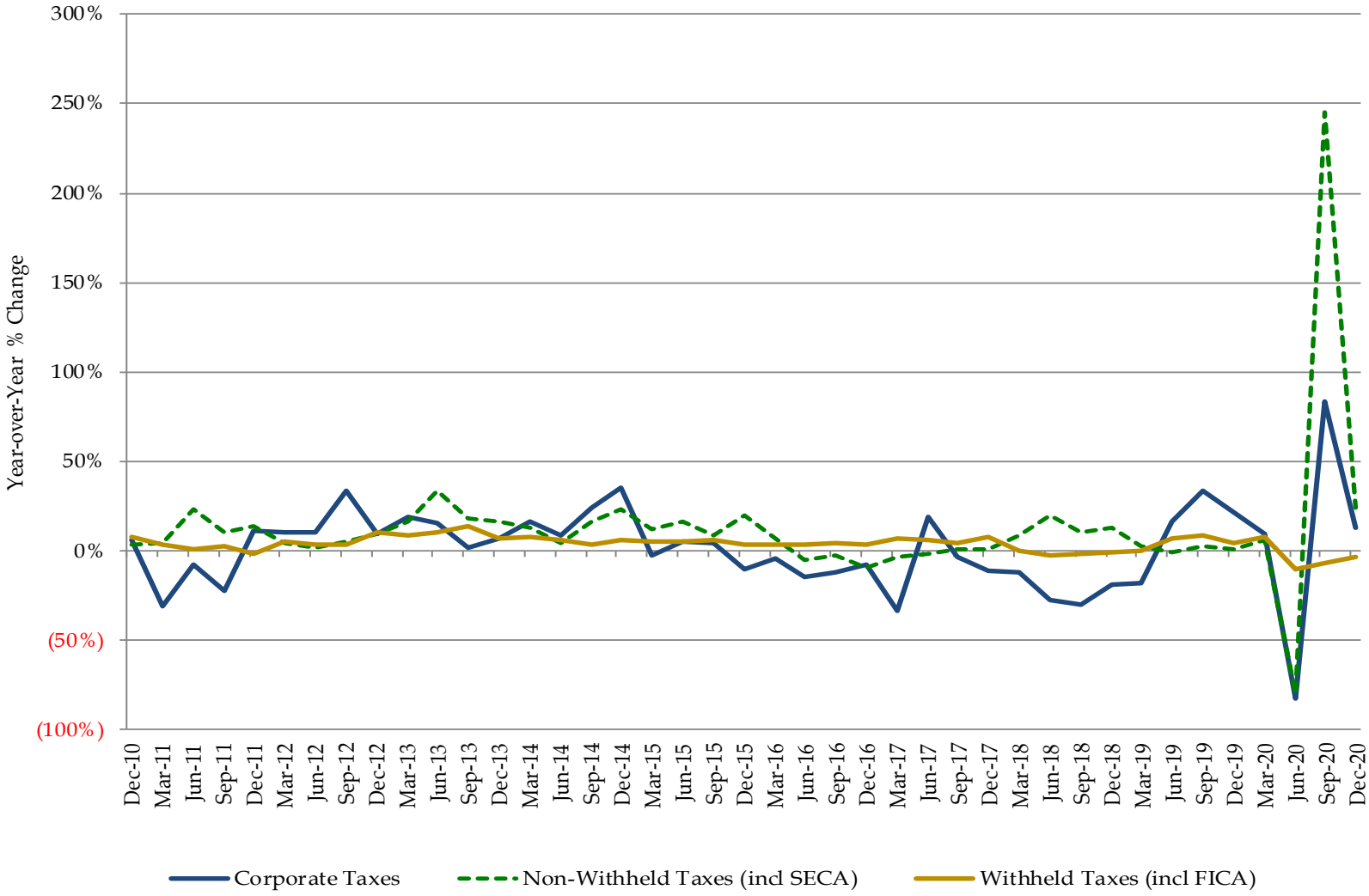
- Treasury's Office of Fiscal Projections (OFP) currently forecasts a net privately-held marketable borrowing need of $274 billion for Q2 FY2021, with an end-of-March cash balance of $800 billion. For Q3 FY2021, OFP forecasts a net privately-held marketable borrowing need of $95 billion assuming end-of-June cash balance of $500 billion. These borrowing estimates are based upon current law and do not include any assumptions for the impact of additional legislation that may be passed. Enactment of additional recovery and stimulus related legislation could result in actual borrowing that is greater than these current law estimates. Privately-held marketable borrowing excludes rollovers (auction "add-ons") of Treasury securities held in the Federal Reserve's System Open Market Account (SOMA) but includes financing required due to SOMA redemptions. Secondary market purchases of Treasury securities by SOMA do not directly change net privately-held marketable borrowing but, all else equal, when the securities mature and assuming the Fed does not redeem any maturing securities would increase the amount of cash raised for a given privately-held auction size by increasing the SOMA "add-on" amount.

Demand for Treasury Securities

- Bid-to-cover ratios for all securities were within historical ranges over the last quarter.
- Foreign demand remained robust.

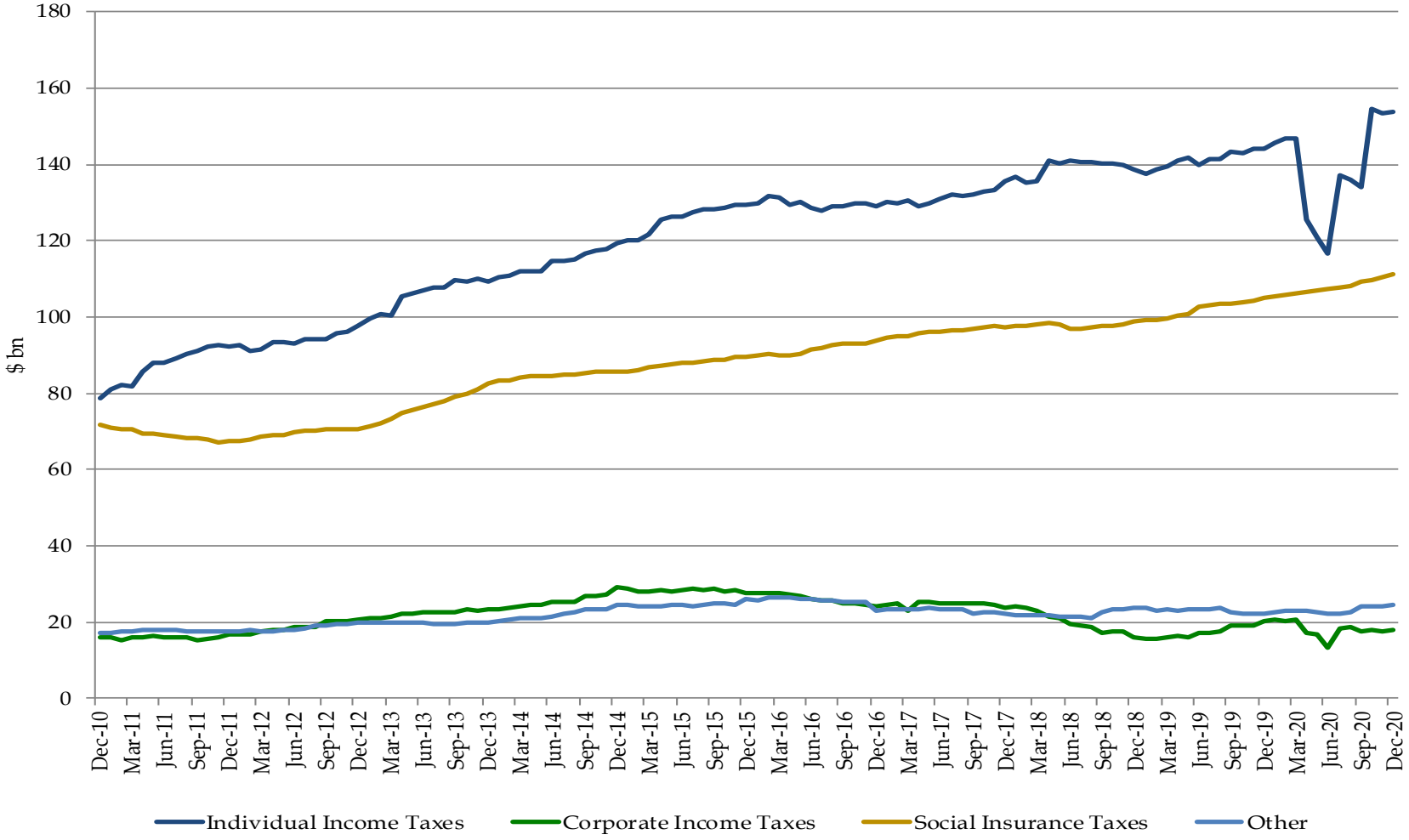
Section II: Fiscal

Quarterly Tax Receipts



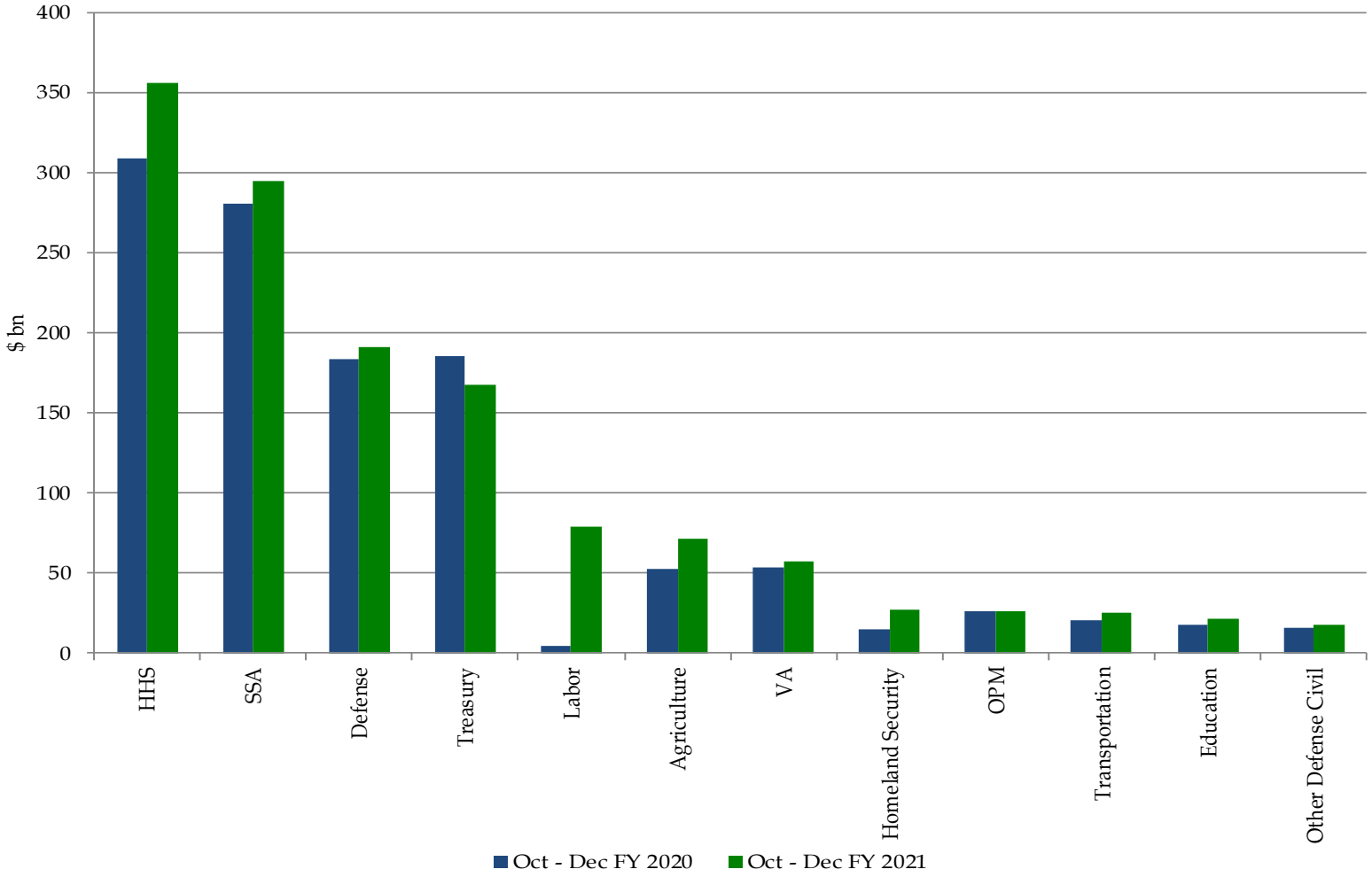
Quarterly tax receipts for Q4 FY2020 reflect the adjustment of April and June 2020 tax deadlines to July 15th, 2020.
Source: United States Department of the Treasury

Monthly Receipt Levels
(12-Month Moving Average)



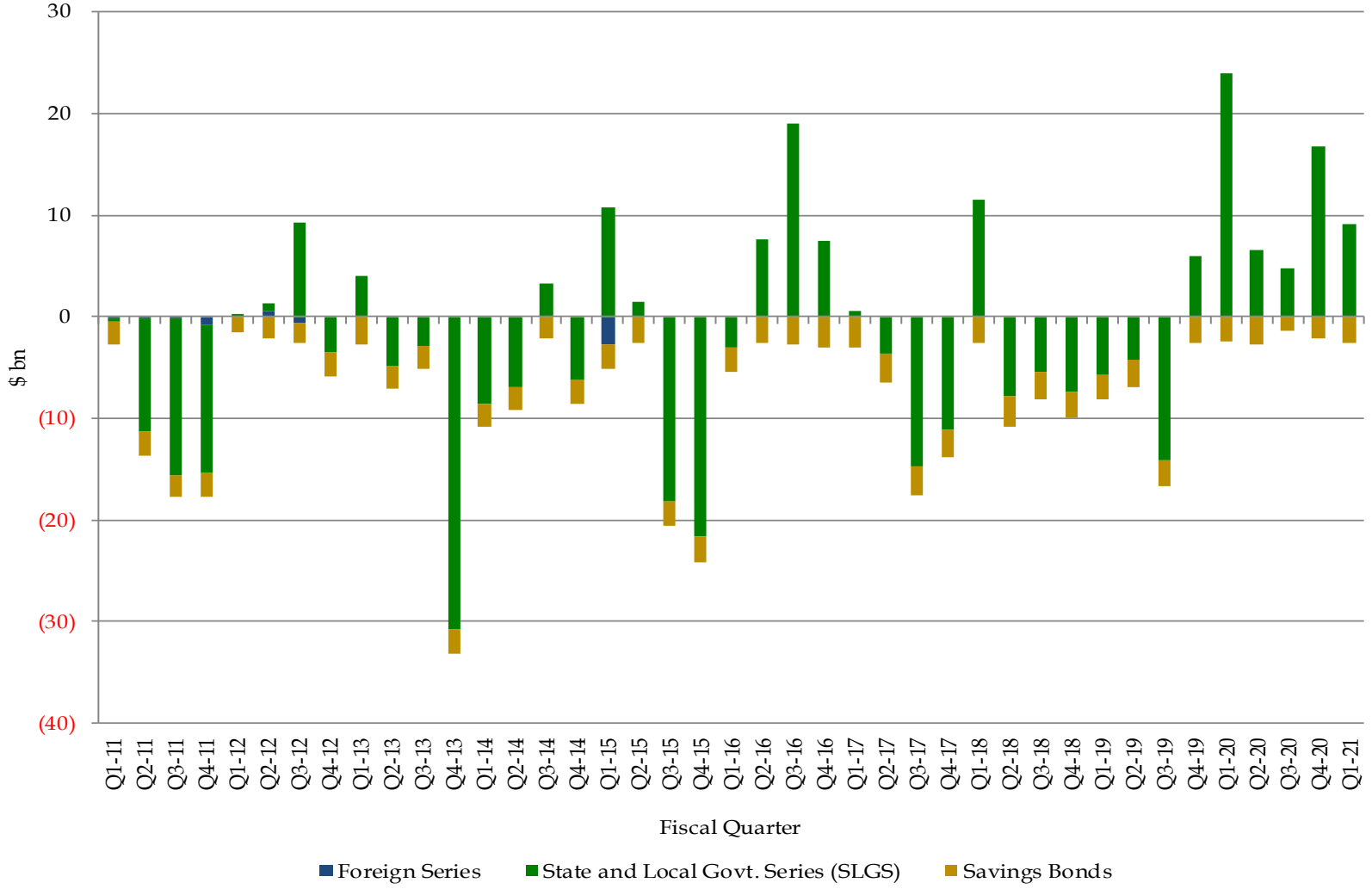
Quarterly tax receipts for Q4 FY2020 reflect the adjustment of April and June 2020 tax deadlines to July 15th, 2020. Individual Income Taxes include withheld and non-withheld. Social Insurance Taxes include FICA, SECA, RRTA, UTF deposits, FUTA and RUIA. Other includes excise taxes, estate and gift taxes, customs duties and miscellaneous receipts.
Source: United States Department of the Treasury

Largest Outlays



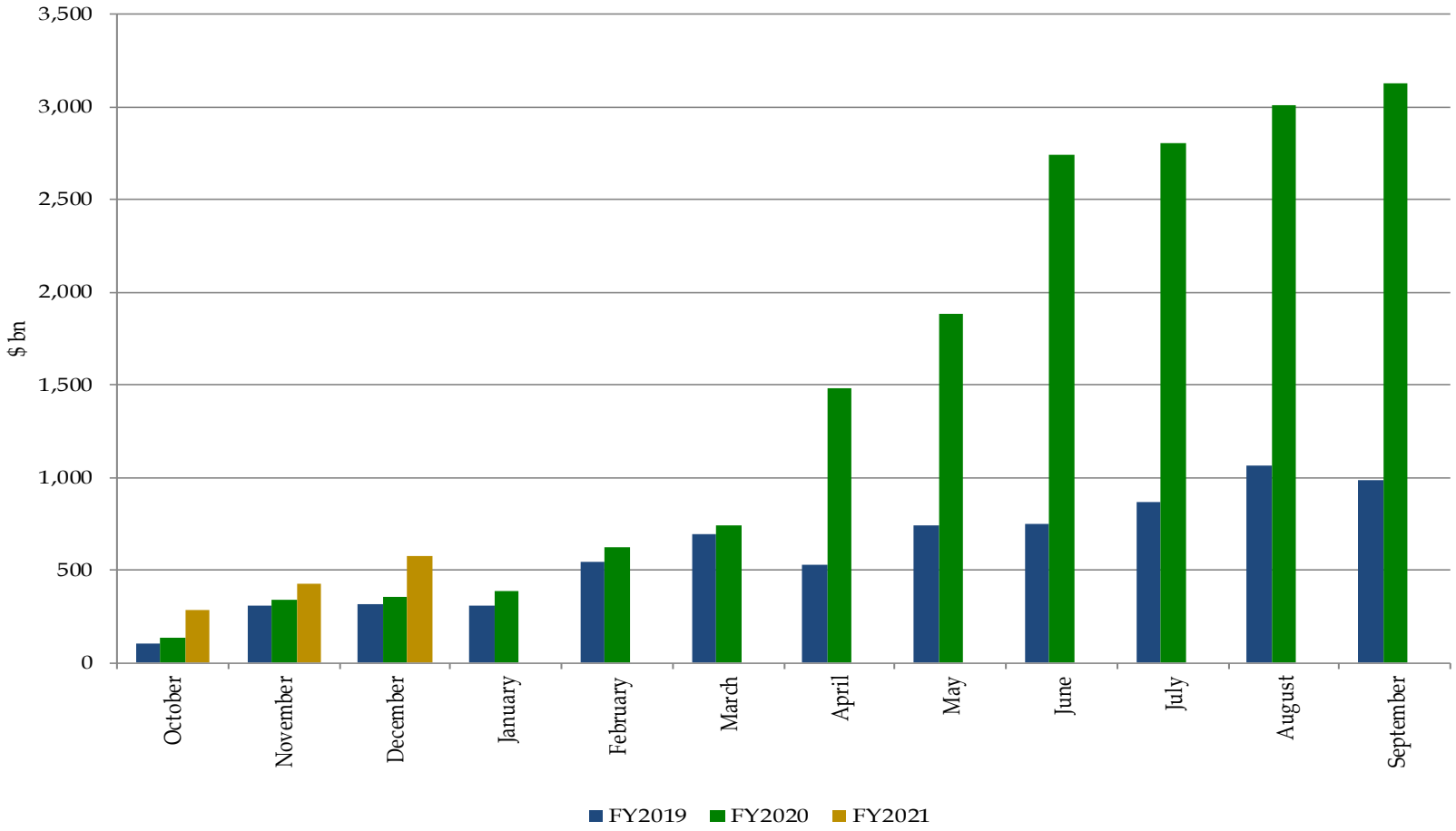
Source: United States Department of the Treasury

Treasury Net Nonmarketable Borrowing



Source: United States Department of the Treasury

Cumulative Budget Deficits by Fiscal Year



Source: United States Department of the Treasury

FY 2021-2023 Deficits and Privately-Held Net Marketable Borrowing Estimates*, in $ billions

	Primary Dealers[1]	CBO[2]
FY2021 Deficit Estimate	3,200	1,810
FY2022 Deficit Estimate	1,743	1,336
FY2023 Deficit Estimate	1,327	1,124
FY2021 Deficit Estimate Range	2,400-4,600	
FY2022 Deficit Estimate Range	1,300-3,100	
FY2023 Deficit Estimate Range	700-2,000	
FY2021 Privately-Held Net Marketable Borrowing Estimate	2,600	1,661
FY2022 Privately-Held Net Marketable Borrowing Estimate	1,700	1,389
FY2023 Privately-Held Net Marketable Borrowing Estimate	1,325	1,200
FY2021 Privately-Held Net Marketable Borrowing Range	1,100-3,800	
FY2022 Privately-Held Net Marketable Borrowing Range	800-2,600	
FY2023 Privately-Held Net Marketable Borrowing Range	600-1,900	
Estimates as of:	Jan-21	Sep-20

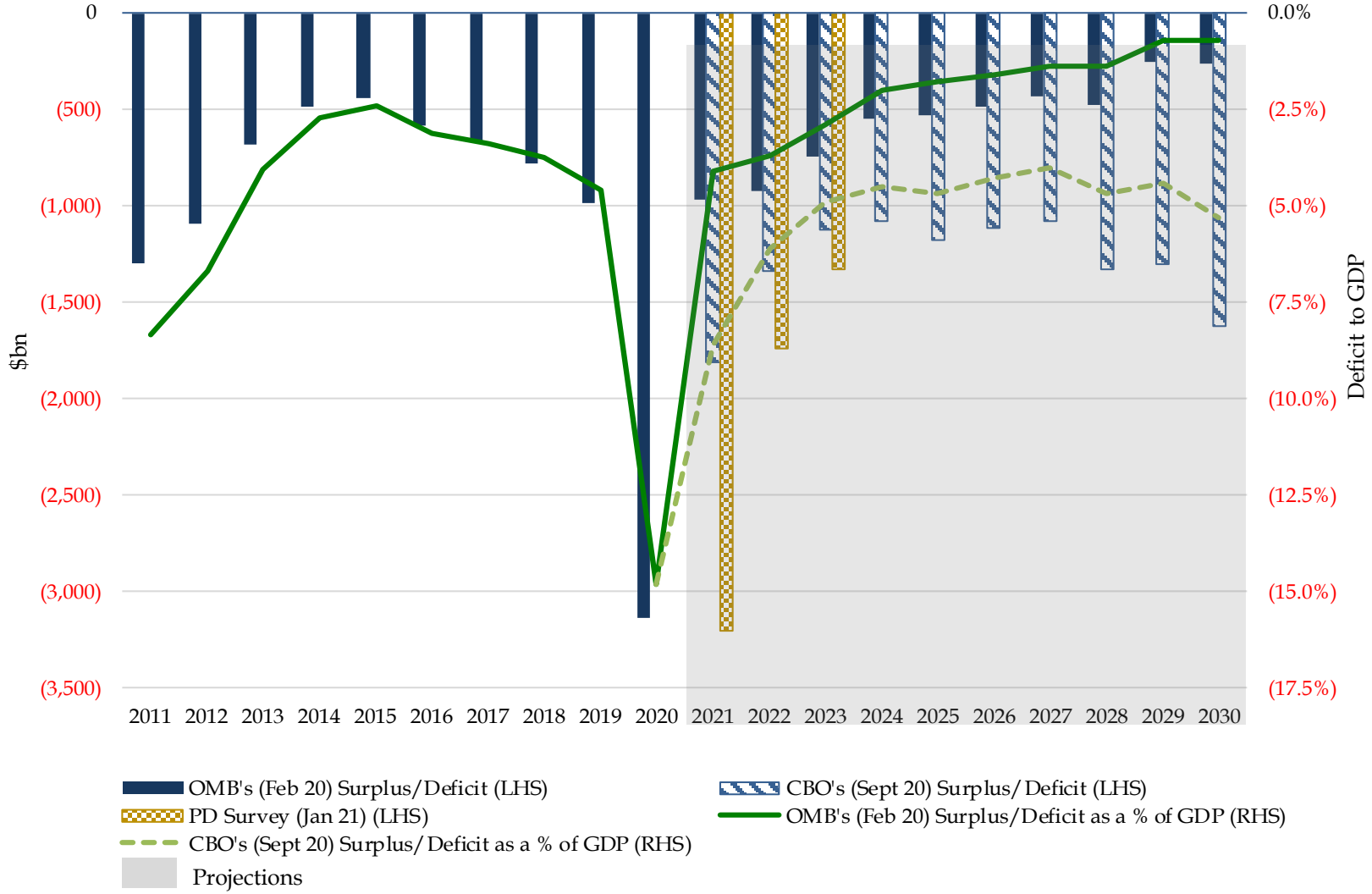
[1]Estimates represent the medians from the primary dealer survey in January 2021.

[2]CBO estimates are from Table 1 of "An Update to the Budget Outlook: 2020 to 2030," September, 2020.

According to the "An Overview of the Economic Outlook: 2021 To 2031" published on Feb 2021, CBO estimates that the pandemic-related provisions in the Consolidated Appropriations Act, 2021 signed in December 2020, will add $774 billion to the deficit in fiscal year 2021 and $98 billion in 2022. https://www.cbo.gov/system/files/2021-02/56965-Economic-Outlook.pdf.

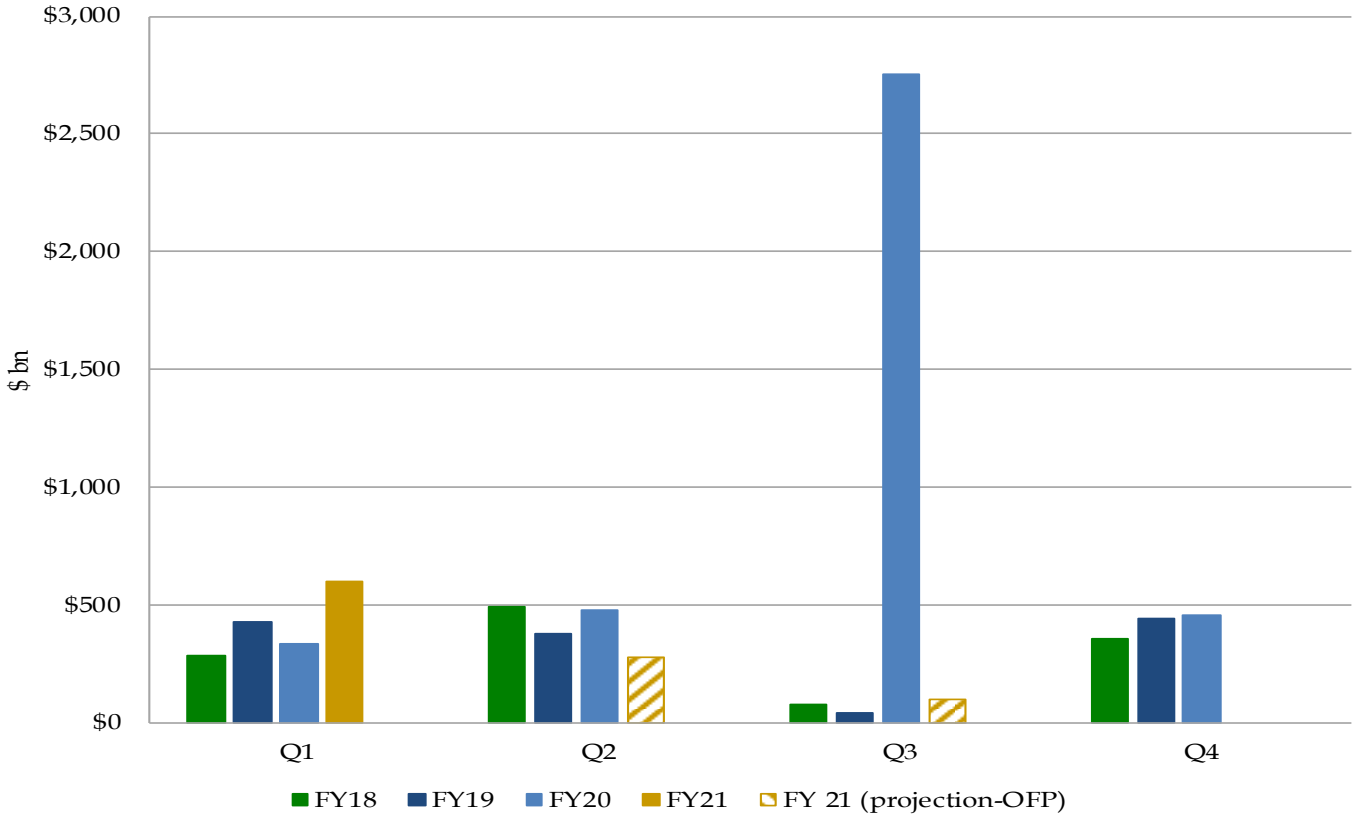
*Privately-held marketable borrowing excludes rollovers (auction "add-ons") of Treasury securities held in the Federal Reserve's System Open Market Account (SOMA) but includes financing required due to SOMA redemptions. Secondary market purchases of Treasury securities by SOMA do not directly change net privately-held marketable borrowing but, all else equal, when the securities mature and assuming the Fed does not redeem any maturing securities, would increase the amount of cash raised for a given privately-held auction size by increasing the SOMA "add-on" amount.

Budget Surplus/Deficit*



OMB's Projections are from OMB's Table S-10 of "A Budget for America's Future, Fiscal Year 2021," February 2020.
CBO's Projections are from CBO's Table 1 of "An Update to the Budget Outlook: 2020 to 2030," September 2020.
According to the "An Overview of the Economic Outlook: 2021 To 2031" published on Feb 2021, CBO estimates that the pandemic-related provisions in the Consolidated Appropriations Act, 2021 signed in December 2020, will add $774 billion to the deficit in fiscal year 2021 and $98 billion in 2022. https://www.cbo.gov/system/files/2021-02/56965-Economic-Outlook.pdf.
*OMB projections reflect pre-CARES Act forecasts and will be updated when new projections become available.

Privately-Held Net Marketable Borrowing Outlook*



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Section III: Financing

Assumptions for Financing Section (pages 16 to 19)

- Portfolio and SOMA holdings as of 12/31/2020.
- Estimates assume private announced issuance sizes and patterns remain constant for nominal coupons, TIPS, and FRNs given changes made before the February 2021 refunding, while using total bills outstanding of ~$4.96 trillion.
- The principal on the TIPS securities was accreted to each projection date based on market ZCIS levels as of 12/31/2020.
- No attempt was made to account for future financing needs.

Sources of Privately-Held Financing in FY21 Q1*

October - December 2020	
Net Bill Issuance	(65)
Net Coupon Issuance	662
Subtotal: Net Marketable Borrowing	597
Ending Cash Balance	1729
Beginning Cash Balance	1782
Subtotal: Change in Cash Balance	(53)
Net Implied Funding for FY 2021 Q1**	650

Security	October - December 2020 Bill Issuance			Fiscal Year-to-Date Bill Issuance		
	Gross	Maturing	Net	Gross	Maturing	Net
4-Week	390	390	(0)	390	390	(0)
8-Week	455	455	0	455	455	0
13-Week	756	756	(0)	756	756	(0)
26-Week	714	711	3	714	711	3
52-Week	136	64	72	136	64	72
CMBs						
6-Week	390	390	0	390	390	0
15-Week	325	340	(15)	325	340	(15)
17-Week	420	445	(25)	420	445	(25)
22-Week	390	460	(70)	390	460	(70)
39-Week	0	0	0	0	0	0
Other	30	60	(30)	30	60	(30)
Bill Subtotal	4,006	4,071	(65)	4,006	4,071	(65)

Security	October - December 2020 Coupon Issuance			Fiscal Year-to-Date Coupon Issuance		
	Gross	Maturing	Net	Gross	Maturing	Net
2-Year FRN	74	55	19	74	55	19
2-Year	168	86	82	168	86	82
3-Year	162	58	104	162	58	104
5-Year	171	83	88	171	83	88
7-Year	168	61	107	168	61	107
10-Year	114	43	71	114	43	71
20-Year	73	0	73	73	0	73
30-Year	74	0	74	74	0	74
5-Year TIPS	32	0	32	32	0	32
10-Year TIPS	12	0	12	12	0	12
30-Year TIPS	0	0	0	0	0	0
Coupon Subtotal	1,048	386	662	1,048	386	662

*Privately-held marketable borrowing excludes rollovers (auction "add-ons") of Treasury securities held in the Federal Reserve's System Open Market Account (SOMA) but includes financing required due to SOMA redemptions. Secondary market purchases of Treasury securities by SOMA do not directly change net privately-held marketable borrowing but, all else equal, when the securities mature and assuming the Fed does not redeem any maturing securities, would increase the amount of cash raised for a given privately-held auction size by increasing the SOMA "add-on" amount.

**By adjusting the change in cash balance, Treasury arrives at the net implied funding number.

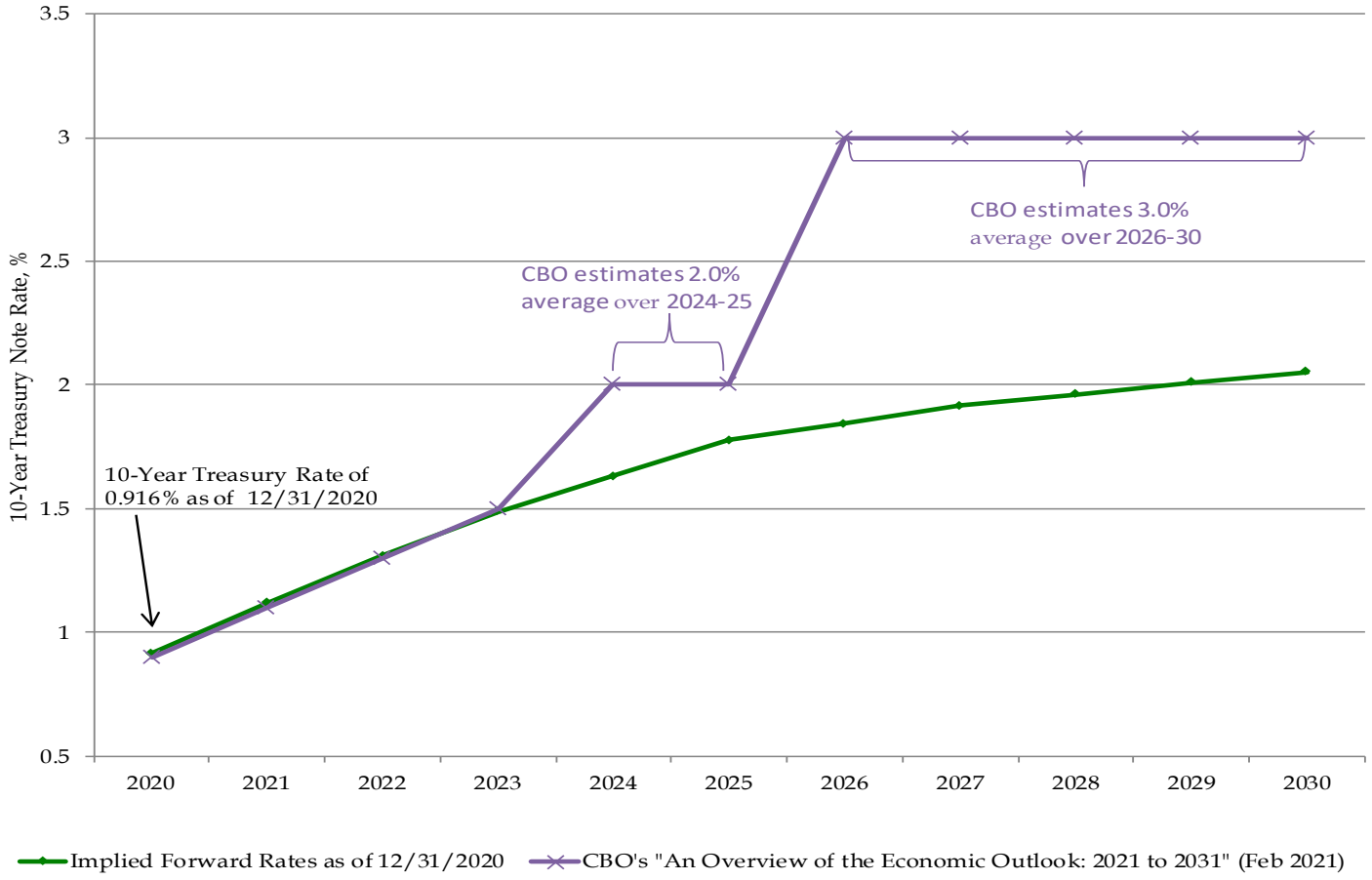
Sources of Privately-Held Financing in FY21 Q2*

January - March 2021	
Assuming Constant Coupon Issuance Sizes**	
Treasury Announced Net Marketable Borrowing***	274
Net Coupon Issuance	695
Implied Change in Bills	(421)

Security	January - March 2021 Coupon Issuance			Fiscal Year-to-Date Coupon Issuance		
	Gross	Maturing^	Net	Gross	Maturing	Net
2-Year FRN	80	56	24	154	111	43
2-Year	180	49	131	348	135	213
3-Year	174	58	116	336	115	221
5-Year	183	83	100	354	166	188
7-Year	186	84	102	354	145	209
10-Year	117	41	76	231	84	147
20-Year	75	0	75	148	0	148
30-Year	75	3	72	149	3	146
5-Year TIPS	0	0	0	32	0	32
10-Year TIPS	28	38	(10)	40	38	2
30-Year TIPS	8	0	8	8	0	8
Coupon Subtotal	1,106	411	695	2,154	797	1,357

* Privately-held marketable borrowing excludes rollovers (auction "add-ons") of Treasury securities held in the Federal Reserve's System Open Market Account (SOMA) but includes financing required due to SOMA redemptions. Secondary market purchases of Treasury securities by SOMA do not directly change net privately-held marketable borrowing but, all else equal, when the securities mature and assuming the Fed does not redeem any maturing securities, would increase the amount of cash raised for a given privately-held auction size by increasing the SOMA "add-on" amount.
** Keeping announced issuance sizes and patterns constant for nominal coupons, TIPS, and FRNs based on changes made before the February 2021 refunding.
*** Assumes an end-of-March 2021 cash balance of $800 billion versus a beginning-of-January 2021 cash balance of $1,729 billion.
Financing Estimates released by the Treasury can be found here: http://www.treasury.gov/resource-center/data-chart-center/quarterly-refunding/Pages/Latest.aspx
^ Maturing amounts could change based on future Federal Reserve purchases.

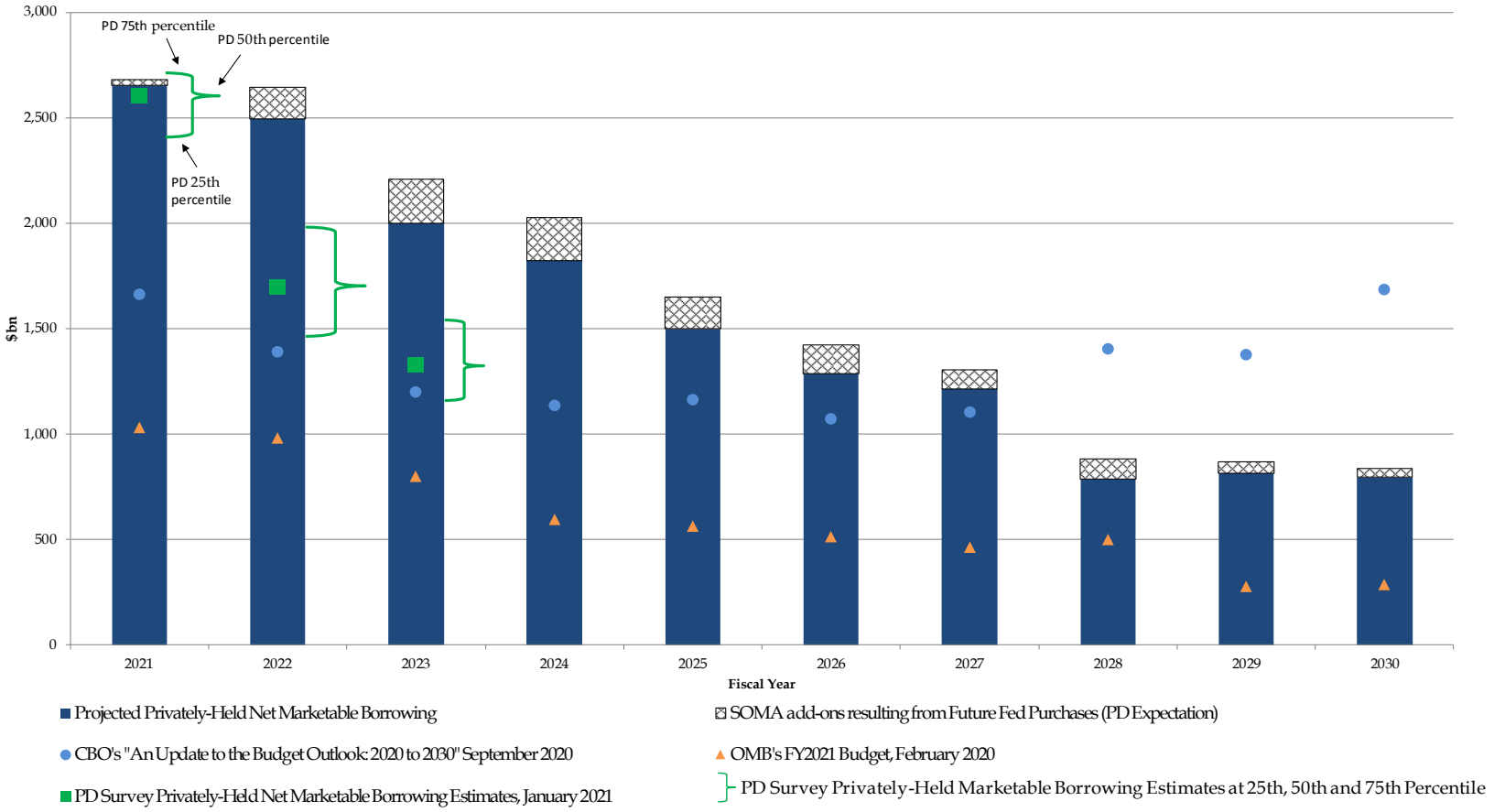
Interest Rate Assumptions: 10-Year Treasury Note*



*CBO's February 2021 economic assumption of the annual average 10-Year Treasury note rates reflect projections for 2021, 2022, 2023, and averages for the periods 2024-25 and 2026-30. The forward rates are the implied 10-Year Treasury note rates on December 31, 2020.

Projected Privately-Held Net Marketable Borrowing

Assuming Private Coupon Issuance & Total Bills Outstanding Remain Constant as of 12/31/2020*

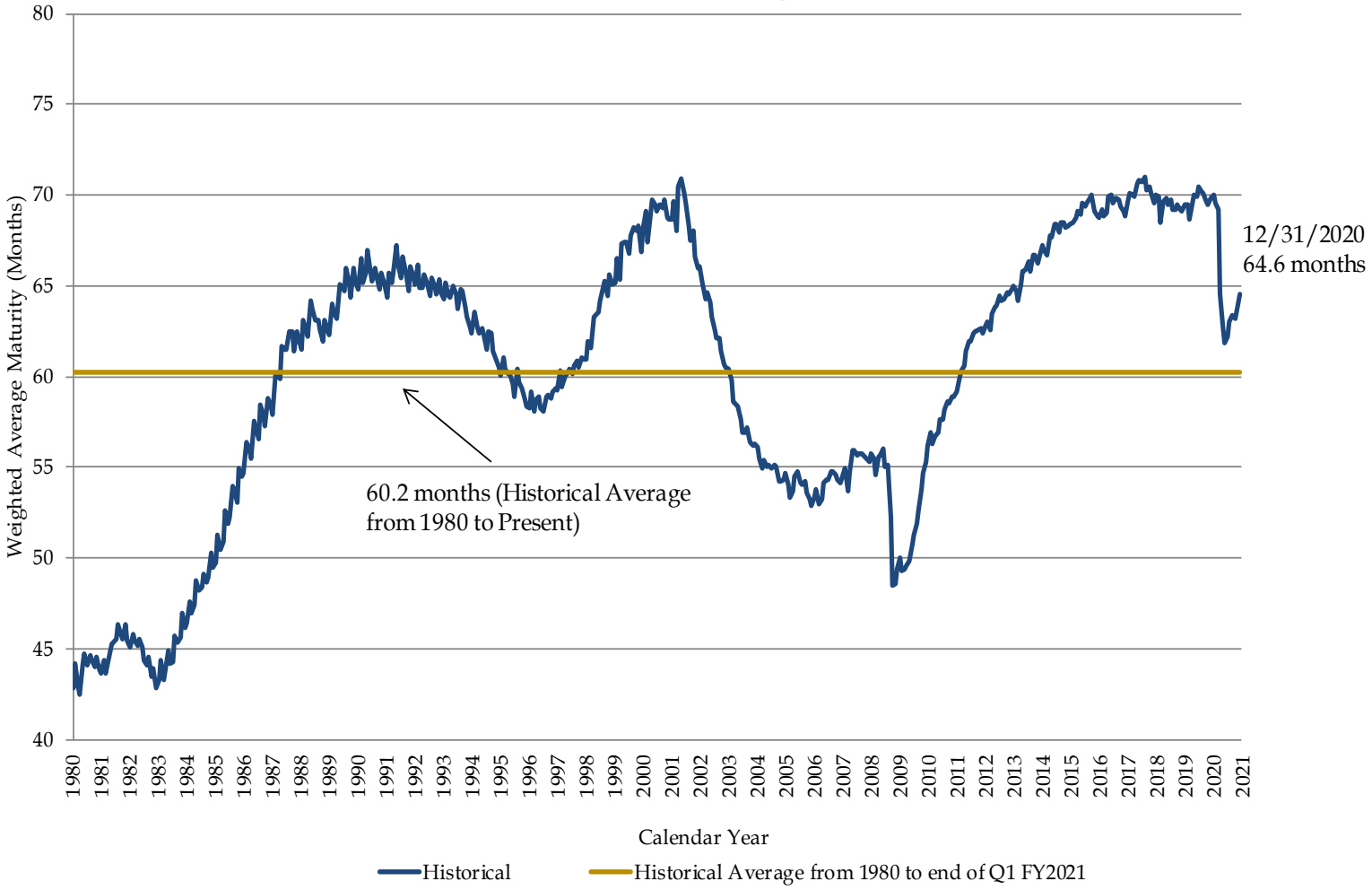


Treasury's latest primary dealer survey median estimates can be found on page 11. OMB's projections of the change in debt held by the public are from Table S-10 of "A Budget for America's Future, Fiscal Year 2021," February 2020. CBO's current law budget projections of the change in debt held by the public for FY2021 to FY2030 are derived from Table 1 of CBO's "An Update to The Budget Outlook: 2020 to 2030," September 2020. According to the "An Overview of the Economic Outlook: 2021 To 2031" published on Feb 2021, CBO estimates that the pandemic-related provisions in the Consolidated Appropriations Act, 2021 signed in December 2020, will add $774 billion to the deficit in fiscal year 2021 and $98 billion in 2022. https://www.cbo.gov/system/files/2021-02/56965-Economic-Outlook.pdf. Future Fed purchases are derived from the Fed's December 2020 Primary Dealer Survey median results with maturity bucket weights based on current operations and pro-rata across securities within each maturity bucket.
https://www.newyorkfed.org/medialibrary/media/markets/survey/2020/dec-2020-spd-results.pdf.

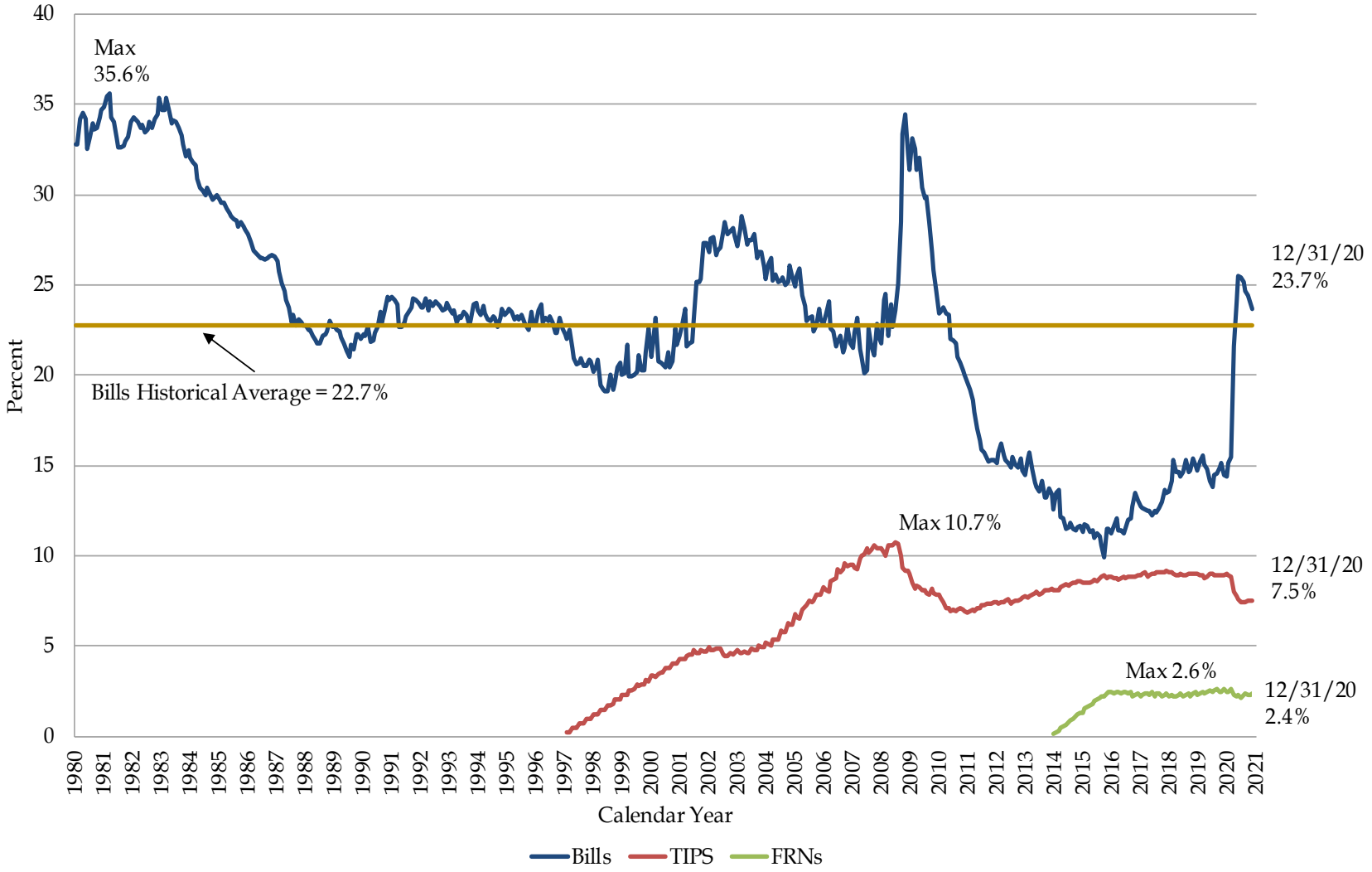
* Privately-held marketable borrowing excludes rollovers (auction "add-ons") of Treasury securities held in the Federal Reserve's System Open Market Account (SOMA) but includes financing required due to SOMA redemptions. No adjustments are made for open-market outright purchases.
OMB projections before April 2020 reflect pre-CARES Act forecasts and will be updated when new projections become available.

Section IV:
Portfolio Metrics

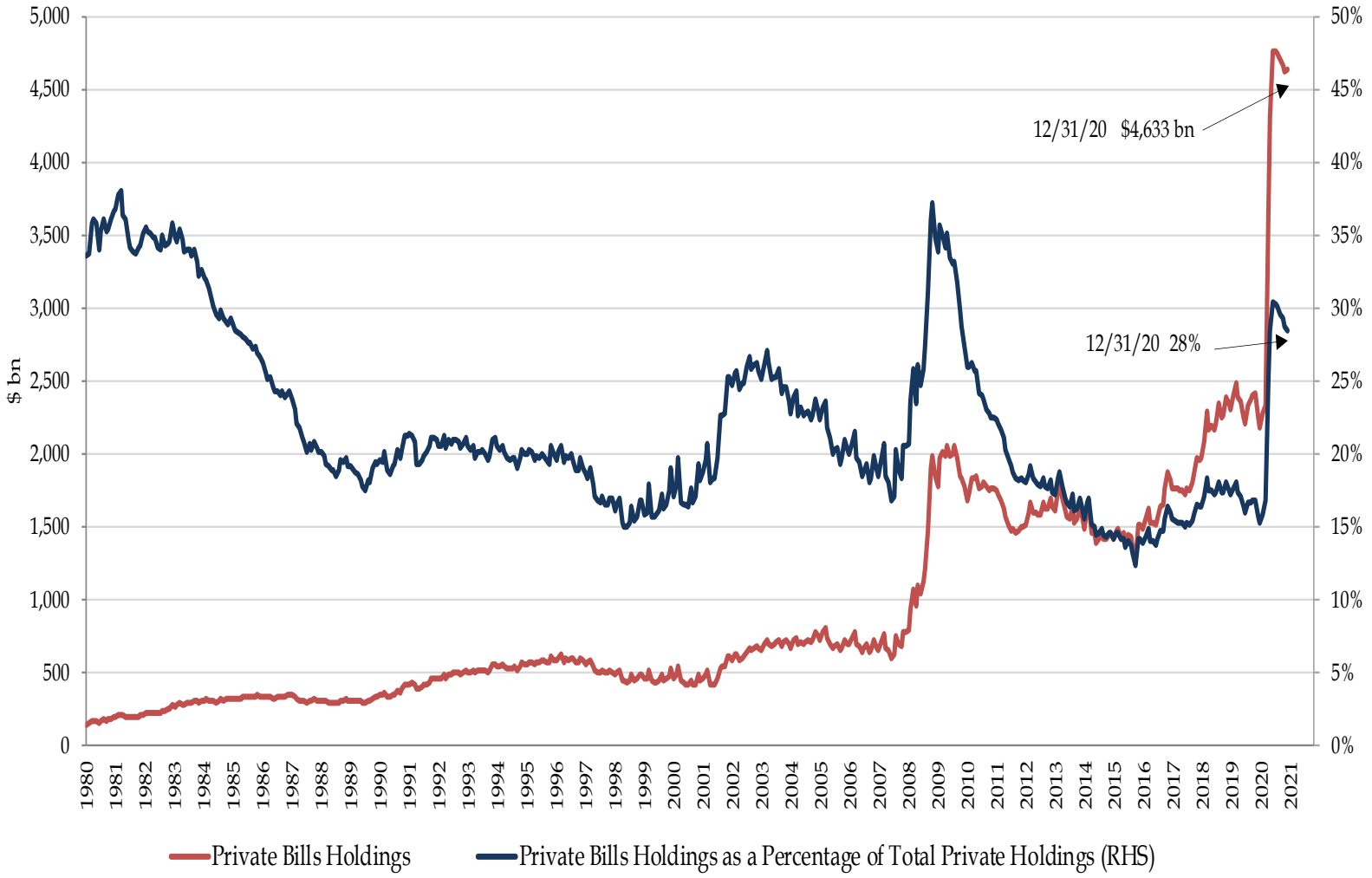
Historical Weighted Average Maturity of Marketable Debt Outstanding

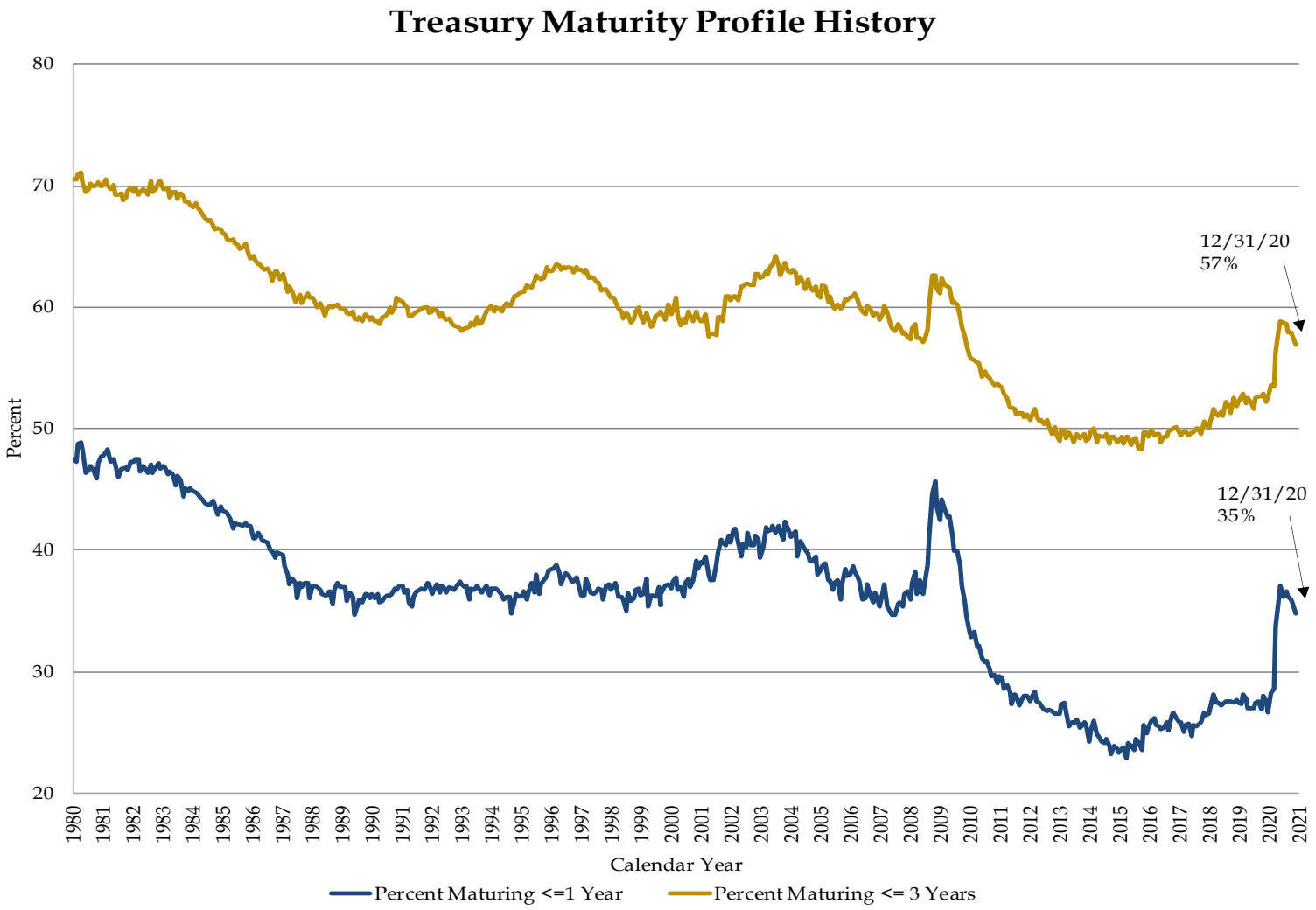


Bills, TIPS & FRNs Outstanding as a Percent of Marketable Debt Outstanding



Private Bills Holdings as a Percentage of Total Private Holdings




Treasury Maturity Profile History
80
70
60
50
40
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Percent
12/31/20
57%
12/31/20
35%
1980
1981
1982
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2018
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2020
2021
Calendar Year
Percent Maturing <=1 Year
Percent Maturing <= 3 Years

Section V: Demand

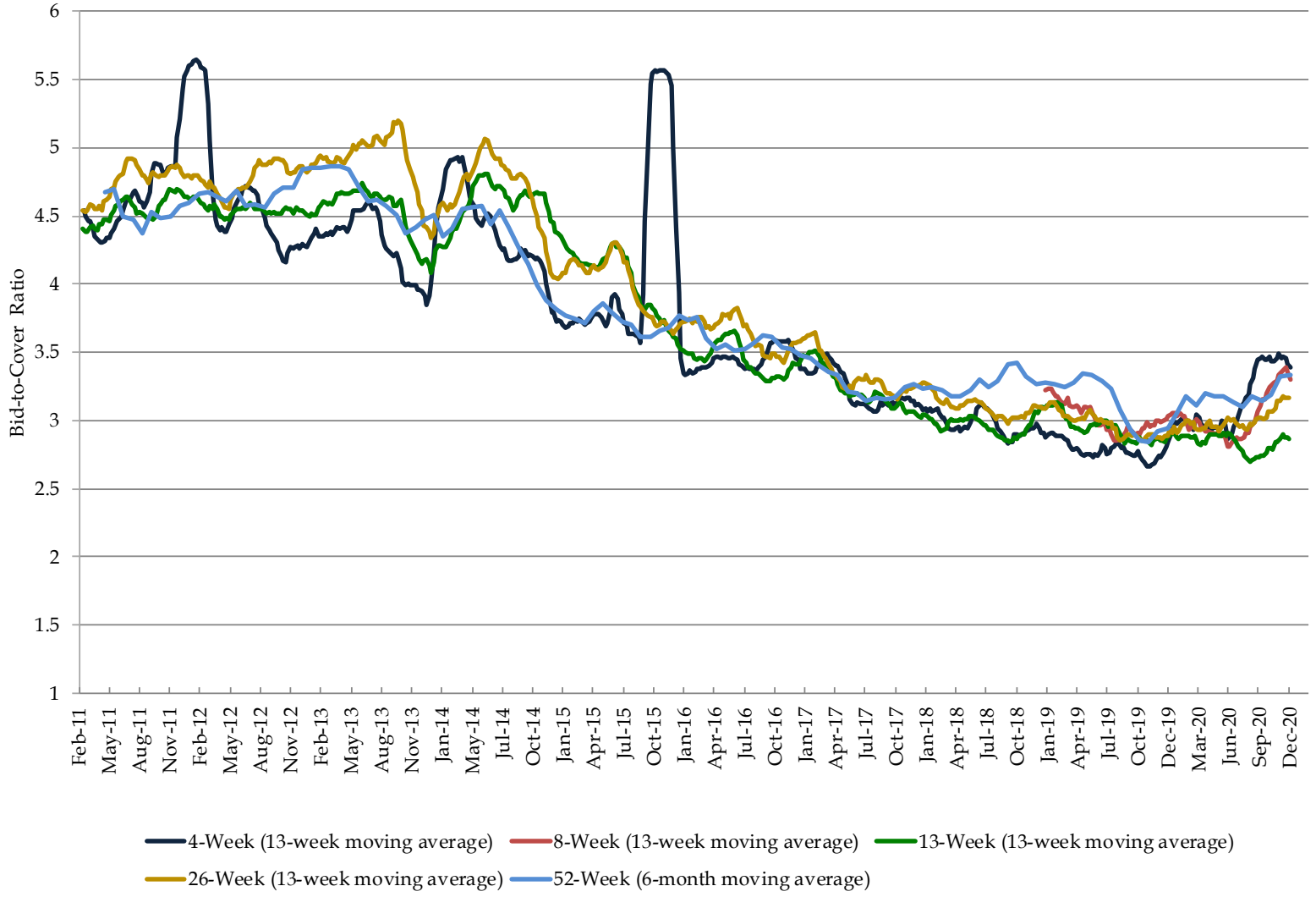
Summary Statistics for Fiscal Year 2021 Q1 Auctions

Security Type	Term	Stop Out Rate (%)*	Bid-to-Cover Ratio*	Competitive Awards ($bn)	% Primary Dealer*	% Direct*	% Indirect*	Non-Competitive Awards ($bn)	SOMA "Add-Ons" ($bn)	10-Year Equivalent ($bn)**
Bill	4-Week	0.080	3.4	399.8	58.5	8.3	33.3	20.16	38.6	3.7
Bill	8-Week	0.084	3.3	479.4	50.2	5.1	44.7	10.64	45.1	8.7
Bill	13-Week	0.092	2.9	685.6	49.7	6.9	43.4	16.43	81.5	20.7
Bill	26-Week	0.101	3.2	650.9	41.0	4.8	54.1	12.07	76.9	39.0
Bill	52-Week	0.124	3.4	135.1	55.4	5.0	39.6	0.95	21.3	16.5
CMB	6-Week	0.084	3.4	389.7	53.4	8.7	37.9	0.34	0.0	4.8
CMB	15-Week	0.093	3.8	325.0	51.3	5.8	42.9	0.04	0.0	9.9
CMB	17-Week	0.096	3.5	389.8	57.6	5.0	37.4	0.23	0.0	13.5
CMB	22-Week	0.099	3.5	390.0	54.1	5.2	40.8	0.02	0.0	17.4
Coupon	2-Year	0.151	2.5	167.6	34.5	16.3	49.2	0.39	22.3	40.1
Coupon	3-Year	0.218	2.4	161.8	37.8	14.3	47.9	0.21	18.6	57.0
Coupon	5-Year	0.374	2.4	170.9	26.1	15.5	58.4	0.06	22.7	101.2
Coupon	7-Year	0.639	2.3	168.0	22.3	15.5	62.2	0.01	22.4	137.6
Coupon	10-Year	0.897	2.4	114.0	26.2	14.0	59.8	0.04	13.8	128.4
Coupon	20-Year	1.422	2.4	73.0	23.7	16.2	60.1	0.00	9.7	151.6
Coupon	30-Year	1.643	2.4	74.0	20.6	16.1	63.2	0.02	9.1	208.3
TIPS	5-Year	-1.440	2.8	31.9	21.6	15.0	63.4	0.07	2.3	17.7
TIPS	10-Year	-0.867	2.7	12.0	14.1	16.5	69.3	0.01	1.7	13.8
FRN	2-Year	0.056	3.0	73.9	46.0	2.5	51.5	0.07	2.8	0.0

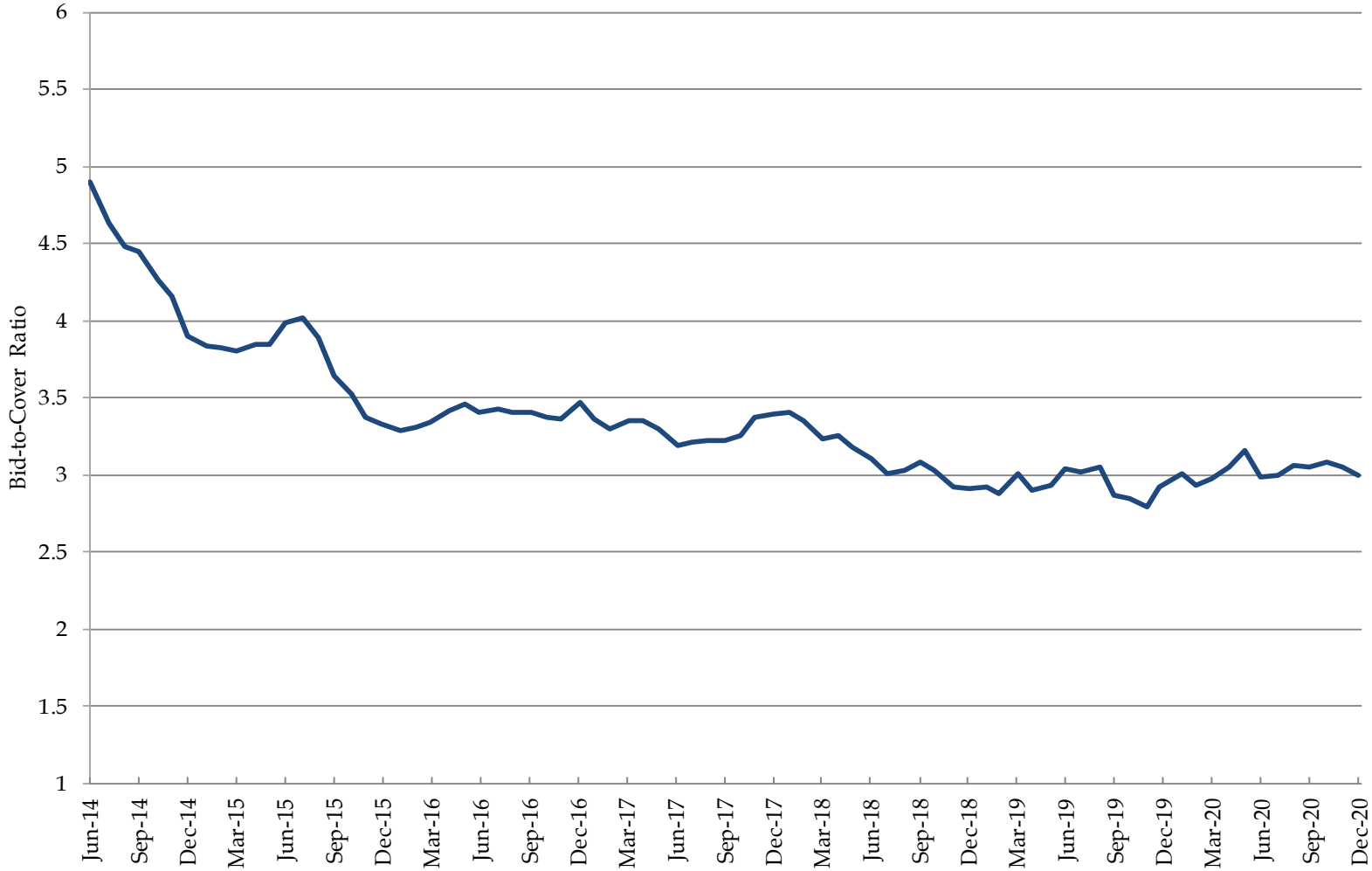
Total Bills	0.093	3.3	3,845.2	51.2	6.1	42.7	60.88	263.4	134.2
Total Coupons	0.602	2.4	929.3	28.4	15.3	56.3	0.74	118.7	824.0
Total TIPS	-1.283	2.7	43.9	19.6	15.4	65.0	0.08	3.9	31.5
Total FRN	0.056	3.0	73.9	46.0	2.5	51.5	0.07	2.8	0.0

*Weighted averages of Competitive Awards. FRNs are reported on discount margin basis.
**Approximated using prices at settlement and includes both Competitive and Non-Competitive Awards. For TIPS 10-year equivalent, a constant auction BEI is used as the inflation assumption.

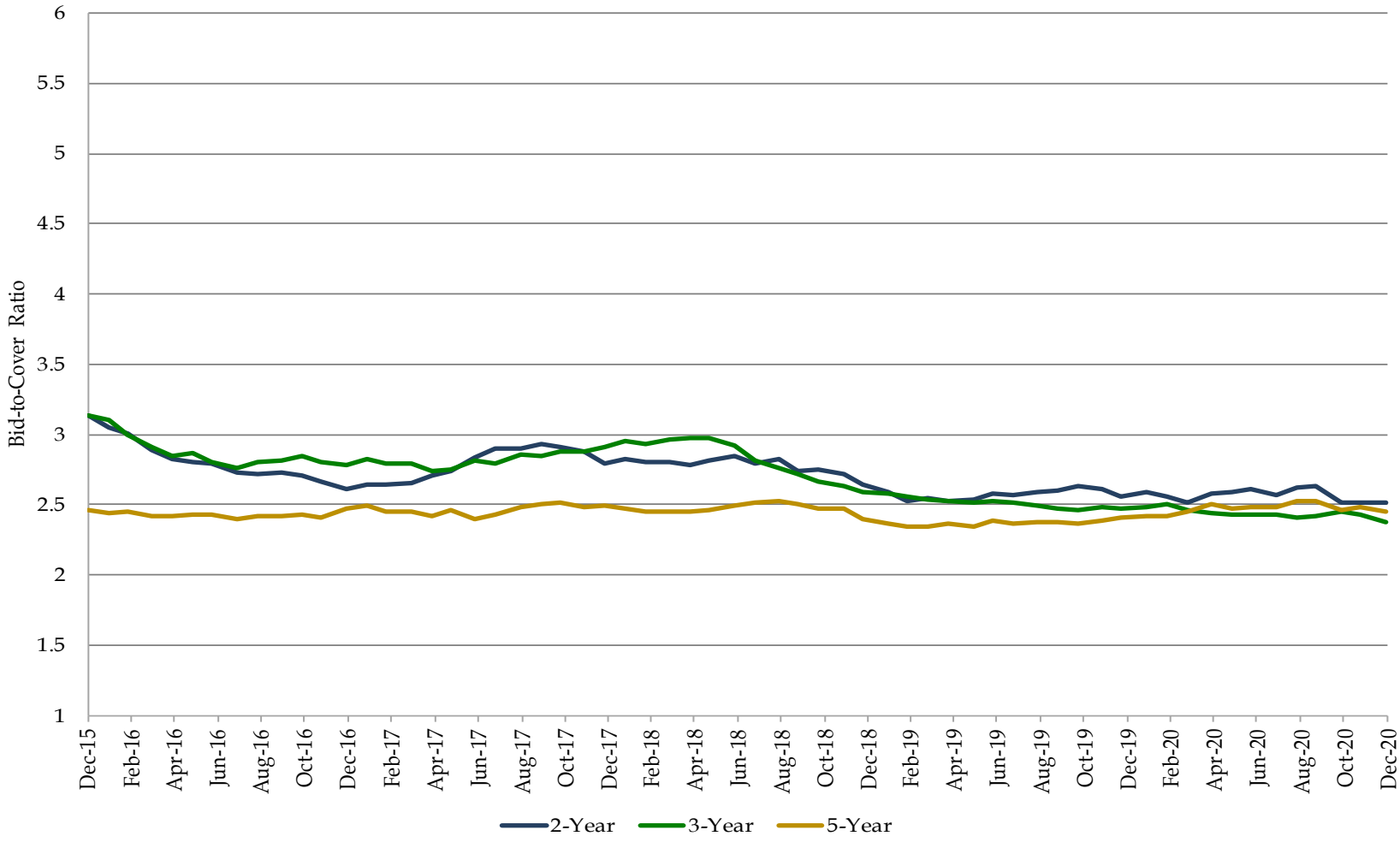
Bid-to-Cover Ratios for Treasury Bills



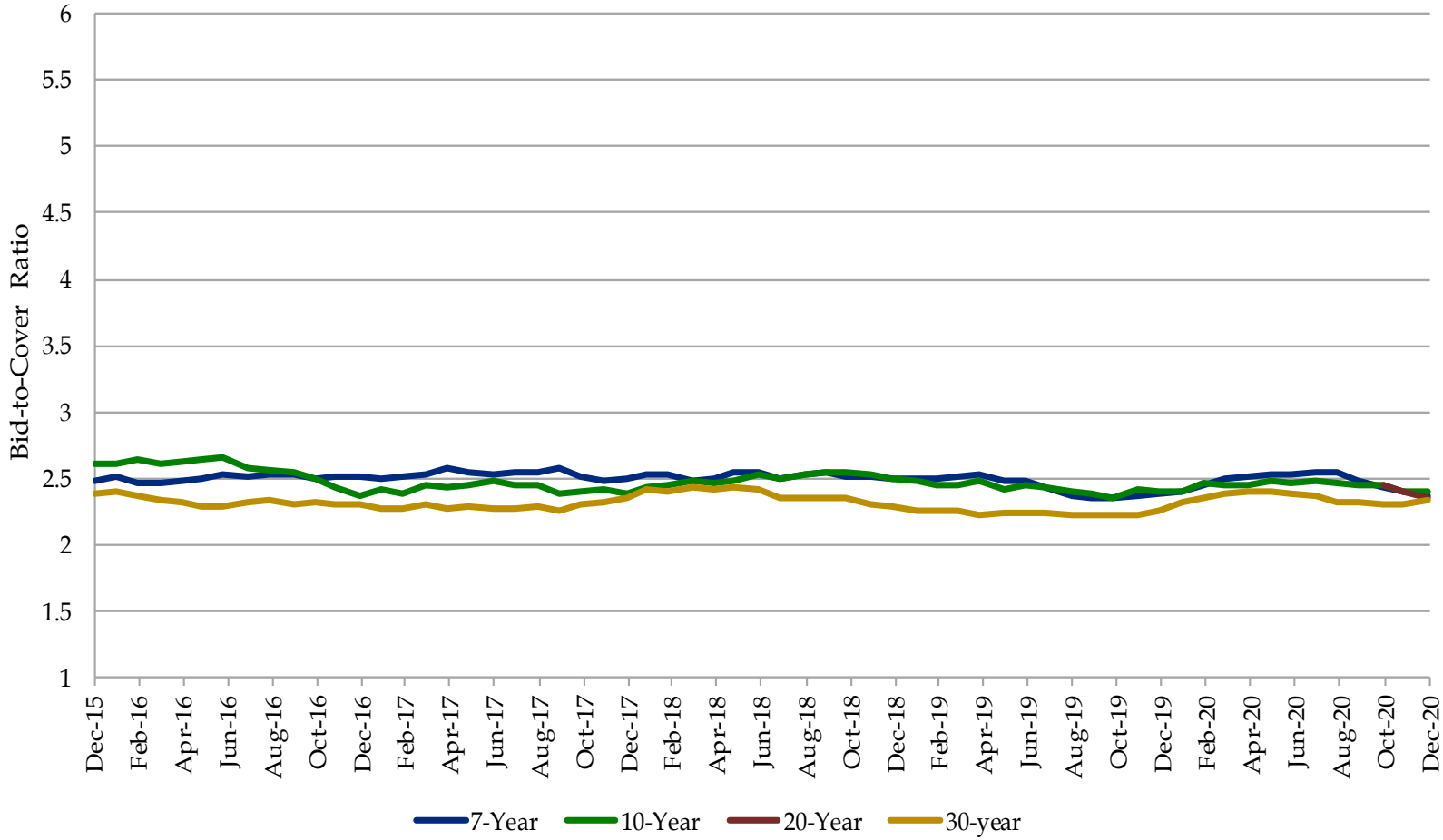
Bid-to-Cover Ratios for FRNs
(6-Month Moving Average)



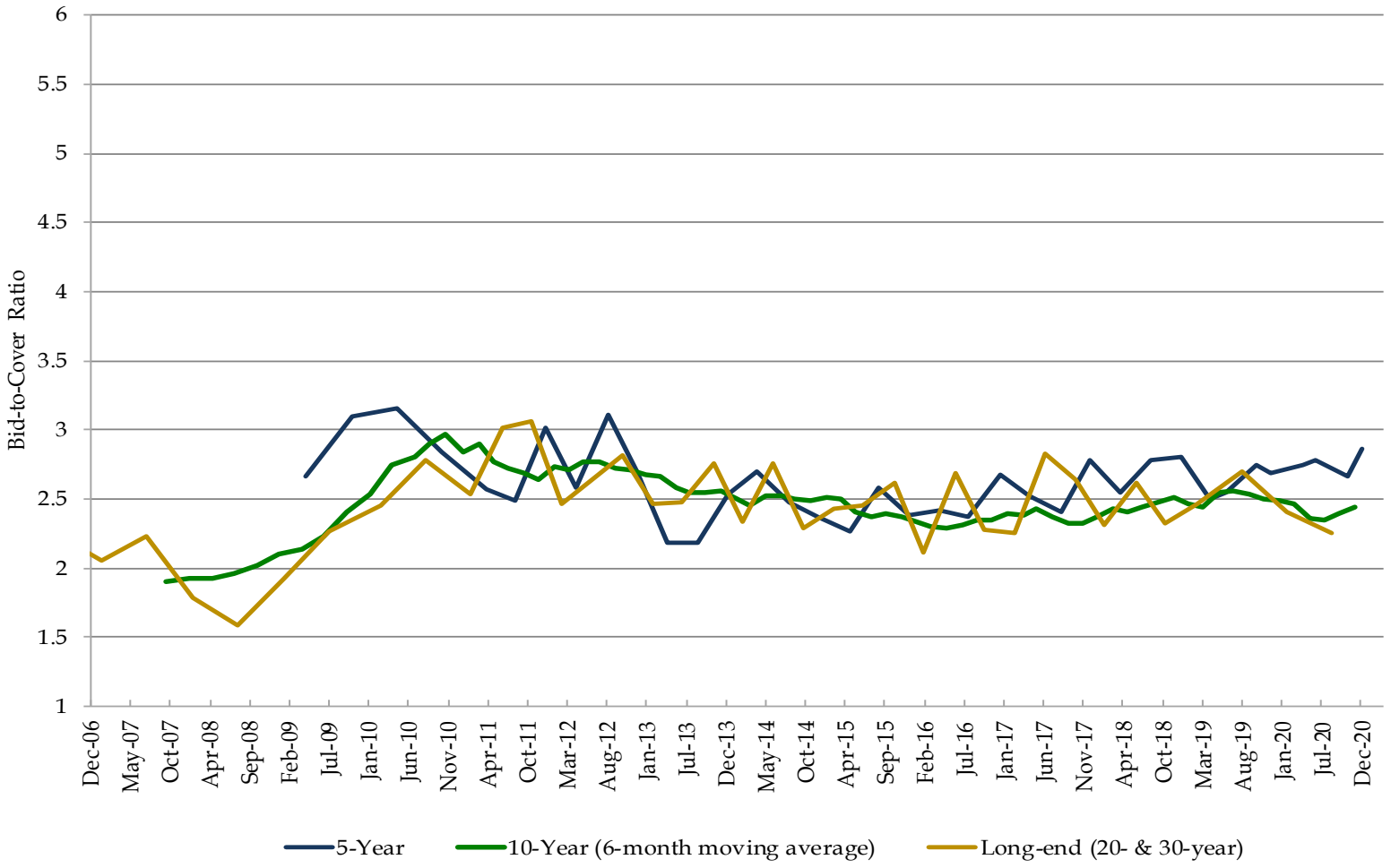
Bid-to-Cover Ratios for 2-, 3-, and 5-Year Nominal Securities (6-Month Moving Average)

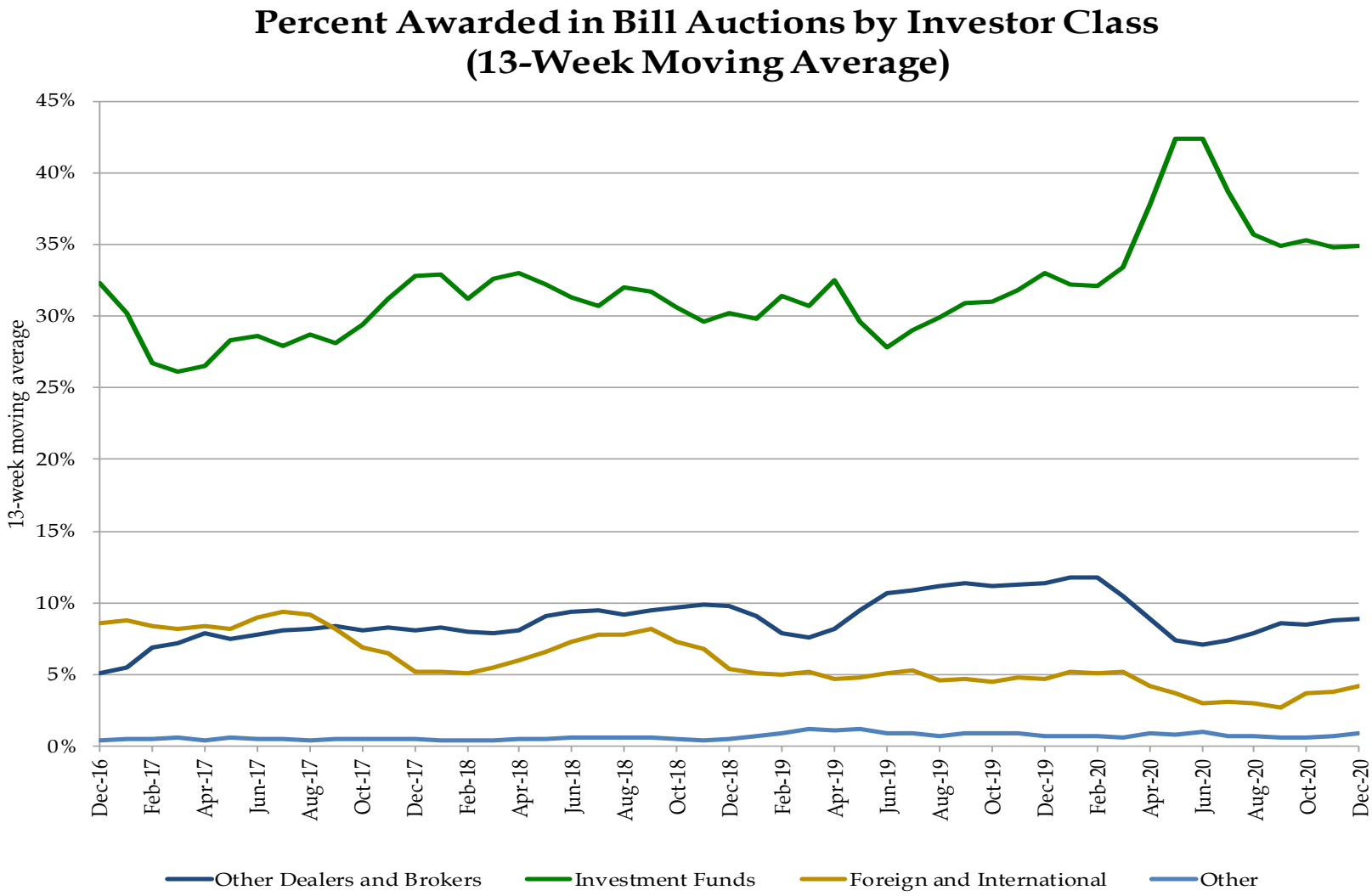


Bid-to-Cover Ratios for 7-, 10-, 20-, and 30-Year Nominal Securities(6-Month Moving Average)

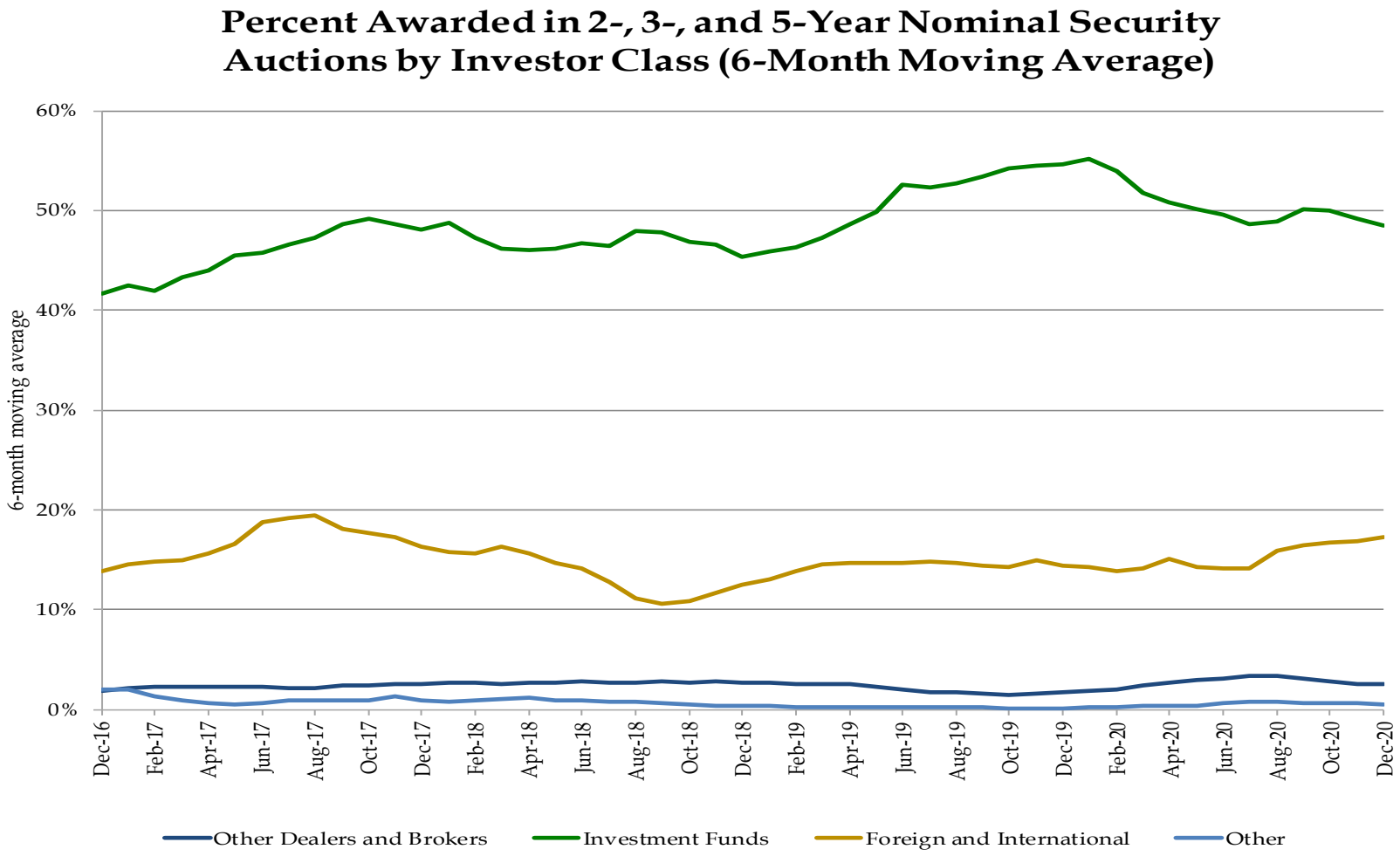


Bid-to-Cover Ratios for TIPS



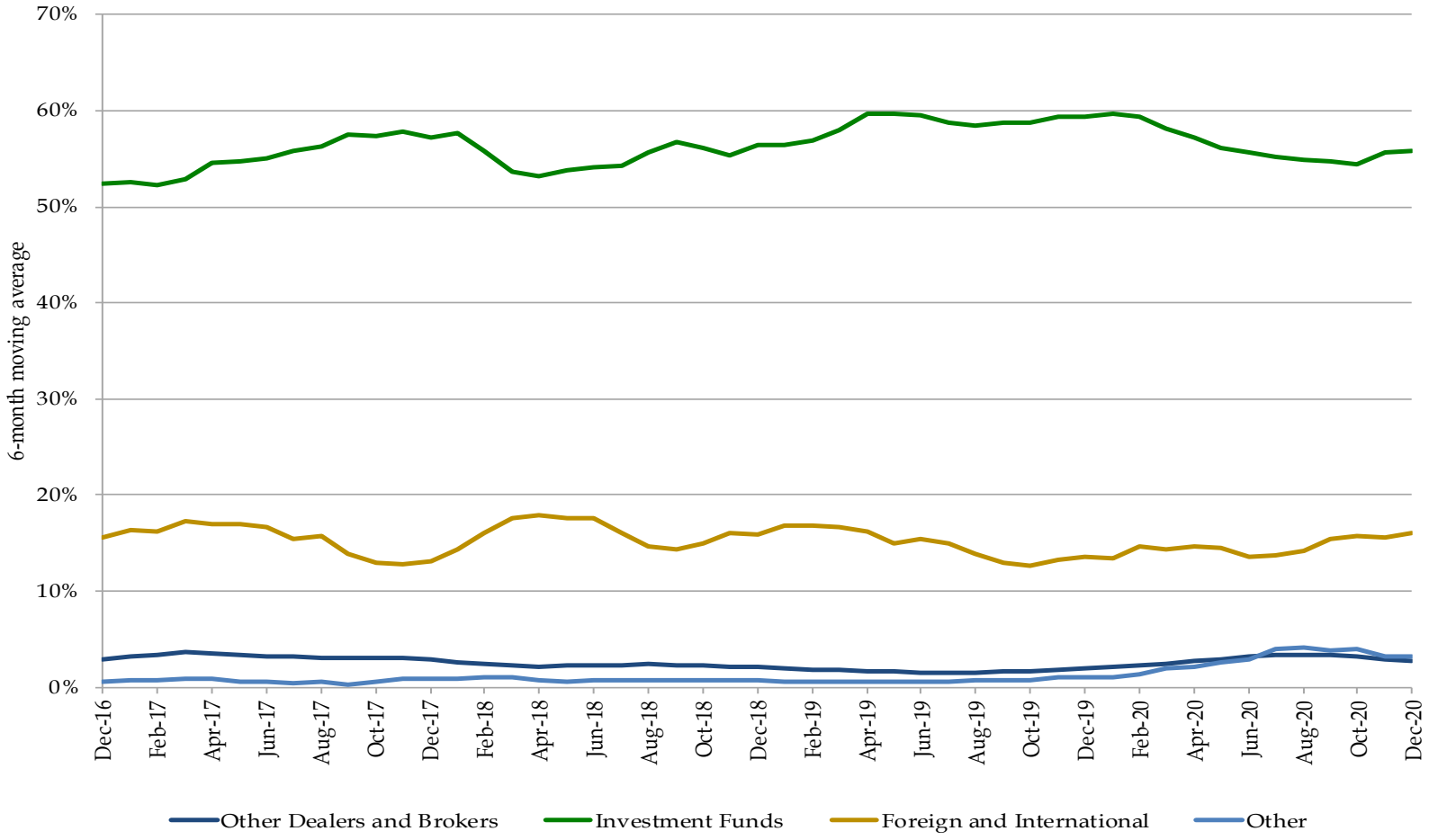


Excludes SOMA add-ons. The "Other" category includes categories that are each less than 5%, which include Depository Institutions, Individuals, Pension and Insurance.



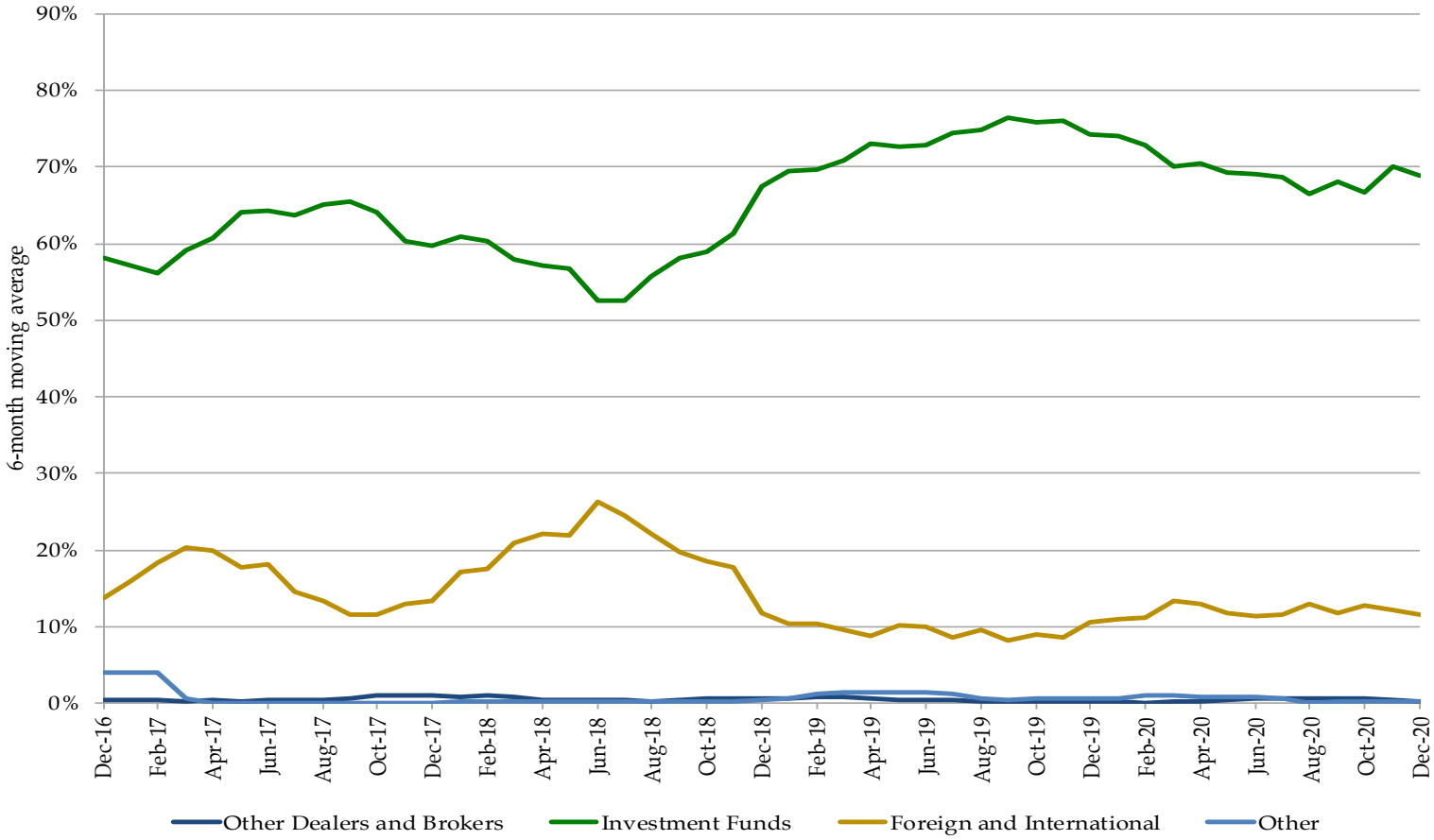
Excludes SOMA add-ons. The "Other" category includes categories that are each less than 5%, which include Depository Institutions, Individuals, Pension and Insurance.

Percent Awarded in 7-, 10-, 20-, 30-Year Nominal Security Auctions by Investor Class (6-Month Moving Average)



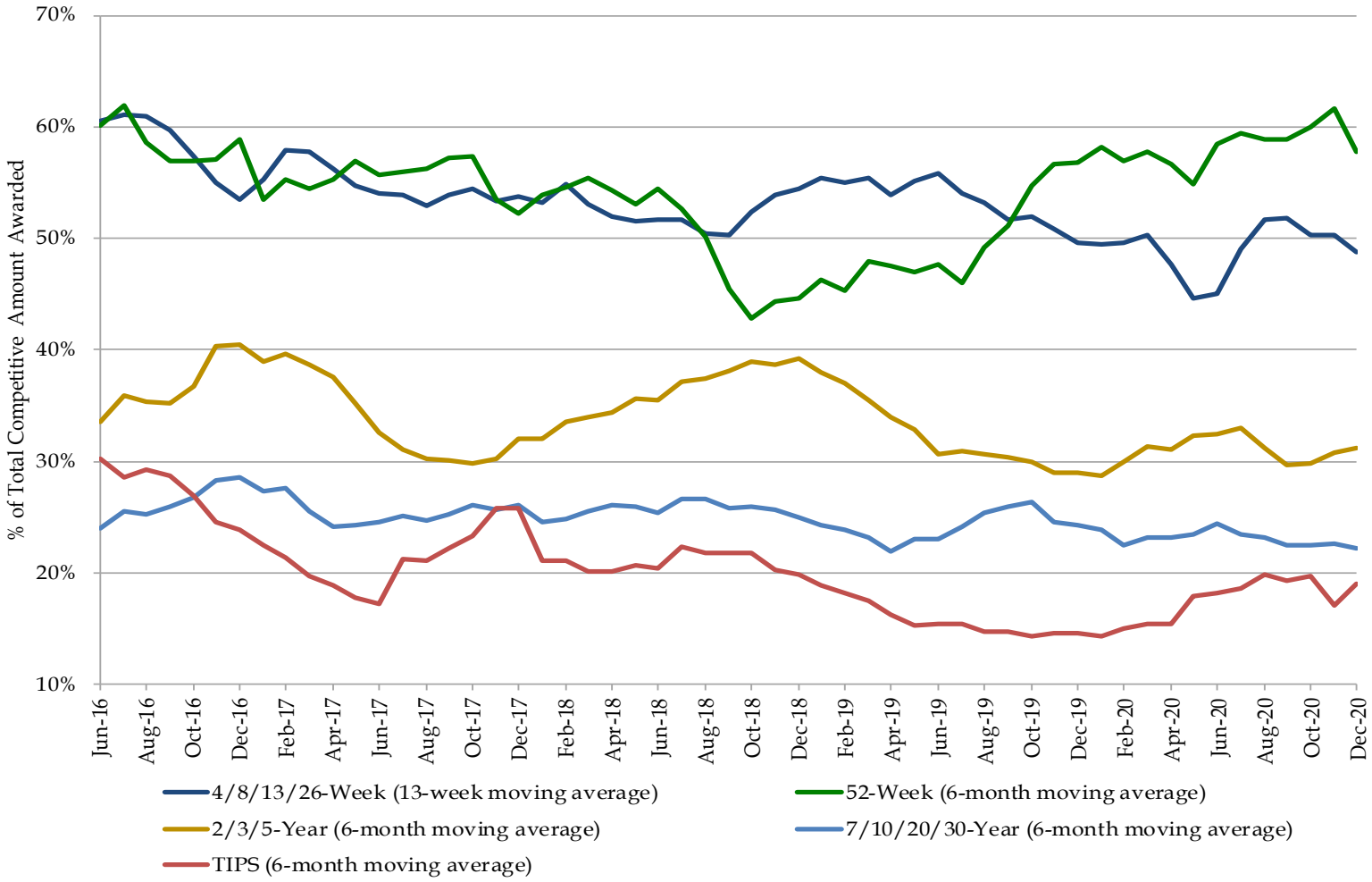
Excludes SOMA add-ons. The "Other" category includes categories that are each less than 5%, which include Depository Institutions, Individuals, Pension and Insurance.

Percent Awarded in TIPS Auctions by Investor Class (6-Month Moving Average)



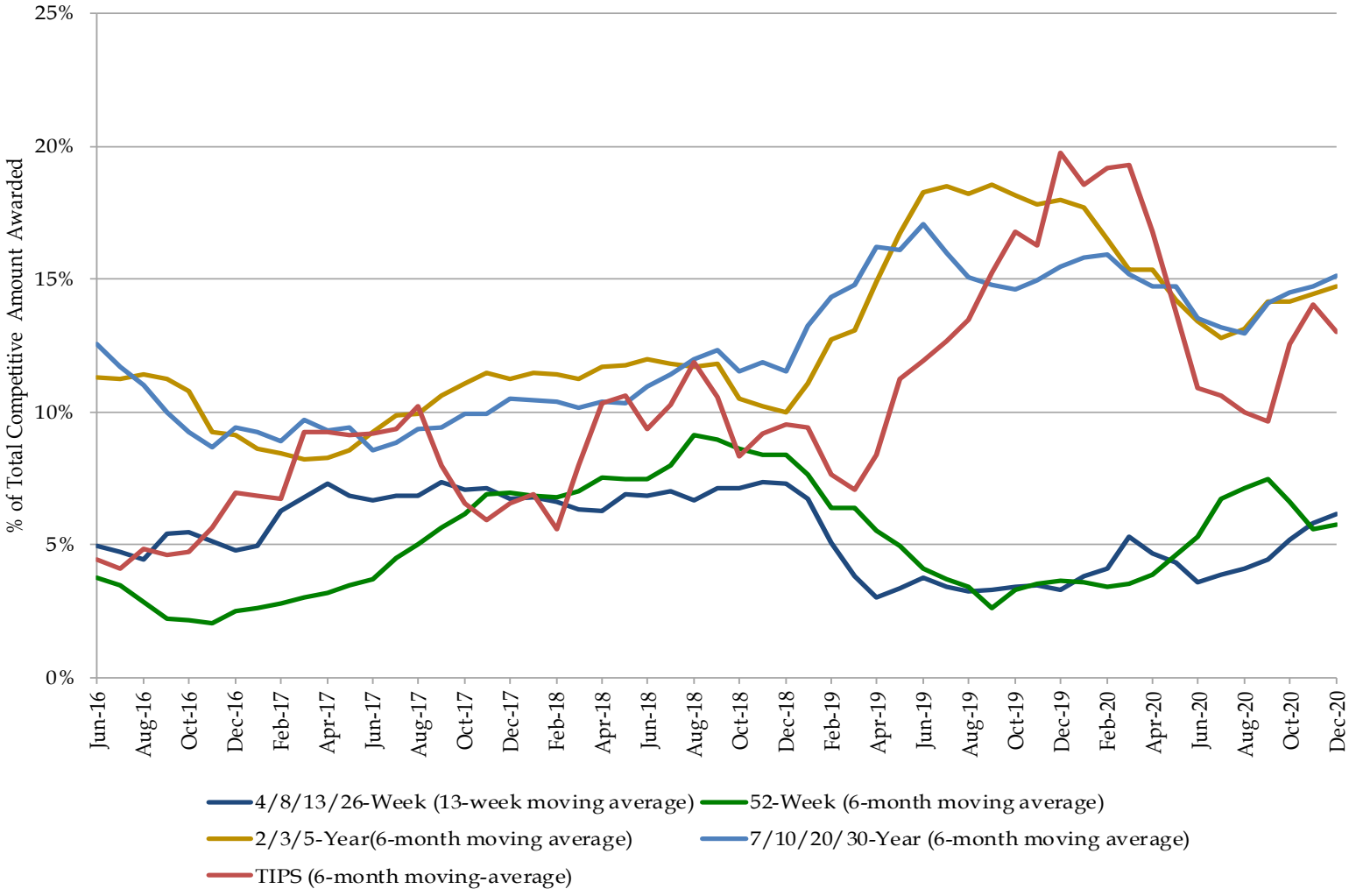
Excludes SOMA add-ons. The "Other" category includes categories that are each less than 5%, which include Depository Institutions, Individuals, Pension and Insurance.

Primary Dealer Awards at Auction



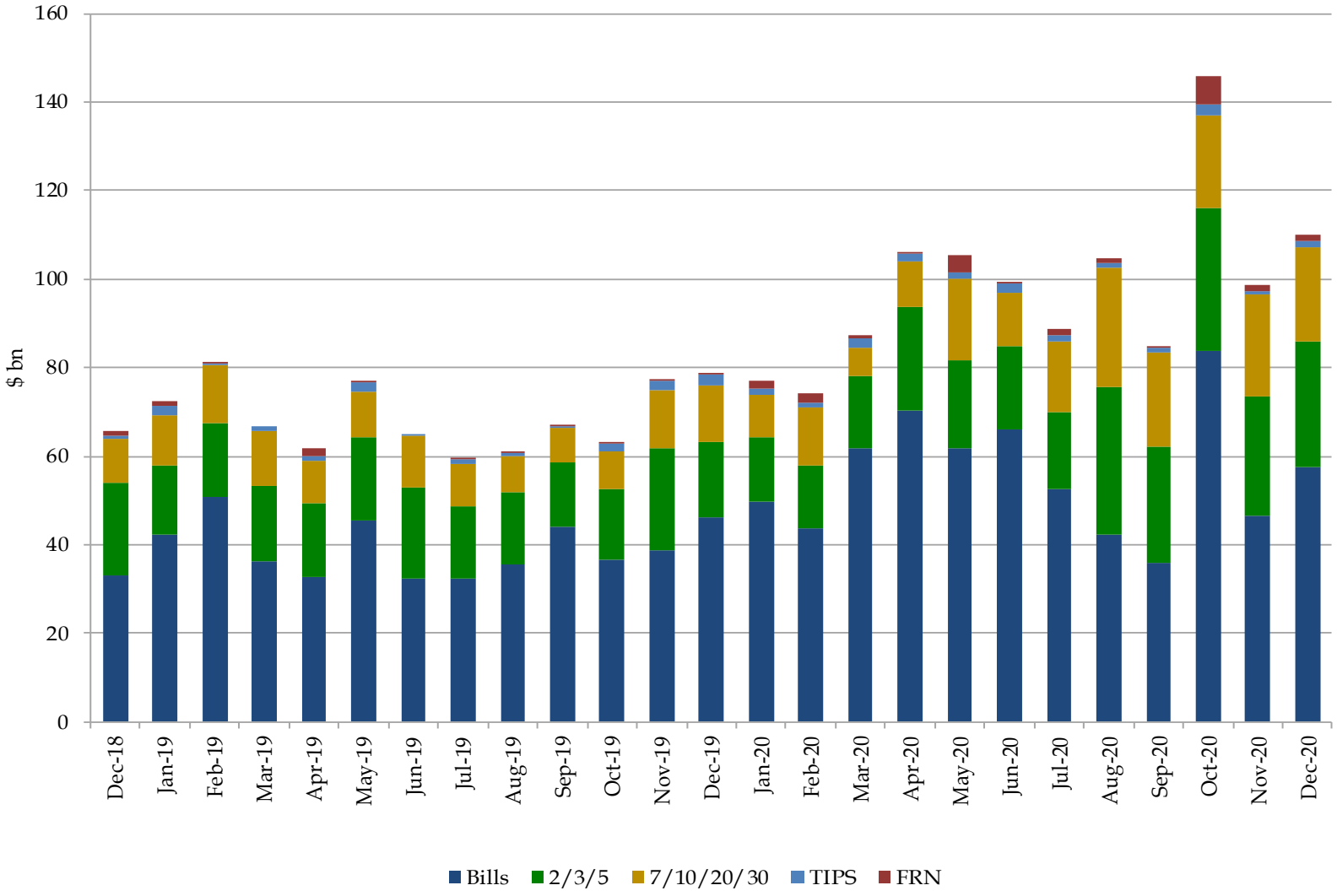
Competitive Amount Awarded excludes SOMA add-ons.

Direct Bidder Awards at Auction



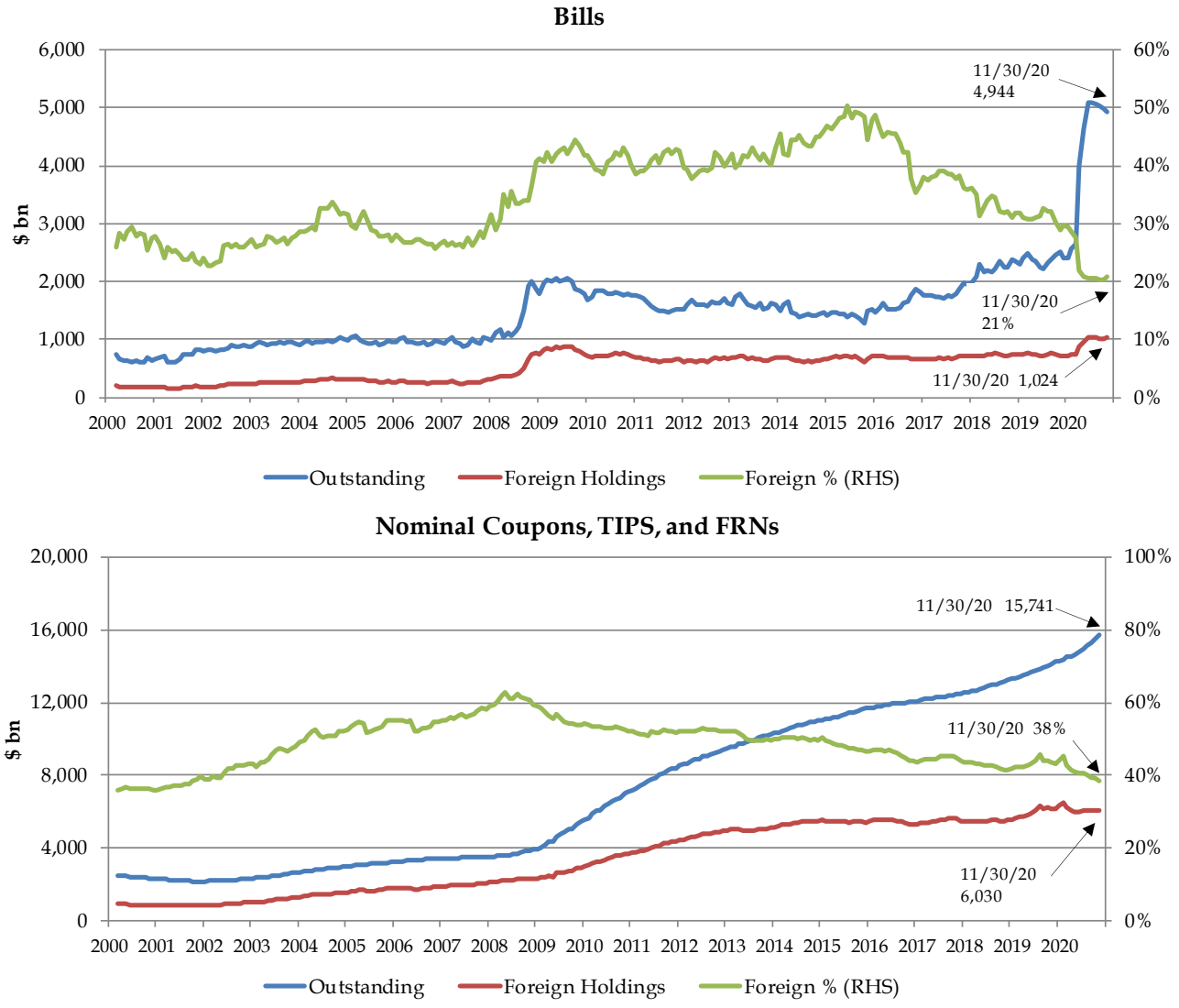
Competitive Amount Awarded excludes SOMA add-ons.

Total Foreign Awards of Treasuries at Auction, $ billions



Foreign includes both private sector and official institutions.

Total Foreign Holdings



Source: Treasury International Capital (TIC) System.
For more information on foreign participation data, including more details about the TIC data shown here, please refer to Treasury Presentation to TBAC "Brief Overview of Key Data Sources on Foreign Participation in the U.S. Treasury Securities Market" at the Treasury February 2019 Refunding.

Appendix

Projected Privately-Held Net Marketable Borrowing
Assuming Private Coupon Issuance & Total Bills Outstanding Remain Constant as of 12/31/2020*

Fiscal Year	Bills	2/3/5	7/10/20/30	TIPS	FRN	Historical/Projected Net Borrowing Capacity
2016	289	(107)	515	58	41	795
2017	155	(66)	378	51	(0)	519
2018	438	197	493	45	23	1,196
2019	137	498	534	51	59	1,280
2020	2,652	538	724	46	55	4,014
2021	(65)	1,250	1,324	51	92	2,652
2022	0	1,003	1,370	44	80	2,496
2023	0	776	1,190	29	6	2,002
2024	0	482	1,297	46	0	1,824
2025	0	227	1,290	(17)	0	1,500
2026	0	12	1,276	(1)	0	1,288
2027	0	0	1,214	1	0	1,215
2028	0	0	805	(16)	0	789
2029	0	0	825	(9)	0	816
2030	0	0	795	1	0	797

Projections reflect only SOMA rollovers at auction of principal payments of Treasury securities. No adjustments are made for open-market outright purchases and subsequent rollovers.

*Privately-held marketable borrowing excludes rollovers (auction "add-ons") of Treasury securities held in the Federal Reserve's System Open Market Account (SOMA) but includes financing required due to SOMA redemptions.

Bills										
Issue	Settle Date	Stop Out Rate (%)*	Bid-to-Cover Ratio*	Competitive Awards ($bn)	% Primary Dealer*	% Direct*	% Indirect*	Non-Competitive Awards ($bn)	SOMA "Add Ons" ($bn)	10-Year Equivalent ($bn)**
4-Week	10/6/2020	0.085	3.33	28.6	51.1	10.3	38.6	1.4	2.9	0.3
4-Week	10/13/2020	0.090	3.34	28.7	70.5	6.3	23.2	1.3	2.4	0.3
4-Week	10/20/2020	0.090	3.29	28.6	61.9	6.2	32.0	1.4	2.9	0.3
4-Week	10/27/2020	0.085	3.56	29.0	58.9	16.7	24.3	1.0	2.8	0.3
4-Week	11/3/2020	0.080	3.30	28.1	68.2	6.5	25.2	1.9	2.9	0.3
4-Week	11/10/2020	0.080	3.32	28.5	54.3	4.9	40.8	1.5	2.4	0.3
4-Week	11/17/2020	0.085	3.40	28.9	66.6	8.1	25.2	1.1	2.9	0.3
4-Week	11/24/2020	0.070	3.53	28.5	56.7	6.9	36.5	1.5	2.8	0.3
4-Week	12/1/2020	0.080	3.38	28.6	50.1	6.8	43.2	1.4	2.9	0.3
4-Week	12/8/2020	0.075	3.37	28.5	60.9	7.5	31.6	1.5	2.4	0.3
4-Week	12/15/2020	0.065	3.64	28.6	63.4	7.6	29.0	1.4	2.9	0.3
4-Week	12/22/2020	0.075	3.54	28.5	41.8	11.8	46.4	1.5	2.8	0.3
4-Week	12/29/2020	0.080	3.37	28.6	49.0	9.2	41.8	1.4	2.9	0.3
4-Week	1/5/2021	0.080	3.06	28.1	65.2	6.7	28.1	1.9	2.4	0.3
8-Week	10/6/2020	0.085	3.61	34.0	37.3	1.9	60.8	1.0	3.4	0.6
8-Week	10/13/2020	0.090	3.45	33.9	53.7	1.9	44.5	1.1	2.8	0.6
8-Week	10/20/2020	0.095	3.21	34.3	54.8	3.3	42.0	0.7	3.4	0.6
8-Week	10/27/2020	0.090	3.51	34.3	49.6	10.8	39.6	0.7	3.3	0.6
8-Week	11/3/2020	0.085	3.45	33.8	50.6	4.2	45.1	1.2	3.4	0.6
8-Week	11/10/2020	0.085	3.11	34.5	69.7	6.9	23.4	0.5	2.8	0.6
8-Week	11/17/2020	0.090	3.25	34.5	50.2	7.5	42.3	0.5	3.4	0.6
8-Week	11/24/2020	0.070	3.23	34.6	57.2	7.8	35.0	0.4	3.3	0.6
8-Week	12/1/2020	0.080	3.47	33.8	43.5	1.6	54.8	1.2	3.4	0.6
8-Week	12/8/2020	0.075	3.35	34.4	38.0	2.6	59.4	0.6	2.8	0.6
8-Week	12/15/2020	0.075	3.38	34.6	52.2	6.2	41.6	0.4	3.4	0.6
8-Week	12/22/2020	0.080	3.38	34.5	39.5	7.4	53.1	0.5	3.3	0.6
8-Week	12/29/2020	0.090	3.27	34.2	46.7	4.1	49.2	0.8	3.4	0.6
8-Week	1/5/2021	0.085	2.84	33.8	59.6	4.8	35.6	1.2	2.8	0.6

*Weighted averages of competitive awards.
**Approximated using prices at settlement and includes both competitive and non-competitive awards.

Bills (cont.)										
Issue	Settle Date	Stop Out Rate (%)*	Bid-to-Cover Ratio*	Competitive Awards ($bn)	% Primary Dealer*	% Direct*	% Indirect*	Non-Competitive Awards ($bn)	SOMA "Add Ons" ($bn)	10-Year Equivalent ($bn)**
13-Week	10/8/2020	0.095	2.81	52.5	44.2	5.5	50.3	1.5	8.2	1.6
13-Week	10/15/2020	0.105	2.72	52.7	55.4	6.2	38.4	1.3	5.9	1.6
13-Week	10/22/2020	0.100	3.00	52.8	53.6	5.6	40.8	1.2	6.9	1.6
13-Week	10/29/2020	0.100	2.90	52.3	51.6	8.5	39.8	1.7	4.9	1.6
13-Week	11/5/2020	0.095	2.79	53.0	51.5	6.0	42.5	1.0	8.5	1.7
13-Week	11/12/2020	0.100	2.65	53.0	63.1	5.4	31.6	1.0	5.9	1.6
13-Week	11/19/2020	0.090	3.14	52.9	44.4	4.2	51.3	1.1	7.3	1.6
13-Week	11/27/2020	0.085	2.67	52.4	58.1	10.7	31.2	1.6	4.6	1.5
13-Week	12/3/2020	0.085	2.93	53.0	47.6	6.1	46.3	1.0	7.9	1.6
13-Week	12/10/2020	0.080	3.11	52.8	35.0	12.9	52.1	1.2	4.6	1.5
13-Week	12/17/2020	0.075	2.90	52.9	48.7	7.5	43.8	1.1	5.5	1.6
13-Week	12/24/2020	0.090	2.82	52.8	50.5	6.4	43.1	1.2	2.1	1.5
13-Week	12/31/2020	0.095	2.81	52.5	42.7	4.9	52.3	1.5	9.1	1.7
26-Week	10/8/2020	0.110	2.91	49.8	47.1	2.9	49.9	1.2	7.7	3.1
26-Week	10/15/2020	0.115	3.02	50.2	38.5	2.2	59.3	0.8	5.6	3.0
26-Week	10/22/2020	0.115	3.04	50.1	38.6	6.5	54.9	0.9	6.5	3.0
26-Week	10/29/2020	0.110	3.49	49.5	35.8	5.8	58.4	1.5	4.6	2.9
26-Week	11/5/2020	0.110	2.98	50.4	47.2	4.9	47.9	0.6	8.1	3.1
26-Week	11/12/2020	0.110	2.98	50.3	43.4	4.0	52.6	0.7	5.5	3.0
26-Week	11/19/2020	0.100	3.18	50.2	51.5	3.5	44.9	0.8	6.9	3.0
26-Week	11/27/2020	0.090	3.57	49.6	39.1	10.4	50.5	1.5	4.3	2.9
26-Week	12/3/2020	0.090	3.20	50.4	41.4	2.3	56.3	0.6	7.5	3.1
26-Week	12/10/2020	0.090	3.32	50.3	30.4	8.3	61.3	0.7	4.4	2.9
26-Week	12/17/2020	0.085	3.16	50.2	48.5	5.3	46.2	0.8	5.2	3.0
26-Week	12/24/2020	0.090	3.15	50.4	36.1	2.8	61.2	0.6	2.0	2.8
26-Week	12/31/2020	0.100	3.10	49.6	35.8	4.0	60.2	1.4	8.6	3.2
52-Week	10/8/2020	0.140	3.15	33.8	56.2	2.7	41.1	0.2	5.2	4.1
52-Week	11/5/2020	0.135	3.54	33.8	58.5	3.0	38.5	0.2	5.4	4.2
52-Week	12/3/2020	0.110	3.73	33.7	48.3	2.7	49.1	0.3	5.0	4.1
52-Week	12/31/2020	0.110	3.21	33.8	58.4	11.8	29.9	0.2	5.7	4.2

*Weighted averages of competitive awards.
**Approximated using prices at settlement and includes both competitive and non-competitive awards.

Bills (cont.)										
Issue	Settle Date	Stop Out Rate (%)*	Bid-to-Cover Ratio*	Competitive Awards ($bn)	% Primary Dealer*	% Direct*	% Indirect*	Non-Competitive Awards ($bn)	SOMA "Add Ons" ($bn)	10-Year Equivalent ($bn)**
6-Week	10/8/2020	0.090	3.30	30.0	41.3	14.8	43.8	0.0	0.0	0.4
6-Week	10/15/2020	0.095	3.43	30.0	55.4	12.9	31.7	0.0	0.0	0.4
6-Week	10/22/2020	0.090	3.67	30.0	40.5	5.2	54.3	0.0	0.0	0.4
6-Week	10/29/2020	0.080	3.44	30.0	50.4	9.4	40.2	0.0	0.0	0.4
6-Week	11/5/2020	0.085	3.21	30.0	58.0	8.9	33.0	0.0	0.0	0.4
6-Week	11/12/2020	0.095	3.31	30.0	50.9	8.9	40.2	0.0	0.0	0.4
6-Week	11/19/2020	0.095	3.76	30.0	53.6	7.6	38.9	0.0	0.0	0.4
6-Week	11/27/2020	0.075	3.15	30.0	70.2	8.5	21.3	0.0	0.0	0.4
6-Week	12/3/2020	0.080	3.34	30.0	66.9	7.6	25.5	0.0	0.0	0.4
6-Week	12/10/2020	0.070	3.81	30.0	48.9	6.6	44.5	0.0	0.0	0.4
6-Week	12/17/2020	0.075	3.21	30.0	56.2	11.5	32.4	0.0	0.0	0.4
6-Week	12/24/2020	0.080	3.38	30.0	55.6	8.2	36.1	0.0	0.0	0.4
6-Week	12/31/2020	0.085	3.66	30.0	46.3	2.5	51.2	0.0	0.0	0.4
15-Week	10/13/2020	0.100	3.45	25.0	59.8	2.6	37.6	0.0	0.0	0.8
15-Week	10/20/2020	0.105	3.52	25.0	55.9	3.0	41.1	0.0	0.0	0.8
15-Week	10/27/2020	0.100	3.84	25.0	57.9	9.6	32.5	0.0	0.0	0.8
15-Week	11/3/2020	0.095	4.08	25.0	37.2	9.5	53.2	0.0	0.0	0.8
15-Week	11/10/2020	0.100	3.36	25.0	62.8	6.0	31.2	0.0	0.0	0.8
15-Week	11/17/2020	0.095	3.78	25.0	55.3	5.2	39.5	0.0	0.0	0.8
15-Week	11/24/2020	0.090	3.90	25.0	54.8	8.8	36.3	0.0	0.0	0.8
15-Week	12/1/2020	0.085	4.35	25.0	38.0	3.3	58.7	0.0	0.0	0.8
15-Week	12/8/2020	0.085	3.94	25.0	47.2	4.5	48.3	0.0	0.0	0.8
15-Week	12/15/2020	0.085	3.70	25.0	57.1	6.0	36.9	0.0	0.0	0.8
15-Week	12/22/2020	0.085	3.82	25.0	43.2	2.9	54.0	0.0	0.0	0.8
15-Week	12/29/2020	0.090	3.62	25.0	41.3	9.6	49.1	0.0	0.0	0.8
15-Week	1/5/2021	0.090	3.55	25.0	56.1	4.6	39.3	0.0	0.0	0.8

*Weighted averages of competitive awards.
**Approximated using prices at settlement and includes both competitive and non-competitive awards.

Bills (cont.)										
Issue	Settle Date	Stop Out Rate (%)*	Bid-to-Cover Ratio*	Competitive Awards ($bn)	% Primary Dealer*	% Direct*	% Indirect*	Non-Competitive Awards ($bn)	SOMA "Add Ons" ($bn)	10-Year Equivalent ($bn)**
17-Week	10/8/2020	0.105	3.13	30.0	67.3	4.6	28.1	0.0	0.0	1.0
17-Week	10/15/2020	0.110	3.36	30.0	47.3	2.2	50.5	0.0	0.0	1.0
17-Week	10/22/2020	0.105	3.54	30.0	57.6	2.5	39.9	0.0	0.0	1.0
17-Week	10/29/2020	0.100	3.26	30.0	74.2	4.9	20.9	0.0	0.0	1.0
17-Week	11/5/2020	0.105	3.20	30.0	70.7	4.6	24.8	0.0	0.0	1.0
17-Week	11/12/2020	0.100	3.77	30.0	52.0	5.1	42.9	0.0	0.0	1.0
17-Week	11/19/2020	0.095	3.82	30.0	58.2	9.1	32.7	0.0	0.0	1.0
17-Week	11/27/2020	0.090	3.48	30.0	54.9	3.5	41.6	0.0	0.0	1.0
17-Week	12/3/2020	0.090	3.57	30.0	65.3	2.9	31.9	0.0	0.0	1.0
17-Week	12/10/2020	0.080	3.58	30.0	52.4	9.9	37.7	0.0	0.0	1.0
17-Week	12/17/2020	0.085	3.47	30.0	56.3	7.8	35.9	0.0	0.0	1.0
17-Week	12/24/2020	0.090	3.42	30.0	53.5	5.4	41.1	0.0	0.0	1.0
17-Week	12/31/2020	0.095	3.73	30.0	39.6	2.2	58.2	0.0	0.0	1.0
22-Week	10/13/2020	0.110	3.17	30.0	58.8	2.0	39.2	0.0	0.0	1.3
22-Week	10/20/2020	0.120	3.25	30.0	52.1	2.4	45.5	0.0	0.0	1.3
22-Week	10/27/2020	0.115	3.61	30.0	46.1	13.5	40.3	0.0	0.0	1.3
22-Week	11/3/2020	0.105	3.23	30.0	56.8	2.4	40.7	0.0	0.0	1.3
22-Week	11/10/2020	0.105	3.55	30.0	58.1	4.3	37.7	0.0	0.0	1.3
22-Week	11/17/2020	0.100	3.38	30.0	59.3	4.1	36.6	0.0	0.0	1.4
22-Week	11/24/2020	0.090	3.47	30.0	64.1	10.3	25.6	0.0	0.0	1.3
22-Week	12/1/2020	0.090	3.65	30.0	40.5	3.0	56.5	0.0	0.0	1.3
22-Week	12/8/2020	0.090	3.84	30.0	43.7	2.2	54.1	0.0	0.0	1.3
22-Week	12/15/2020	0.090	3.51	30.0	56.5	5.9	37.7	0.0	0.0	1.3
22-Week	12/22/2020	0.090	3.28	30.0	63.1	6.9	30.0	0.0	0.0	1.3
22-Week	12/29/2020	0.095	3.48	30.0	42.0	5.5	52.5	0.0	0.0	1.3
22-Week	1/5/2021	0.090	3.52	30.0	61.6	4.9	33.4	0.0	0.0	1.4

*Weighted averages of competitive awards.
**Approximated using prices at settlement and includes both competitive and non-competitive awards.

Nominal Coupons										
Issue	Settle Date	Stop Out Rate (%)*	Bid-to-Cover Ratio*	Competitive Awards ($bn)	% Primary Dealer*	% Direct*	% Indirect*	Non-Competitive Awards ($bn)	SOMA "Add Ons" ($bn)	10-Year Equivalent ($bn)**
2-Year	11/2/2020	0.151	2.41	53.9	32.0	15.6	52.4	0.1	5.7	12.6
2-Year	11/30/2020	0.165	2.71	55.9	38.3	15.7	46.0	0.1	7.8	13.4
2-Year	12/31/2020	0.137	2.45	57.9	33.3	17.5	49.2	0.1	8.8	14.1
3-Year	10/15/2020	0.193	2.44	52.0	31.7	12.6	55.7	0.0	1.5	16.8
3-Year	11/16/2020	0.250	2.40	53.9	46.8	14.3	38.9	0.1	14.8	21.8
3-Year	12/15/2020	0.211	2.28	55.9	34.9	15.9	49.3	0.1	2.4	18.4
5-Year	11/2/2020	0.330	2.38	55.0	24.1	14.0	61.9	0.0	5.8	31.8
5-Year	11/30/2020	0.397	2.38	57.0	29.2	14.3	56.5	0.0	7.9	33.7
5-Year	12/31/2020	0.394	2.39	59.0	24.9	18.0	57.1	0.0	9.0	35.7
7-Year	11/2/2020	0.600	2.24	53.0	24.9	14.3	60.9	0.0	5.6	42.5
7-Year	11/30/2020	0.653	2.37	56.0	19.5	15.1	65.4	0.0	7.8	45.8
7-Year	12/31/2020	0.662	2.31	59.0	22.7	17.0	60.3	0.0	9.0	49.3
10-Year	10/15/2020	0.765	2.47	35.0	22.9	14.2	62.9	0.0	1.0	35.9
10-Year	11/16/2020	0.960	2.32	41.0	32.0	13.1	54.8	0.0	11.2	52.9
10-Year	12/15/2020	0.951	2.33	38.0	23.0	14.7	62.3	0.0	1.6	39.5
20-Year	11/2/2020	1.370	2.43	22.0	21.5	15.6	62.9	0.0	2.3	45.1
20-Year	11/30/2020	1.422	2.27	27.0	23.5	15.3	61.2	0.0	3.7	56.0
20-Year	12/31/2020	1.470	2.39	24.0	26.0	17.7	56.3	0.0	3.7	50.5
30-Year	10/15/2020	1.578	2.29	23.0	23.0	15.0	62.0	0.0	0.6	60.0
30-Year	11/16/2020	1.680	2.29	27.0	21.6	16.5	61.9	0.0	7.4	86.2
30-Year	12/15/2020	1.665	2.48	24.0	17.4	16.8	65.9	0.0	1.0	62.1
2-Year FRN	11/2/2020	0.055	3.22	26.0	42.1	0.3	57.6	0.0	2.8	0.0
2-Year FRN	11/27/2020	0.053	2.90	24.0	47.1	5.4	47.5	0.0	0.0	0.0
2-Year FRN	12/28/2020	0.060	2.83	24.0	49.1	2.0	48.9	0.0	0.0	0.0

TIPS										
Issue	Settle Date	Stop Out Rate (%)*	Bid-to-Cover Ratio*	Competitive Awards ($bn)	% Primary Dealer*	% Direct*	% Indirect*	Non-Competitive Awards ($bn)	SOMA "Add Ons" ($bn)	10-Year Equivalent ($bn)**
5-Year TIPS	10/30/2020	(1.320)	2.66	17.0	16.7	20.5	62.8	0.0	0.0	8.9
5-Year TIPS	12/31/2020	(1.575)	2.86	15.0	27.1	8.7	64.2	0.0	2.3	8.8
10-Year TIPS	11/30/2020	(0.867)	2.71	12.0	14.1	16.5	69.3	0.0	1.7	13.8

*Weighted averages of competitive awards. FRNs are reported on discount margin basis.
**Approximated using prices at settlement and includes both competitive and non-competitive awards.
For TIPS 10-Year equivalent, a constant auction BEI is used as the inflation assumption.

Treasury Borrowing Advisory Committee

Charge: What are the implications of the current abundant reserve environment for Treasury issuance? Are there significant differences between the current abundant reserve environment compared to previous periods of abundant reserves that Treasury should consider? How does an abundant reserve environment affect private demand for Treasuries at different maturities?

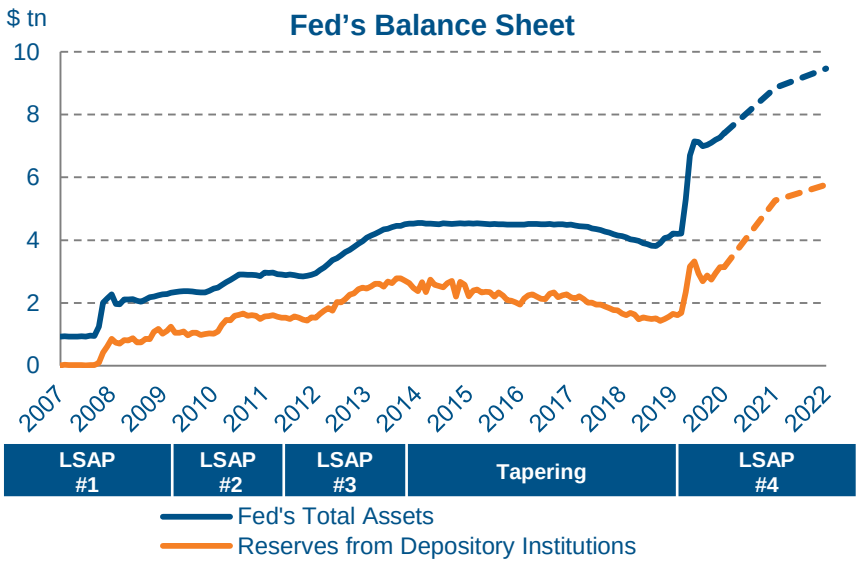
February 2, 2021

Executive Summary

- Large scale asset purchases (LSAPs) by the Fed, and in turn reserve creation, have contributed to a favorable backdrop for Treasury issuance
- Reserves are projected to increase sharply in 2021 driven by the continuation of the LSAPs and reduction in the Treasury General Account (TGA) balance
- Reserve creation leads to deposit growth in the banking system which, in turn, leads to increased bank demand for Treasuries
- The current period of reserve creation is resulting in a build-up of excess liquidity on bank balance sheets; it also coincides with a period of historically low yields and credit spreads
- We project sharp increases in bank securities purchases with a significant portion in short to intermediate Treasuries
- Reserve growth should also be supportive of non-bank private sector demand for Treasuries
- Notably, continued growth in reserves is likely to bolster money market fund balances and lead to increased demand for T-bills
- However, continued growth in reserves negatively impacts Tier 1 Leverage, SLR, and GSIB surcharge calculations and could constrain bank balance sheet capacity for repo and Treasury inventory

Reserve balances at the Fed are set to increase sharply over the next two years

- Continued asset purchases by the Fed will lead to significant additional growth in reserve balances
- The Treasury General Account (TGA) is likely to decline from its current elevated level and will result in an increase in reserve balances
- Historically the TGA balance has been much smaller and we assume that it reverts to $800 bn by the end of 2021 as suggested by previous Treasury borrowing estimate announcements
- LSAPs are projected to continue at current pace in 2021 before tapering in 2022
- Finally, we assume currency grows at the rate of nominal GDP in 2021 and 2022
- **In the median scenario, we project reserve balances to increase by over $2.1 tn in 2021 and by about $500 bn in 2022**



Projected Federal Reserve Balance Sheet

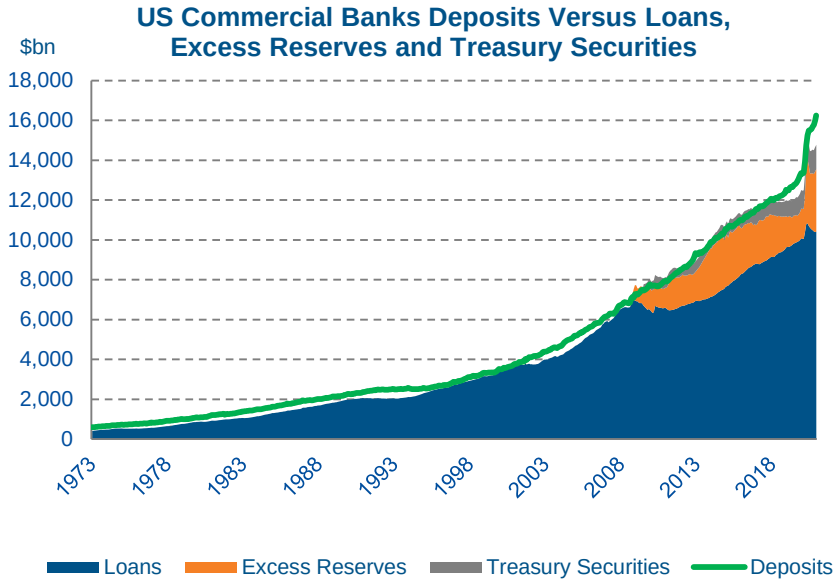
			Year-over-Year Change					
	Actual Levels		Median		25th Percentile		75th Percentile	
$bn	2019	2020	2021	2022	2021	2022	2021	2022
Total Assets	**4,214**	**7,411**	**1,441**	**618**	**1,191**	**203**	**1,442**	**925**
Treasury	2,329	4,689	960	465	823	180	960	623
MBS	1,420	2,039	481	153	368	23	482	302
Other	465	683						
Total Liabilities	**4,214**	**7,411**	**1,441**	**618**	**1,191**	**203**	**1,442**	**925**
Currency	1,802	2,087	129	122	129	122	129	122
TGA	352	1,614	(814)		-814		(814)	
Other	411	568						
Reserve Balance	1,648	3,143	2,125	496	1,875	81	2,126	803

Asset Growth: Based on Federal Reserve Bank of New York's Survey of Primary Dealers
TGA: Shrinks to $800bn per Treasury guidance
Currency growth: Follows Bloomberg Economist Survey Nominal GDP growth of 6.2% in 2021 and 5.5% in 2022

Sources: Federal Reserve (H.4.1), Federal Reserve Bank of New York's Survey of Primary Dealers, Bloomberg Economist Survey (top chart and bottom table)

Reserve creation by the Fed has contributed to a significant increase in deposits in the banking system

- Large scale asset purchases (LSAPs) by the Fed are funded by creating reserves
- When the Fed purchases a security from a non-bank private sector entity it results in the creation of a bank deposit
- When banks make loans or purchase Treasuries it also results in the creation of bank deposits; deploying reserves into loans or Treasuries has a multiplier effect on deposit creation
- Past periods of reserve creation have resulted in large increases in bank deposits
- Until 2007, deposits in the banking system had increased in line with loans. Since the inception of LSAPs, deposit growth has consistently and significantly outpaced the rate of loan growth
- Furthermore, these deposits in recent years have tended to be sticky and have largely stayed in the banking system
- In the median scenario, **we project about $2.6 tn of increases in deposits in the US banking system**



Projected Reserve Increases Lead to Deposit Growth

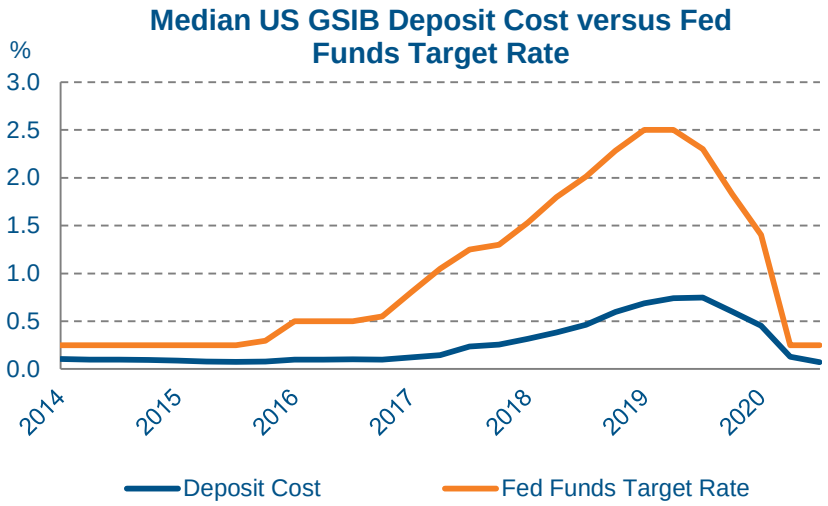
			Year-over-Year Change					
	Actual Levels		Median		25th Percentile		75th Percentile	
$bn	2019	2020	2021	2022	2021	2022	2021	2022
Federal Reserve Balance Sheet								
Reserve Balance	1,648	3,143	2,125	496	1,875	81	2,126	803
US Commercial Bank Balance Sheets								
Deposits	13,350	16,238	2,125	496	1,875	81	2,126	803

* Beta of 1 used. Refer to Appendix for regression analysis supporting relationship

Sources: Federal Reserve (H.3, H.4.1, H.6, H.8) (top chart and bottom table)

Rapid deposit growth in the banking system is likely to create demand for duration

- Bank deposits are liabilities and typically add negative duration to the balance sheet
- Banks typically hedge the duration risk associated with deposits by buying/originating fixed rate assets or via the use of derivatives
- Deposits created in a period of increasing reserves tend to be large institutional deposits ("non-core"); these deposits tend to exhibit higher run-off rates and greater re-pricing sensitivity to rate changes than traditional retail deposits and hence have a shorter duration
- There are significant differences in modeled duration for different deposit cohorts; traditional retail deposits durations range from 3 to 7-years while "non-core" deposit durations are about 2-years
- Estimates of deposit duration vary significantly across banking institutions and therefore we estimate demand under different duration assumptions
- **Using a 2-year duration estimate, we project demand of $1.3 to $2.0 tn in 3-year equivalents**



Projected 3-year Equivalents Demand ($bn)

Deposit Duration	Median (2021 & 2022)	25th Percentile (2021 & 2022)	75th Percentile (2021 & 2022)
1 years	880	656	983
2 years	1,759	1,313	1,965
3 years	2,639	1,969	2,948

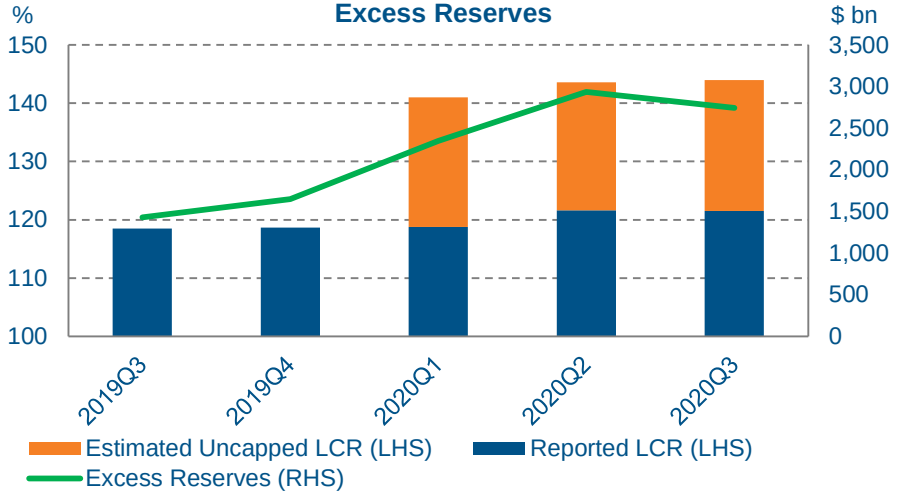
* 3-year duration = 2.98

Sources: SNL and Bloomberg (top chart). US GSIBs include BAC, BK, C, GS, JPM, MS, STT, WFC

Key differences in this current abundant reserve period relative to prior periods

- During past LSAPs, banks were in the process of building HQLA to comply with new liquidity regulations; higher reserves at the Fed played a significant part in banks' ability to meet these requirements
- The current period of reserve creation is resulting in a build-up of excess liquidity providing banks flexibility to deploy the cash reserves into higher yielding assets
- The total amount of excess liquidity is understated in reported holding company LCR due to transferability rules between holding company and bank subsidiaries which caps the LCR benefit of excess liquidity held at the bank
- We estimate that bank HQLA has grown $1.2 tn since 2019Q3 which equates to an "uncapped" LCR of 144% highlighting the amount of liquidity available to banks
- The current period of reserve creation coincides with historically low term and credit risk premiums

Reported and Estimated Uncapped LCR* versus Excess Reserves



* Uncapped LCR is estimated by adding the quarterly change in estimated bank HQLA from call reports to the 2019Q3 BHC Reported HQLA divided by the BHC Reported NCOs. More details can be found in the Appendix

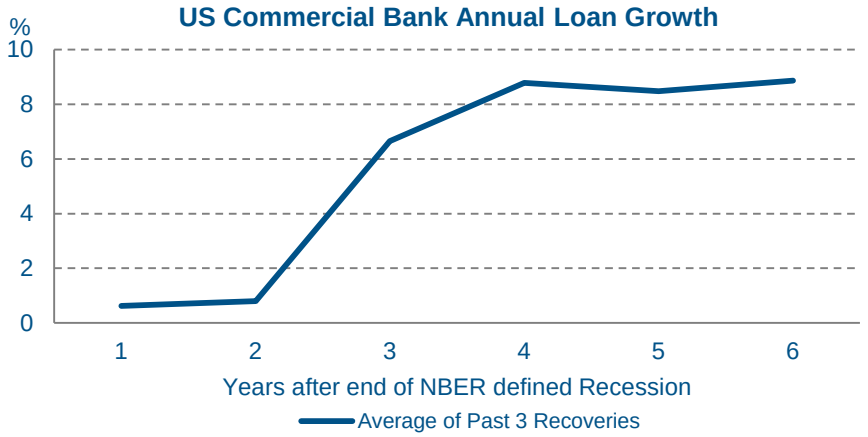
Average Term Premium and JULI Spread in Reserve Periods

	10Y ACM Term Premium (%)	JULI Spread to Treasury (bps)
9/30/2008 – 12/31/2011	2.21	255
1/31/2012 – 8/31/2014	1.14	163
10/31/2019 – 12/31/2020	(0.66)	175

Sources: Bank LCR Disclosures and SNL (top chart), Bloomberg and JP Morgan (bottom table)

Tepid loan growth and asset sensitive balance sheets will likely require banks increase securities portfolios

- Loan growth has historically been slow in the first couple of years of an economic recovery
- We expect loan growth to be tepid in 2021 and loan balances to increase only modestly
- Slow loan growth would further support bank demand for securities given the lack of investment opportunities and amount of excess liquidity
- Record low interest rates combined with strong deposit growth has resulted in bank balance sheets becoming very asset sensitive and creating demand for duration
- Banks have historically owned Treasuries in the short-to-intermediate part of the curve; aggregated US GSIB Treasury holdings show that over 75% have a maturity of less than 5 years



US GSIB Weighted Average NII Sensitivity: % Change over the Next 12 Months

	2020Q3	2017Q4	2007Q4	2006Q4	2005Q4
Instantaneous +100 bps	13.4	5.7	-1.7	-2.8	-0.8
Gradual +100 bps	12.2	3.3	-1.0	-1.2	-0.4
Gradual +200 bps	16.1	2.9	3.6	NA	NA

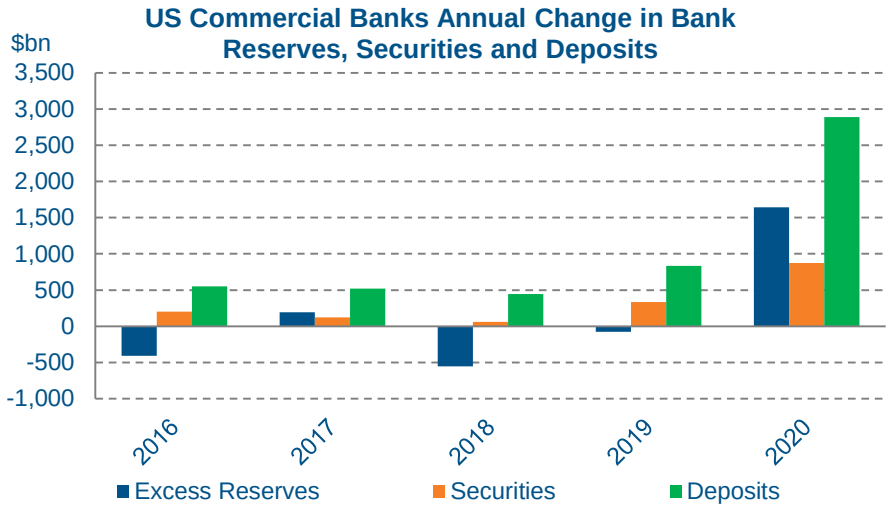
US GSIB Holdings of US Treasury & Government Agencies: Contractual Maturity Distribution (% of Carrying Value)

As of: 9/30/2020	<= 1 Year	>1 Year; <= 5 Years	>5 Years; <= 10 Years	> 10 Years	Estimated WAL (years)
Estimated Total WAL (years)	0.5	3.0	7.5	12.0	3.6
Total (%)	21.9	55.6	19.5	3.1	100.0
Total ($bn)	155.4	394.7	138.6	21.7	710.3

Sources: Federal Reserve (H.8) and National Bureau of Economic Research (top chart), US GSIB 10Ks/10Qs (tables)

We expect banks to increase securities purchases in 2021 which could be an important source of demand for Treasuries

- Banks have accelerated the pace at which they added securities in 2020, but cash reserves are still at record levels and expected to grow sharply in 2021 and 2022
- We expect steady growth in banks' securities portfolios with accelerated purchases if rates rise
- Overall, we project incremental bank demand for fixed income assets to increase by about $1.8 tn over the next two years
- Given historically tight credit spreads, we expect private label securities to remain a small portion of these securities purchases
- With low term premiums and yield levels, and given banks' preferred habitat, **we expect most of the incremental bank demand for duration to materialize in short and intermediate Treasuries**
- Balance sheet flexibility may also provide increased demand for short-dated Treasuries and Treasury asset swaps which will help keep swap spreads stable despite significant expected increases in net issuance



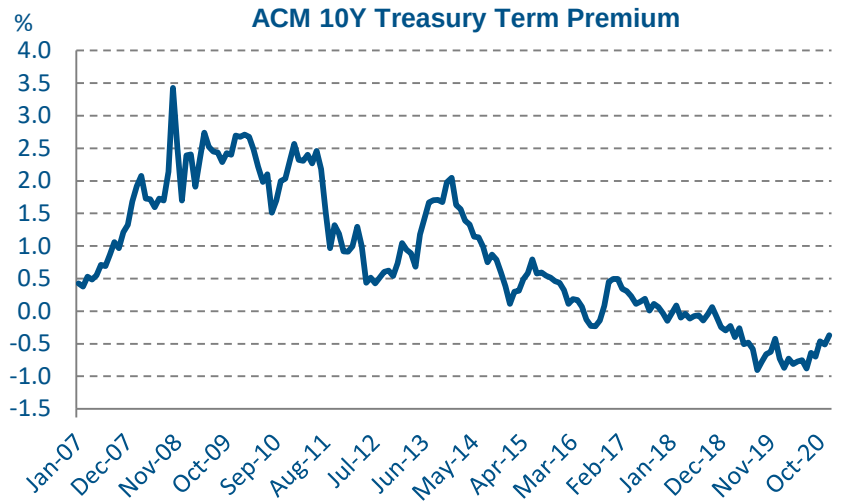
Bank HQLA/Securities Matrix

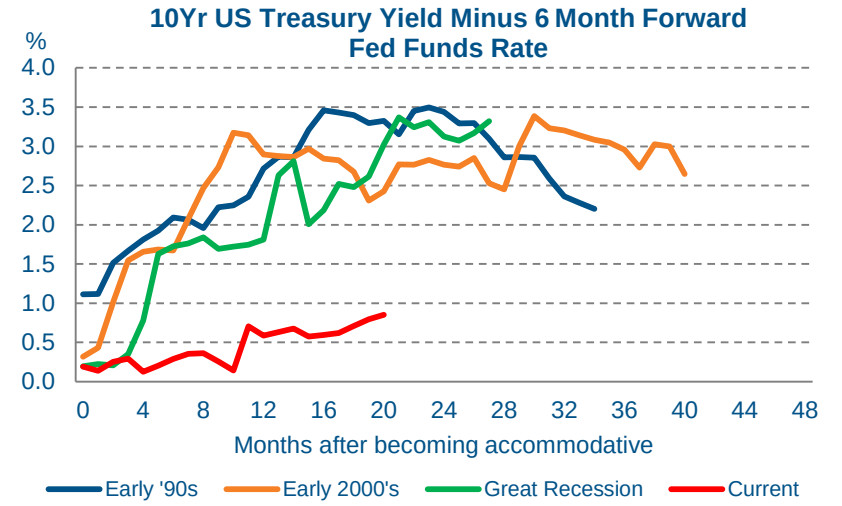
Asset Type	Liquidity/ HQLA	Duration	Yield/Income
Central Bank Balances	Highest	Zero	Low
T-bills/Reverse Repos	Very High	Very Low	Low
Treasury asset swaps	High	Zero	Low/Medium
T-notes	High	Low/Medium/High	Low/Medium
Agency MBS	High	Medium	Medium
Private Label	Low	Medium	Medium

Sources: Federal Reserve (H.3, H.6, H.8) (top chart)

Reserve growth is also consistent with increased non-bank private demand

- Non-bank private demand for Treasuries is affected by LSAPs, which are the mechanism that drives reserve creation. Money manager portfolios are liquefied by selling Treasury holdings to the Fed, and they may seek to redeploy those available funds into Treasuries or other fixed income sectors
- While multi-asset managers can reallocate LSAP proceeds to a wider range of assets, government bond portfolio managers, including passive index funds, will likely reinvest across the Treasury curve due to their investment criteria
- This persistent demand, and the increased interest in purchasing Treasuries if yields move higher, could be contributing to the low level of the term premium. The term premium often increases during a recession and early into an economic recovery, but it has remained well below historical norms despite heavy increases in the issuance calendar
- **The abundant reserves environment may be helping to keep term premiums low despite heavy issuance**

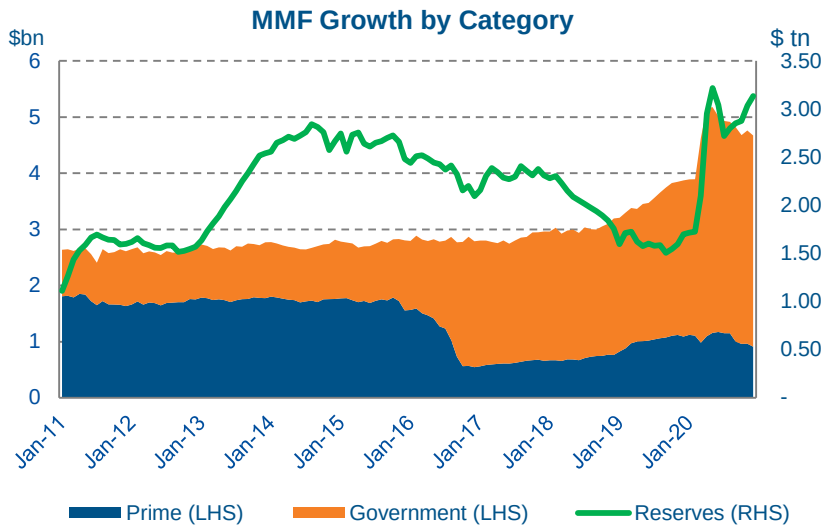


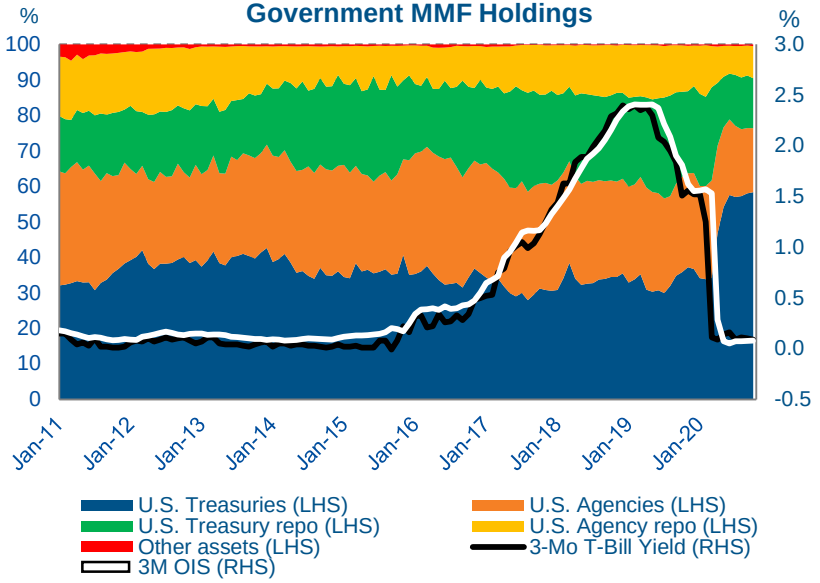


Sources: Federal Reserve Bank of New York (top chart), Bloomberg, JP Morgan, Federal Reserve Bank of New York (bottom chart). Policy is defined as accommodative when the 6M Forward Fed Funds Rate minus Core PCE Inflation is less than the Laubach-Williams One-sided Estimate of the Natural Rate of Interest

A rising reserve environment bolsters growth in money market funds, leading to increased T-bill demand

- In a period of rapid reserve growth, some of the banking system liquidity is likely to migrate to money market fund (MMF) balances as depositors / cash managers diversify their short-term liquidity portfolios
- Money market fund investments must remain on the short end of the curve, and in recent years most of the asset growth has come in T-bills
- Government and Prime MMF's allocation to T-bills has increased to more than 50%. MMFs now own ~40% of T-bills outstanding, up from 15% a few years ago
- Increased flows to MMFs and their increased allocation to T-bills has driven T-bill yields lower
- Potential negative T-bill yields driven by an increase in demand could create challenges for MMFs from a business model perspective

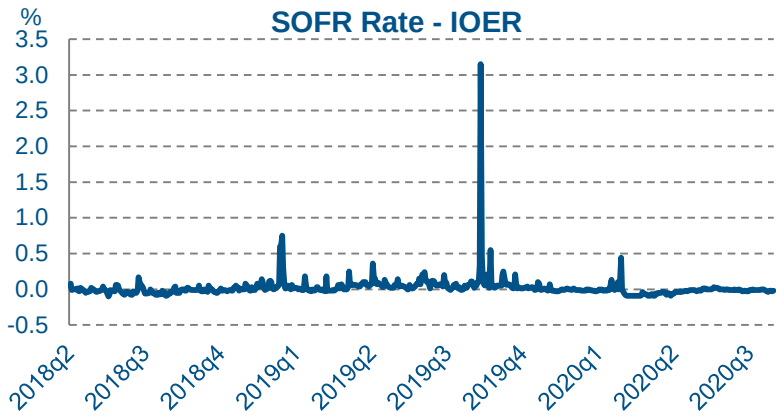


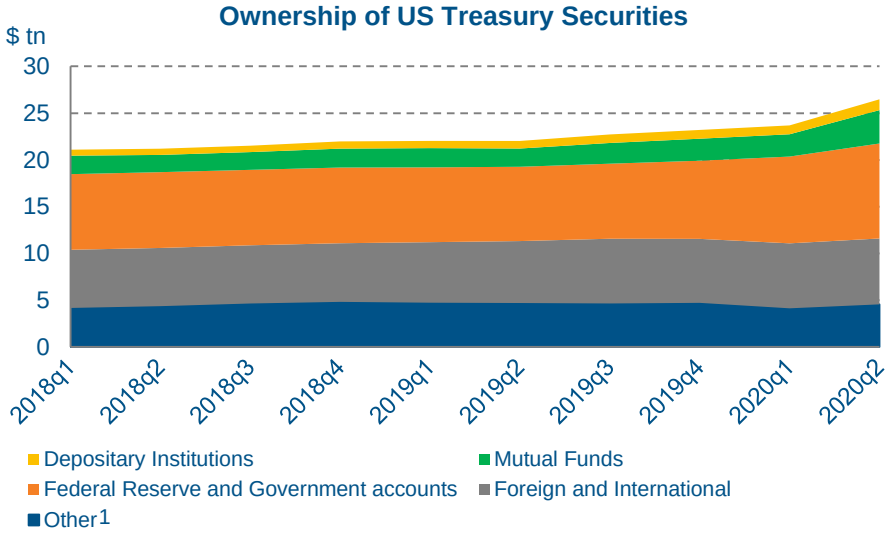


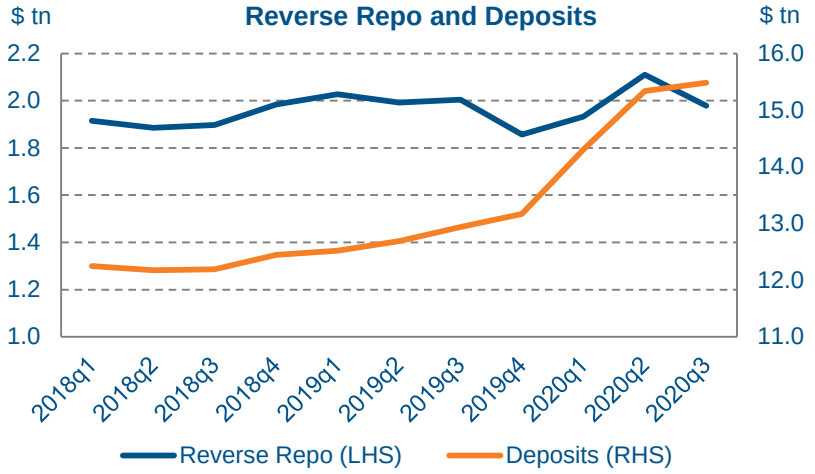
Sources: Office of Financial Research and Factors Affecting Reserve Balances - H.4.1 (left chart), Federal Reserve Money Market Funds: Investment Holdings Detail and Bloomberg (right chart)

Abundant reserves and deposits support repo financing of growing Treasury supply, given current bank balance sheet capacity

- Current deposit and repo market capacity reliably supports financing needs across US Treasury ownership sectors
- Short-term disruption in repo market was initially supported by the Federal Reserve's 3/12/20 announcement of asset purchases and term repo operations to address temporary market disruptions. The subsequent LSAPs ultimately increased bank liquidity creating capacity for repo and Treasury purchases



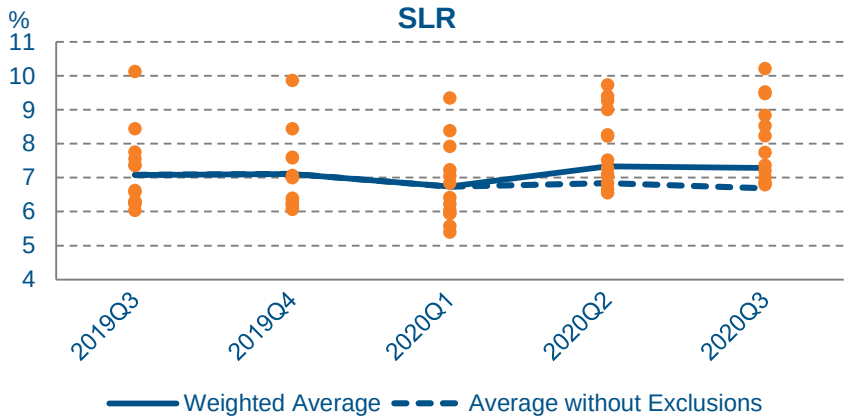




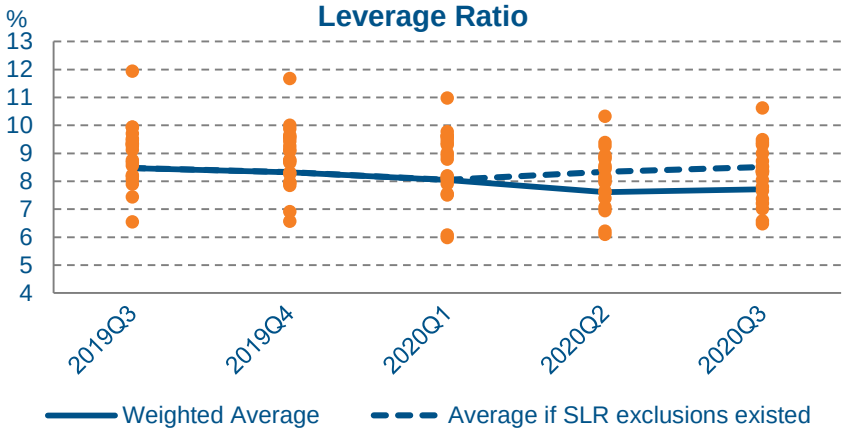
1) Other Includes individuals, GSE, brokers and dealers, bank personal trusts and estates, businesses, pension funds, insurance companies, US saving bonds, state and local governments and other investors.
Sources: Bloomberg (top right), Federal Reserve Bank of New York, Research and Statistics Group, "Quarterly Trends for Consolidated U.S. Banking Organizations" (bottom right). Treasury Bulletin (bottom left)

Increased reserves are putting pressure on bank capital ratios which could reduce capacity for deposits and repos in the future

- Temporary exclusion of US Treasuries and deposits at Federal Reserve Banks from SLR calculations is scheduled to expire on March 31st
- Without this, SLR ratios are expected to drop by ~ 60 bps in Q3 2020 despite capital growth from curtailment of buybacks



- Excluding US Treasuries and deposits at Federal Reserve Banks would have improved the Leverage ratio by approx. ~ 80 bps in Q3 2020



- **G-SIB Surcharge impact driven by reserve and related deposit growth**

G-SIB Bank	Q3 2020	Potential to increase in 2022
JP Morgan Chase	3.50%	✓
Citigroup	3.00%	✓
BNY Mellon	1.50%	✓
Morgan Stanley	3.00%	×
Goldman Sachs	2.50%	✓
Bank of America	2.50%	✓
Wells Fargo	2.00%	×
State Street	1.00%	✓

- Reserves were significantly lower when capital rules and surcharges were calibrated.
- If SLR, Tier 1 Leverage, and CET1 capital ratio requirements become binding driven by reserve growth, banks will be required to issue debt and/or retain higher equity to maintain regulatory compliance.
- As a result, balance sheet availability for deposit growth and repo financing becomes increasingly expensive
- We expect these costs would be passed on to depositors and repo counterparts

Sources: SNL- sample includes 5 largest Money Centers, 3 largest Custody Banks and 12 Regional Banks (top right and left charts), Barclays Research (bottom left table)

Conclusions

- Reserve balances at the Fed, which are already historically high, are likely to grow sharply over the next two years
- The abundant reserves contribute to a favorable environment to absorb Treasury issuance
- Reserve creation is likely to drive strong bank demand for Treasuries
- We expect most of the bank demand to materialize in the short and intermediate part of the curve
- Abundant reserve balances have led to growth in money market funds and in turn increased demand for T-bills
- A sharp reduction in TGA balances accompanied by a reduction in T-bill issuance may result in lower T-bill yields
- Continued growth in reserves may constrain bank balance sheet capacity as leverage and capital ratios approach regulatory minima

Appendix

Bank guidance and commentary indicates caution on incremental investment risk

- In the Sep 2020, Senior Financial Officer Survey[1], which aggregates responses of 80 banks representing 75% of total reserve balances. Referring to the elevated levels of reserves during Q2 2020, Bank officials noted:
  - Banks hold high reserve balances to be prepared for potential drawdowns on committed credit lines or a desire to conduct asset/liability matching, given a large inflow of deposits with potentially high runoff rates or both
  - Second most important driver of reserve accumulation is a lack of attractive alternative investment opportunities
  - Domestic survey respondents expect a decrease in their reserve levels relative to August 2020 citing: Concerns over Net Interest Margin, increase in the expected return on alternative HQLA vs IOER
  - Actions cited to reduce reserves: On the asset side, increase securities portfolio, both non-HQLA and HQLA. On the liabilities side, allow wholesale funding to mature without replacing it.

- During Q4 2020 Earnings[2] Bank executives commented on how they expect to deploy liquidity:
  - Referring to excess liquidity, JP Morgan said “the theme is we're being opportunistic but patient […] And as we think about managing the balance sheet, it's not just about NII. Of course, it's about capital. And so, there is risk in adding duration at these levels in a further sell-off. So, we're being very patient.”
  - Citigroup said “We intend to continue to grow as it relates to increasing those deposits. And we've been smart about how we've been managing our liquidity, keeping some liquidity obviously there for lending needs [..] but also paying down wholesale debt. We did that through the year and also investing”
  - State Street said “We will be opportunistic from here, regarding the deployment of cash and the expansion of our investment portfolio, but we also need to be mindful of currently tight credit spreads and the potential for OCI risk from interest rate changes”
  - Bank of America said “the balance sheet expanded $81 billion versus Q3 to $2.8 trillion in total assets. The main point is that deposits are driving and funding substantially all of this growth. Deposits grew $93 billion in the quarter and are up $361 billion from Q4 '19. On the other hand, loans declined from Q3, with deposits up loans down excess liquidity is piling up in our cash and securities portfolios”

1) https://www.federalreserve.gov/data/sfos/files/senior-financial-officer-survey-202009.pdf
2) Transcripts sourced from Bloomberg

Balance Sheet of Commercial Banks in the United States

Federal Reserve Balance Sheet ($bn)	2000	2005	2007	2009	2012	2014	2017	2018	2019	2020	13yr chg	1yr chg
Excess Reserves	**1**	**2**	**2**	**1,075**	**1,459**	**2,524**	**2,121**	**1,568**	**1,491**	**3,135**	**3,133**	**1,644**
Assets and Liabilities of Commercial Banks in the United States ($bn)												
Total Assets	**6,136**	**8,814**	**10,883**	**11,776**	**13,140**	**15,050**	**16,789**	**17,050**	**17,856**	**20,648**	**9,765**	**2,793**
Cash incl. Central Bank Balances	306	336	325	1,233	1,696	2,797	2,407	1,916	1,784	3,228	2,903	1,443
Securities	1,183	1,840	2,090	2,324	2,743	2,944	3,447	3,509	3,842	4,715	2,625	873
Treasury & Agency Securities	790	1,144	1,128	1,448	1,879	2,050	2,535	2,677	3,014	3,750	2,622	736
MBS				1,006	1,347	1,403	1,822	1,878	2,084	2,529	2,529	446
Non-MBS				442	532	647	713	799	930	1,220	1,220	290
Other Securities	393	695	962	876	864	894	912	832	828	965	3	137
Loans	3,710	5,232	6,493	6,482	6,932	7,644	9,150	9,623	10,080	10,417	3,924	338
Other Assets	938	1,406	1,975	1,737	1,769	1,664	1,785	2,002	2,150	2,289	313	138
Total Liabilities	**5,613**	**7,929**	**9,753**	**10,465**	**11,638**	**13,428**	**14,941**	**15,159**	**15,879**	**18,665**	**8,912**	**2,786**
Deposits	3,764	5,625	6,720	7,758	9,335	10,550	12,074	12,517	13,350	16,238	9,517	2,888
Borrowings	1,186	1,635	2,122	1,893	1,535	1,757	2,081	1,946	1,967	1,688	(435)	(279)
Other Liabilities	664	669	910	814	767	1,121	787	697	562	739	(171)	178
Equity	**523**	**884**	**1,130**	**1,311**	**1,502**	**1,621**	**1,848**	**1,890**	**1,977**	**1,984**	**853**	**7**
HQLA Eligible Assets*	1,096	1,480	1,453	2,680	3,575	4,847	4,943	4,593	4,798	6,977	5,524	2,179
Deposits – Loans	54	393	227	1,275	2,403	2,905	2,924	2,894	3,271	5,820	5,593	2,550
Deposits – Loans – Treasury**				833	1,871	2,258	2,211	2,095	2,341	4,600		2,259
Nominal GDP***	10,439	13,332	14,682	14,628	16,359	17,850	19,938	20,910	21,747	21,157	6,476	(590)
Ratios (%)												
Loans/Deposits	98.6%	93.0%	96.6%	83.6%	74.3%	72.5%	75.8%	76.9%	75.5%	64.2%	-32.5%	-11.3%
Cash/Total Assets	5.0%	3.8%	3.0%	10.5%	12.9%	18.6%	14.3%	11.2%	10.0%	15.6%	12.6%	5.6%
Treasury+Agency/Total Assets	12.9%	13.0%	10.4%	12.3%	14.3%	13.6%	15.1%	15.7%	16.9%	18.2%	7.8%	1.3%
Treasury/Total Assets				3.8%	4.0%	4.3%	4.2%	4.7%	5.2%	5.9%	5.9%	0.7%
Treasury+Agency/Total Securities	66.8%	62.2%	54.0%	62.3%	68.5%	69.6%	73.6%	76.3%	78.5%	79.5%	25.6%	1.1%
Treasury/Total Securities				19.0%	19.4%	22.0%	20.7%	22.8%	24.2%	25.9%	25.9%	1.7%

* HQLA Eligible Assets include Cash and Treasury and Agency Securities

** Non-MBS Treasury and Agency Securities used as proxy for Treasury Securities

*** GDP is only updated through 2020Q3

Sources: Federal Reserve (H.3, H.6, H.8)

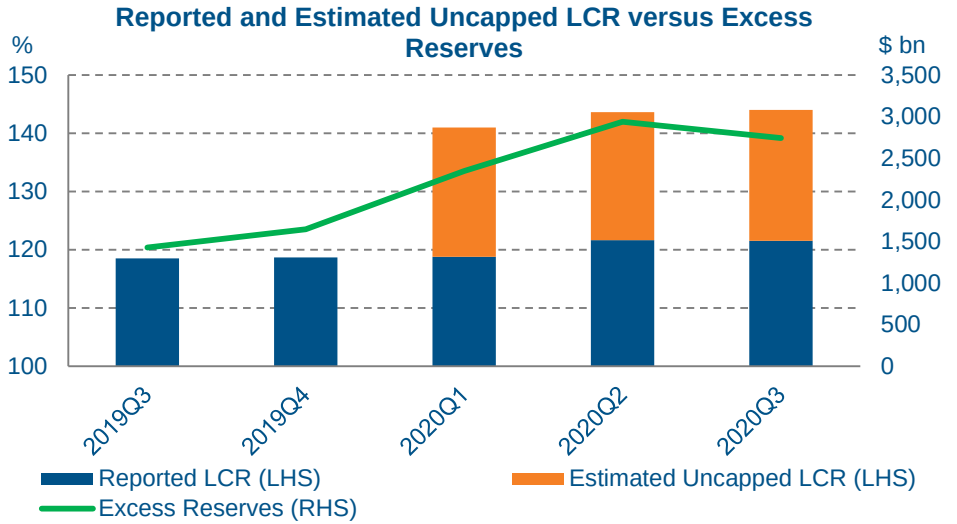
Structural liquidity increased with reserves despite stable reported LCR

- Reported holding company HQLA has increased significantly less than reserves due to transferability rules between holding company and bank subsidiaries
  - Excess liquidity in bank subsidiaries above their standalone LCR requirement are excluded from the holding company HQLA per LCR rules
- This has resulted in a large amount of "capped" liquidity in bank subsidiaries leading to the reported LCR understating the total amount of liquidity
- HQLA eligible assets on bank subsidiary balance sheets are estimated to have grown by $1.2 tn between 2019Q3 and 2020Q3, in line with the growth in reserves
- We estimate that the "uncapped" HQLA has grown in line with bank HQLA eligible assets and reserves. The "uncapped" LCR is estimated at 144% highlighting the total amount of liquidity available to banks

($bn)	2019Q3	2019Q4	2020Q1	2020Q2	2020Q3	Change
Federal Reserves	**1,427**	**1,648**	**2,348**	**2,938**	**2,743**	**1,316**
Reported BHC HQLA	**2,582**	**2,648**	**2,711**	**3,068**	**3,157**	**575**
Reported BHC NCO	2,179	2,231	2,282	2,522	2,598	419
Reported BHC LCR (%)	**118.5**	**118.7**	**118.8**	**121.6**	**121.5**	**3.0**
Reported BHC Liquidity Surplus	403	417	429	546	559	156
Estimated Bank HQLA*	**2,492**	**2,555**	**3,128**	**3,531**	**3,651**	**1,159**
QoQ Change		64	572	403	119	
Estimated Uncapped HQLA**	**2,582**	**2,646**	**3,218**	**3,621**	**3,741**	**1,159**
Reported BHC NCO	2,179	2,231	2,282	2,522	2,598	419
Estimated Uncapped LCR (%)	**118.5**	**118.6**	**141.0**	**143.6**	**144.0**	**25.5**
Uncapped Liquidity Surplus	403	414	936	1,100	1,143	740

* Estimated using Federal Reserve Balance, Balance due from Foreign Banks, US Treasury and Agency MBS from Call Report. Does not include Foreign Gov't securities or impact of pledges

** Estimated by applying quarterly change in Estimated Bank HQLA to 2019Q3 Reported HQLA



Sources: SNL, Federal Reserve (H.3, H.6). Banks include BAC, BK, COF, C, GS, JPM, MS, NTRS, PNC, STT, USB, WFC

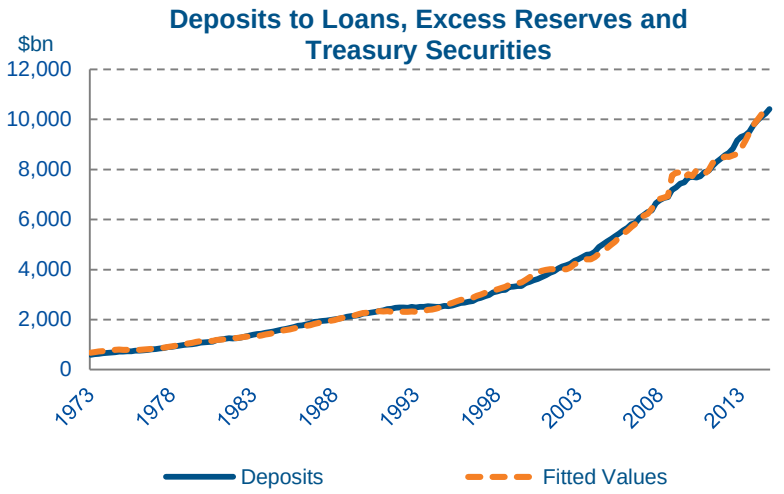
Details on regression statistics for drivers of total Commercial Bank deposits

- **Dependent variable**: Total commercial bank deposits in the US (*Deposits*)
- **Independent variables**: Total loans and leases at commercial banks in the US (*Loans*) and total reserves had at the Federal Reserve (*FRB Reserves*)
- Regression fitted on level values over the time horizon of 1973 to 2014 to capture the impact of reserve growth on deposit growth during periods where the Fed's balance sheet was increasing
- Coefficients robust to changes in sample horizon
- Data in the regression is quarterly and the units are billions. Quarterly series derived by taking the average of the underlying monthly values within each quarter

Regression Statistics

Dependent Variable: Deposits	
Intercept	238.731***
Loans	0.996***
FRB Reserves	0.986***
R^2	0.997
Freq.	Quarterly
Sample	1973Q1-2014Q4
*** p-value<0.01; ** p-value<0.05	

Dependent variable is total commercial bank deposits held by commercial banks. Regressors include total commercial bank loans and total FRB reserves. All data in billions



Sources: Federal Reserve (H.3, H.6, H.8)

Federal Reserve Bank of New York's Survey of Primary Dealers: LSAP Projections

Net Purchases of U.S. Treasury securities ($bn)												
	Dec 2020	Jan 2021	Feb 2021	Mar 2021	Apr 2021	May 2021	June 2021	2021 H2	2022 H1	2022 H2	2023 H1	2023 H2
25th Percentile	80	80	80	80	80	80	80	343	175	5	0	0
Median	80	80	80	80	80	80	80	480	285	180	10	0
75th Percentile	80	80	80	80	80	80	80	480	383	240	120	100

Net Purchases of agency MBS ($bn)												
	Dec 2020	Jan 2021	Feb 2021	Mar 2021	Apr 2021	May 2021	June 2021	2021 H2	2022 H1	2022 H2	2023 H1	2023 H2
25th Percentile	40	40	40	40	40	40	40	128	23	0	0	0
Median	40	40	40	40	40	40	40	240	128	25	0	0
75th Percentile	40	40	40	40	40	40	40	240	191	110	50	0

Net Purchases of agency CMBS ($ millions)												
	Dec 2020	Jan 2021	Feb 2021	Mar 2021	Apr 2021	May 2021	June 2021	2021 H2	2022 H1	2022 H2	2023 H1	2023 H2
25th Percentile	26	0	0	0	0	0	0	0	0	0	0	0
Median	100	80	75	75	75	50	50	240	50	0	0	0
75th Percentile	150	125	125	125	125	125	125	750	450	225	1	0

Sources: Federal Reserve Bank of New York

US GSIBs: Cost of Deposits

Rate Paid on Interest-bearing Deposits							
	Dec-14	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19	Sep-20
BAC	0.13	0.11	0.14	0.32	0.67	0.61	0.08
BK	0.03	0.01	-0.01	0.17	0.86	0.73	-0.05
C	0.58	0.54	0.58	0.77	1.27	1.20	0.34
GS	0.40	0.53	0.81	1.24	2.08	1.93	0.77
JPM	0.18	0.13	0.16	0.35	0.73	0.67	0.07
MS	0.17	0.07	0.09	0.26	1.00	0.94	0.30
STT	0.10	0.10	0.04	0.22	0.41	0.32	-0.16
WFC	0.13	0.11	0.18	0.39	0.77	0.85	0.13
Median	**0.15**	**0.11**	**0.15**	**0.34**	**0.82**	**0.79**	**0.11**

Rate Paid on Total Deposits							
	Dec-14	Dec-15	Dec-16	Dec-17	Dec-18	Dec-19	Sep-20
BAC	0.08	0.07	0.09	0.21	0.46	0.44	0.05
BK	0.02	0.01	-0.01	0.12	0.63	0.58	-0.04
C	0.46	0.42	0.44	0.61	1.04	1.01	0.29
GS	0.39	0.51	0.81	1.20	2.02	1.87	0.76
JPM	0.12	0.09	0.11	0.25	0.53	0.50	0.05
MS	-	-	0.09	0.26	1.00	0.94	0.30
STT	0.07	0.07	0.03	0.17	0.32	0.27	-0.13
WFC	0.09	0.08	0.12	0.28	0.56	0.63	0.09
Median	**0.09**	**0.08**	**0.10**	**0.26**	**0.60**	**0.60**	**0.07**

Sources: SNL and Bloomberg

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

- 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.

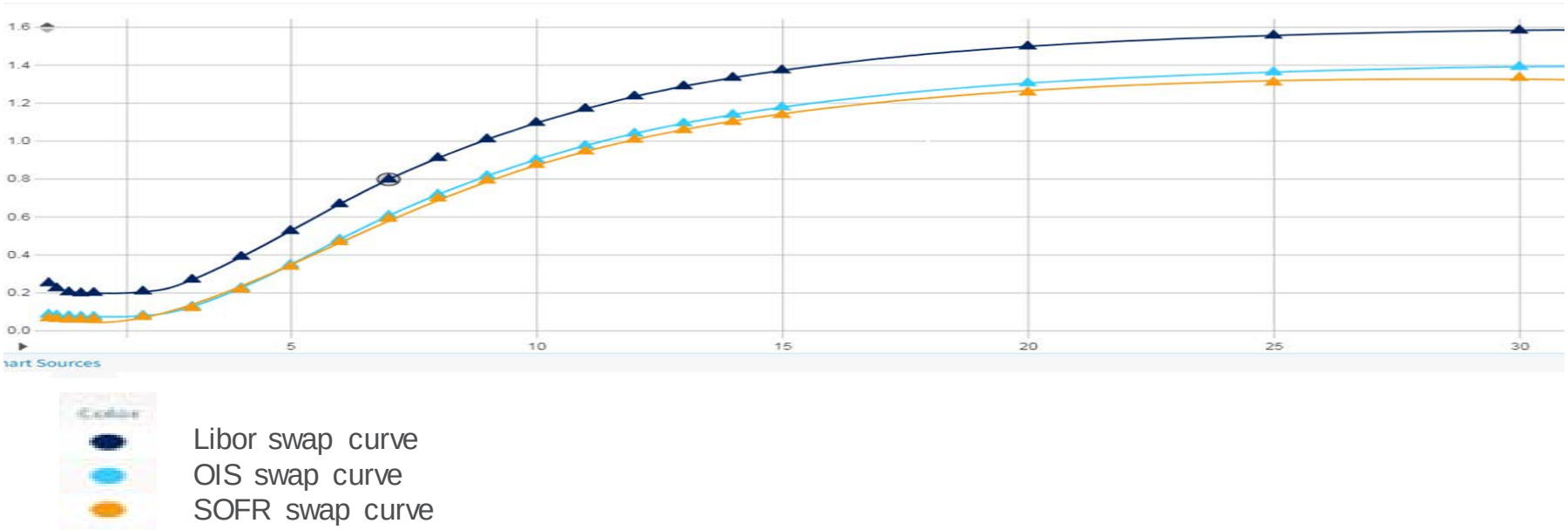
- Swap spreads can therefore provide information about the effects of Treasury supply on the pricing of those instruments. However, spreads are not a straightforward measure of those effects, as one has to take into account the potential influence of all the other factors that affect swap spreads.

- 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

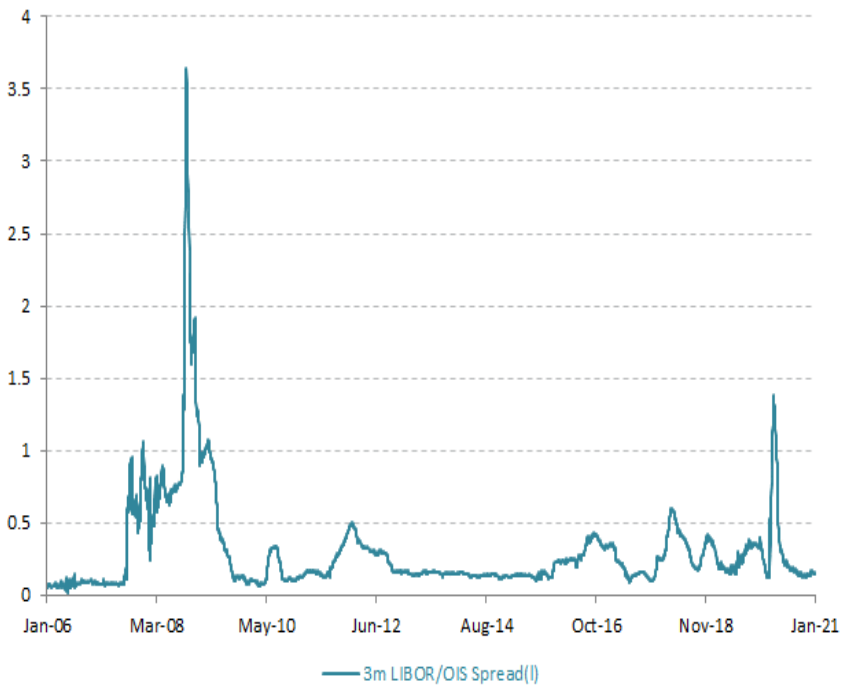
Which swap spreads are we talking about?

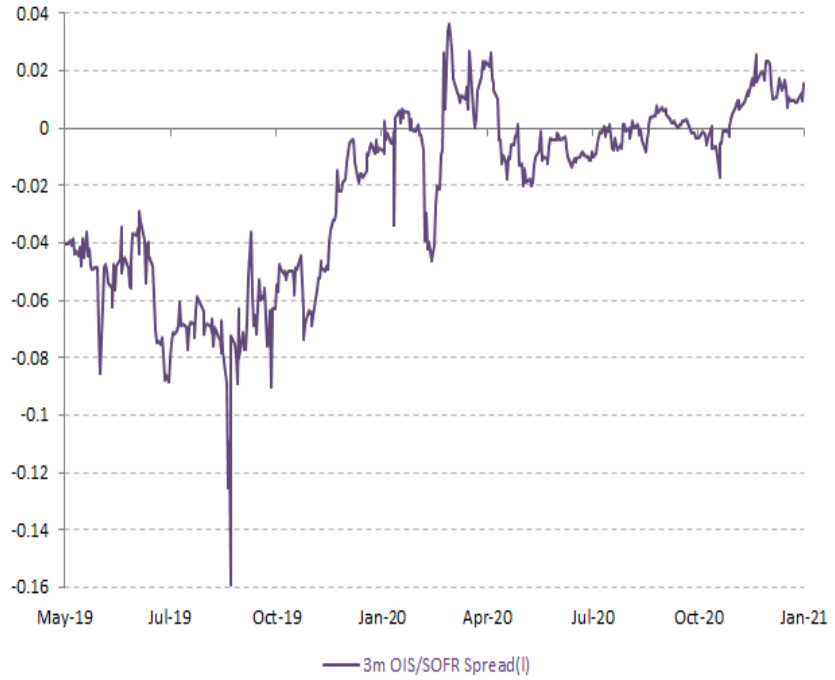
Type	Index	Description	Liquidity	Comments
Libor	3m Libor	Unsecured term funding rate for banks	Longest history, deep liquidity, even out to longer tenors	Index spikes during stress, rate sourced from survey rather than transactions; publication to cease by June 2023
OIS	Fed funds effective	Overnight 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.

Source: Barclays Research, Bloomberg.

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.

Source: Fed Flow of Funds Data

…and in swaps. Select investors toggle between both.

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…

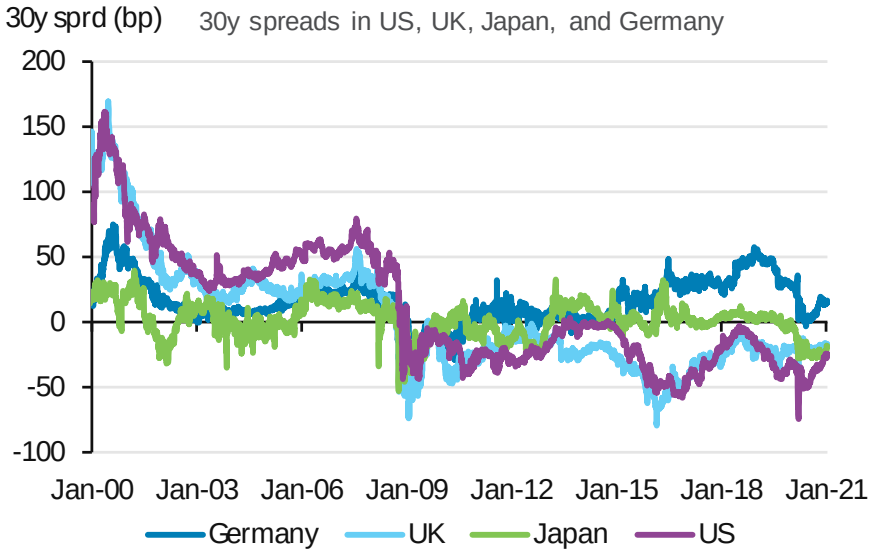
- Changes in the actual and prospective supply of Treasury securities have driven substantial and sustained changes in swap spreads.

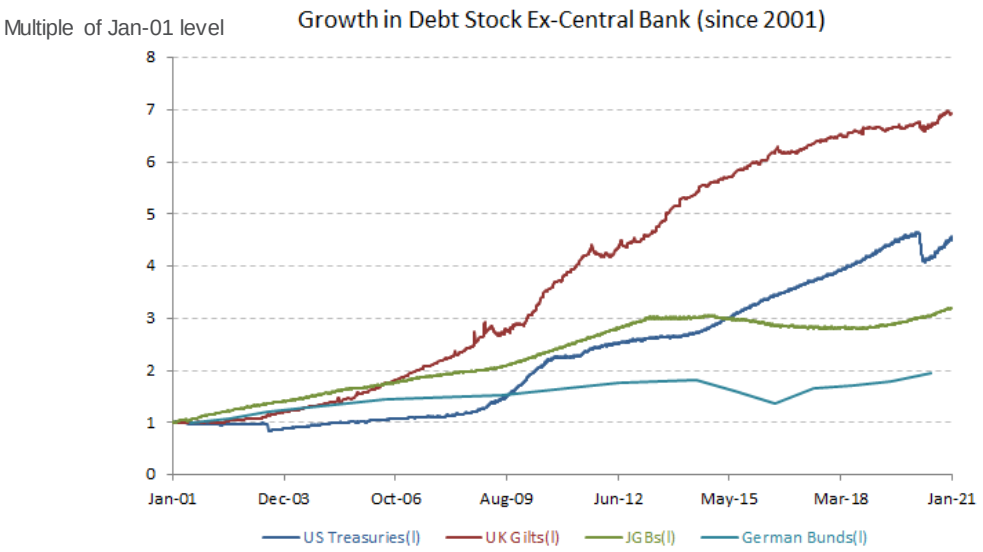
- Expectations of declining Treasury supply drove swap spreads wider from 1999 to 2001…

- …but a large increase in supply post GFC has helped drive spreads into negative territory over the last 12 years.

Source: CBO, Bloomberg, Barclays Research.

…and in other major G7 countries

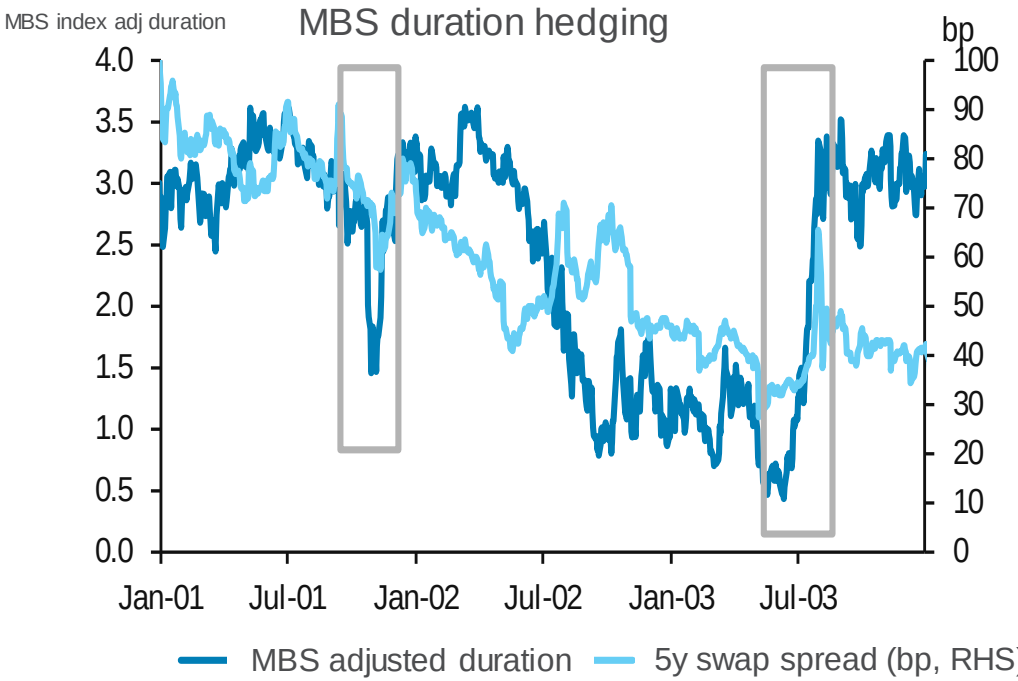


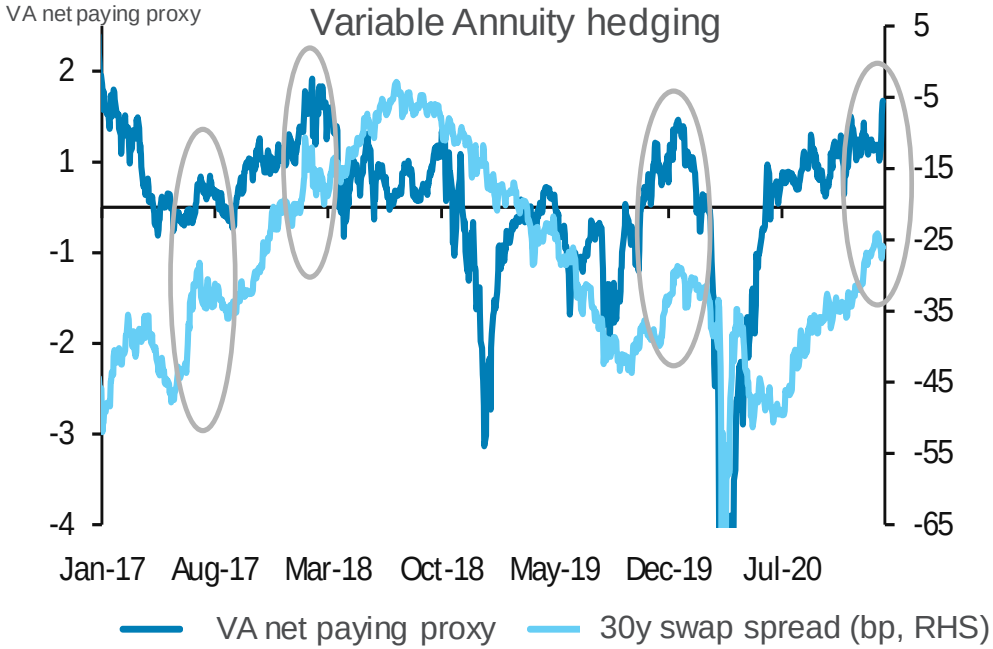


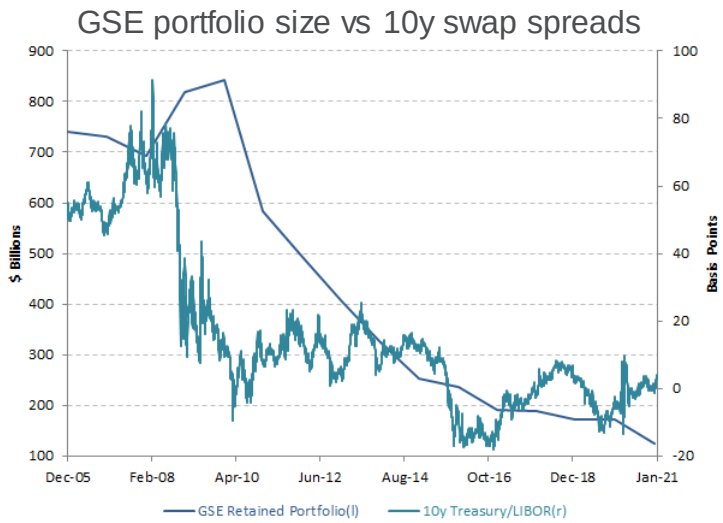
- Over the past 20 years, debt stocks have increased in the US, UK, Japan and Germany. Swap spreads have tightened in all 4 markets.
  - Germany's debt stock exhibited the slowest growth, and has had the smallest decline in swap spreads
  - Japan's swap spreads correlate with medium term deficits net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

Source: Haver Analytics, Bloomberg, Barclays Research

Other factors driving swap spreads: Hedging needs



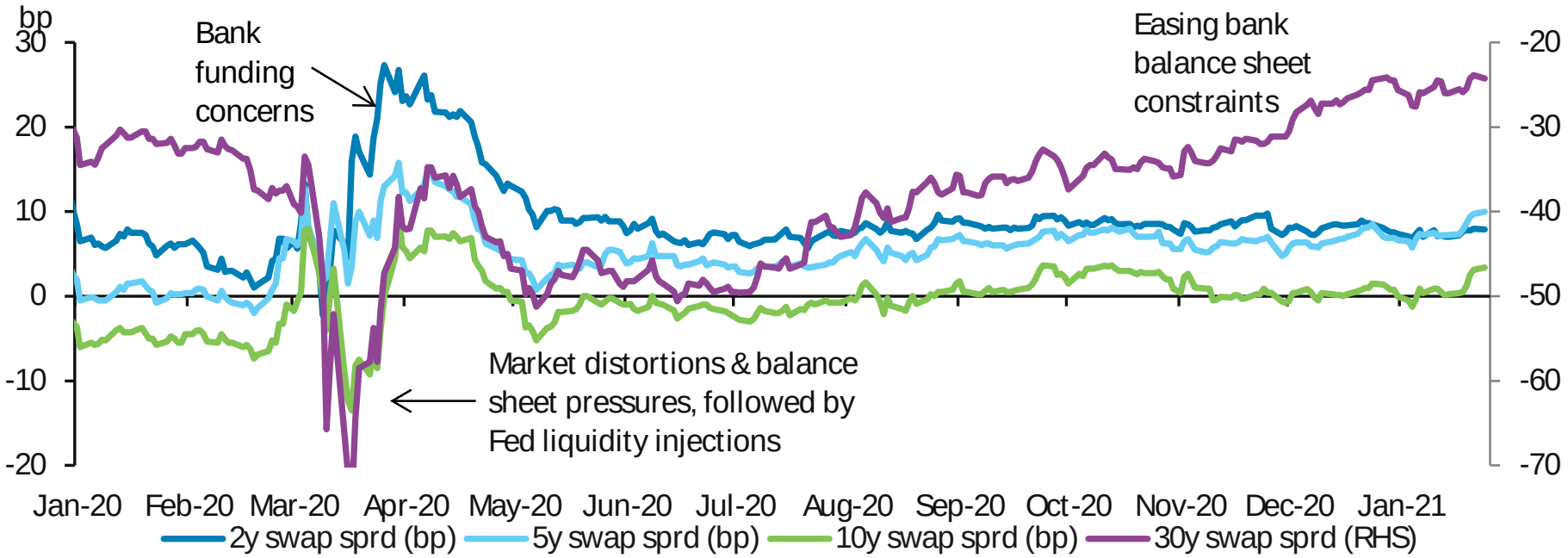




- MBS hedging needs can drive swap spreads in either direction, most famously in summer 2003.
- Post GFC, GSE portfolios shrank and the Fed bought MBS, causing net mortgage hedger paying to decline significantly.
- Variable annuity hedging has become a more important factor in recent years.

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

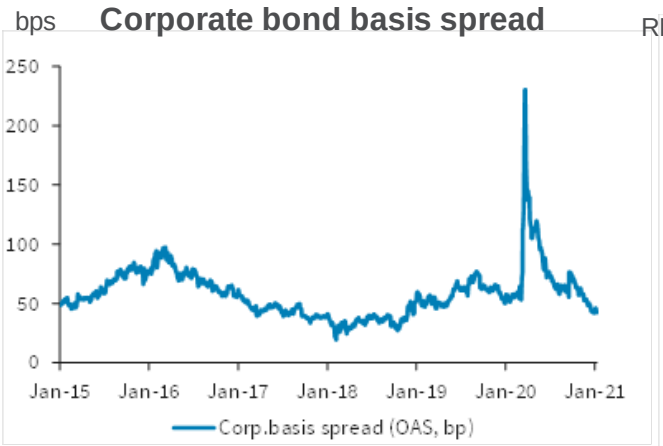
Other factors: Bank funding concerns, regulatory changes, balance sheet availability

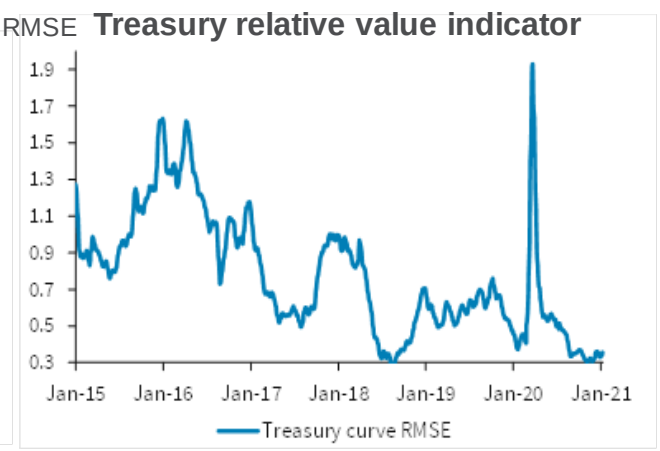


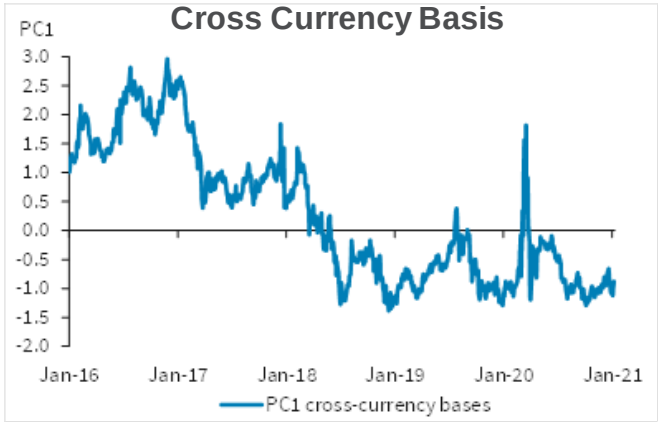
- In March 2020, long end spreads temporarily collapsed due to market distortions and balance sheet pressures. Following a rebound in spread as the market stabilized, long end spreads again narrowed in April/May on expectations of increased Treasury issuance.
- Short end spreads initially widened on 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.

Source: Bloomberg, Barclays Research.

Other factors: Importance of bank balance sheet availability





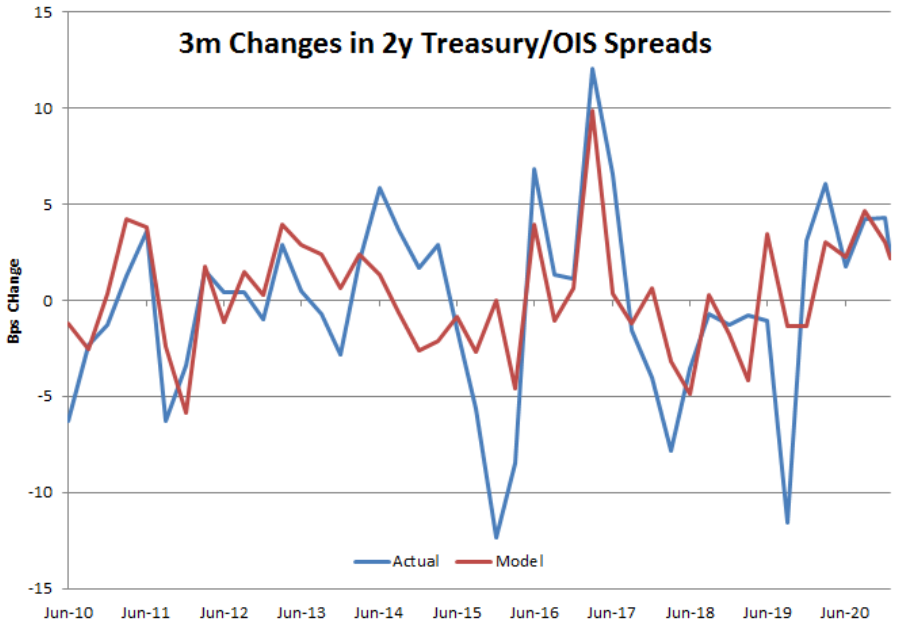


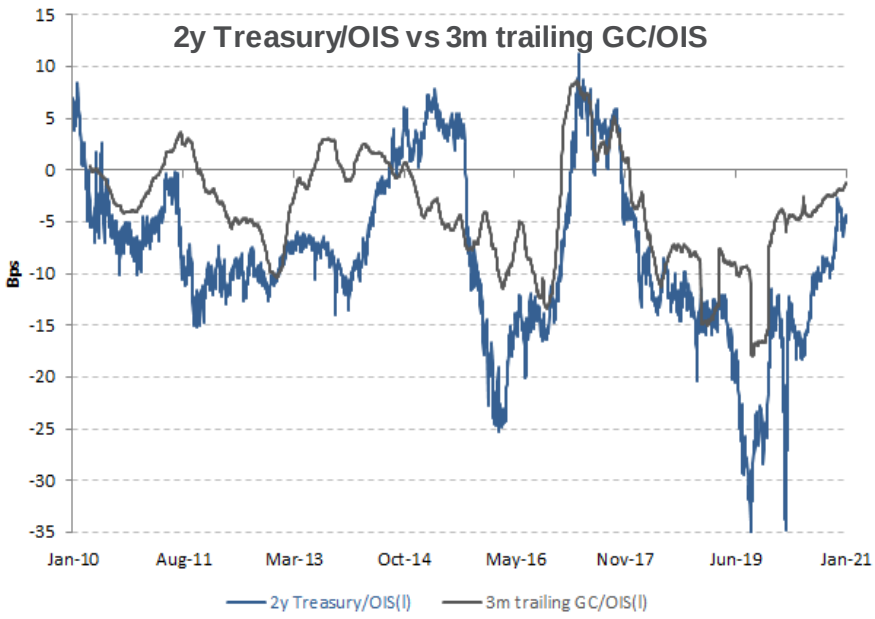
- Balance sheet availability has improved as seen in the lack of arbitrage opportunities in each of:
  - The CDS-cash basis in corporates / Deviations from Treasury spline / Covered interest parity
- As balance sheet becomes more available, banks and hedge funds may deploy capital to buy Treasuries and 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.

Source: Bloomberg, Barclays Research.

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

What do the models say? 2y swap spreads



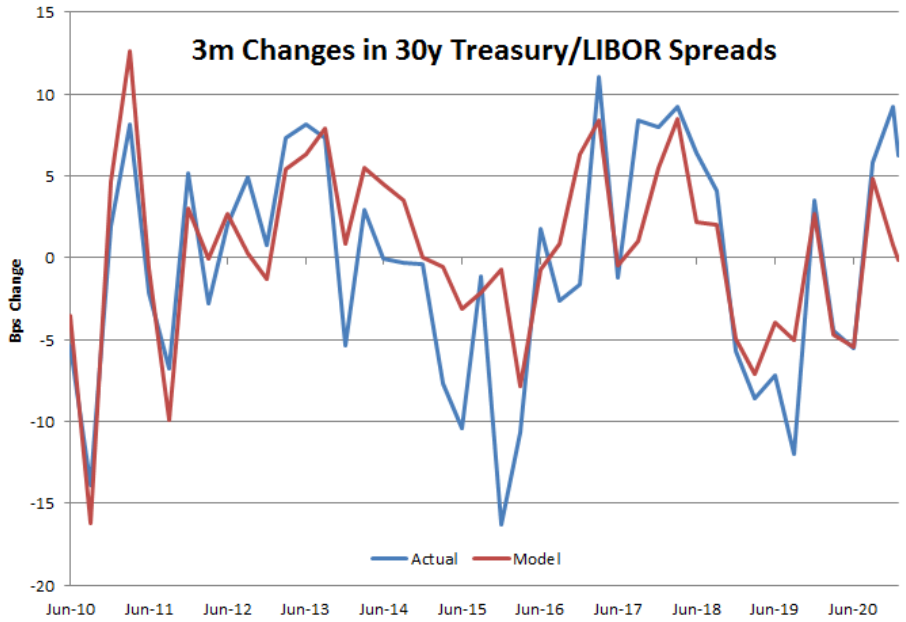


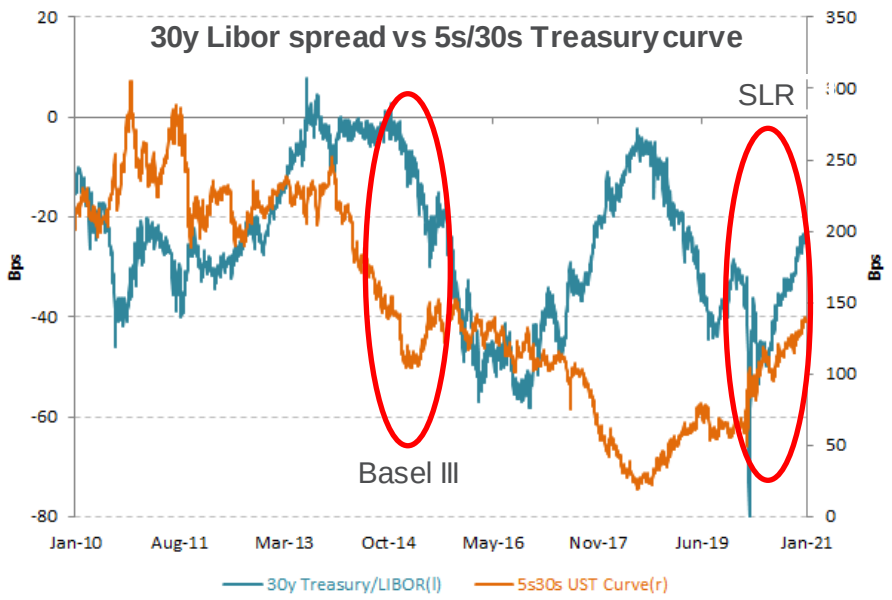
- When we model 2y OIS spreads, we find that GC/OIS is a natural anchor for front-end spreads and is the dominant driver of spread changes. Since 2010, 2y OIS spreads have averaged ~4.5 bps tighter than GC/OIS, with investors requiring a premium to extend from GC to 2y Treasuries.
- In addition, our 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

Source: Bloomberg, Barclays Research. Estimated with data from Jan-2010 to Dec-2020

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.

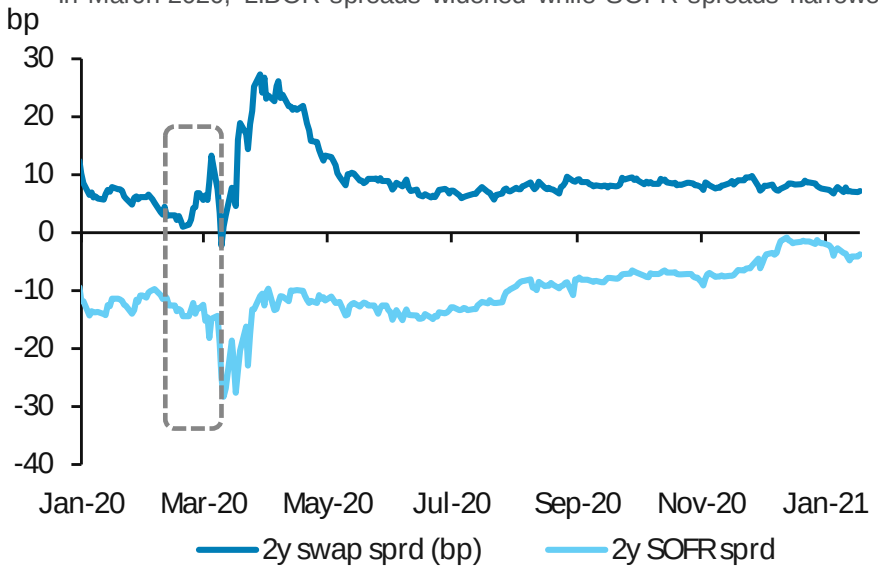
	5s30s UST Curve	Duration Stock Ex-Fed	S&P 500	MBS Duration
Coefficient	(15.93)	(51.60)	49.46	5.11
T-Stat	(3.90)	(1.81)	2.73	4.33

Source: Bloomberg, Barclays Research, Presenting member calculations. Estimated with data from Jan-2010 to Dec-2020

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?

	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 arbitraged away.

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

Note: Fungibility only for cleared instruments

Why should the US Treasury care about swap spreads?

- 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.