Treasury Presentation to TBAC

Office of Debt Management

Fiscal Year 2019 Q1 Report

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Section I:
Executive Summary

Highlights of Treasury's February 2019 Quarterly Refunding Presentation to the Treasury Borrowing Advisory Committee (TBAC)

Receipts and Outlays

- Year-over-year, overall net receipts were up just $17 billion (<1%) for Q1 FY 2019. Increases in social insurance taxes of $16 billion (6%), excise taxes of $10 billion (49%), and customs deposits of $9 billion (96%) were mostly offset by declines in individual taxes of $17 billion (-4%), corporate taxes of $11 billion (-17%), and miscellaneous receipts of $3 billion (-12%). Cuts in individual and corporate tax rates and increases to customs duties had impacts on these results.

- After calendar adjustments, FY 2019 year-to-date outlays were $45 billion (4%) higher than the comparable period last year. Treasury outlays were $16 billion (10%) higher, mainly due to increased interest on the public debt. Social Security and Veteran's Affairs expenditures were up $11 billion (4%) and $5 billion (9%), respectively, due to an increased number of beneficiaries and average benefit payment. Defense spending was $11 billion (7%) higher mostly from increased operation and maintenance activities. Homeland Security expenditures were $8 billion (32%) lower largely because spending for disaster relief was higher than usual in FY 2018.

Projected Net Marketable Borrowing (FY 2019)

- Based on the quarterly borrowing estimate, Treasury's Office of Fiscal Projections (OFP) currently forecasts a net privately-held marketable borrowing need of $365 billion for Q2 FY 2019, with an end-of-March cash balance of $320 billion. For Q3 FY 2019, the net privately-held marketable borrowing need is projected to be $83 billion, with an end-of-June cash balance of $300 billion. 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.

- Recent deficit estimates contained in OMB's "Mid-Session-Review, Fiscal Year 2019" (July 2018) in conjunction with SOMA redemptions suggest that Treasury auction sizes will need to rise over the next few years.

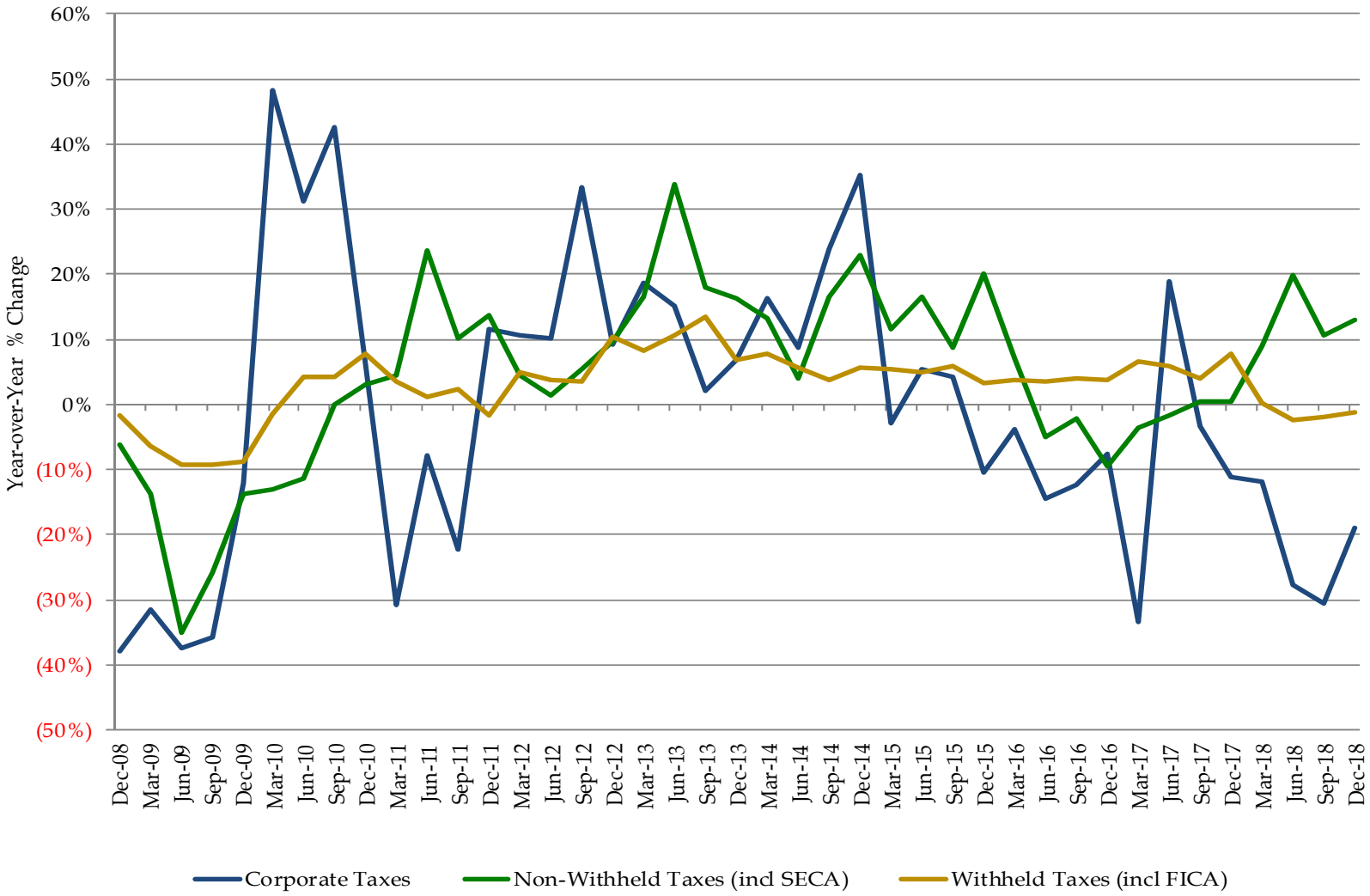
Demand for Treasury Securities

- Bid-to-cover ratios for all securities were largely stable over the last quarter.

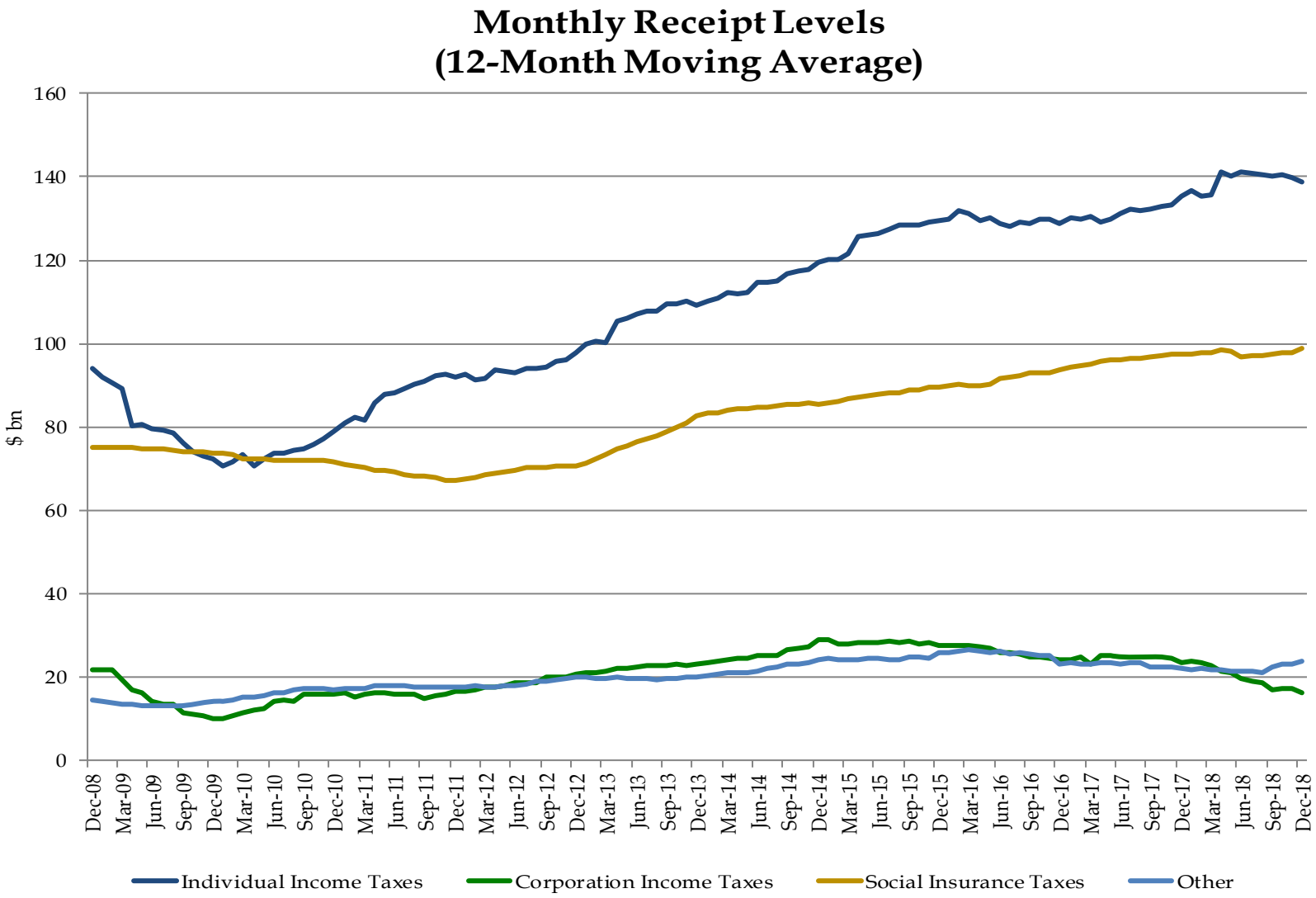
- Foreign demand remained steady.

Section II:
Fiscal

Quarterly Tax Receipts

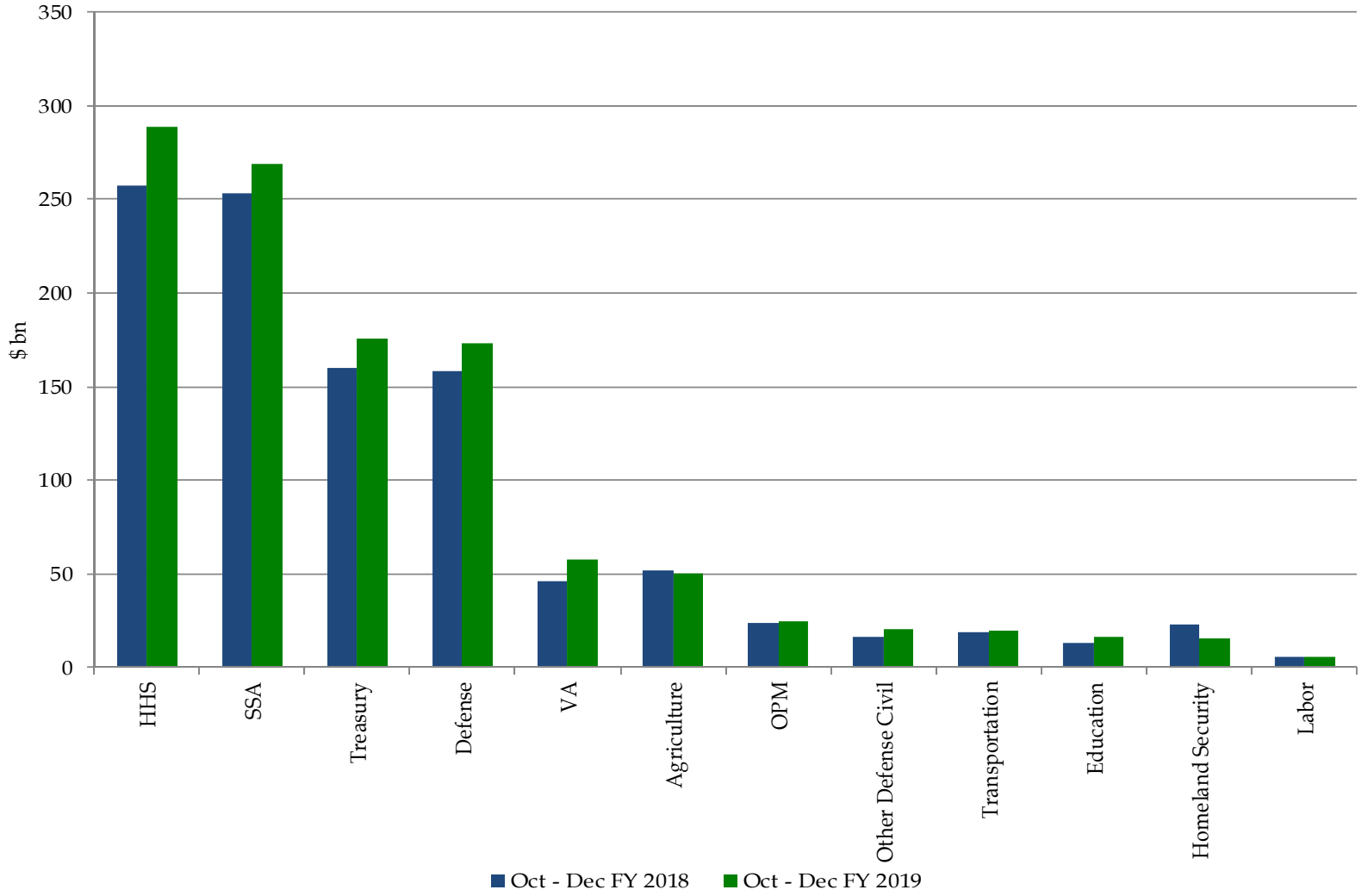


Source: United States Department of the Treasury
Note: Budget results are not available for December as a result of the lapse in appropriations. December figures represent estimated budget results based on cash reporting in the Daily Treasury Statement. The revised publish date for the December 2018 budget results in the Monthly Treasury Statement will be February 13, 2019.



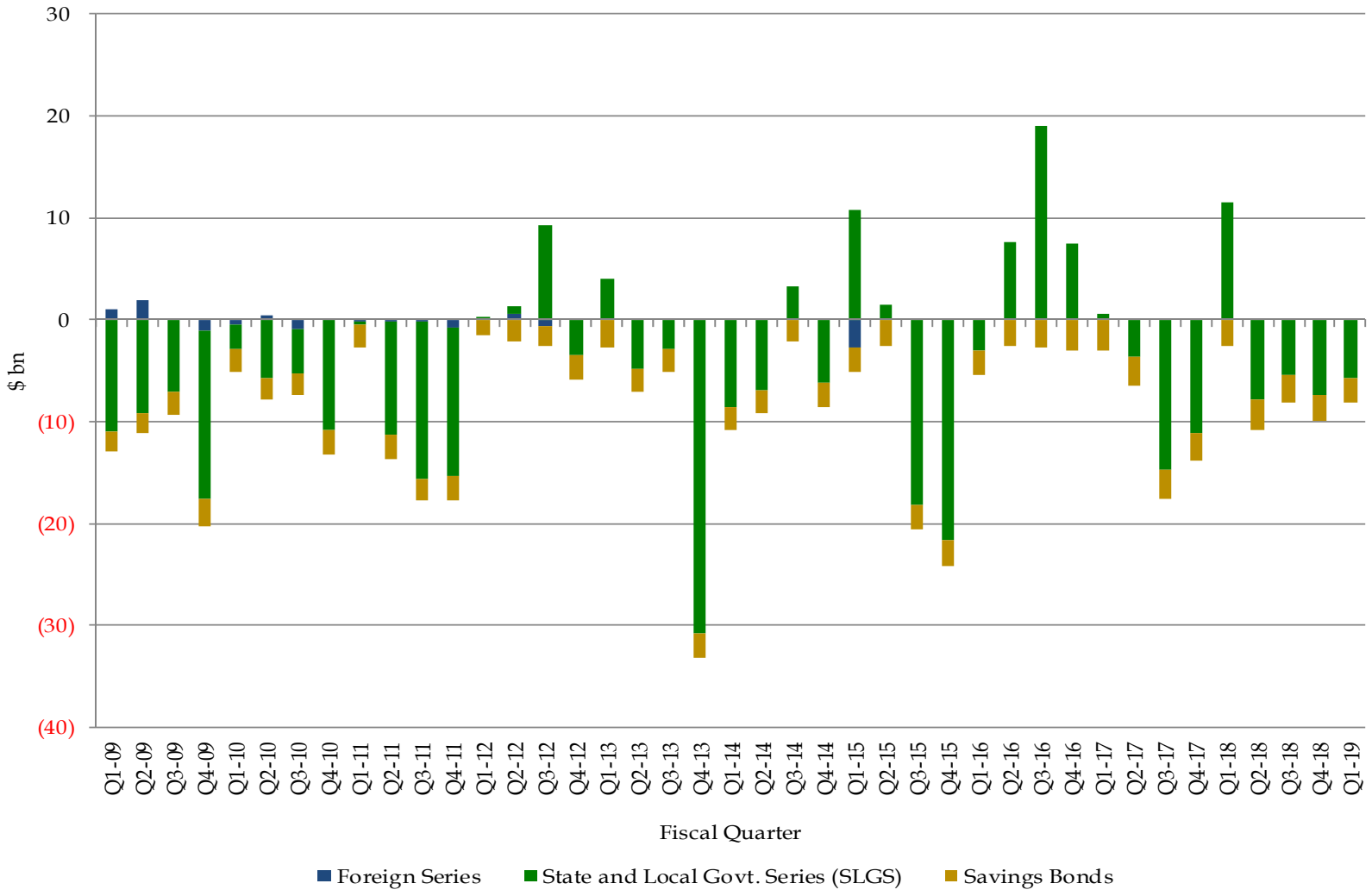
Individual Income Taxes include withheld and non-withheld. Social Insurance Taxes include FICA, SECA, RRTA, UTF deposits, FUTA and RUIA. Other includes excise taxes, estate and gift taxes, customs duties and miscellaneous receipts.
Source: United States Department of the Treasury
Note: Budget results are not available for December as a result of the lapse in appropriations. December figures represent estimated budget results based on cash reporting in the Daily Treasury Statement. The revised publish date for the December 2018 budget results in the Monthly Treasury Statement will be February 13, 2019.

Largest Outlays



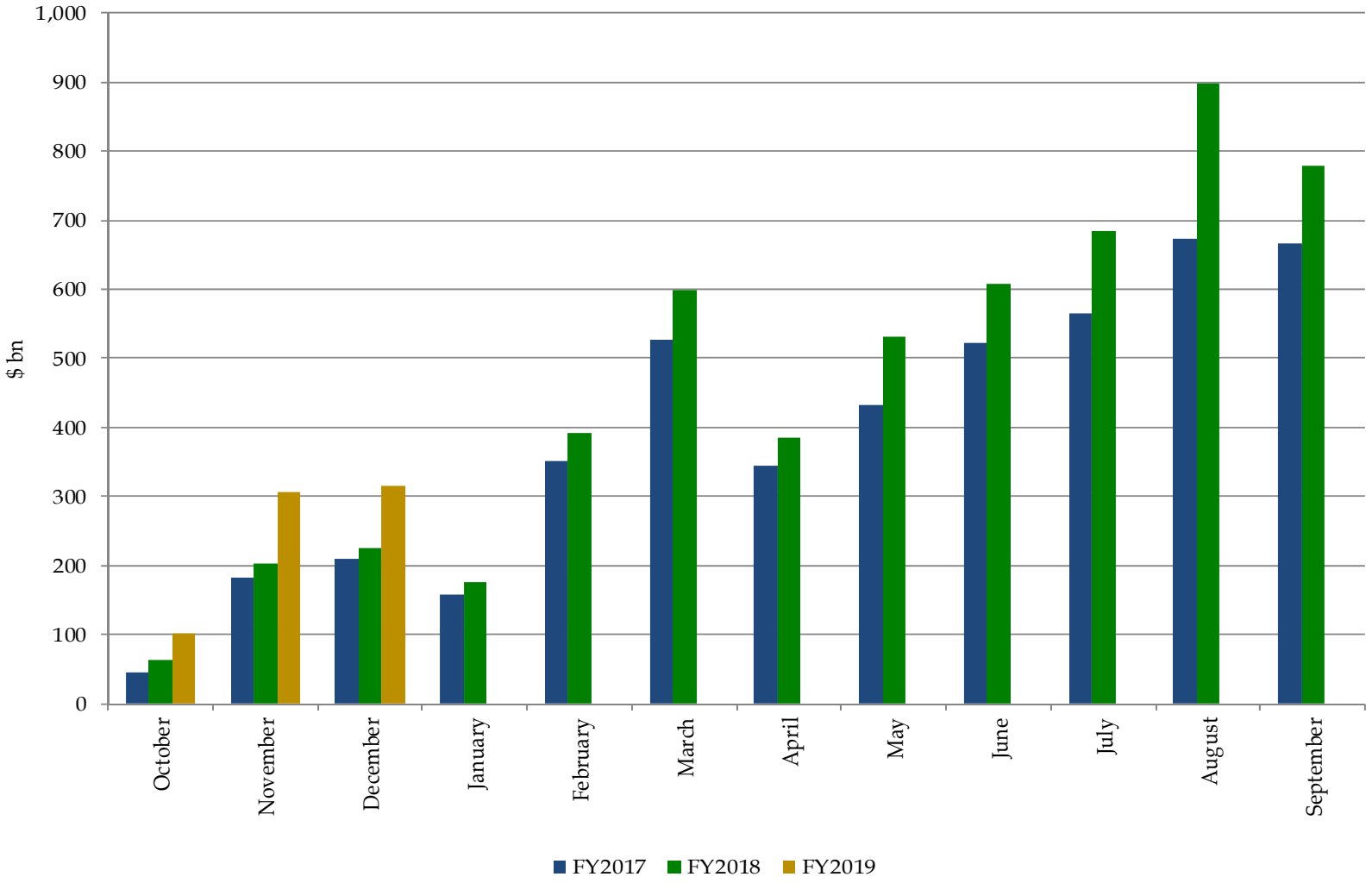
Source: United States Department of the Treasury
Note: Budget results are not available for December as a result of the lapse in appropriations. December figures represent estimated budget results based on cash reporting in the Daily Treasury Statement. The revised publish date for the December 2018 budget results in the Monthly Treasury Statement will be February 13, 2019.

Treasury Net Nonmarketable Borrowing



Source: United States Department of the Treasury
Note: Budget results are not available for December as a result of the lapse in appropriations. December figures represent estimated budget results based on cash reporting in the Daily Treasury Statement. The revised publish date for the December 2018 budget results in the Monthly Treasury Statement will be February 13, 2019.

Cumulative Budget Deficits by Fiscal Year



Source: United States Department of the Treasury
Note: Budget results are not available for December as a result of the lapse in appropriations. December figures represent estimated budget results based on cash reporting in the Daily Treasury Statement. The revised publish date for the December 2018 budget results in the Monthly Treasury Statement will be February 13, 2019.

FY 2019-2021 Deficits and Net Marketable Borrowing Estimates*, in $ billions

	Primary Dealers[1]	CBO[2]	OMB[3]	CBO[4]
FY 2019 Deficit Estimate	1,000	897	1,086	955
FY 2020 Deficit Estimate	1,070	903	1,076	866
FY 2021 Deficit Estimate	1,156	974	1,010	945
FY 2019 Deficit Range	825-1,130			
FY 2020 Deficit Range	950-1,250			
FY 2021 Deficit Range	1,000-1,365			
FY 2019 Privately-Held Net Marketable Borrowing Estimate	1,345			
FY 2020 Privately-Held Net Marketable Borrowing Estimate	1,200			
FY 2021 Privately-Held Net Marketable Borrowing Estimate	1,225			
FY 2019 Privately-Held Net Marketable Borrowing Range	932-1,400			
FY 2020 Privately-Held Net Marketable Borrowing Range	975-1,554			
FY 2021 Privately-Held Net Marketable Borrowing Range	905-1,506			
FY 2019 SOMA Redemption Estimate	286			
FY 2020 SOMA Redemption Estimate	73			
FY 2021 SOMA Redemption Estimate	0			
FY 2019 Net Marketable Borrowing Estimate	1,059	885	1,186	1,049
FY 2020 Net Marketable Borrowing Estimate	1,127	965	1,164	924
FY 2021 Net Marketable Borrowing Estimate	1,225	1,025	1,097	993
Estimates as of:	Jan-19	Jan-19	Jul-18	May-18

1Based on primary dealer feedback in January 2019. Estimates above are medians.

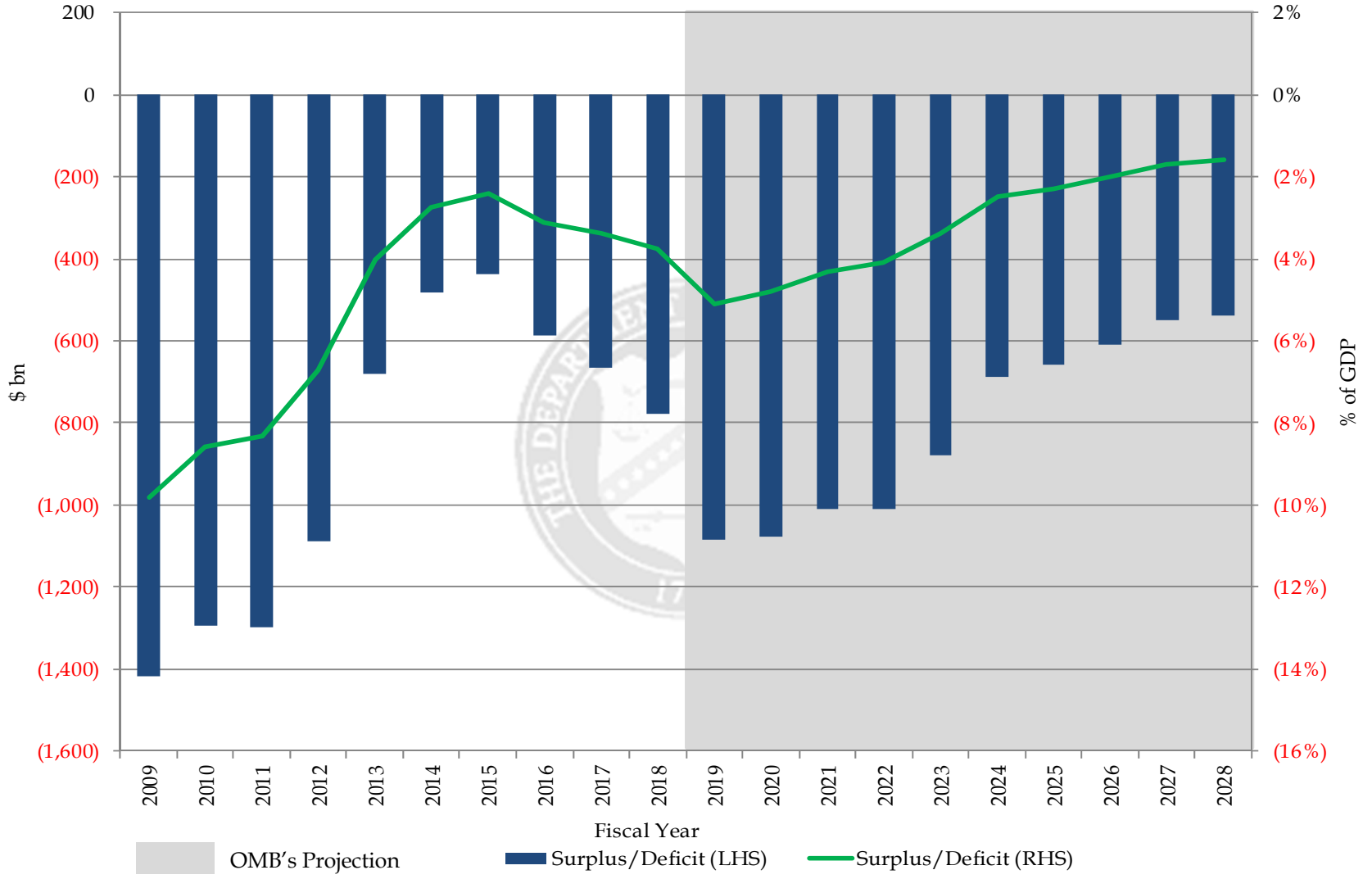
2Table 1-1 of CBO's "The Budget and Economic Outlook: 2019 to 2029," January 2019 (current law).

3Table S-11 of OMB's "Mid-Session Review, Fiscal Year 2019," July 2018.

4Table 2 of CBO's "An Analysis of the President's 2019 Budget," May 2018.

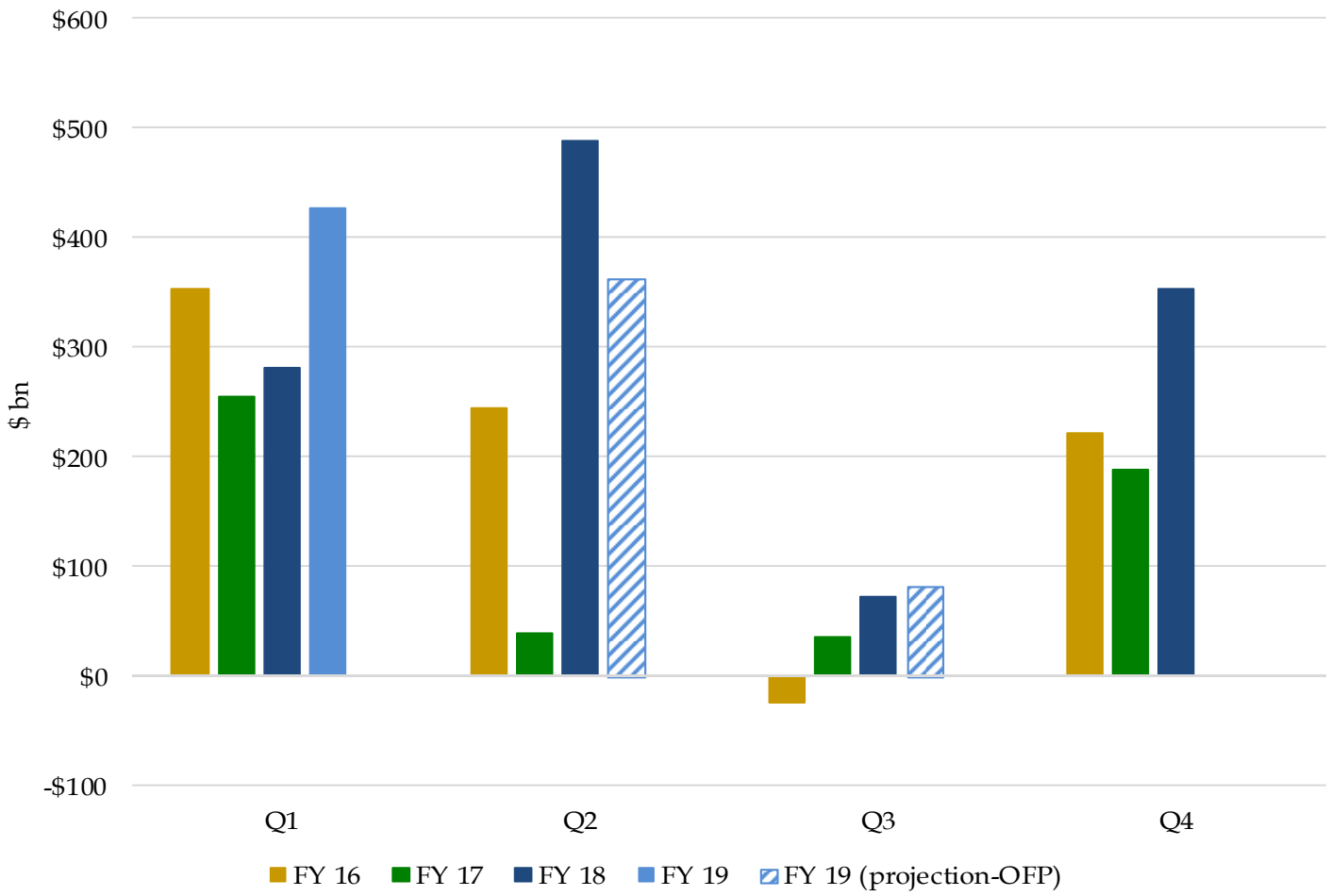
*Privately-held marketable borrowing excludes rollovers (auction "add-ons") of Treasury securities held in the Federal Reserve's System Open Market Account (SOMA), but includes financing required due to SOMA redemptions.

Budget Surplus/Deficit



Projections are from OMB's Table S-11 of "Mid-Session Review, Fiscal Year 2019," July 2018.

Privately-Held Net Marketable Borrowing Outlook



Note: 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.

Section III: Financing

Assumptions for Financing Section (pages 16 to 21)

- Portfolio and SOMA holdings as of 12/31/2018.
- Estimates assume an end date for SOMA capped redemptions at the end of CY2020. The assumption is based on the median case from "Statement Regarding the Annual Report on Open Market Operations during 2017," Federal Reserve Bank of New York, April 2018.
- Estimates assume announced issuance sizes and patterns remain constant for nominal coupons, TIPS, and FRNs given changes made at the November 2018 refunding, while using a total of ~$2.34 trillion of bills outstanding.
- The principal on the TIPS securities was accreted to each projection date based on market ZCIS levels as of 12/31/2018.
- No attempt was made to account for future financing needs.

Sources of Privately-Held Financing in FY19 Q1*

October - December 2018	
Net Bill Issuance	100
Net Coupon Issuance	326
Subtotal: Net Marketable Borrowing	426
Ending Cash Balance	402
Beginning Cash Balance	385
Subtotal: Change in Cash Balance	17
Net Implied Funding for FY19 Q1**	409

Security	October - December 2018 Bill Issuance			Fiscal Year-to-Date Bill Issuance		
	Gross	Maturing	Net	Gross	Maturing	Net
4-Week	565	585	(20)	565	585	(20)
8-Week	315	75	240	315	75	240
13-Week	558	645	(87)	558	645	(87)
26-Week	495	546	(51)	495	546	(51)
52-Week	78	60	18	78	60	18
CMBs	0	0	0	0	0	0
Bill Subtotal	2,011	1,911	100	2,011	1,911	100

Security	October - December 2018 Coupon Issuance			Fiscal Year-to-Date Coupon Issuance		
	Gross	Maturing	Net	Gross	Maturing	Net
2-Year FRN	55	41	14	55	41	14
2-Year	154	104	50	154	104	50
3-Year	111	72	39	111	72	39
5-Year	158	94	64	158	94	64
7-Year	126	91	35	126	91	35
10-Year	74	27	47	74	27	47
30-Year	50	3	47	50	3	47
5-Year TIPS	14	0	14	14	0	14
10-Year TIPS	11	0	11	11	0	11
30-Year TIPS	5	0	5	5	0	5
Coupon Subtotal	758	432	326	758	432	326

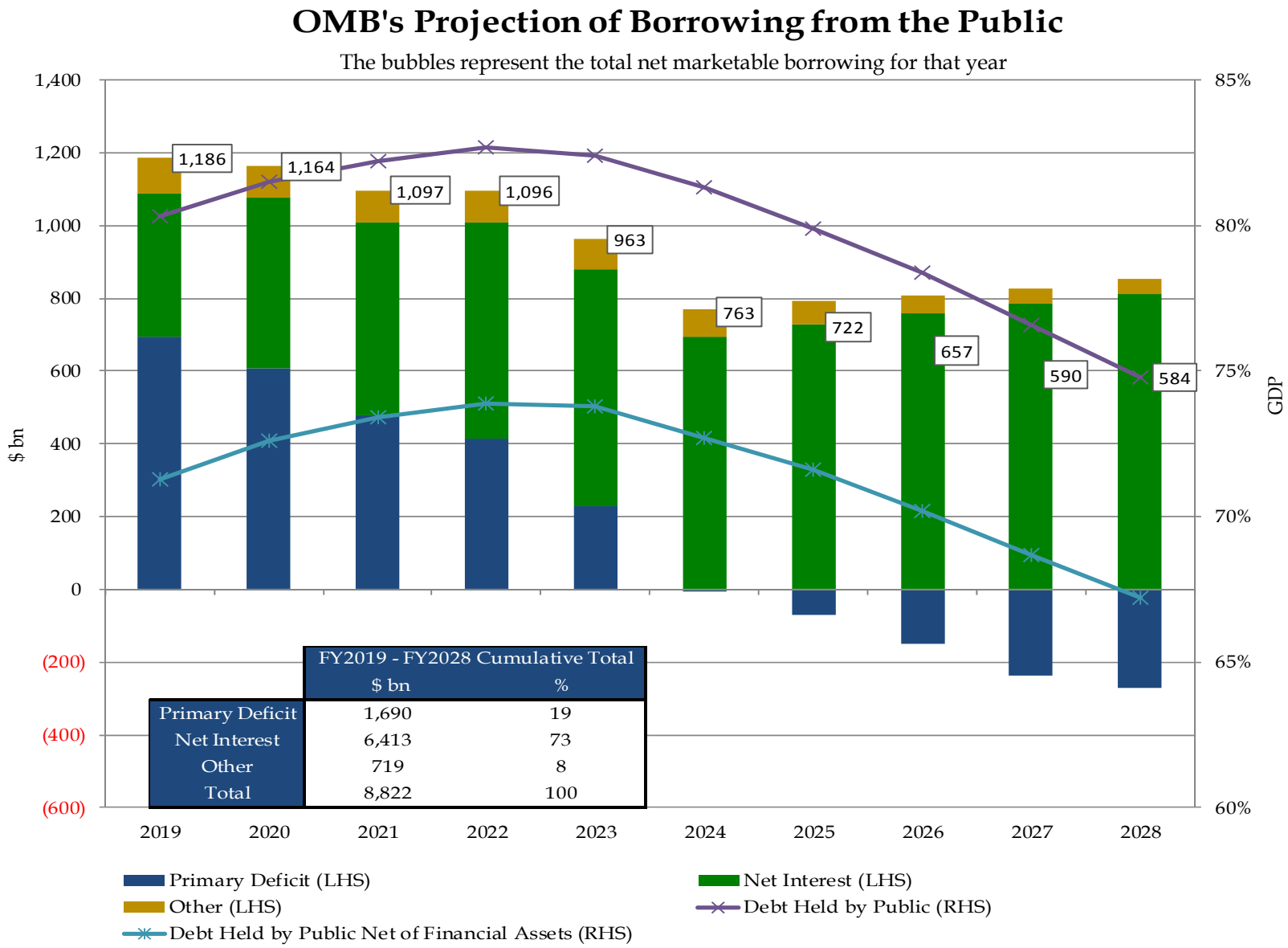
*Privately-held marketable borrowing excludes rollovers (auction "add-ons") of Treasury securities held in the Federal Reserve's System Open Market Account (SOMA), but includes financing required due to SOMA redemptions.
**An end-of-December 2018 cash balance of $402 billion versus a beginning-of-October 2018 cash balance of $385 billion. By keeping the cash balance constant, Treasury arrives at the net implied funding number.

Sources of Privately-Held Financing in FY19 Q2*

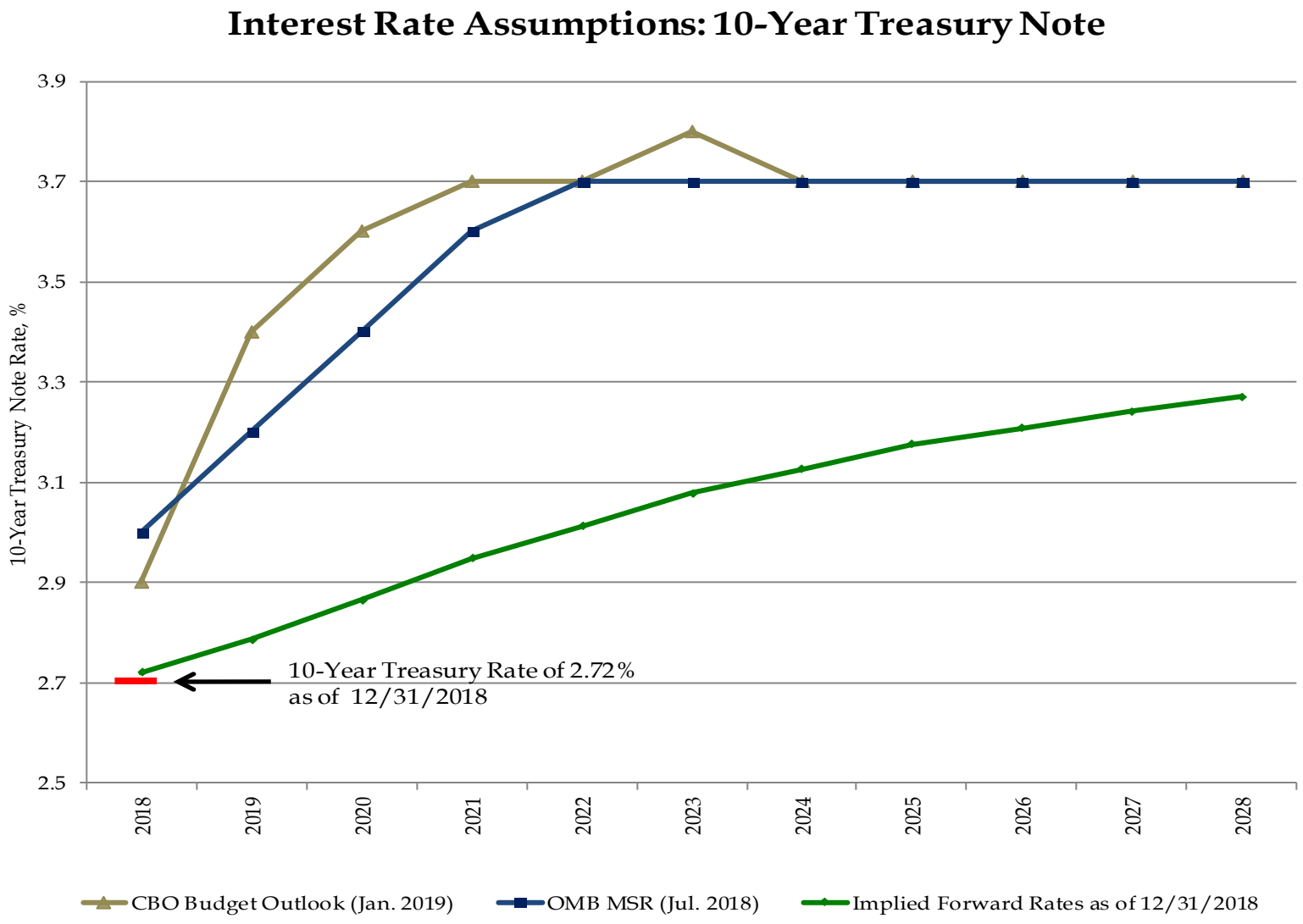
January - March 2019	
Assuming Constant Coupon Issuance Sizes**	
Treasury Announced Net Marketable Borrowing***	365
Net Coupon Issuance	233
Implied Change in Bills	132

Security	January - March 2019 Coupon Issuance			Fiscal Year-to-Date Coupon Issuance		
	Gross	Maturing	Net	Gross	Maturing	Net
2-Year FRN	56	41	15	111	82	29
2-Year	80	52	28	234	156	78
3-Year	114	72	42	225	144	81
5-Year	82	63	19	240	157	83
7-Year	64	47	17	190	138	52
10-Year	75	25	50	149	52	97
30-Year	51	6	45	101	9	92
5-Year TIPS	0	0	0	14	0	14
10-Year TIPS	24	15	9	35	15	20
30-Year TIPS	7	0	7	12	0	12
Coupon Subtotal	553	320	233	1,311	752	559

*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.
**Keeping announced issuance sizes and patterns constant for nominal coupons, TIPS, and FRNs based on changes made at the November 2018 refunding.
***Assumes an end-of-March 2019 cash balance of $320 billion versus a beginning-of-January 2019 cash balance of $402 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

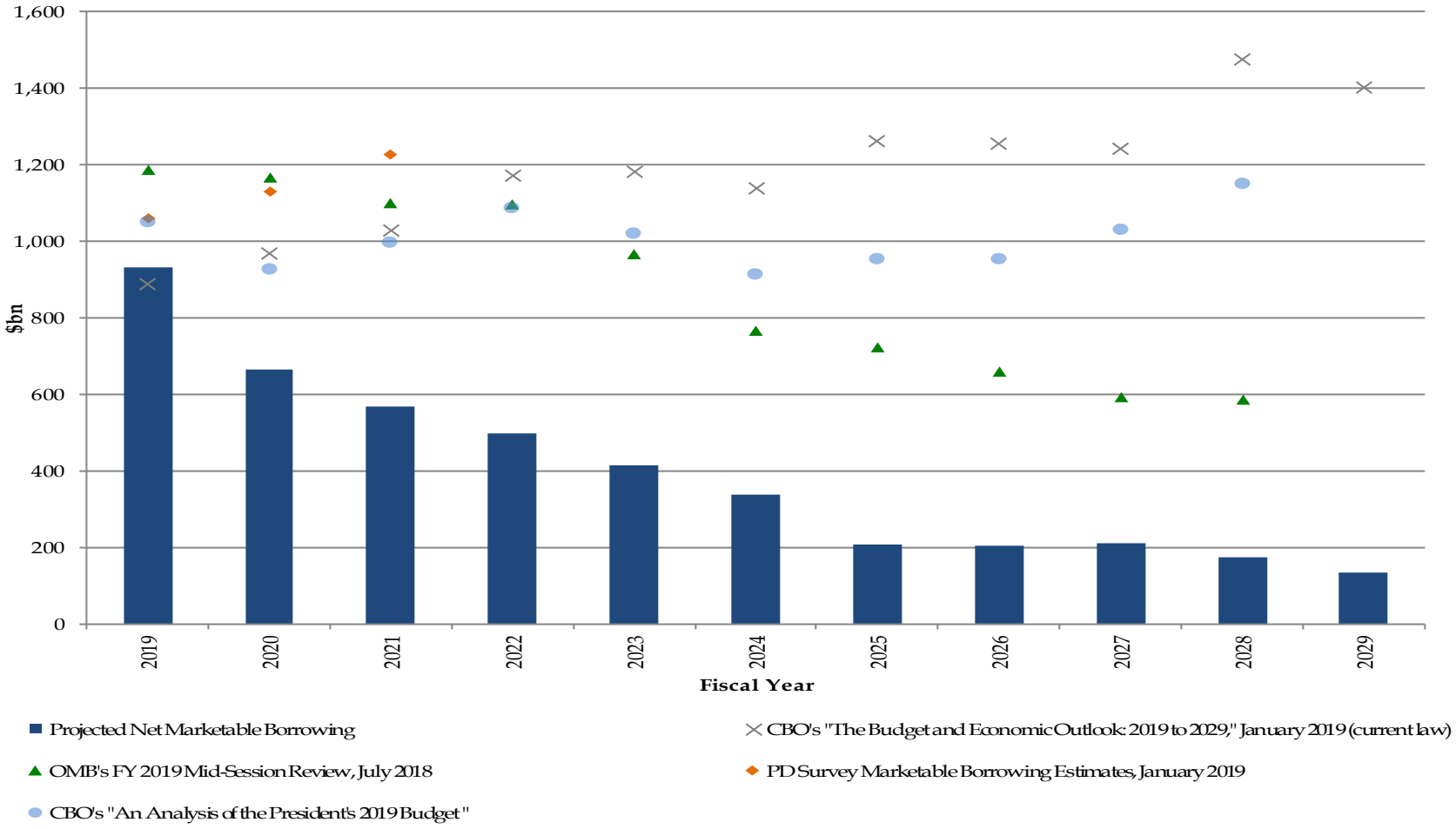


OMB's projections of the change in debt held by the public (borrowing) are from Table S-11 of "Mid-Session Review, Fiscal Year 2019," July 2018. "Other" represents borrowing from the public to provide direct and guaranteed loans.



OMB's economic assumption of the 10-Year Treasury Note rates are from Table 2 of OMB's "Mid-Session Review, Fiscal Year 2019," July 2018. CBO's economic assumption of the 10-Year Treasury Note rates are from Table E-1 of CBO's "The Budget and Economic Outlook: 2019 to 2029," January 2019. The forward rates are the implied 10-Year Treasury Note rates on December 31, 2018.

Projected Net Marketable Borrowing
Assuming Future Issuance Remains Constant*



Treasury's latest primary dealer survey estimates can be found on page 11. OMB's projections of the change in debt held by the public are from Table S-11 of "Mid-Session Review, Fiscal Year 2019," July 2018. CBO's baseline budget projections of the change in debt held by the public are from Table 2 of "An Analysis of the President's 2019 Budget," May 2018. CBO's current law budget projections of the change in debt held by the public are from Table 1-1 of "The Budget and Economic Outlook: 2019 to 2029," January 2019. See table at the end of this section for details.
*Projections reflect capped SOMA Treasury redemptions up until the end of CY 2020.

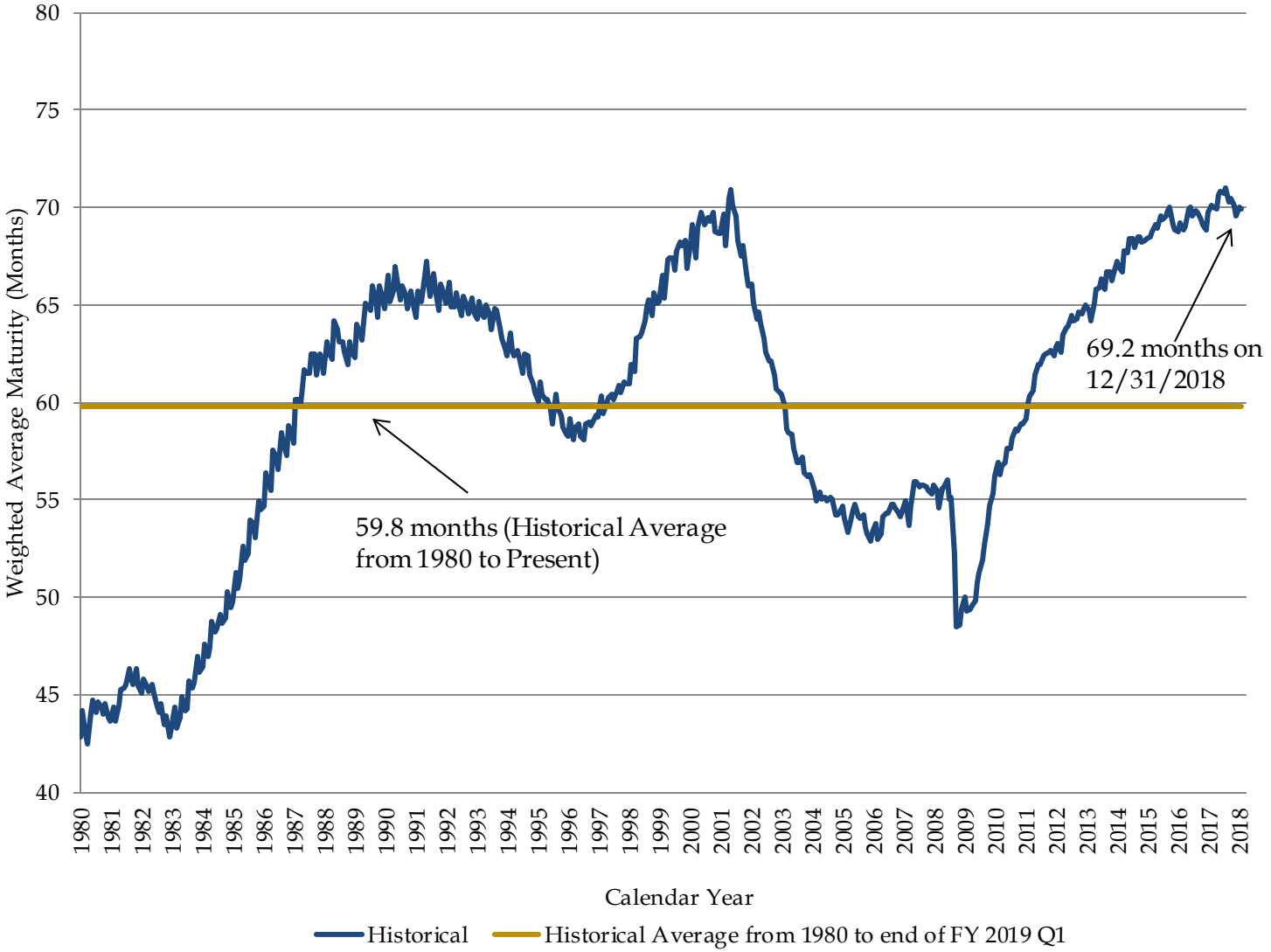
Historical Net Marketable Borrowing and Projected Net Borrowing Assuming Future Issuance Remains Constant, $ billions

Fiscal Year	Bills	2/3/5	7/10/30	TIPS	FRN	Historical/Projected Net Borrowing Capacity	OMB's FY 2019 Mid-Session Review	CBO's "The Budget and Economic Outlook: 2019 to 2029"	Primary Dealer Survey
2014	(119)	(92)	669	88	123	669			
2015	(53)	(282)	641	88	164	558			
2016	289	(82)	477	64	47	795			
2017	155	9	292	55	9	519			
2018	438	209	316	51	26	1,040			
2019	100	494	238	45	53	930	1,186	885	1,059
2020	0	336	277	28	27	668	1,164	965	1,127
2021	0	221	333	13	1	568	1,097	1,025	1,225
2022	0	133	358	2	3	497	1,096	1,169	
2023	0	171	233	5	5	415	963	1,181	
2024	0	0	319	18	1	338	763	1,136	
2025	0	(31)	297	(55)	(2)	208	722	1,260	
2026	0	(29)	282	(48)	(2)	203	657	1,253	
2027	0	(5)	257	(37)	(3)	211	590	1,241	
2028	0	(13)	246	(64)	3	172	584	1,472	

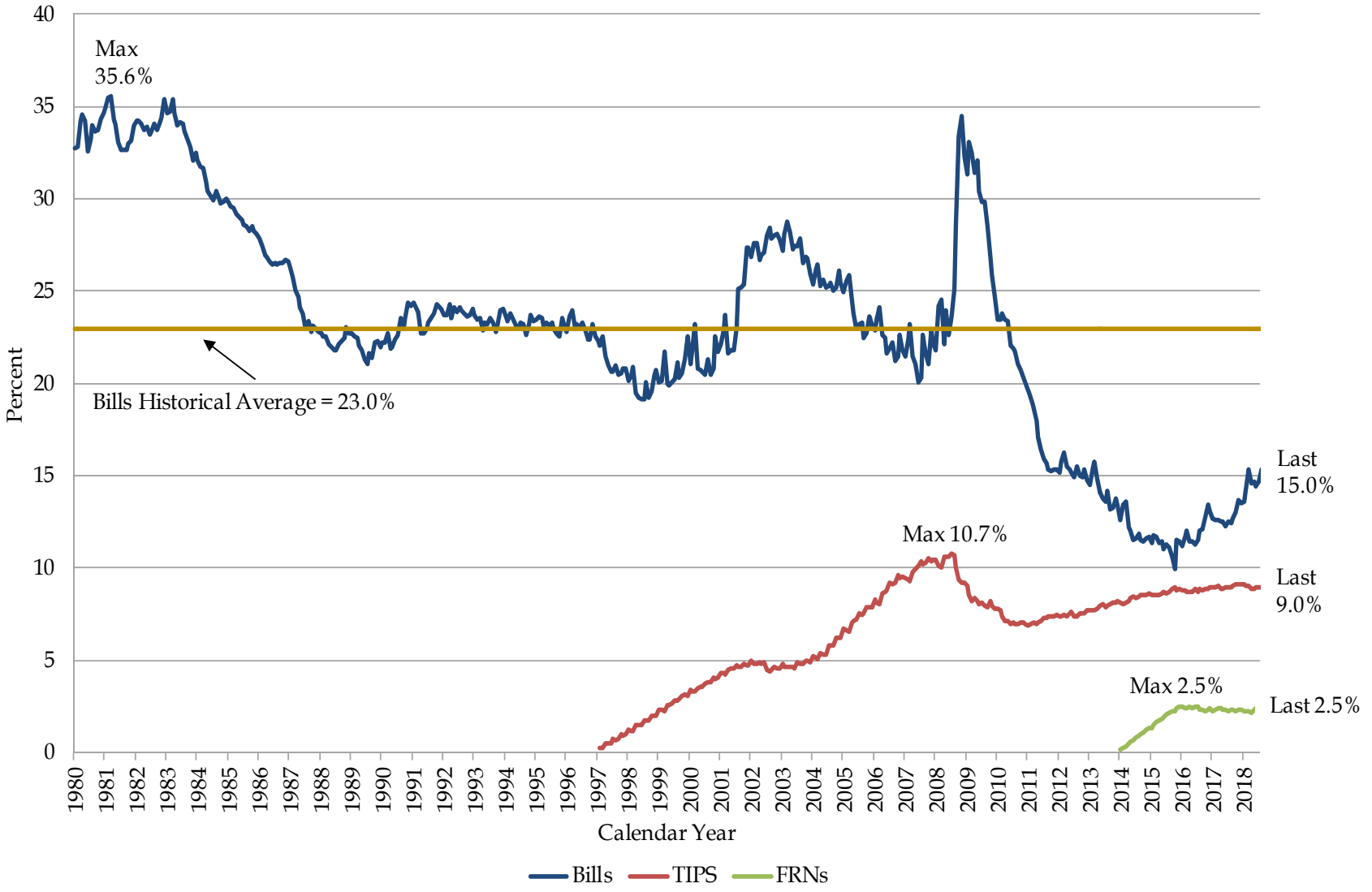
Net borrowing capacity reflects capped SOMA redemptions up until the end of CY 2020.
Treasury's latest primary dealer survey estimates can be found on page 11. OMB's projections of the change in debt held by the public are from Table S-11 of "Mid-Session Review, Fiscal Year 2019," July 2018. CBO's baseline budget projections of the change in debt held by the public are from Table 1-1 of CBO's "The Budget and Economic Outlook: 2019 to 2029," January 2019.

Section IV:
Portfolio Metrics

Historical Weighted Average Maturity of Marketable Debt Outstanding



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



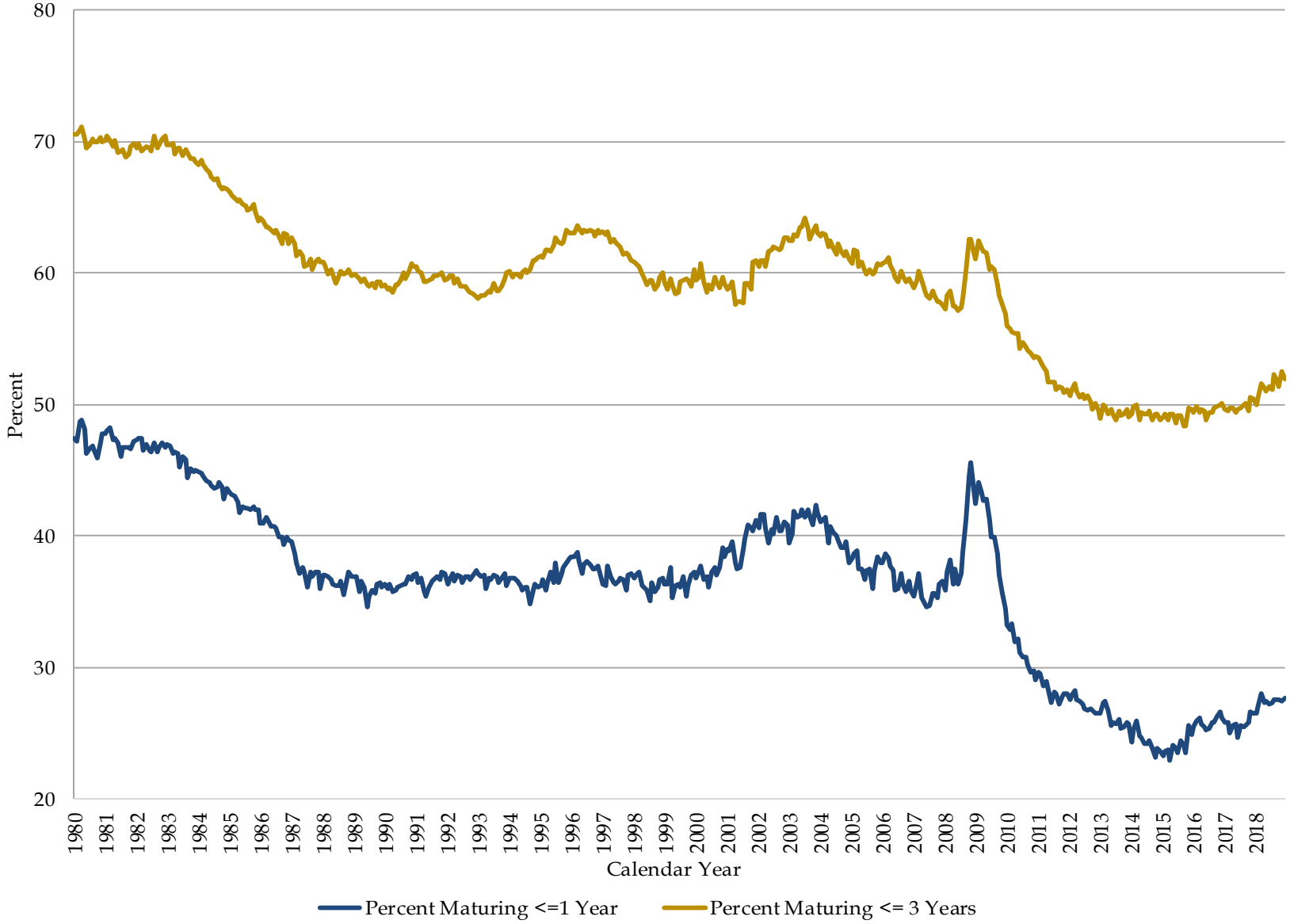
End of Fiscal Year Maturity Profile, $ billions

Date	(0,1]	(1,2]	(2,3]	(3,5]	(5,7]	(7,10]	(10,30]	Total	(0,5]
Sep-11	2,620	1,334	980	1,541	1,070	1,053	1,017	9,616	6,476
Sep-12	2,951	1,373	1,104	1,811	1,214	1,108	1,181	10,742	7,239
Sep-13	2,939	1,523	1,242	1,965	1,454	1,136	1,331	11,590	7,669
Sep-14	2,935	1,739	1,319	2,207	1,440	1,113	1,528	12,281	8,199
Sep-15	3,097	1,775	1,335	2,382	1,478	1,121	1,654	12,841	8,589
Sep-16	3,423	1,828	1,538	2,406	1,501	1,151	1,800	13,648	9,195
Sep-17	3,631	2,027	1,504	2,433	1,466	1,180	1,946	14,188	9,596
Sep-18	4,299	2,076	1,603	2,472	1,531	1,209	2,077	15,268	10,450

End of Fiscal Year Maturity Profile, percent

Date	(0,1]	(1,2]	(2,3]	(3,5]	(5,7]	(7,10]	(10,30]	(0,3]	(0,5]
Sep-11	27.2	13.9	10.2	16.0	11.1	10.9	10.6	51.3	67.3
Sep-12	27.5	12.8	10.3	16.9	11.3	10.3	11.0	50.5	67.4
Sep-13	25.4	13.1	10.7	17.0	12.5	9.8	11.5	49.2	66.2
Sep-14	23.9	14.2	10.7	18.0	11.7	9.1	12.4	48.8	66.8
Sep-15	24.1	13.8	10.4	18.5	11.5	8.7	12.9	48.3	66.9
Sep-16	25.1	13.4	11.3	17.6	11.0	8.4	13.2	49.7	67.4
Sep-17	25.6	14.3	10.6	17.1	10.3	8.3	13.7	50.5	67.6
Sep-18	28.2	13.6	10.5	16.2	10.0	7.9	13.6	52.3	68.4

Treasury Maturity Profile History



Section V: Demand

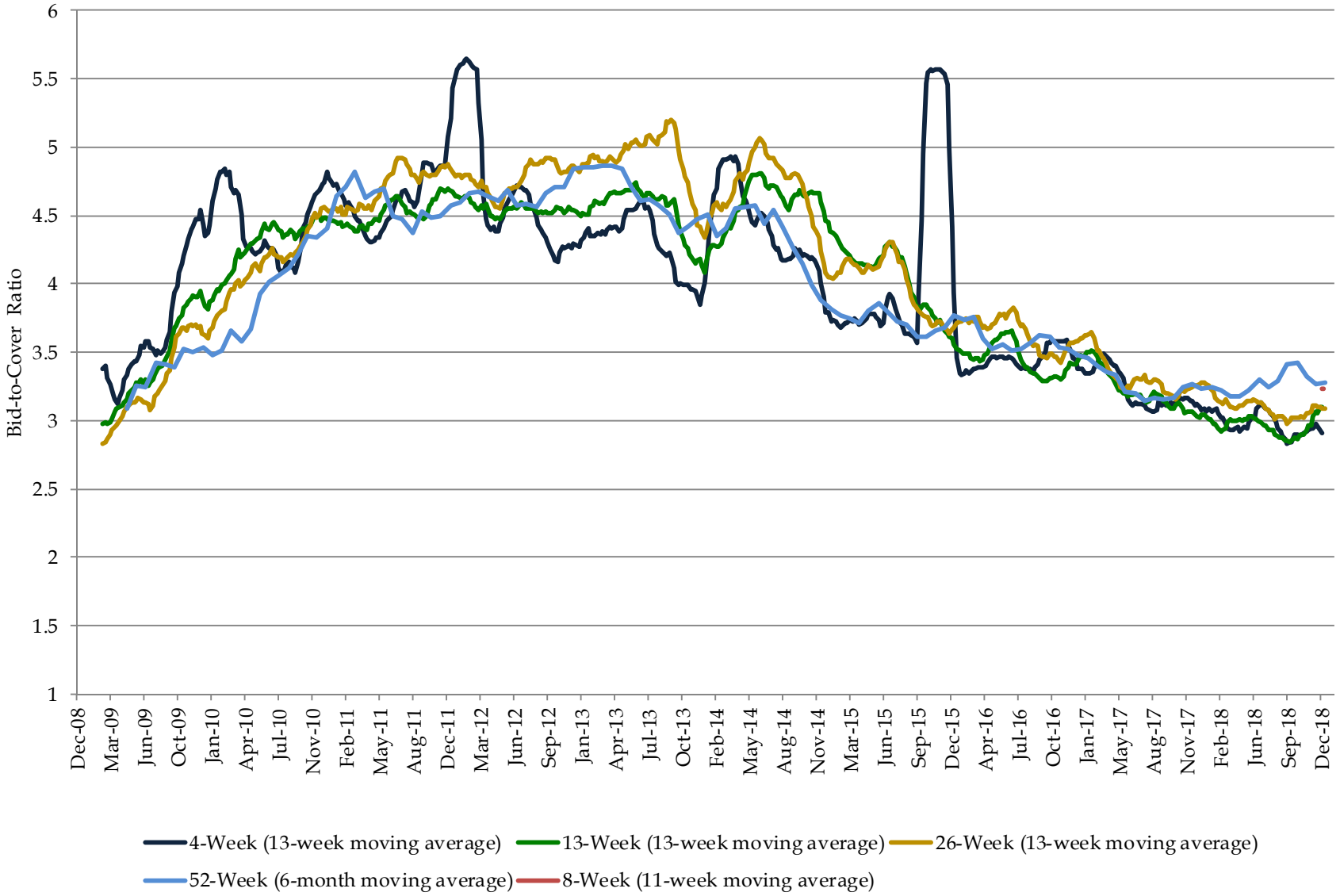
Summary Statistics for Fiscal Year 2019 Q1 Auctions

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	2.239	2.9	589.2	60.4	8.8	30.8	15.8	0.0	5.3
Bill	8-Week	2.305	3.2	343.4	55.0	8.9	36.1	1.6	0.0	6.1
Bill	13-Week	2.326	3.1	576.5	52.7	8.1	39.2	20.5	0.0	17.5
Bill	26-Week	2.446	3.1	512.3	49.2	3.5	47.2	18.7	0.0	31.1
Bill	52-Week	2.601	3.2	101.4	46.2	6.8	46.9	2.6	0.0	12.1
Coupon	2-Year	2.776	2.5	115.6	41.6	11.0	47.4	1.4	3.4	27.5
Coupon	3-Year	2.904	2.6	110.2	42.7	8.5	48.9	0.8	7.5	40.1
Coupon	5-Year	2.833	2.3	119.7	35.2	7.3	57.5	0.3	3.5	67.7
Coupon	7-Year	2.908	2.5	94.9	21.4	15.7	62.9	0.1	2.8	72.9
Coupon	10-Year	3.119	2.4	73.9	27.0	5.6	67.4	0.1	5.5	80.0
Coupon	30-Year	3.315	2.2	50.0	28.4	8.6	63.0	0.0	3.9	120.8
TIPS	5-Year	1.129	2.8	14.0	12.6	6.7	80.8	0.0	0.0	7.0
TIPS	10-Year	1.109	2.6	11.0	19.8	12.1	68.1	0.0	1.0	13.0
TIPS	30-Year	1.235	2.3	5.0	23.3	0.9	75.7	0.0	0.0	14.9
FRN	2-Year	0.081	2.9	54.9	46.9	2.0	51.1	0.1	1.6	0.0

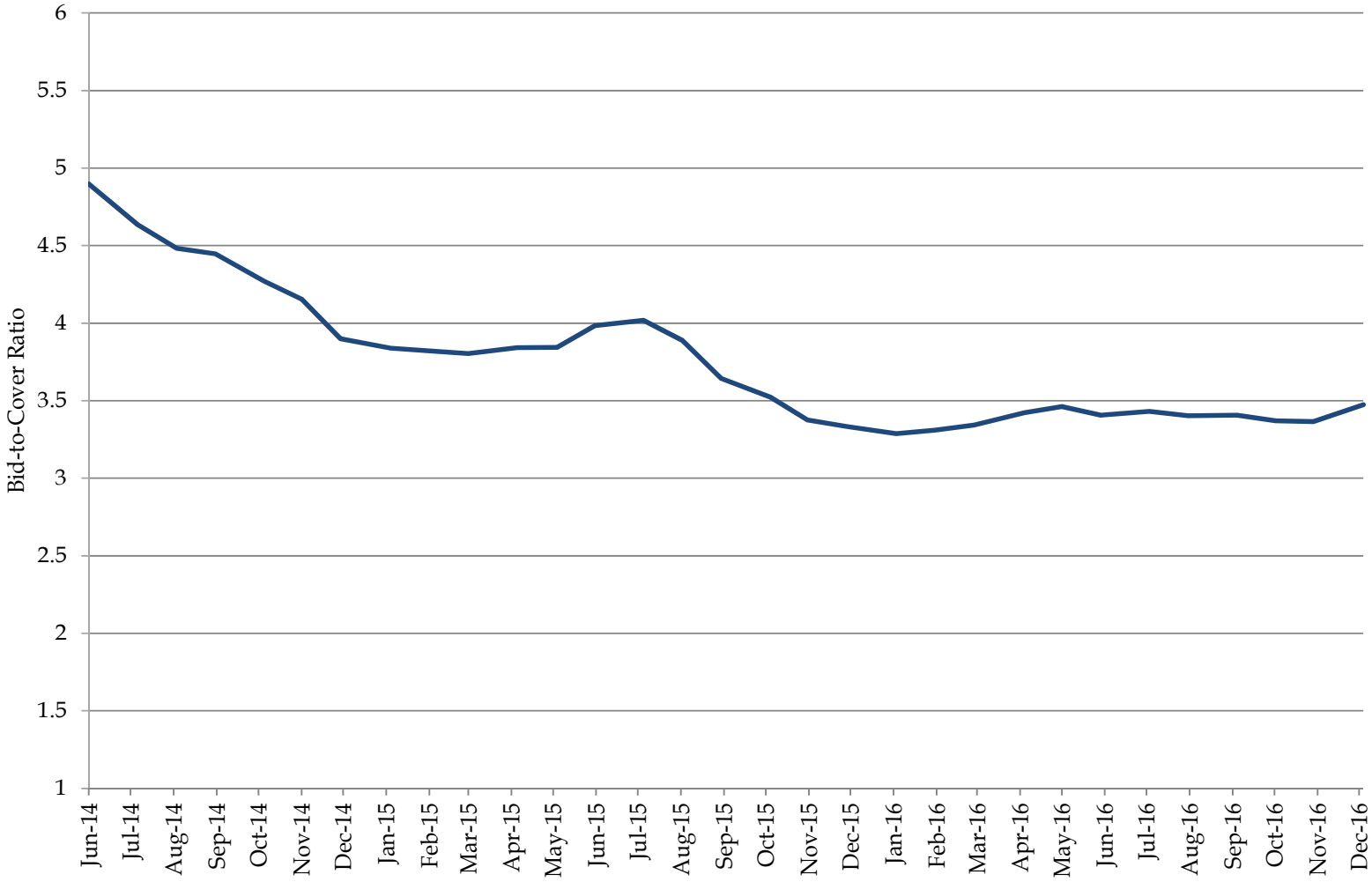
Total Bills	2.341	3.1	2,122.8	54.1	7.3	38.7	59.2	0.0	72.1
Total Coupons	2.928	2.4	564.3	34.0	9.6	56.4	2.7	26.7	408.9
Total TIPS	1.139	2.6	30.0	17.0	7.7	75.3	0.0	1.0	34.9
Total FRN	0.081	2.9	54.9	46.9	2.0	51.1	0.1	1.6	0.0

*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.

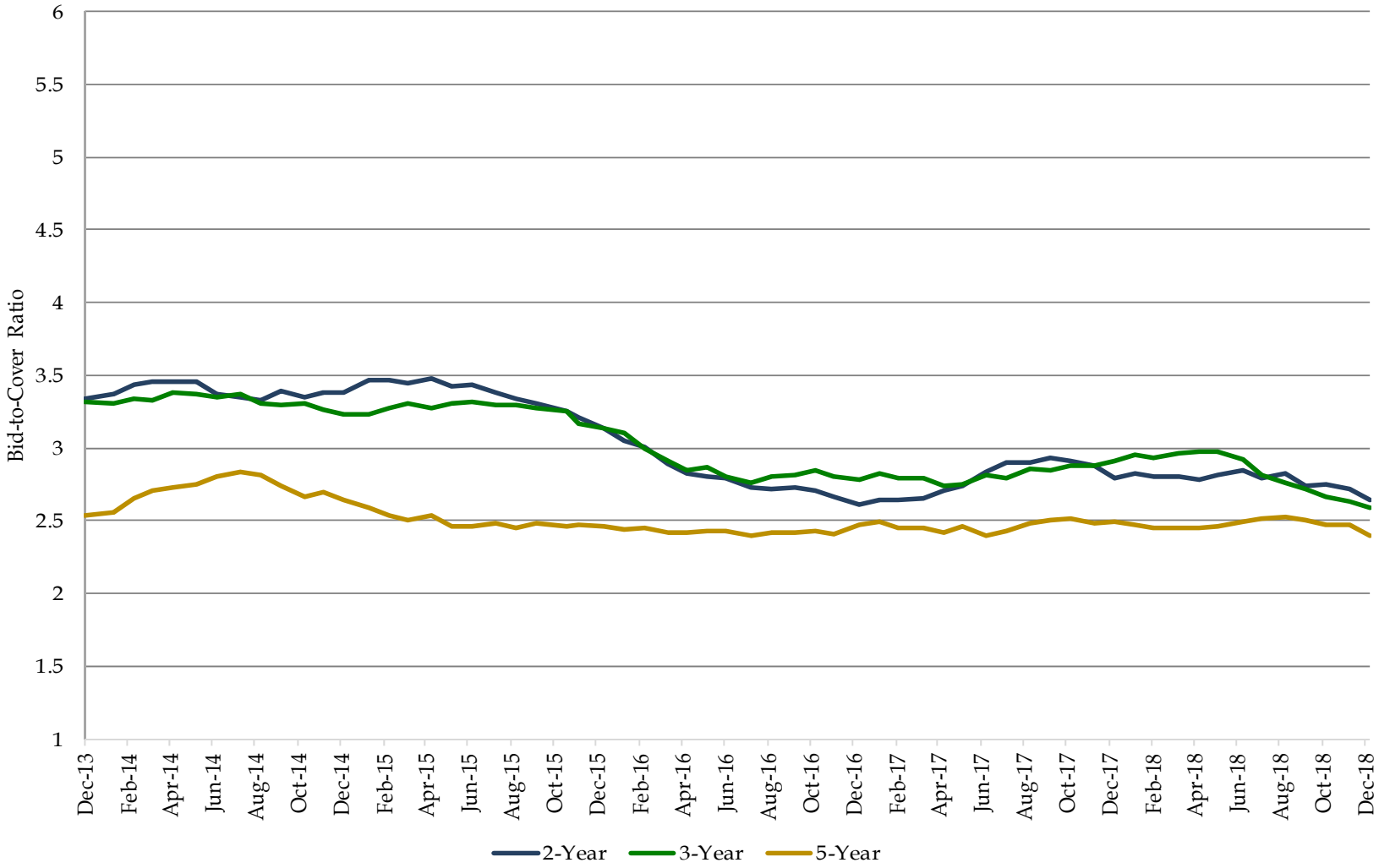
Bid-to-Cover Ratios for Treasury Bills



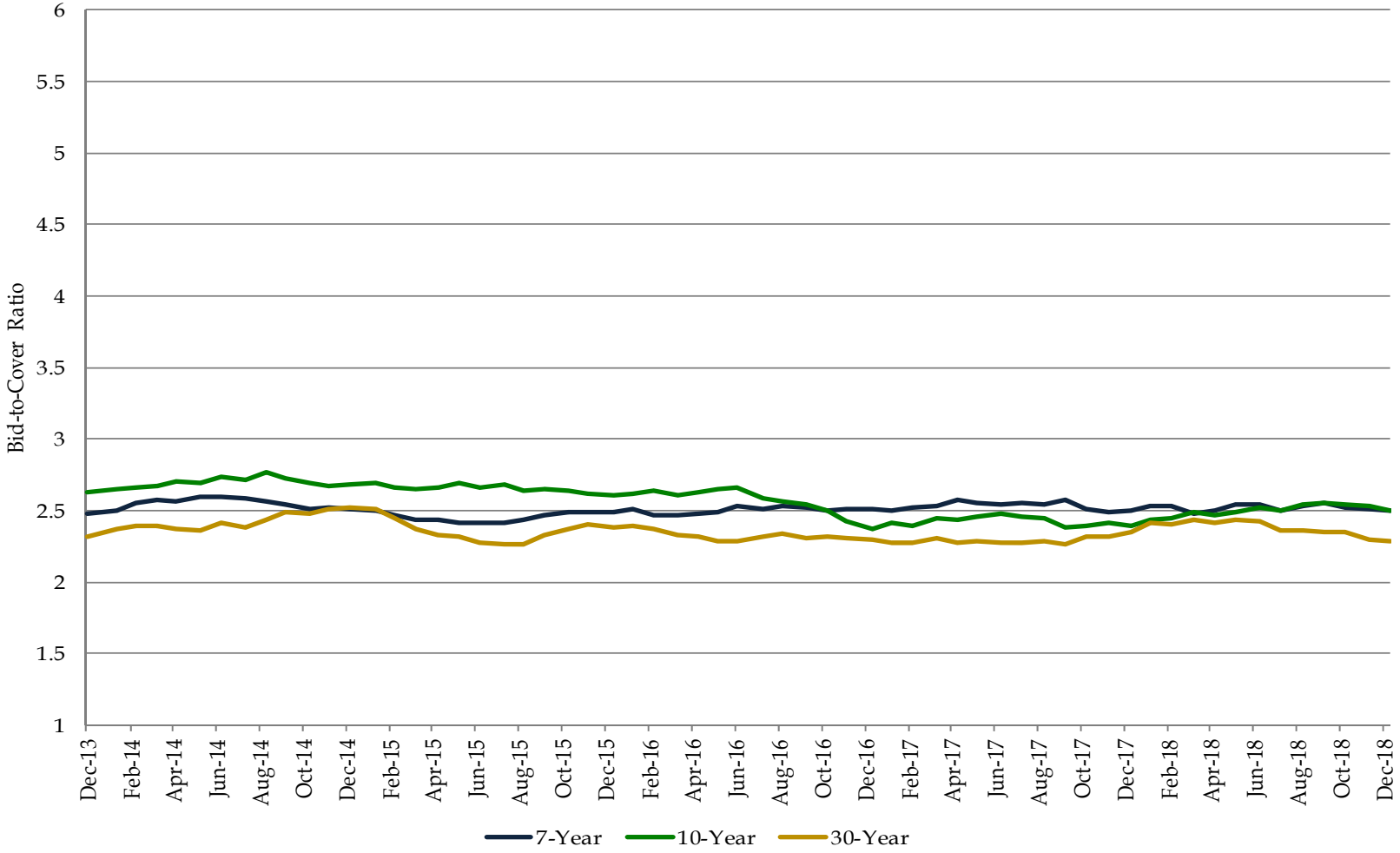
Bid-to-Cover Ratios for FRNs
(6-Month Moving Average)



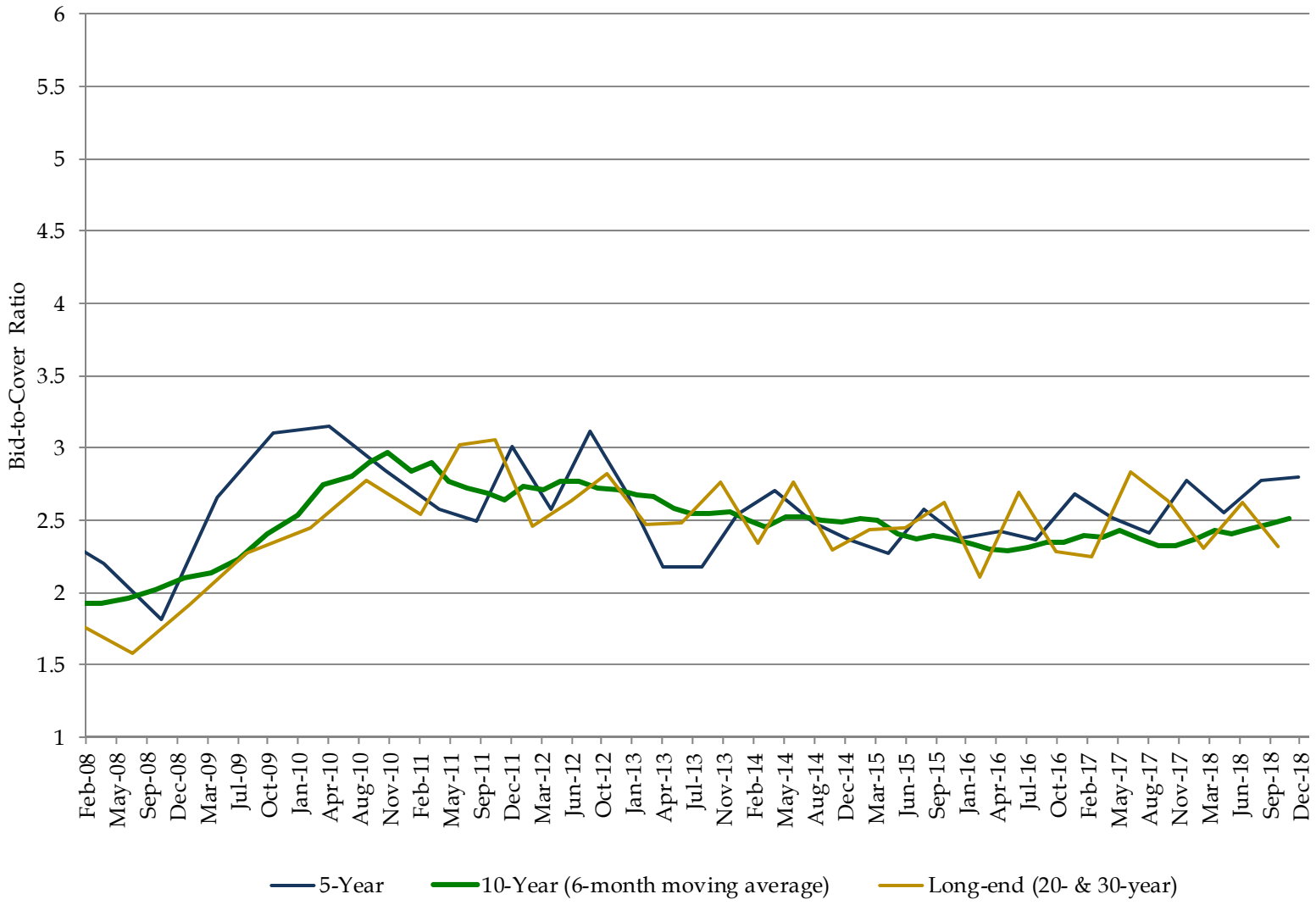
Bid-to-Cover Ratios for 2-, 3-, and 5-Year Nominal Securities (6-Month Moving Average)

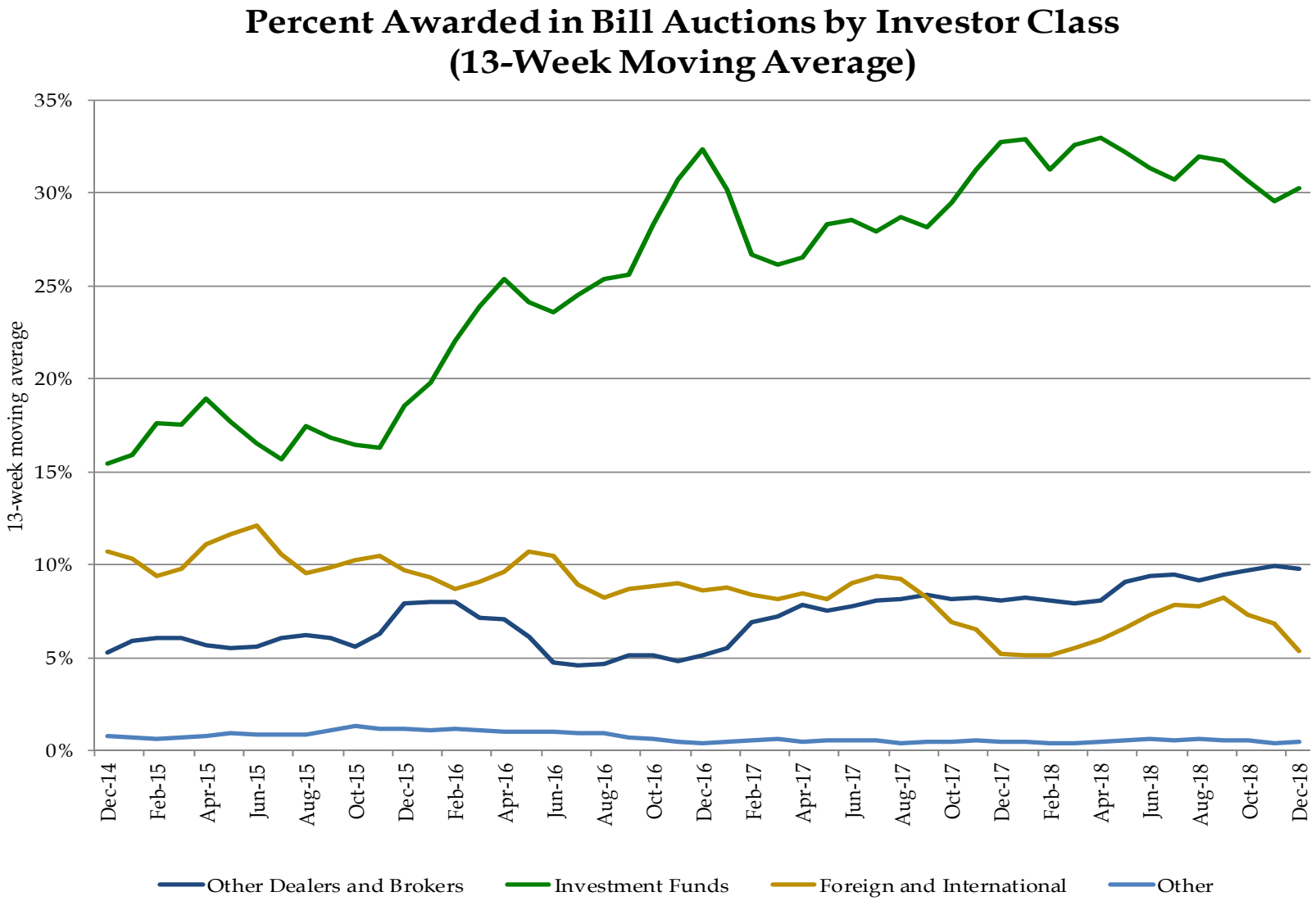


Bid-to-Cover Ratios for 7-, 10-, and 30-Year Nominal Securities (6-Month Moving Average)



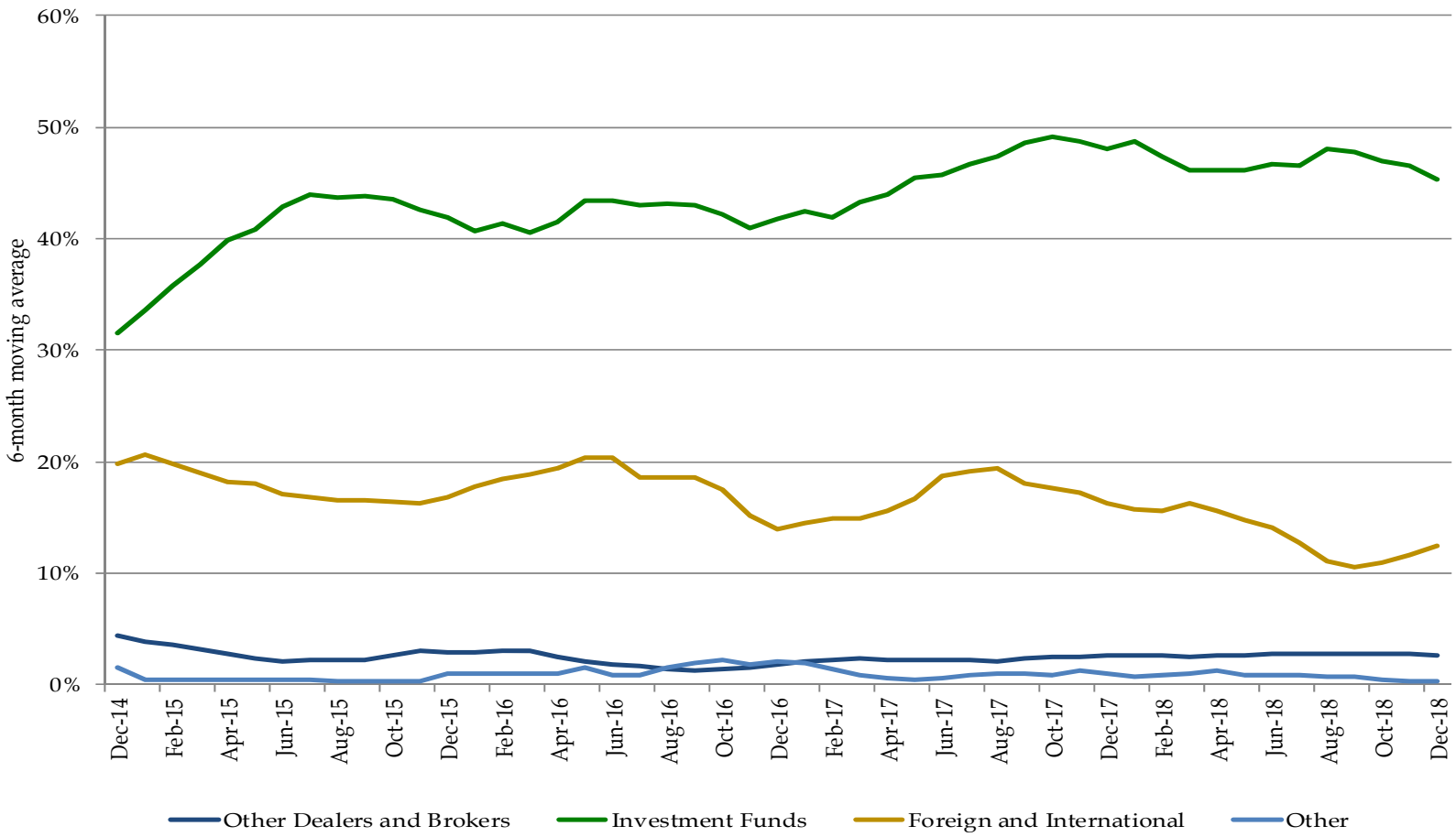
Bid-to-Cover Ratios for TIPS





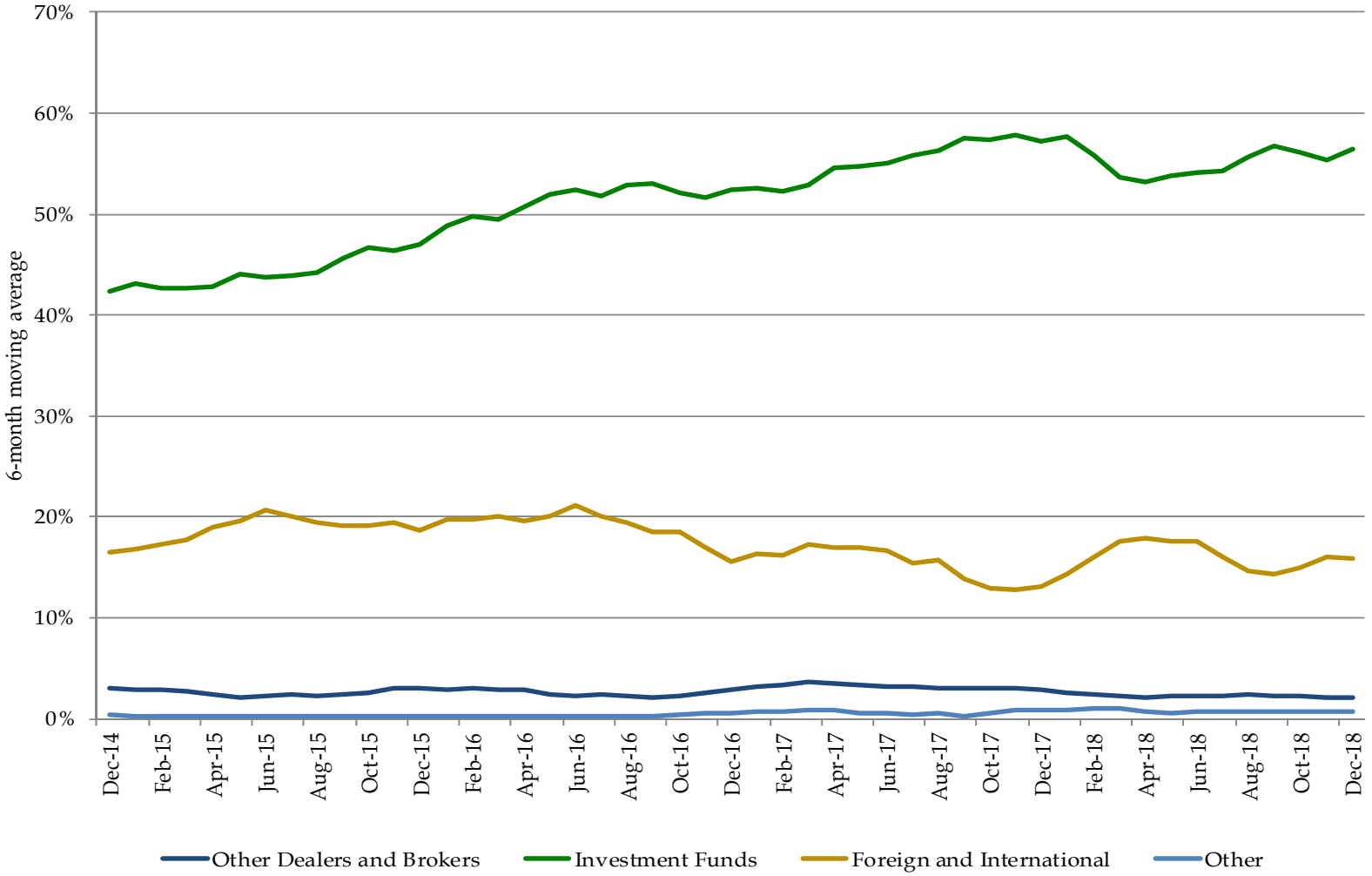
Excludes SOMA add-ons. The "Other" category includes categories that are each less than 5%, which include Depository Institutions, Individuals, Pension and Insurance.

Percent Awarded in 2-, 3-, and 5-Year Nominal Security Auctions by Investor Class (6-Month Moving Average)



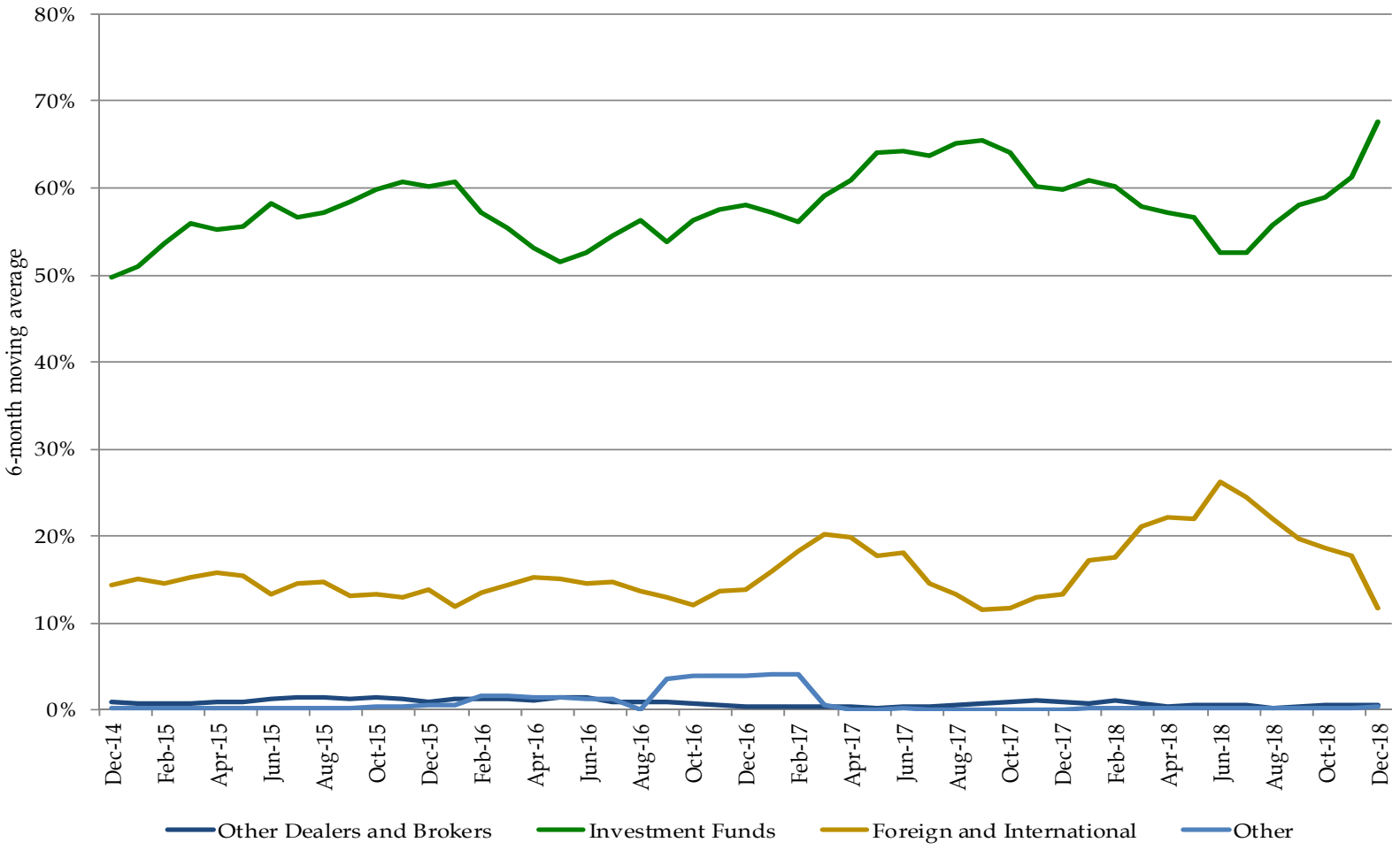
Excludes SOMA add-ons. The "Other" category includes categories that are each less than 5%, which include Depository Institutions, Individuals, Pension and Insurance.

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



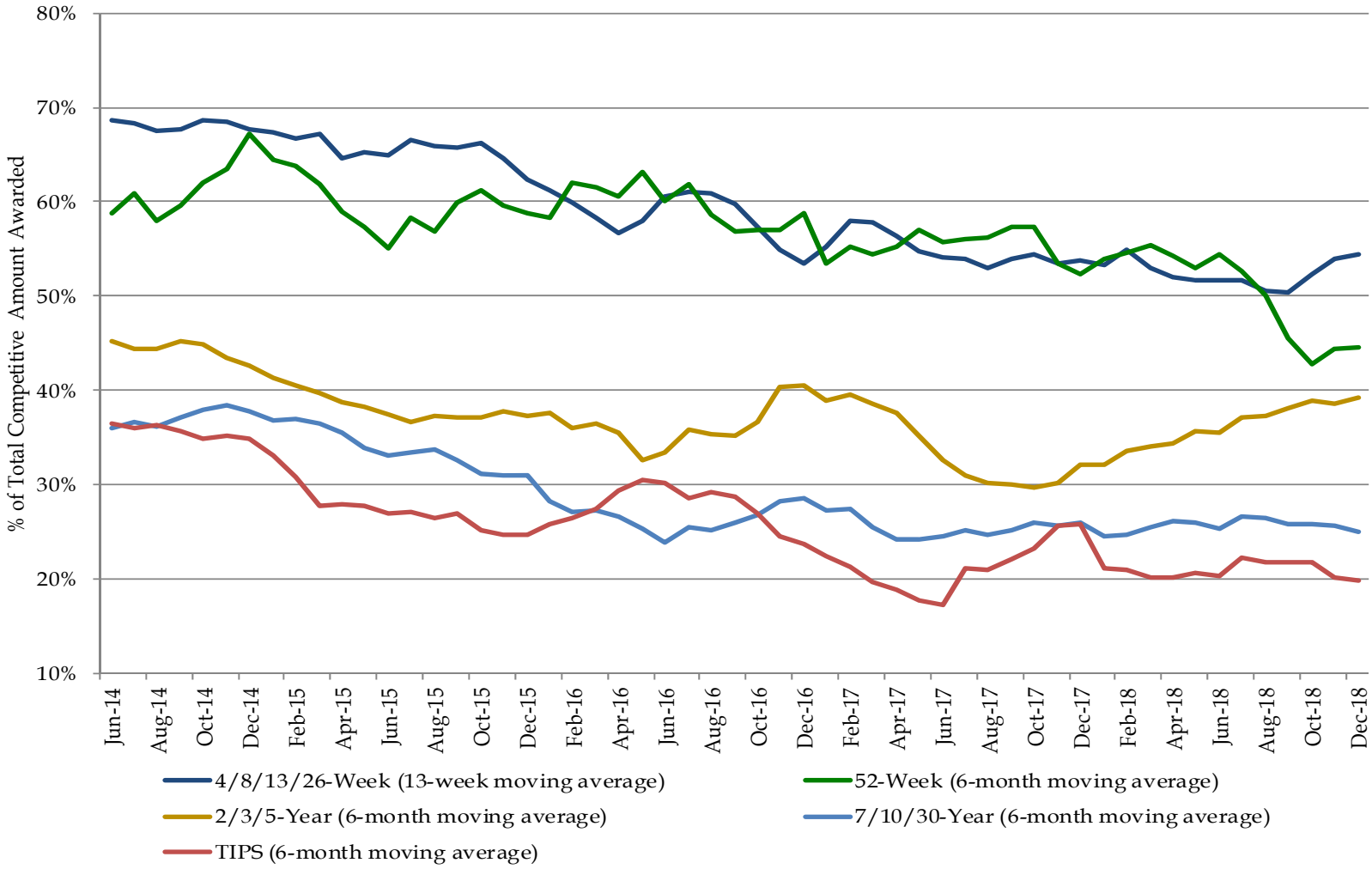
Excludes SOMA add-ons. The "Other" category includes categories that are each less than 5%, which include Depository Institutions, Individuals, Pension and Insurance.

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



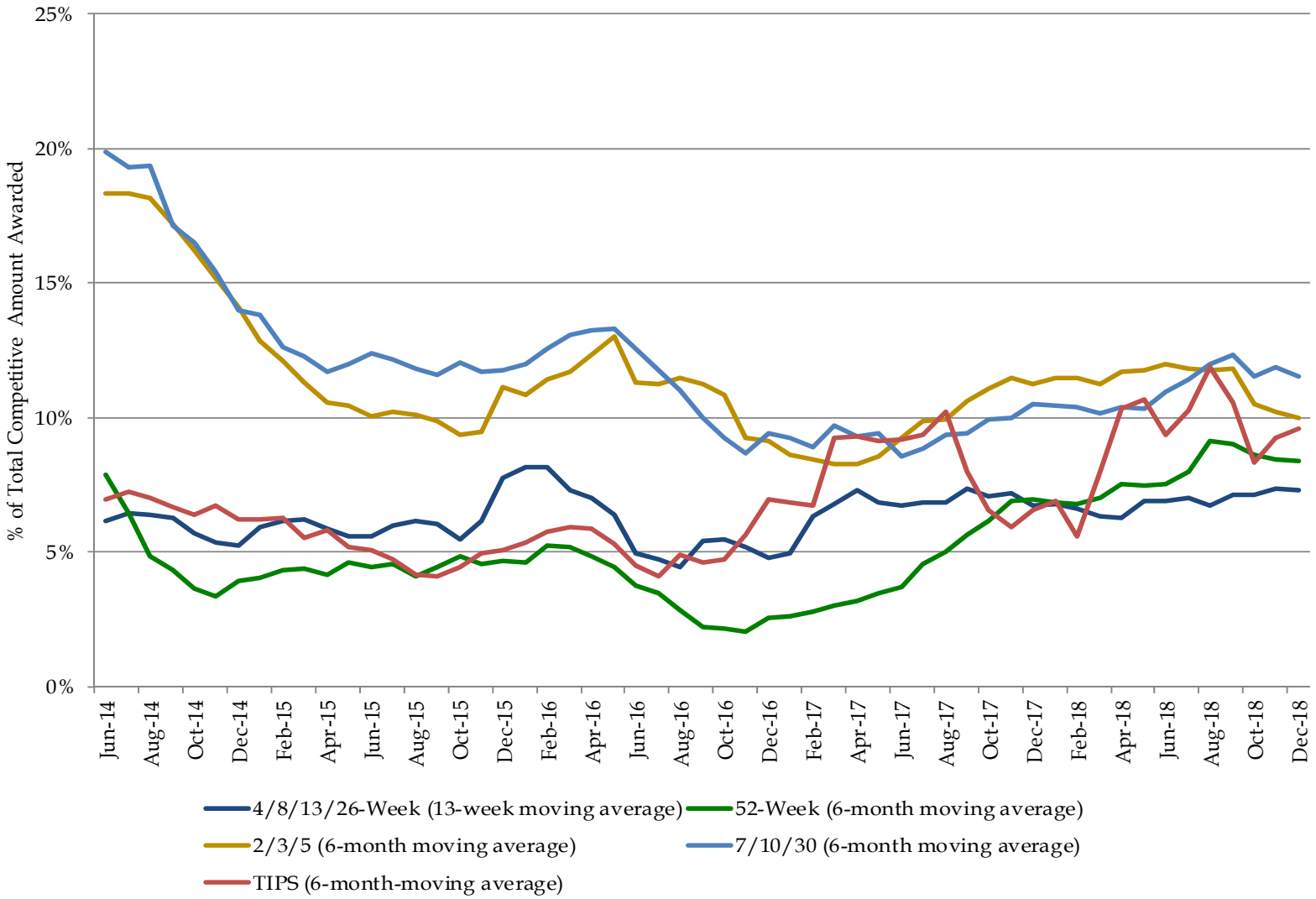
Excludes SOMA add-ons. The "Other" category includes categories that are each less than 5%, which include Depository Institutions, Individuals, Pension and Insurance.

Primary Dealer Awards at Auction



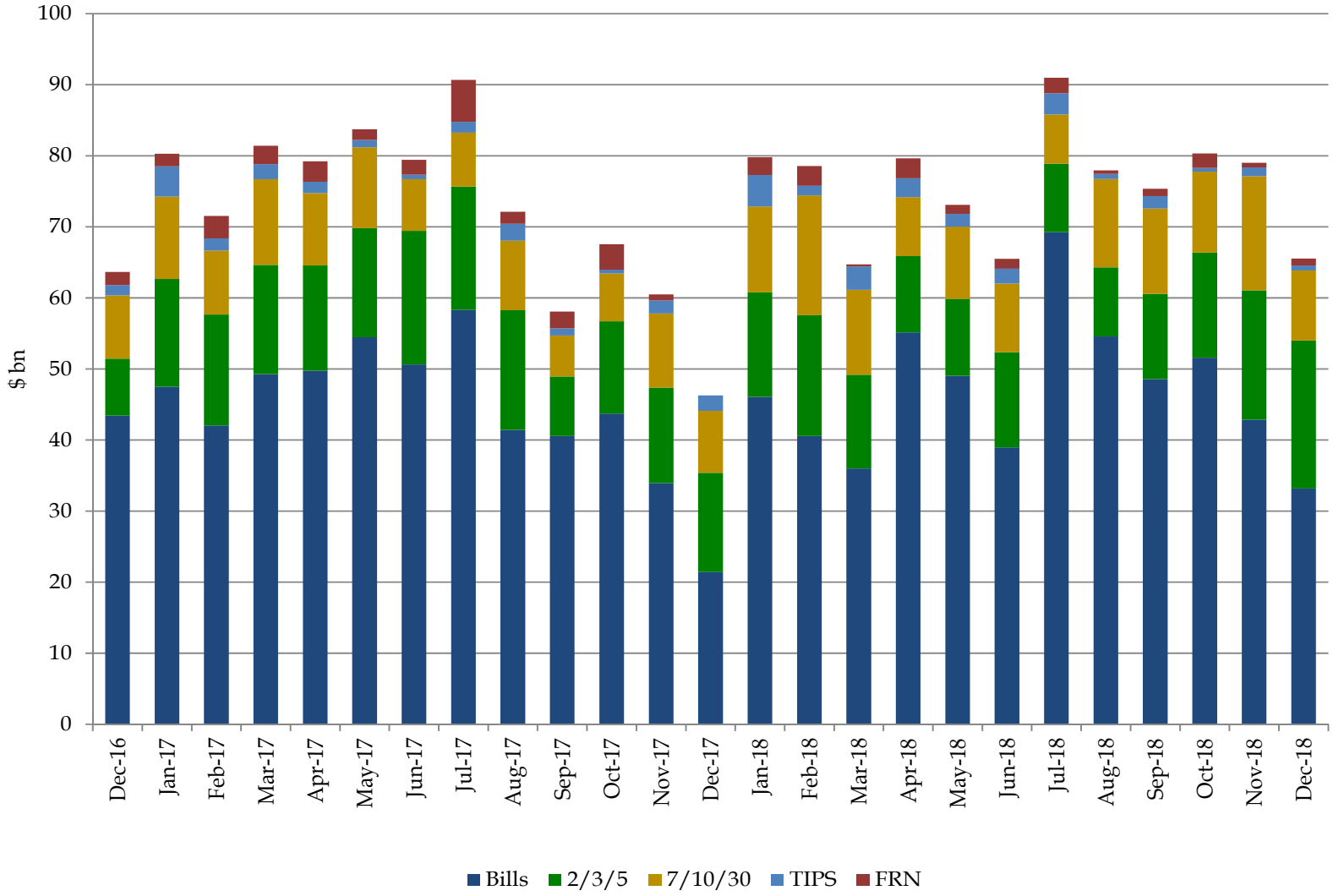
Excludes SOMA add-ons.

Direct Bidder Awards at Auction



Excludes SOMA add-ons.

Total Foreign Awards of Treasuries at Auction, $ billions



Foreign includes both private sector and official institutions.

Appendix

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	10/4/2018	2.105	3.12	38.9	50.7	9.5	39.8	1.1	0.0	0.4
4-Week	10/11/2018	2.135	3.17	38.8	57.0	5.5	37.5	1.2	0.0	0.4
4-Week	10/18/2018	2.155	2.81	39.0	65.7	10.8	23.5	1.0	0.0	0.4
4-Week	10/25/2018	2.180	2.86	39.0	67.4	9.0	23.6	1.0	0.0	0.4
4-Week	11/1/2018	2.165	2.85	43.9	47.7	13.5	38.9	1.1	0.0	0.4
4-Week	11/8/2018	2.200	2.91	48.7	55.6	7.5	36.9	1.3	0.0	0.5
4-Week	11/15/2018	2.200	2.78	49.0	69.7	10.9	19.4	1.0	0.0	0.4
4-Week	11/23/2018	2.200	2.90	48.9	58.3	7.7	34.0	1.1	0.0	0.4
4-Week	11/29/2018	2.270	2.75	49.0	74.6	5.9	19.5	1.0	0.0	0.4
4-Week	12/6/2018	2.320	3.07	38.7	54.6	7.2	38.2	1.3	0.0	0.3
4-Week	12/11/2018	2.365	3.04	39.3	54.3	9.4	36.4	0.7	0.0	0.4
4-Week	12/18/2018	2.325	2.92	38.7	59.1	13.1	27.8	1.3	0.0	0.4
4-Week	12/26/2018	2.360	2.68	38.6	71.9	9.8	18.3	1.4	0.0	0.3
4-Week	1/2/2019	2.400	3.03	38.8	55.9	3.9	40.3	1.2	0.0	0.3
8-Week	10/18/2018	2.170	3.13	24.9	62.0	15.1	22.9	0.1	0.0	0.4
8-Week	10/25/2018	2.180	3.43	24.9	59.2	7.2	33.7	0.1	0.0	0.4
8-Week	11/1/2018	2.205	3.08	24.9	61.9	8.1	29.9	0.1	0.0	0.4
8-Week	11/8/2018	2.240	3.09	29.9	62.4	5.4	32.2	0.1	0.0	0.5
8-Week	11/15/2018	2.285	3.13	29.8	52.9	10.1	37.1	0.2	0.0	0.5
8-Week	11/23/2018	2.300	3.48	29.9	45.7	11.4	42.9	0.1	0.0	0.5
8-Week	11/29/2018	2.315	3.23	29.9	48.1	14.1	37.8	0.1	0.0	0.5
8-Week	12/6/2018	2.360	3.24	29.9	40.2	10.3	49.5	0.1	0.0	0.5
8-Week	12/11/2018	2.390	3.01	30.0	58.4	6.2	35.4	0.0	0.0	0.5
8-Week	12/18/2018	2.360	3.81	29.8	43.3	10.0	46.7	0.2	0.0	0.5
8-Week	12/26/2018	2.375	2.98	29.8	63.0	6.5	30.5	0.2	0.0	0.5
8-Week	1/2/2019	2.420	3.13	29.8	66.4	3.2	30.4	0.2	0.0	0.5

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

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)*
13-Week	10/4/2018	2.175	2.93	46.4	59.1	8.8	32.1	1.6	0.0	1.4
13-Week	10/11/2018	2.220	2.72	46.2	71.6	6.8	21.6	1.8	0.0	1.4
13-Week	10/18/2018	2.270	2.96	43.6	60.9	6.3	32.8	1.4	0.0	1.3
13-Week	10/25/2018	2.300	3.06	42.9	53.3	6.0	40.8	2.1	0.0	1.3
13-Week	11/1/2018	2.305	2.90	43.3	45.8	17.5	36.8	1.7	0.0	1.3
13-Week	11/8/2018	2.320	3.07	43.7	53.6	9.2	37.2	1.3	0.0	1.3
13-Week	11/15/2018	2.340	3.14	43.6	49.6	9.4	40.9	1.4	0.0	1.3
13-Week	11/23/2018	2.345	3.06	40.6	52.8	6.4	40.8	1.4	0.0	1.2
13-Week	11/29/2018	2.370	3.74	37.1	42.0	8.0	50.1	1.9	0.0	1.1
13-Week	12/6/2018	2.365	3.26	37.7	42.8	7.1	50.1	1.3	0.0	1.1
13-Week	12/13/2018	2.375	2.95	37.8	50.4	9.6	40.0	1.2	0.0	1.1
13-Week	12/20/2018	2.375	3.52	37.8	44.8	9.5	45.7	1.2	0.0	1.1
13-Week	12/27/2018	2.415	2.94	37.7	53.3	4.3	42.4	1.3	0.0	1.1
13-Week	1/3/2019	2.465	2.81	38.0	51.7	3.7	44.6	1.0	0.0	1.1
26-Week	10/4/2018	2.335	2.89	40.7	57.6	4.1	38.3	1.3	0.0	2.4
26-Week	10/11/2018	2.380	2.79	40.6	57.8	3.8	38.4	1.4	0.0	2.5
26-Week	10/18/2018	2.415	2.87	37.7	59.1	3.0	37.9	1.3	0.0	2.3
26-Week	10/25/2018	2.425	3.13	37.1	46.6	2.6	50.8	1.9	0.0	2.3
26-Week	11/1/2018	2.430	3.01	37.8	46.5	5.0	48.5	1.2	0.0	2.3
26-Week	11/15/2018	2.465	3.26	37.9	52.0	3.8	44.3	1.1	0.0	2.3
26-Week	11/23/2018	2.455	3.16	34.8	54.7	3.8	41.5	1.2	0.0	2.1
26-Week	11/29/2018	2.475	3.61	34.6	36.1	5.2	58.8	1.4	0.0	2.1
26-Week	12/6/2018	2.495	3.05	34.8	58.6	2.8	38.6	1.2	0.0	2.1
26-Week	12/13/2018	2.480	3.07	34.9	43.2	3.9	52.9	1.1	0.0	2.1
26-Week	12/20/2018	2.485	3.13	34.9	42.7	3.7	53.7	1.1	0.0	2.1
26-Week	12/27/2018	2.480	3.04	34.2	32.1	1.2	66.7	1.8	0.0	2.1
26-Week	1/3/2019	2.505	2.92	34.3	46.8	2.8	50.4	1.7	0.0	2.1
52-Week	10/11/2018	2.580	3.48	25.3	35.8	7.1	57.1	0.7	0.0	3.0
52-Week	11/8/2018	2.645	3.05	25.3	51.6	6.5	41.9	0.7	0.0	3.1
52-Week	12/6/2018	2.635	3.05	25.4	45.4	5.9	48.7	0.6	0.0	3.0
52-Week	1/3/2019	2.545	3.13	25.4	52.1	7.8	40.1	0.6	0.0	3.0

*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	10/31/2018	2.880	2.67	37.5	41.9	5.5	52.6	0.5	0.0	8.7
2-Year	11/30/2018	2.836	2.65	38.6	35.6	19.5	44.9	0.4	3.4	9.6
2-Year	12/31/2018	2.619	2.31	39.5	47.2	7.8	45.0	0.5	0.0	9.2
3-Year	10/15/2018	2.989	2.56	35.7	43.3	9.8	46.9	0.3	0.0	12.1
3-Year	11/15/2018	2.983	2.54	36.7	47.9	3.0	49.1	0.3	7.5	15.2
3-Year	12/17/2018	2.748	2.59	37.8	37.0	12.5	50.5	0.2	0.0	12.8
5-Year	10/31/2018	2.977	2.30	38.9	39.1	1.9	59.0	0.1	0.0	21.4
5-Year	11/30/2018	2.880	2.49	39.9	29.8	10.3	59.9	0.1	3.5	23.7
5-Year	12/31/2018	2.652	2.09	41.0	36.8	9.6	53.6	0.0	0.0	22.6
7-Year	10/31/2018	3.074	2.39	31.0	30.1	5.2	64.6	0.0	0.0	23.1
7-Year	11/30/2018	2.974	2.55	32.0	16.3	27.0	56.6	0.0	2.8	25.8
7-Year	12/31/2018	2.680	2.46	32.0	18.0	14.6	67.4	0.0	0.0	24.0
10-Year	10/15/2018	3.225	2.39	23.0	30.1	5.4	64.5	0.0	0.0	22.9
10-Year	11/15/2018	3.209	2.54	27.0	25.0	1.2	73.8	0.0	5.5	33.1
10-Year	12/17/2018	2.915	2.35	24.0	26.1	10.8	63.1	0.0	0.0	24.0
30-Year	10/15/2018	3.344	2.42	15.0	22.8	12.8	64.4	0.0	0.0	33.9
30-Year	11/15/2018	3.418	2.06	19.0	38.1	2.9	59.1	0.0	3.9	51.1
30-Year	12/17/2018	3.165	2.31	16.0	22.1	11.5	66.4	0.0	0.0	35.7
2-Year FRN	10/31/2018	0.045	3.32	19.0	48.0	0.1	51.9	0.0	0.0	0.0
2-Year FRN	11/30/2018	0.050	2.62	18.0	60.6	5.8	33.6	0.0	1.6	0.0
2-Year FRN	12/28/2018	0.150	2.71	18.0	32.2	0.1	67.7	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	12/31/2018	1.129	2.80	14.0	12.6	6.7	80.8	0.0	0.0	7.0
10-Year TIPS	11/30/2018	1.109	2.59	11.0	19.8	12.1	68.1	0.0	1.0	13.0
30-Year TIPS	10/31/2018	1.235	2.32	5.0	23.3	0.9	75.7	0.0	0.0	14.9

*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.

Office of Debt Management

Brief Overview of Key Data Sources on
Foreign Participation in the U.S. Treasury Securities Market

Executive Summary

- Several publicly available data sources provide information on foreign participation in the primary and secondary Treasury securities markets.
- Understanding this data, i.e. the way it is collected and reported and its strengths and weaknesses, is important for accurate analysis of foreign participation in the Treasury market.
- This presentation provides a brief survey of commonly used data sources.
  - **Primary Market** data on auction awards:
    1) *Treasury Investor Class Data*
    2) *Treasury Auction Results Data*
  - **Secondary Market** data on holdings and transactions:
    3) *Treasury International Capital (TIC) Data (Holdings and Transactions)*
    4) *Federal Reserve's H.4.1 – Factors Affecting Reserve Balances (Holdings)*

- Other sources of foreign holdings include: The Bureau of Economic Analysis's International Transactions and its International Investment Positions; the Federal Reserve's Z.1 - Financial Accounts of the U.S.; and the Treasury Bulletin. For foreign holdings, these sources rely on data derived from TIC.
- Finally, some individual foreign central banks may choose to disclose Treasury securities holdings or transactions voluntarily. We do not cite those sources here.

Primary Market
1) *Treasury Investor Class Data*

- Treasury releases "Investor Class" data on a lagged basis for all Treasury auctions. The investor class data provides a comprehensive breakdown of auction awards by entity type, including by "foreign and international" entities.
  - Coupons data is published about every two weeks for securities issued since the last publication.
  - Bills data is published at the beginning of the month for securities issued the prior month.
- A sample of the Investor Class coupon data for the month of December 2018 appears below:

Auction Allotments By Investor Class For Marketable Treasury Coupon Securities

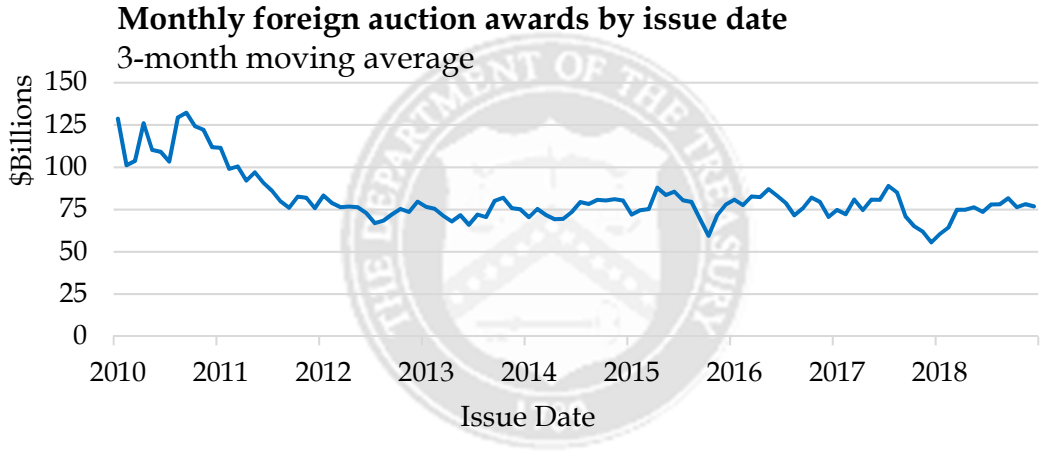
[In billions of dollars. Source: Office of Debt Management, Office of the Under Secretary for Domestic Finance]

Issue date	Security type	(%) Coupon rate Or Spread	Cusip	Maturity date	Total issue	(SOMA) Federal Reserve banks	Depository institutions	Individuals	Dealers and brokers	Pension and Retirement funds and Ins. Co.	Investment funds	Foreign and international	Other
12/31/2018	2-Year Note	2.500	9128285S5	12/31/2020	40.001	0.000	0.001	0.380	19.888	0.000	12.709	7.024	0.000
12/31/2018	5-Year TIPS Note	0.625	9128284H0	04/15/2023	14.000	0.000	0.000	0.030	1.757	0.130	11.351	0.732	0.000
12/31/2018	5-Year Note	2.625	9128285U0	12/31/2023	40.999	0.000	0.001	0.028	16.174	0.050	16.728	7.802	0.216
12/31/2018	7-Year Note	2.625	9128285T3	12/31/2025	32.000	0.000	0.000	0.012	6.614	0.000	20.817	4.398	0.160

- The "Foreign and international" category includes awards related to:
  - Competitive bids for foreign entities, whether official or private, placed directly or through a Primary Dealer or other Direct bidder (other dealers or depository institutions).
  - Noncompetitive bids for Foreign and International Monetary Authorities placed through the Federal Reserve Bank of New York (FRBNY).

Primary Market
1) *Treasury Investor Class Data (continued)*

- The investor class data provides information on foreign participation in auctions, but subsequent secondary market activity can affect foreign holdings.
- The following chart and table, respectively, demonstrate foreign awards over time and the various investor class allocations by product in CY2018.



Average award allocations in CY2018, weighted by issuance amount less SOMA

	Depository Institutions	Individuals	Dealers and Brokers	Pension, Retirement Funds, and Ins. Co.	Investment Funds	Foreign and International	Other*
Bills	0.1%	1.9%	60.1%	0.1%	30.5%	7.2%	0.2%
FRNs	0.4%	0.1%	49.7%	0.4%	27.0%	9.1%	13.3%
Nomimals	0.0%	0.3%	35.0%	0.1%	49.2%	14.8%	0.5%
TIPS	0.0%	0.2%	20.3%	0.3%	61.3%	17.9%	0.0%
All	0.1%	1.5%	54.1%	0.1%	34.7%	9.0%	0.5%

*Other represents the residual from categories not already specified

Primary Market
2) *Treasury Auction Results Data*

Auction awards are divided into "competitive" and "noncompetitive" awards. Data is available at the time of the auction results release.

Competitive awards are divided into 3 bidder categories and provide an indication of how entities are participating at auction

- Foreign participants, can be included in any or all of the 3 categories.
- *1) Primary Dealers:* awards for Primary Dealers' house accounts. Some Primary Dealers are a branch, agency, or subsidiary of a non-U.S. bank or holding company.
- *2) Directs* - awards for the house accounts of non-Primary Dealers.
- *3) Indirects* - awards for customers of: Primary Dealers, other dealers participating as Directs, or depository institutions participating as Directs. Only dealers and depository institutions can submit customer bids.

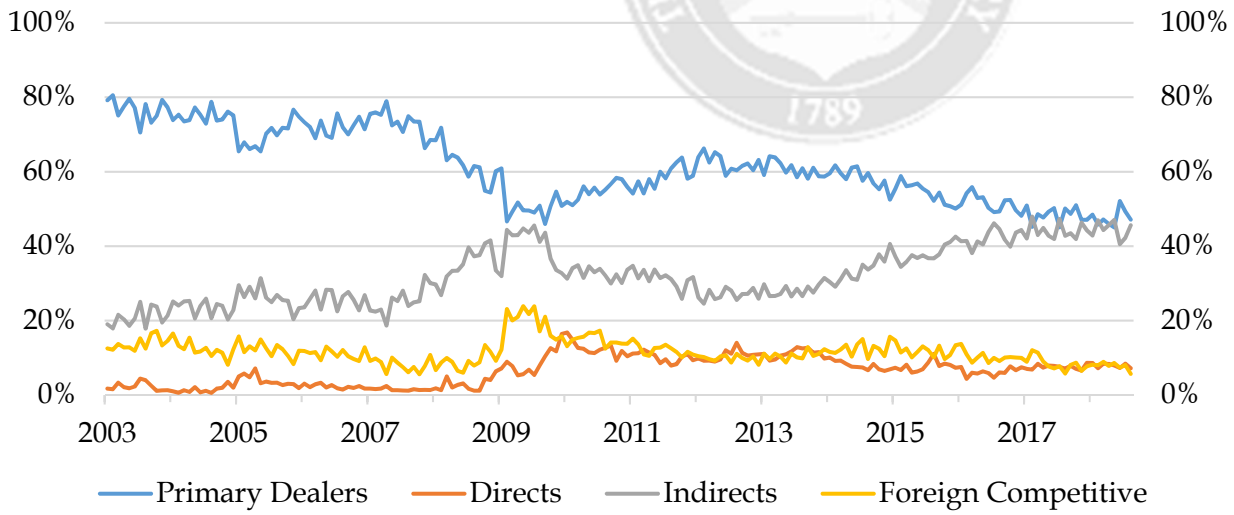
Noncompetitive awards include awards to relatively small investors and aggregated awards to Foreign Institution and Monetary Authorities (FIMA)

- FIMA accounts include foreign central banks, foreign governmental monetary or finance entities, non-governmental international financial organizations that are not private in nature (e.g. the World Bank), and non-financial international organizations in which the U.S participates (e.g. the United Nations).
  - FIMA bids are capped at $100 million per account and $1 billion in total, for a single auction.
  - Total FIMA awards averaged $4.9 billion per month in CY2018.

Primary Market
2) *Treasury Auction Results Data (continued)*

- Some analysts use indirect awards as a proxy for foreign participation in an auction, however competitive award categories do not identify foreign participation.
- Auction participants are permitted to bid both directly and indirectly in the same auction.
- Caution should be exercised in using indirect awards a proxy for foreign auction participation since there is a modest and unstable correlation between the percent of indirect awards and the percent of competitive foreign awards.
- Foreign investors may also choose to acquire holdings in the secondary market rather than the primary market.

Average monthly competitive award breakdowns, weighted by issuance ex-SOMA



Notes

Awards for Primary Dealers, Directs, and Indirects available from auction results. These categories sum to 100%.

Foreign Competitive awards is the difference between the foreign awards reported through investor class data and the noncompetitive FIMA award on the auction results.

Secondary Market
3) *Treasury International Capital (TIC) Data*

- The TIC system collects data on cross-border portfolio investment flows and positions between U.S. residents (including U.S.-based branches of firms headquartered in other countries) and foreign residents (including offshore branches of U.S. firms).
- The annual holdings data, the monthly holdings data, and monthly transactions data provide varying levels of detail on foreign holdings and transactions, as shown below.

Survey	Coverage	Release Schedule	Short-Term (<=1yr)	Long-Term (>1yr)	Foreign Entity Type
Annual 5-Year Benchmark (next in 2019)	Foreign holdings from all U.S. custodians	Spring for survey results from the prior June	Holdings by country or region (MV)	Holdings by country or region, including a breakdown for nominals, TIPS, and FRNs Aggregate breakdown between nominal maturity buckets (MV)	Holdings broken out into foreign official vs foreign private only at the aggregate level (MV)
Annual Non-Benchmark	Foreign holdings from largest U.S. custodians; accounts for 99% of MV of benchmark survey				
Monthly	Foreign Holdings	2-month lag	Holdings by country or region (PV)	Holdings by country or region (MV)	
	Transactions		Not Reported	Gross purchases and sales by country or region (MV)	Net purchases broken out into foreign official vs foreign private entities only at the aggregate level (MV)

PV = Par Value; MV = Market Value

Secondary Market
3) *TIC Data (continued) – Important Features*

Custodian Bias

- The monthly data on holdings, including the monthly table on Major Foreign Holders of Treasury Securities (see next slide), reflect foreign holdings of U.S. securities reported by U.S.-based custodians. As such, these data cannot attribute holdings of U.S. securities to the beneficial owner with complete accuracy. This is commonly known as "custodian bias."
  - For example, if a U.S. Treasury security purchased by a foreign resident in Country A and held in a custodial account in Country B, ownership in the TIC data will be attributed to Country B.
  - The custodial data may also not properly attribute U.S. Treasury securities managed by a foreign entity on behalf of residents of other countries.

Transaction Bias

- A transaction may occur in the country of a foreign intermediary and not represent the actual end-users. In addition, repo transactions may not get classified appropriately and a repo activity can show up in transactions data while holdings data is unaffected.

Valuation

- The TIC data for long-term securities are reported based on market value of the holdings as opposed to par value. This means that sharp movements in yields between reporting periods can change the reported value of a foreign entity's holdings amount substantially, even if the foreign holder did not execute any transactions.

Secondary Market
3) *TIC Data (continued) – Major Foreign Holders*

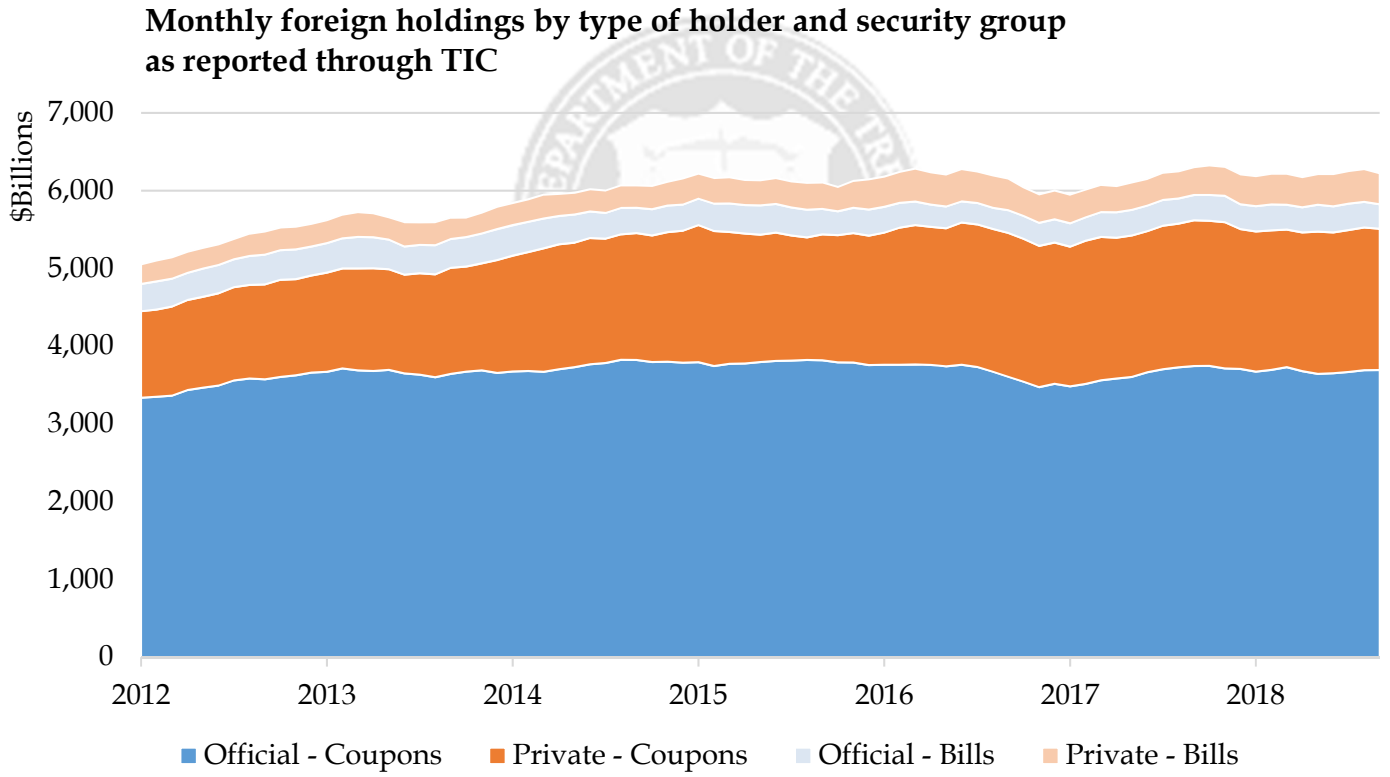
MAJOR FOREIGN HOLDERS OF TREASURY SECURITIES
(in billions of dollars)
HOLDINGS 1/ AT END OF PERIOD

Country	Oct 2018	Sep 2018	Aug 2018	Jul 2018	Jun 2018	May 2018	…
China, Mainland	1,138.9	1,151.4	1,165.1	1,171.0	1,179.0	1,183.1	…
Japan	1,018.5	1,028.0	1,029.9	1,035.5	1,032.2	1,048.8	…
Brazil	313.9	317.0	317.8	299.7	300.1	299.2	…
Ireland	287.3	290.4	311.6	300.2	301.3	301.0	…
United Kingdom	263.9	276.3	272.6	271.7	274.4	265.0	…
Luxembourg	225.4	227.2	224.0	221.5	220.5	209.1	…
Switzerland	225.2	226.9	232.0	233.1	236.3	243.4	…
Cayman Islands	208.2	200.0	197.5	197.9	191.1	186.2	…
Hong Kong	185.0	192.3	193.2	194.4	196.5	191.9	…
Saudi Arabia	171.3	176.1	169.5	166.8	164.3	162.1	…
Belgium	169.7	164.7	154.3	154.5	154.7	150.5	…
Taiwan	162.3	166.4	163.2	164.2	162.6	164.8	…
India	138.2	144.0	140.6	142.6	147.3	148.9	…
…	…	…	…	…	…	…	…
Grand Total	6,199.6	6,225.2	6,277.9	6,253.8	6,213.7	6,214.7	…
Of which:							
For. Official	3,947.2	4,010.1	4,021.1	4,007.8	3,988.8	3,990.8	…
Treasury Bills	306.6	316.7	329.3	339.6	336.3	346.3	…
T-Bonds & Notes	3,640.6	3,693.4	3,691.8	3,668.1	3,652.5	3,644.5	…

Financial centers with a substantial amount of securities held in custody

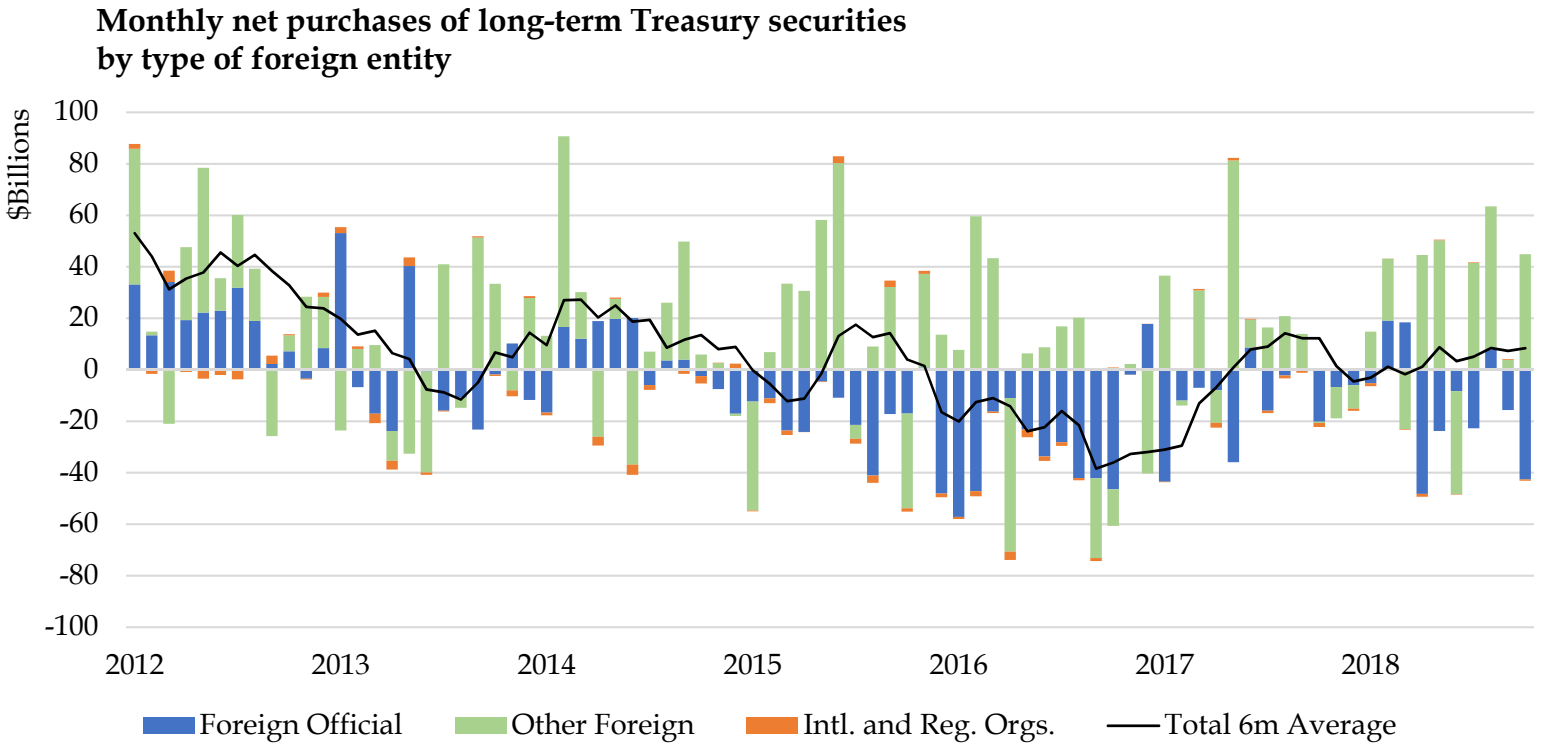
Secondary Market
3) *TIC Data (continued) – Monthly Holdings Breakdown*

- As of October 2018, TIC reported a total of $6.2 trillion held by foreign accounts, of which $3.9 trillion (64%) was held by foreign official accounts.
- The following chart provides the breakdown between coupons and bills and between foreign official and foreign private accounts through September 2018.



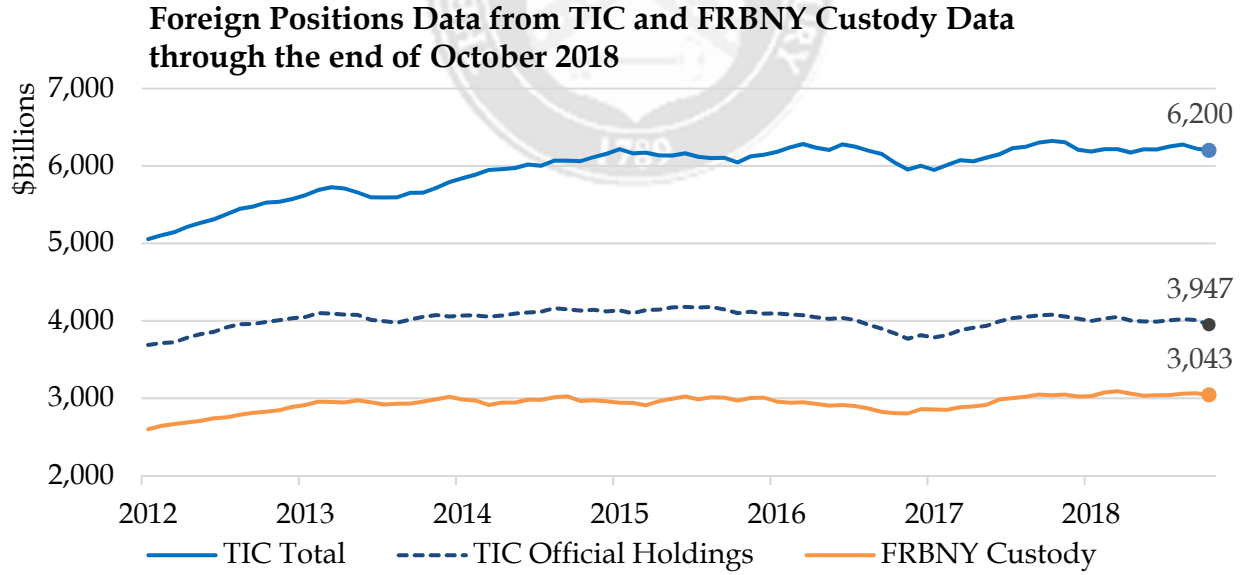
Secondary Market
3) *TIC Data (continued) - Monthly Transactions*

- Monthly transactions data is available for gross purchases and sales by country or region. Data aggregated by type of foreign entity is also available as net purchases (see below).
- The following chart shows net purchases by type of foreign entity, including foreign official, other foreign, and international and regional organization.



Secondary Market
4) *Federal Reserve's H.4.1*

- The Federal Reserve publishes a weekly dataset, *H.4.1 – Factors Affecting Reserve Balances*, that includes Treasury securities held in custody for foreign official and international institutions at the Federal Reserve Bank of New York (FRBNY).
- There are slight differences in methodology that limit the comparability between the H.4.1 holdings data and the TIC data on *foreign official holdings*.
  - H.4.1 is at par value (with principal accretion for TIPS), while TIC uses market values for long-term holdings.
  - H.4.1 does not cover all foreign official holdings, though the reported value of H.4.1 holdings is roughly 77% of the reported foreign official holdings in TIC. Also, H.4.1 can include holdings for international organizations, whereas TIC classifies those entities as foreign private.
  - Holdings that move between FRBNY and other U.S. custodians will affect H.4.1 levels but may affect TIC.



Secondary Market
Other Foreign Holdings Data

The below additional publications also provide information regarding Treasury securities holdings. These data sources rely on Treasury's TIC data as a primary source but may make some adjustments, such as seasonality, and can be subject to revisions.

The Bureau of Economic Analysis's (BEA) international data series

- BEA publishes quarterly reports on *International Transactions* and its *International Investment Positions*, which rely on TIC data for reporting foreign holdings of Treasury securities.

The Federal Reserve's Z.1 - Financial Accounts of the U.S., Flow of Funds

- The Federal Reserve publishes a quarterly release which includes holdings of Treasury securities by type of holder. Within that breakdown, securities held by the "Rest of the World" is based on the BEA data described above.

The Treasury Bulletin

- Treasury publishes the quarterly *Treasury Bulletin*, detailing Treasury-related operations and programs. Within the report, data on ownership of Treasury securities by type of holder, including foreign and international accounts, is based on the Z.1 data described above.

Conclusion

- Understanding the various data sets related to foreign participation in the Treasury market is important for conducting accurate analysis and interpretation of the data.

- The Treasury market is supported by a broad investor base (both foreign and domestic), all with a variety of investment needs that can and do change over time. Foreign participation in the Treasury market has continuously evolved over time. Treasury takes a holistic and long-term perspective on any changes in foreign participation shown in the data.

- The Treasury market is the deepest and most liquid market in the world, and Treasury remains confident that overall demand for Treasury securities will continue to remain strong.

References

Source	Publisher	Publication Schedule
Investor Class Auction Allotments	Treasury	Bills - Beginning of the month for securities issued the prior month Coupons - Roughly every two weeks for securities issued since the last publication
		Coupons' and Bills' data: https://home.treasury.gov/data/investor-class-auction-allotments
Auction Results	Treasury	After each auction
		Press releases: https://treasurydirect.gov/instit/annceresult/press/press.htm
		Competitive bidder breakdown pre-April 2008: https://www.treasurydirect.gov/instit/annceresult/auctdata/auctdata_stat.htm
Treasury International Capital	Treasury	Annual Surveys – each Spring for data as of the prior June Monthly Surveys – two-month lag
		TIC reports: https://www.treasury.gov/resource-center/data-chart-center/tic/Pages/index.aspx
H.4.1 - Factors Affecting Reserve Balances	Federal Reserve	Weekly
		H.4.1 reports: https://www.federalreserve.gov/releases/h41/current/
Z.1 - Financial Accounts of the U.S.	Federal Reserve	Quarterly
		Z.1 reports: https://www.federalreserve.gov/releases/z1/current/
International Transactions and International Investment Positions	Bureau of Economic Analysis	Quarterly
		BEA international reports: http://www.bea.gov/data/economic-accounts/international
Treasury Bulletin	Treasury	Quarterly
		Treasury Bulletins: https://www.fiscal.treasury.gov/reports-statements/treasury-bulletin/current.html

January 2019

Potential Innovation in Treasury Products and Tools

Treasury is always considering ways to minimize borrowing costs, better manage its liability profile, enhance market liquidity, and expand the investor base in Treasury securities. In light of these objectives, we would like the Committee to comment on the likely costs and benefits of potential new Treasury products that might assist Treasury in achieving some or all of these objectives. In addition, are there any other debt management tools or processes that Treasury should consider utilizing? In answering the question, please review the practices and products employed by debt management authorities around the world.

Executive Summary

The Treasury faces unique challenges over the medium term

- Large borrowing needs in context of already large foreign dollar debt holdings and at a time when international reserve growth has stagnated
- Estimated borrowing needs are likely to exceed $12trn over the next decade, even without any recession possibilities factored in
- There is a likely need to finance this borrowing more domestically than in the past

To meet this challenge, we recommend the following:

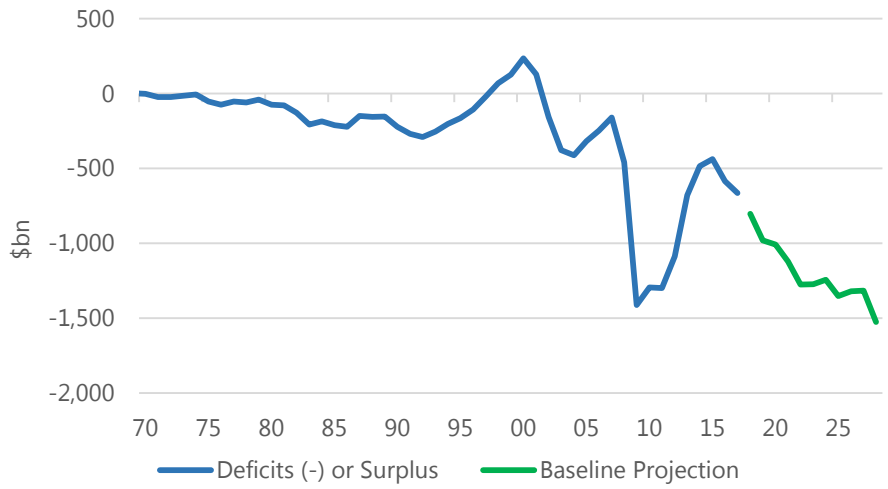
- Focus on thematic issuances
    - Expand investor base by attracting support from pockets of savings in the domestic economy
        - Specifically, depository intuitions, pensions & insurance, non-financial corporates and asset managers
    - These issuances could potentially include
        - CPI subcomponent linked TIPS,
        - Expanded FRN program,
        - Perpetual horizon, and
        - Zero-coupon debt
    - Expand Treasury issuance to take advantage of demand in the 15-20y sector
- Focus on steps to increase attractiveness of Treasuries to foreign investors
- We also recommend evaluating the following process improvements:
    - Making P STRIPS fungible with C STRIPS
    - Further exploring syndication mechanism, especially given the focus on thematic issuances
    - More regular buyback operations and re-openings of scarce issues

These recommendations are preliminary but attractive from a blue sky perspective in the context of the debt management challenge outlined above. A further investigation into each is recommended

Primary debt management challenge

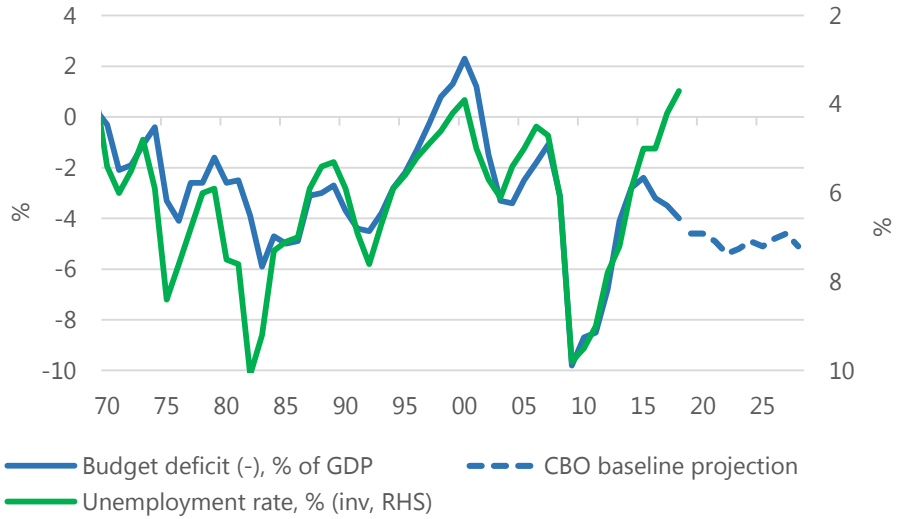
Primary debt management challenge over next 10 years

Treasury's financing needs are expected to increase significantly…



Source: CBO

…even without factoring in recession possibilities over the next decade

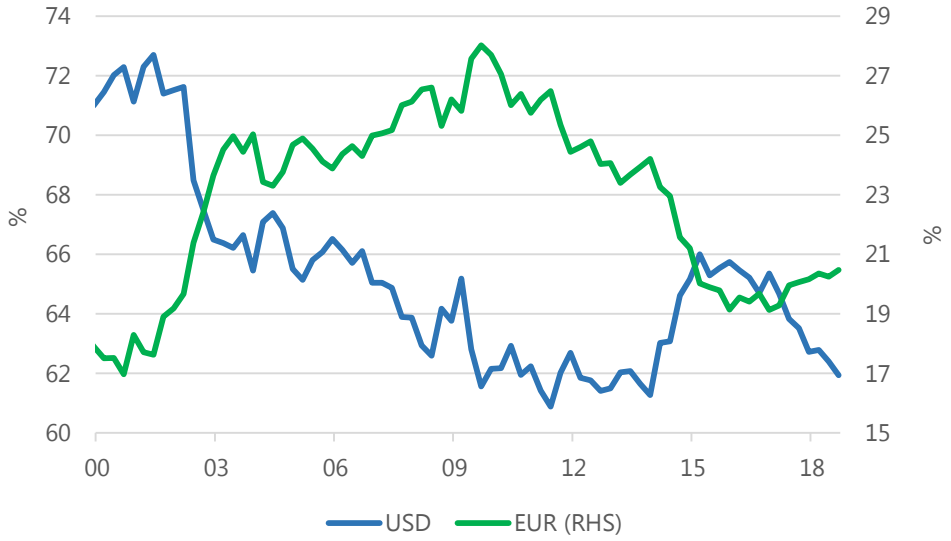


Source: Bloomberg, CBO, Haver Analytics

- Significant deficits need to be financed…
  - $1-$1.5trn a year, and cumulatively over $12trn, over the next decade
- …even without explicitly factoring in recession possibilities
  - CBO and Blue Chip consensus projects steady 1.5-2% real GDP growth over the next 10y
  - Deficits typically rise 2-5% of GDP in recessions
  - This would translate to additional deficits of $0.5-1trn at current GDP levels
- These borrowing needs have to financed in the context of already high global dollar debt exposure

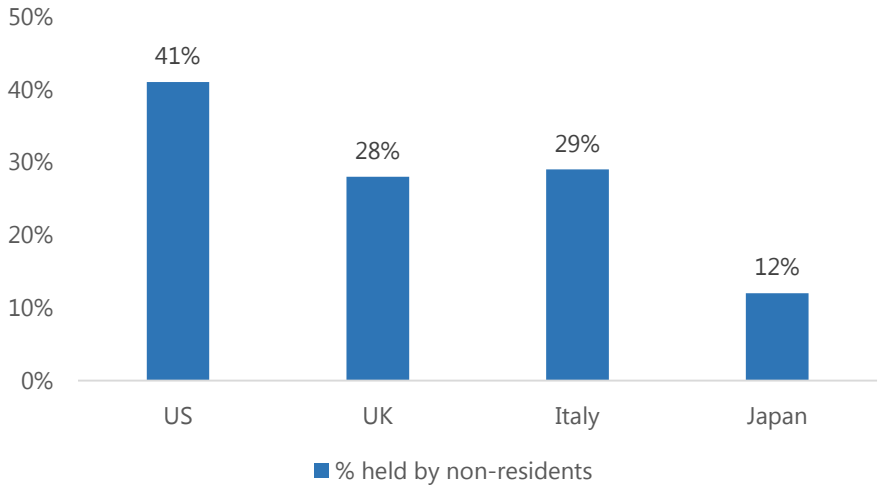
Foreign investors already hold significant dollar debt

USD share in foreign exchange holdings has steadily declined



Source: US Treasury, IMF, Haver Analytics

A comparison of non-resident ownership of government debt



Note: Non-residents is the "Rest of World" sector. Data for EGBs include EU residents
Source: Respective central banks / government , Haver Analytics

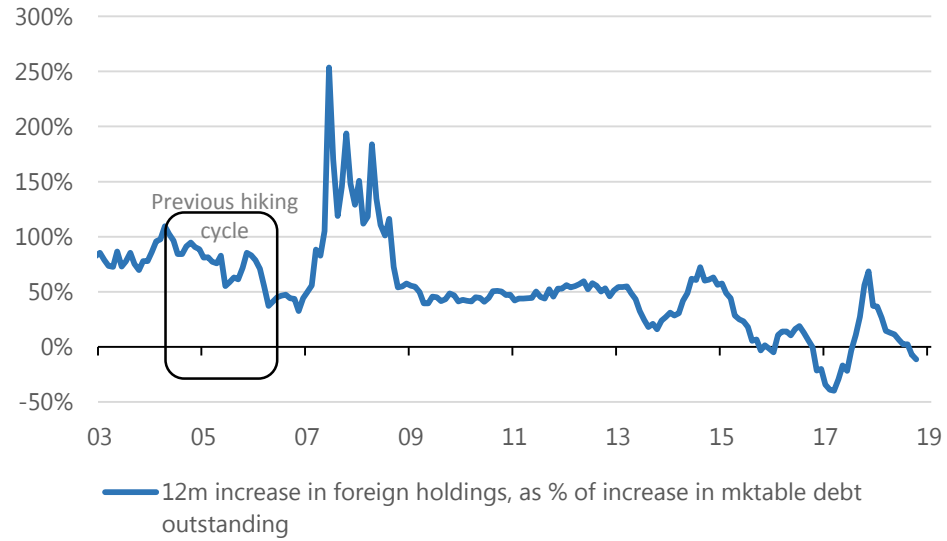
- USD is still the dominant reserve currency
- However, reserve managers have been very gradually increasing allocation to other currencies
    - USD share of FX reserves has steadily come down from 72% in 2000 to 62% now
- Other countries with significant debt issuance needs (as a share of GDP) depend far more on domestic savings
- The Treasury should plan to meet financing needs more domestically than in the recent past

Foreign sponsorship has declined recently with outlook uncertain

International FX reserve growth has stagnated

Source: Bloomberg

Annual increase in foreign holdings, as % of net issuance



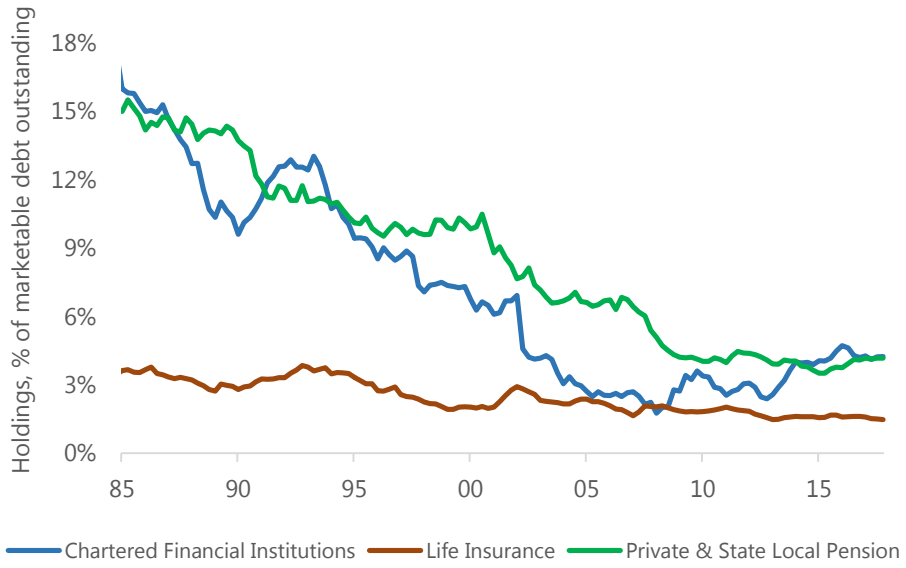
Source: US Treasury, Haver Analytics

- Global FX reserves growth has stalled and global trade, as a share of world GDP, appears to have peaked
  - China is now running a flat current account with the rest of the world
- These have led to lower official foreign demand for USTs
  - Evident in lower foreign bids at 2-5y Treasury auctions compared to longer tenor auctions
- In line, foreign holdings of marketable Treasuries, as % of outstanding, have declined meaningfully from the pre-crisis peak (from 55% in March 2009 to 41% currently)
  - While Treasuries looking less attractive on a FX hedged basis (as is usual in hiking cycles) likely contributes to this, we believe the decline might be more secular in nature

- Overall, we recommend
  - **A greater focus on domestically financing more of the borrowing needs through thematic issuances**
  - **Exploring channels to increase foreign holdings of Treasuries**

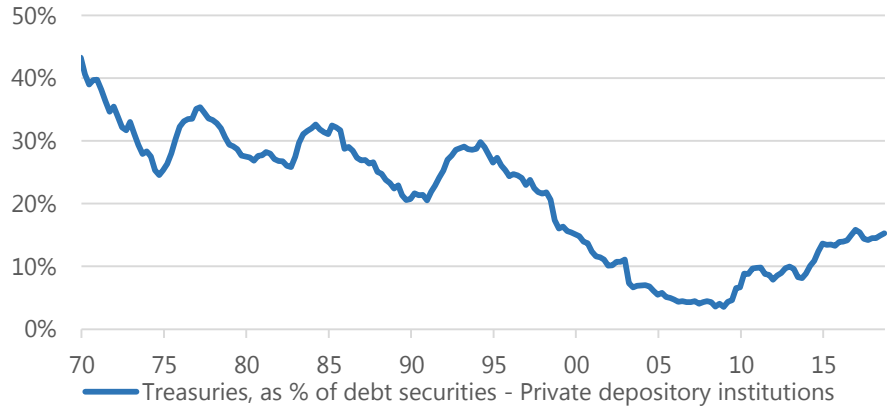
Products targeting specific savings pools could diversify investor base

Trends in non-Fed, non-Foreign holdings of Treasuries



Source: Federal Reserve, Haver Analytics

Despite increase post GFC, Treasuries are still a smaller share of banks' debt securities holdings than historical



Note: Debt securities holdings excludes vault cash, Fed reserves, fed funds and security repos
Source: Federal Reserve, Haver Analytics

Financial institutions

Recommendation: explore further ***longer tenor FRNs issuance***

- Bank holdings of Treasuries, as % of outstanding, have declined
  - Treasury's share of debt holdings for private depository institutions has increased over the past decade, partly driven by regulatory changes. However, they are below pre-2000 levels
- 3y/5y FRNs are likely to be attractive to depository institutions and other non-WAM constrained investors
  - A program half the size of current 2y FRNs, growing at nominal GDP, would have gross issuance of ~$1.4trn over 10 years

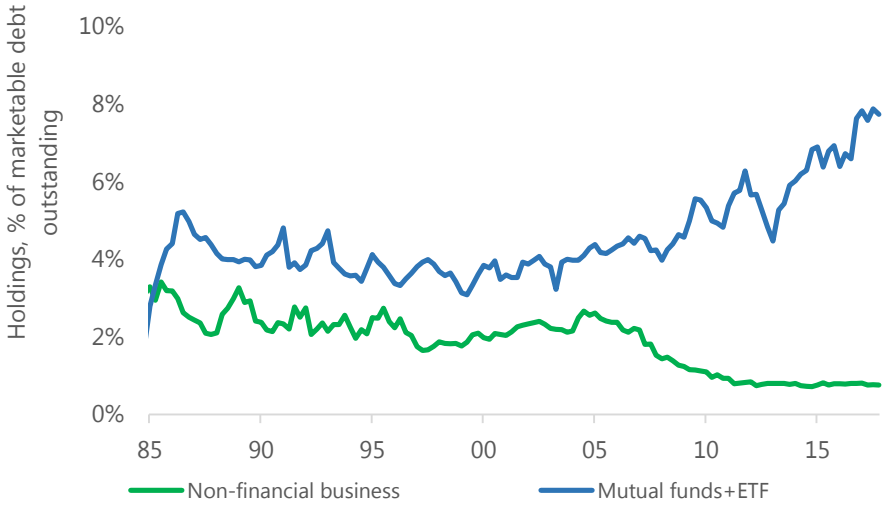
Life Insurance and Pension

Recommendation: explore further ***perpetual horizon, zero-coupon and 15-20y issuance***

- Private and state & local pension holdings have declined from ~10% of Treasuries outstanding in 2000 to ~5% currently
- Data, such as increase in Treasuries held in stripped form, show robust demand trends for longer duration securities
  - For perpetual issuance in a regular and predictable framework, consider that federal infrastructure spending is ~$100bn/year
    - Demand for STRIPS has grown ~$25bn/year over past 3y, suggesting that 20-25% of this spending can likely be supported via this program
- A $60-70bn a year issuance program in the 15-20y sector appears viable prima-facie

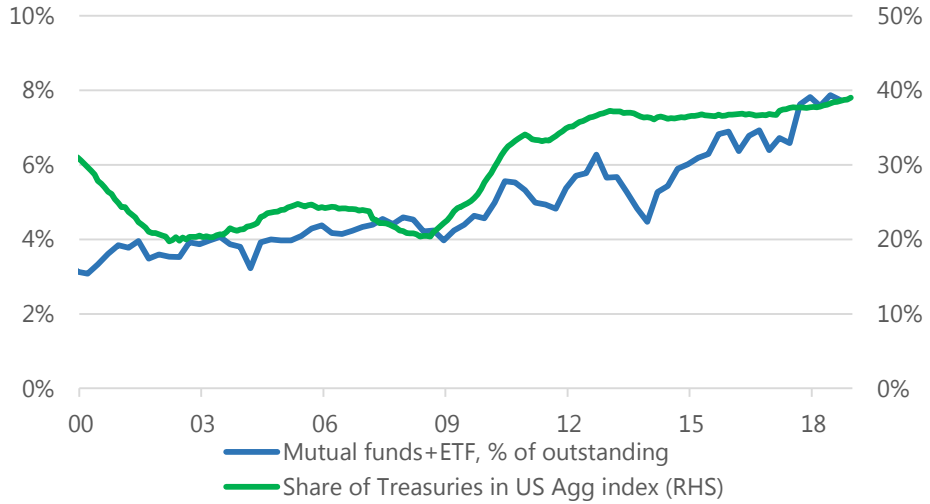
Products targeting specific savings pools could diversify investor base (continued)

Trends in non-Fed, non-Foreign holdings of Treasuries



Source: Federal Reserve, Haver Analytics

Increase in mutual fund Treasuries holdings, as % of outstanding, is in line with Treasuries weight in US Agg index



Source: Federal Reserve, Bloomberg, Haver Analytics

Non financial businesses

Recommendation: explore further ***healthcare/education inflation linked TIPS issuance***

- Non-financial corporate holdings of Treasuries have declined meaningfully, though from a low base
  - If these institutions held the same proportion Treasuries outstanding as they did in 2005, their holdings would be larger by ~$300bn
- Treasury instruments that hedge macro liability, such as healthcare and education, would be attractive to such investors

Asset managers

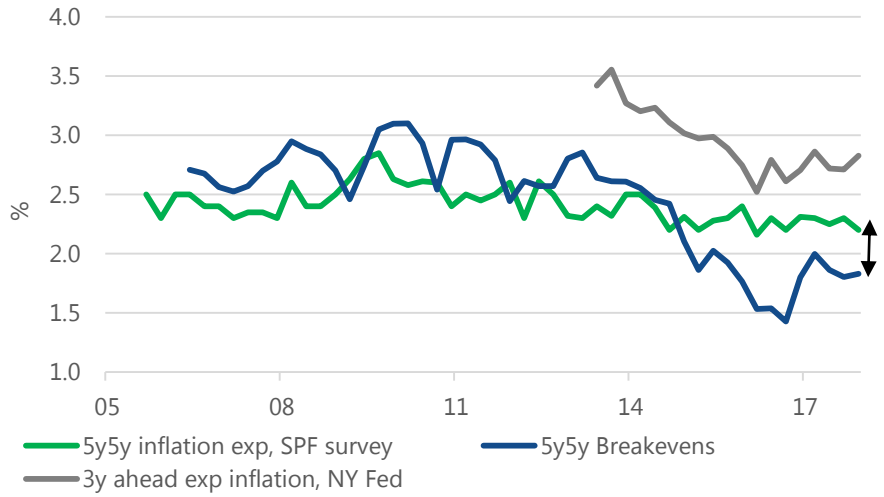
- While the share of Treasuries outstanding held by mutual funds has risen steadily over the past 20 years, it is likely driven by increasing weight of Treasuries in the benchmark indices
  - Out of total mutual fund debt holdings of $4.7trn, Bloomberg estimates that $3.2trn+ is linked to US Agg family of indices
- Treasury products that better align with objectives of funds such as target date retirement funds and 529 plans could lead to higher organic allocation

We estimate that these sources could result in potential demand of $130-$215bn over the next 10y for CPI-subcomponent linked issuance

Potential new Treasury products

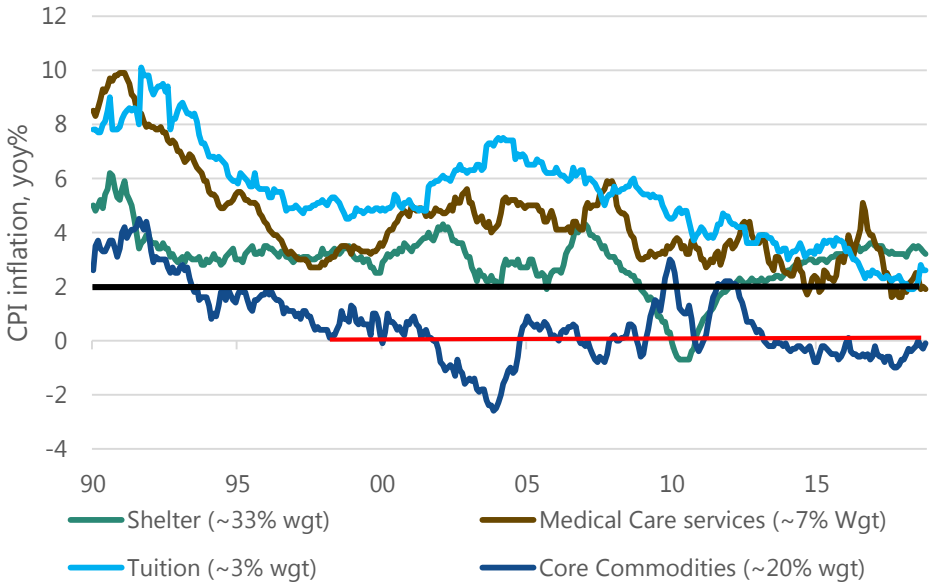
Potential new product: CPI subcomponent linked TIPS issuance

Negative inflation risk premium makes TIPS more expensive than nominals ex-ante



Source: Bloomberg

Long term CPI trends are fragmented

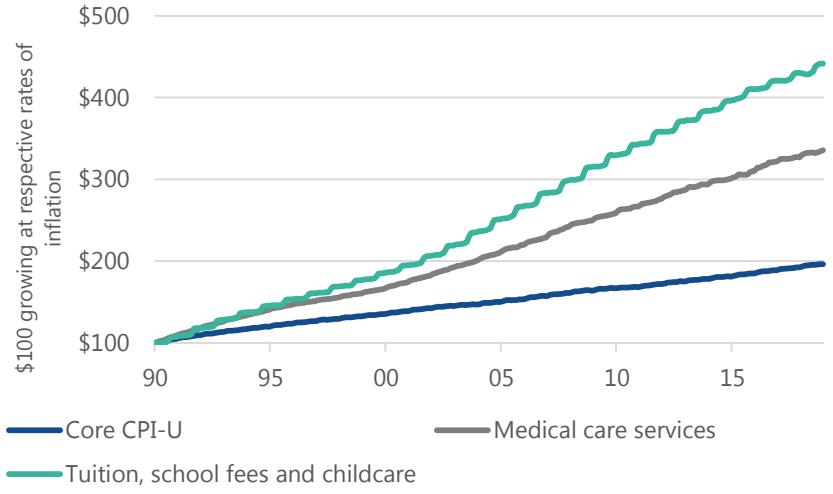


Source: BLS, Haver Analytics

- With inflation risk premia firmly negative, TIPS issuance is more expensive than nominal issuance, ex-ante
  - Ex-post, TIPS have benefited Treasury relative to nominals
- However, negative inflation risk premia is likely not uniform across all CPI-subcomponents
  - 20% of Core CPI (core commodities) has remained negative over a 20y period and is unlikely to command a large positive inflation risk premia…
  - … while education, medical care and shelter (~45% of CPI) have remained firmly above 2%, sometimes significantly so
  - Uncertainty, partly regulatory, over their long term outlook likely would result in higher inflation risk premia for these sub-components
- TIPS linked to these sub-components are likely to result in more cost savings than those linked to the whole CPI basket

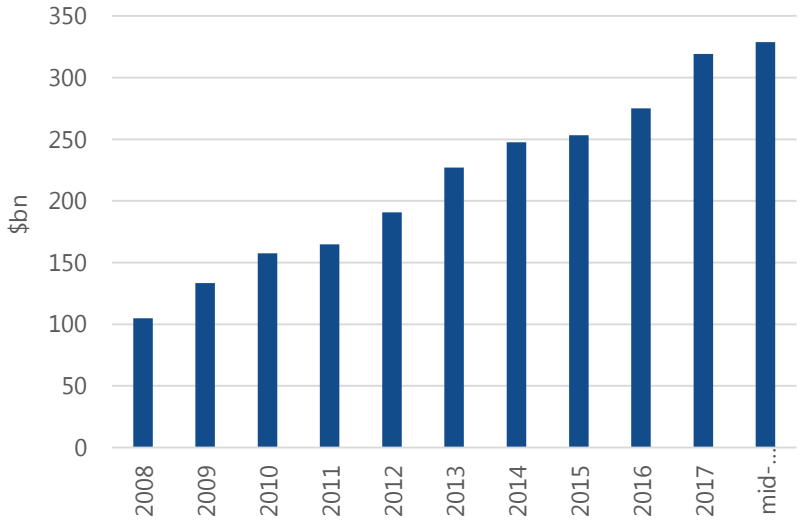
Potential new product: CPI subcomponent linked TIPS issuance

Overall CPI basket is not a good hedge for investors exposed to specific inflation risks



Source: Haver Analytics

529 plan assets have grown at 12% CAGR



Source: College Savings Plans Network

Recommendation

Consider issuing TIPS linked to healthcare and education CPI

Potential new sources of demand

Healthcare-linked TIPS

- Target date retirement funds (TDFs) would find these attractive
  - TDFs are currently expected to hold $75-$200bn in TIPS in 10y[1]
  - A 2% higher allocation to healthcare TIPS due to better product 'fit' would result in $80-$120bn in incremental demand over 10y

- Current Treasuries do not adequately hedge healthcare costs for corporate/state & local healthcare plans
  - Of the $55bn in HSA assets, only ~20% are invested (rest is in cash). HSA assets have grown at 25% CAGR over the last 10y
  - If 10% of invested assets in HSAs are allocated to healthcare TIPS, demand would be ~$10-15bn over 10y[2]. These is before considering institutional allocation

Education-linked TIPS

- State 529 plans and households looking to hedge tuition inflation might find education-linked TIPS attractive

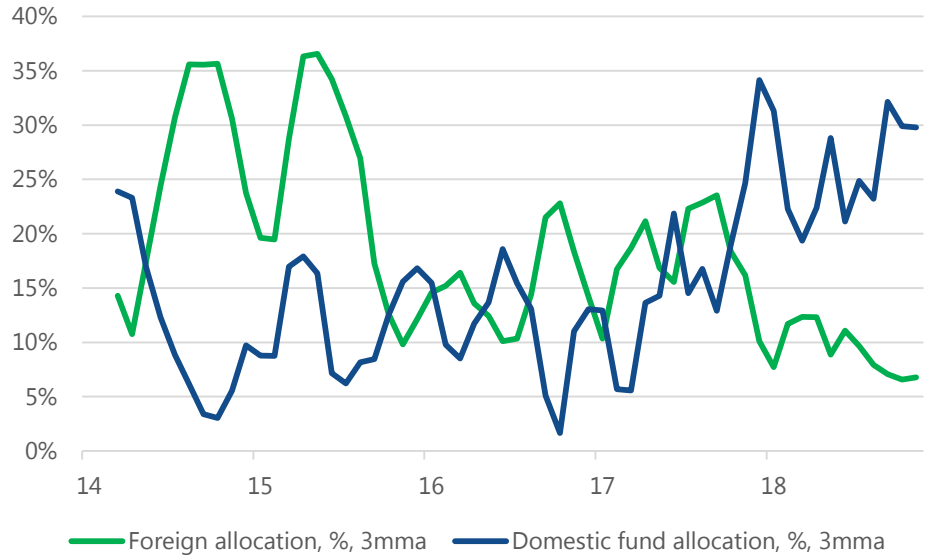
- Assets in 529 savings plans and prepaid tuitions plans are~$320bn with CAGR of 12% over the past 10y
  - For a current 10y old beneficiary, the moderate risk glide path allocates 0% to TIPS even while advocating 75% to US bonds
  - A 5-10% allocation to 'education TIPS' due to better product fit would be $40-$80bn in additional demand over the next 10y[3]

- Combined, we estimate that these sources could result in incremental demand of $130-$215bn over the next 10y

1. Assuming 1.5-3% TIPS allocation and CAGR of TDF assets of 15-20%
2. Assuming 20% CAGR in HSA assets and 25% in invested assets
3. Assuming 10% CAGR

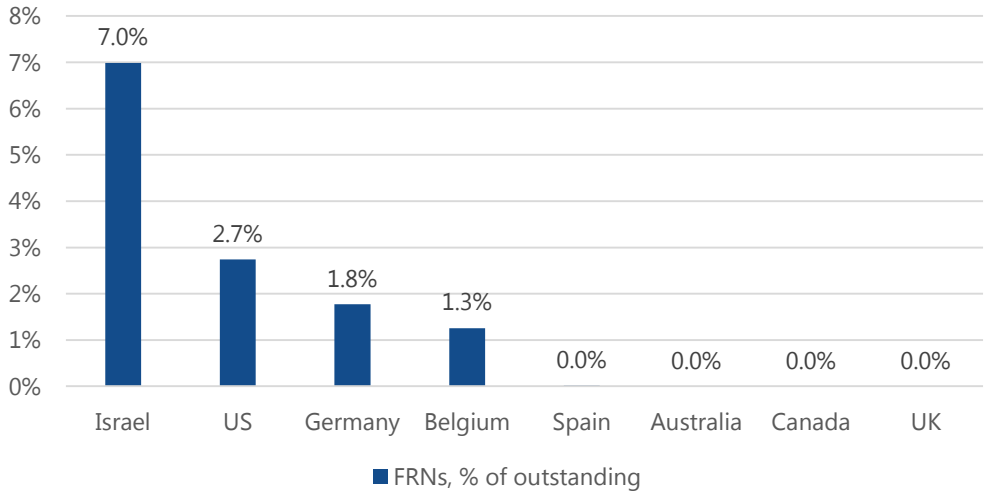
Potential new product: Longer tenor FRNs

Domestic fund investor participation at 2y FRN auctions has increased



Source: US Treasury, Haver Analytics

US Treasury leads peers in FRN issuance



Source: BIS

Recommendation

Explore further 3y and 5y FRN maturities

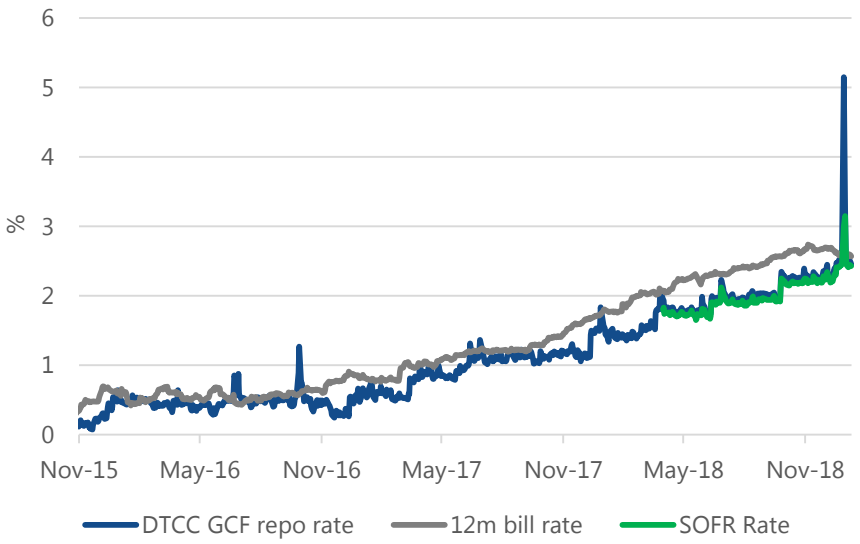
- FRNs are currently ~2.5% of outstanding marketable debt
- The Treasury's current 2y FRN program has been successful
  - Evident in increasing domestic fund participation at auctions

Potential new sources of demand

- Investors not subject to 2a-7 rule or stringent WAM constraints may find longer tenor FRNs attractive
  - *Banks:* Banks could purchase intermediate term FRNs to offset deposit financing cost
  - *State and local governments:* Commonly invest in Treasuries, Agencies and money markets
  - *GSEs:* Could deploy excess cash in longer term floaters instead of fed funds rate
  - *Corporate Cash:* FRNs a more attractive investment than bills for investing cash with no near term deployment needs
  - *Foreign official investors:* FRNs likely to be a suitable reserve management tool
- With this diversified demand base, a program half in size of the current 2y FRNs, growing at the rate of nominal GDP of 4% (for context, marketable Treasury debt grew 7.9% yoy), would cumulate to ~$1.4trn over 10y in gross issuance

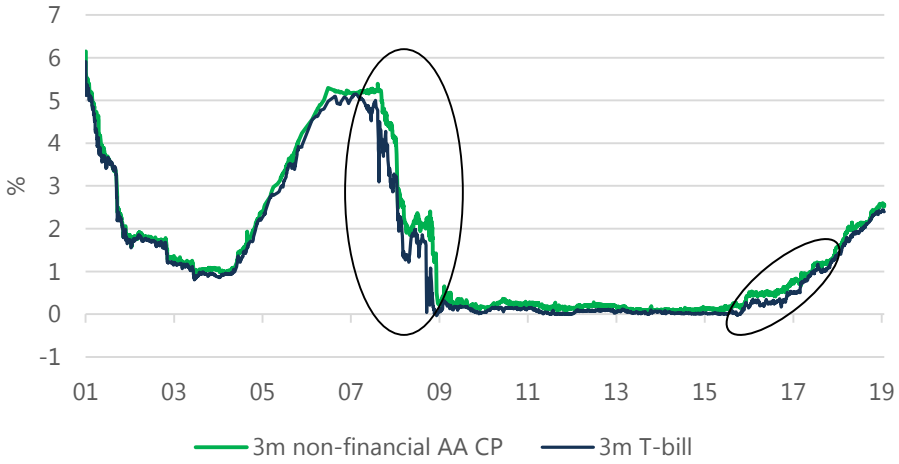
Potential new product: SOFR linked FRNs

T-bill rate is less volatile than SOFR or repo rate



Source: Bloomberg

Treasury rates are not always well correlated with non-financial borrowing costs



Source: Bloomberg

Recommendation

We recommend exploring further SOFR-linked FRN issuance as a product extension option for current FRNs

Benefits

- SOFR linked issuance might make these issuances more attractive to investors unwilling or unable to hedge SOFR-T-bill basis risk
- Debt linked to non-T-bill benchmark might diversify exposure for the Treasury
- A early launch of SOFR linked FRNs would augment the reference rate transition to SOFR

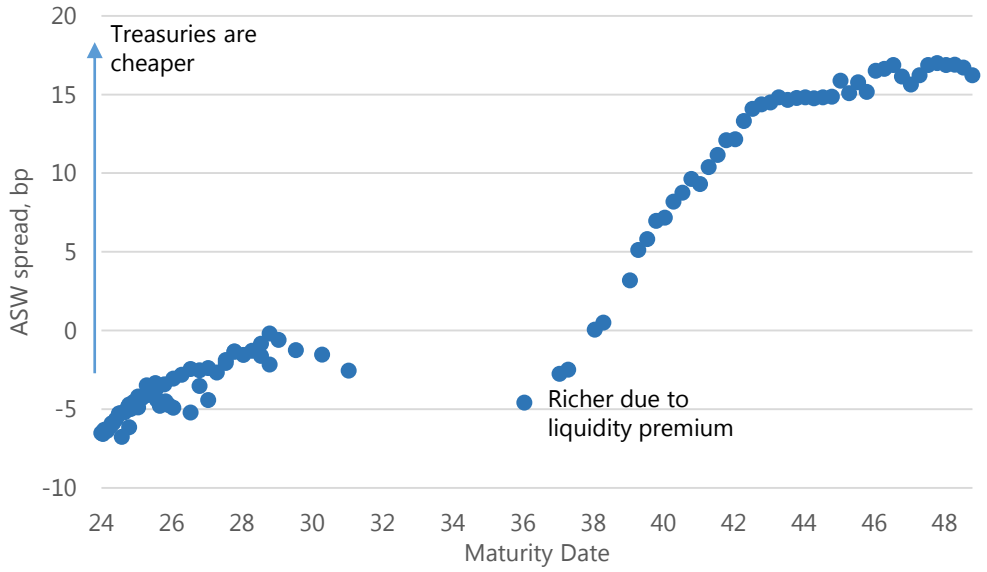
Costs

- SOFR/GC rate is more volatile than bills rate that might result in higher debt service volatility
  - SOFR rate is subject to quarter/year end bank balance sheet pressures. While term markets on SOFR might mitigate this volatility, term markets are in early stages of development[1].
- ARRC's report in Mar 2018 states that "Treasury rates are not well correlated with measures of either private-sector financial or nonfinancial corporate borrowing costs"
  - This wedge might result in a spread between T-bills and GC rates during extreme events with both rates declining unevenly

1 ARRC has proposed development of term reference rate based on SOFR derivatives by end of 2021

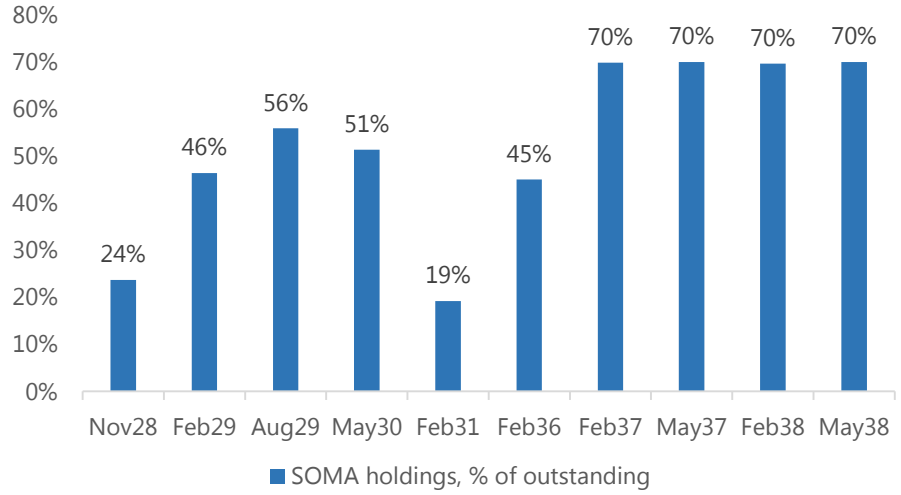
Potential new product: 15-20y issuance

Gap securities trade rich



Source: Barclays

SOMA holdings of gap securities have further reduced float



Source: Bloomberg

Recommendation

Consider issuing 15-20y securities to benefit from demand in the sector

Benefits

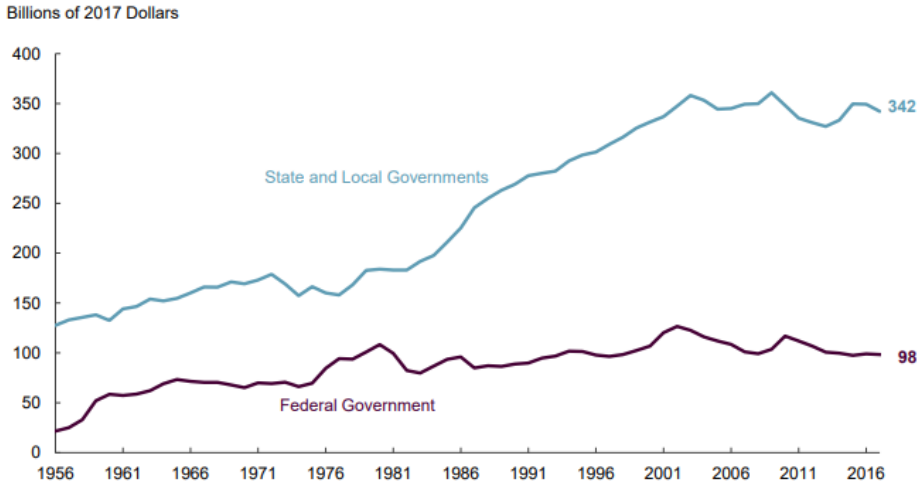
- The issuance gap between 2031 and 2036 securities has resulted in securities between 10y maturity and Feb36s to trade somewhat dislocated (rich).
- SOMA holds roughly ~50% of these securities, further reducing float
- Popularity of US contract highlights enough investor demand at the 15-20y sector to make the new issuance benefit from liquidity premium.
- The issue might benefit from being the benchmark for 20y corporate issuance
- Previous TBAC presentation (Q2 2017) noted - "A reintroduction of the 20 year will have the broadest demand, highest certainty of initial pricing, and quickest market acceptance"
- Applying 10y Treasuries annual issuance/TY contract open interest ratio to the US contract suggests a prima-facie issuance program of ~$60-$70bn a year in the 15-20y sector.

Costs

- Higher funding cost than short-term debt
- WAM extension
- Potential cannibalization of 10y and 30y issuances

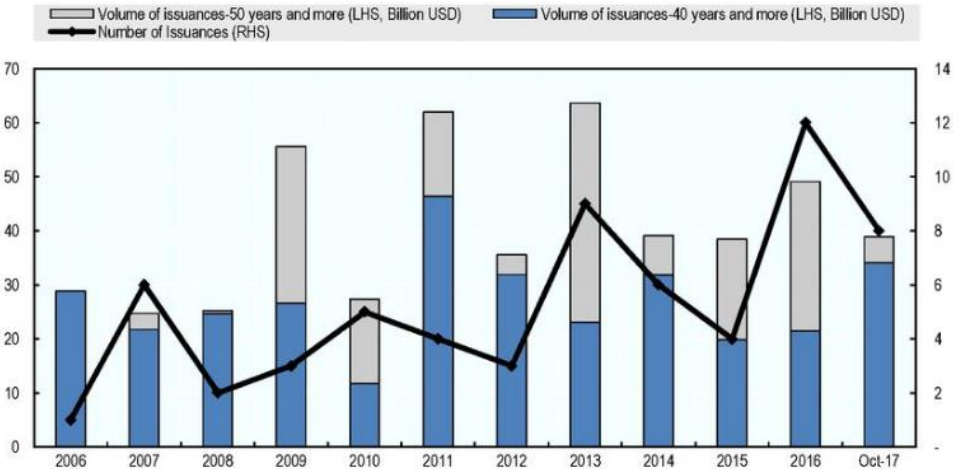
Potential new product: Perpetual horizon debt

Federal spending on water and transportation infrastructure is ~$100bn/year



Source: CBO

OECD issuance of government bonds with maturities of longer than 30 years



Note: For OECD countries, volume based on issuance amounts using flexible exchange rates. Source: OECD

Recommendation

Consider perpetual horizon issuance in 'regular and predictable' framework

- Sovereign ultra-long end issuance has been opportunistic
- There is opportunity to view perpetual issuance in the context of federal infrastructure spending (asset-liability framework)
- Even though main infrastructure spending is 'owned' at state & local level, it imposes a federal cost
  - Federal spending on capital, operation and maintenance of water and transportation infrastructure is ~$100bn/year
    - STRIPS universe has grown ~$25bn a year over the past 3 years. This demand suggests ~20-25% of this spending can be supported via this program.
    - In 30y equivalent terms, it would be 15-20% of current 30y issuance

Benefits

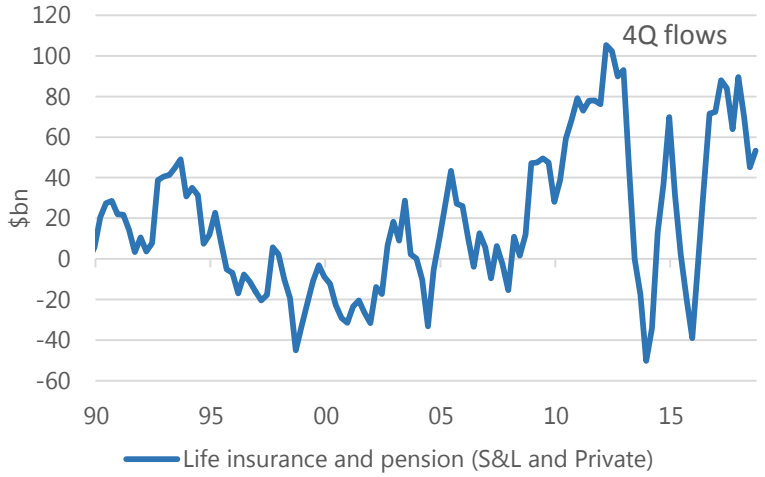
- 14 OECD countries have issued ultra-long bonds with 40-100y maturities. Austria, Belgium and Ireland have issued 100y bonds in the past 2 years
- Help toward a smoother refinancing schedule

Cost

- Higher cost of such issuance than shorter maturity debt

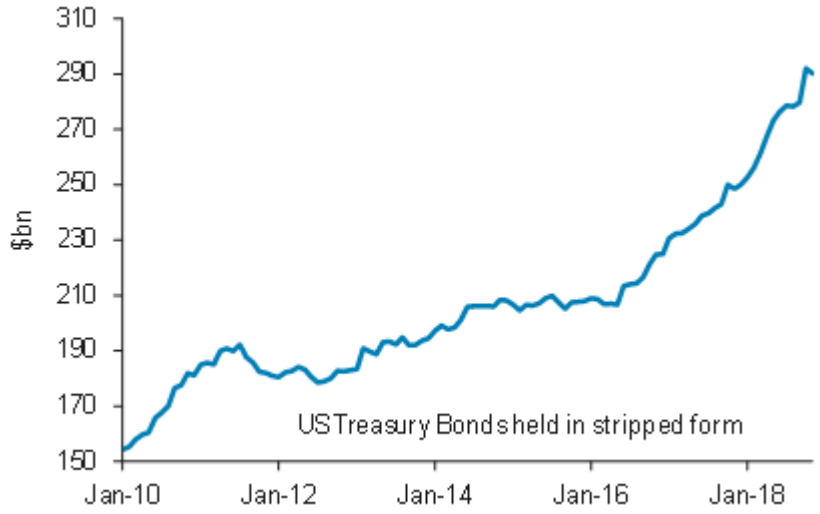
Potential new product: Zero coupon issuance

Life insurance and pension (S/L and private) have been increasing their UST holdings



Source: Federal Reserve, Haver Analytics

Amount of bonds held in stripped form has increased dramatically over the last year or so



Source: US Treasury

Recommendation

Consider issuing zero-coupon bonds

- There is a marked pickup in demand from long-end investors
  - Treasury holdings of life insurance and pension funds have kept pace with the rapid increase in issuance
  - Recent increase in holdings of bonds held in stripped form suggests robust demand
- Currently, balance sheet constraints add to the cost of funding of creating STRIPS
  - Coupon STRIPS trade at a significant discount to principal STRIPS which are non-fungible

Benefits

- Attractive to cash constrained investors, such as underfunded pension funds
  - They would prefer zero-coupon debt to extend duration for a low cash outflow
- Mitigate balance sheet constraints of stripping whole bonds
- The ~$80bn increase over the past 3y in securities held is stripped form is indicative of demand for zero-coupon product from private investors

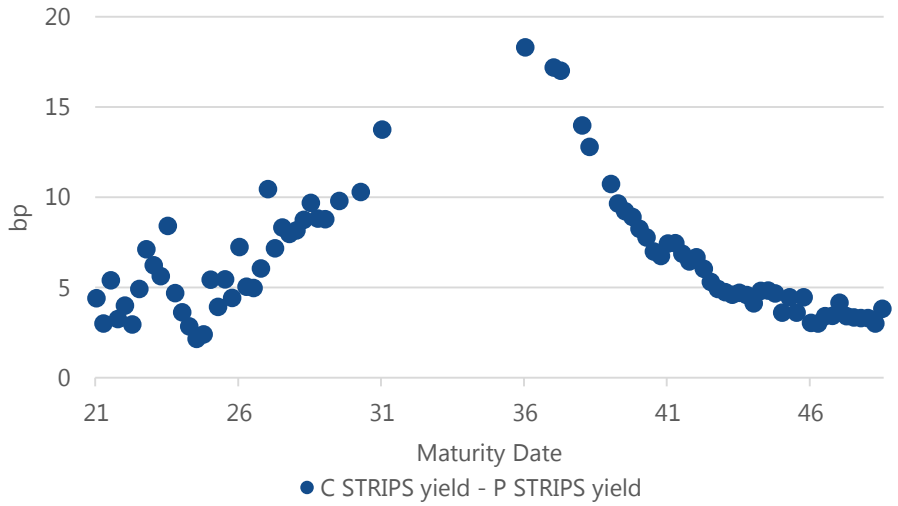
Costs

- Tax issues and accounting issues need to be studied

Potential new processes

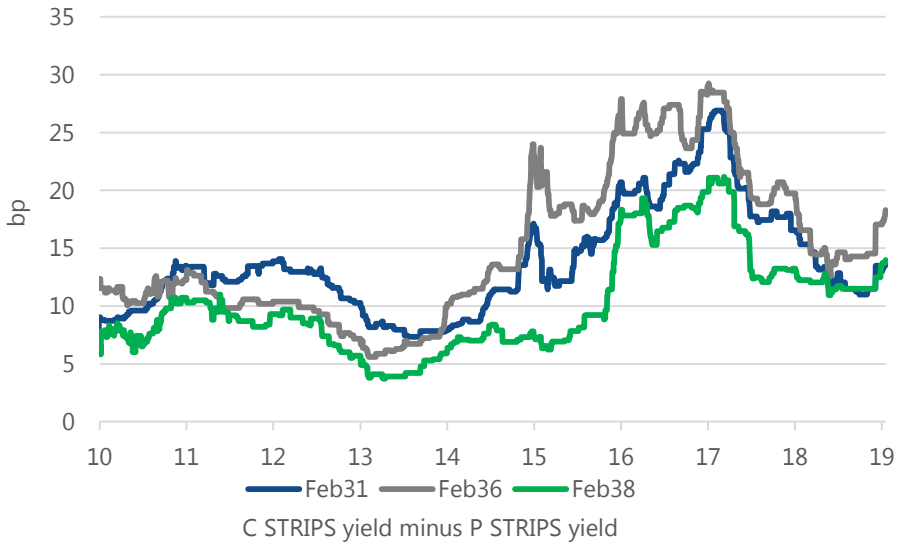
Potential new process: Make P STRIPS fungible with C STRIPS

Yield difference between matched maturity C and P STRIPS



Source: Barclays

C STRIPS tend to cheapen vs P STRIPS during times of higher bank balance sheet constraints



Source: Barclays

Recommendation

Consider making matched maturity C and P STRIPS fungible

- Balance sheet constraints add to the cost of creating STRIPS
  - Coupon STRIPS trade at a significant discount to Principal STRIPS
  - This discount is reflective of balance sheet constraints as was evident in the widening during 2015/16 period
  - Fungibility would reduce the balance sheet cost of stripping whole bonds

Benefits

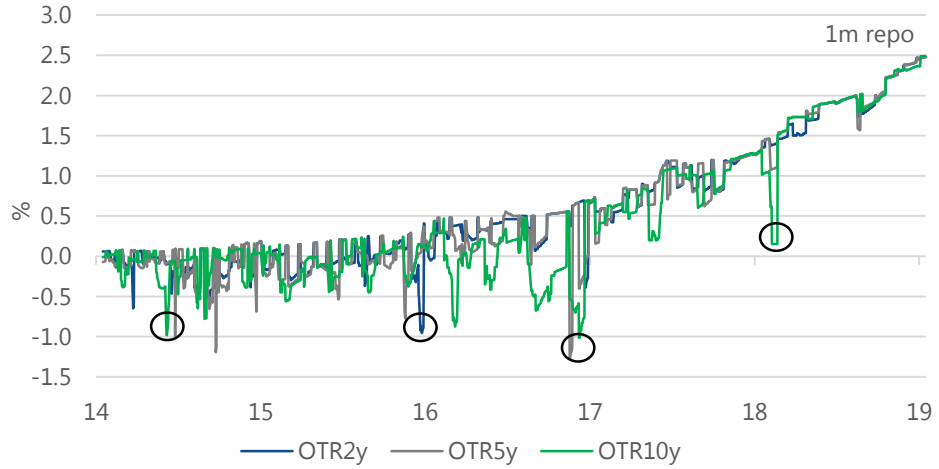
- Fungibility would alleviate market distortion due to bank balance sheet constraints that allows different prices for securities with the same cash flow
- It would allow STRIPS investors access to a more liquid ultra-long duration instrument
- It would also possibly help in reducing long end whole bond relative value dislocations

Costs

- Legal, tax, and accounting hurdles need to be studied further

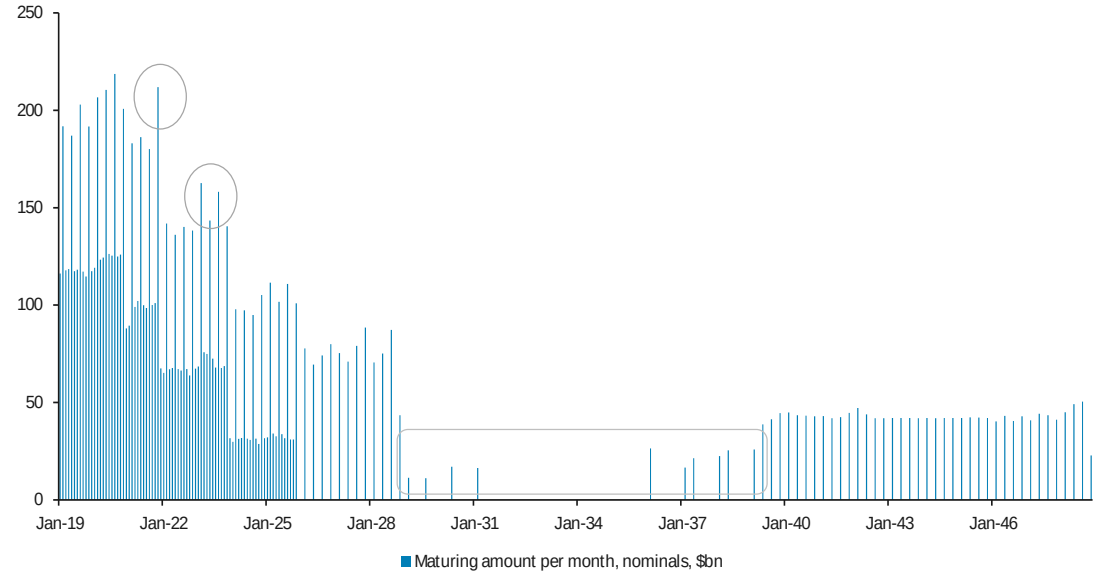
Potential new process: Reopening operations

Scarce securities (on-the-run and CTDs) can trade significantly rich in the repo market



Source: Morgan Stanley

Buybacks and re-openings can smooth out maturity profile



Source: US Treasury

Recommendation

Explore reopening scarce issues to support secondary market trading of these securities

- The maturity profile of the US debt is not smooth, with "peaks" and "gaps"
  - These "gap" securities tend to trade significantly rich on the curve
- In addition, securities with a 'scarcity' premium can trade significantly special in the repo market ahead of the next auction settlement
  - While data shown in chart is for 1m tenor repo, repo rates till next auction settle date show even larger dislocations
- Unlike securities issued during the QE program, new issuances may have limited availability in the Fed's securities lending program

Benefits

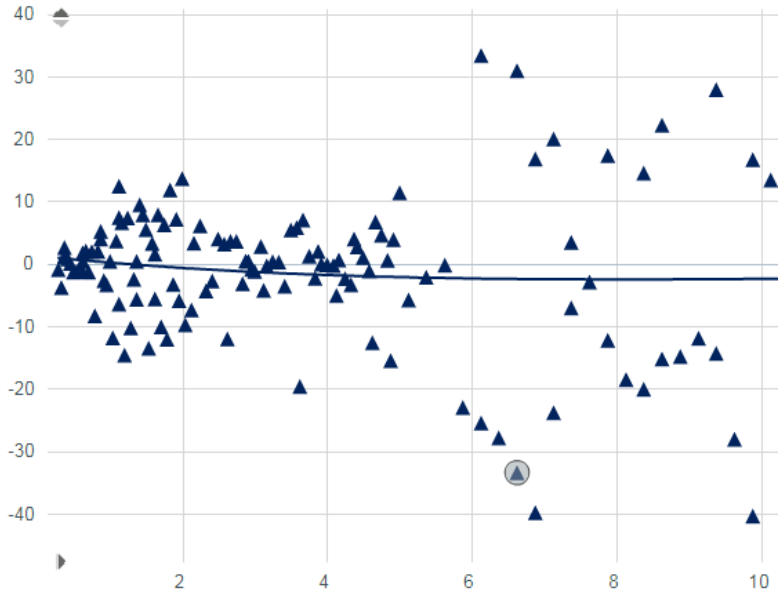
- Reopening scarce securities would improve the secondary market trading profile of these securities
  - The Treasury alleviated severe strain in several issues due to supply shortage in 2008

Costs

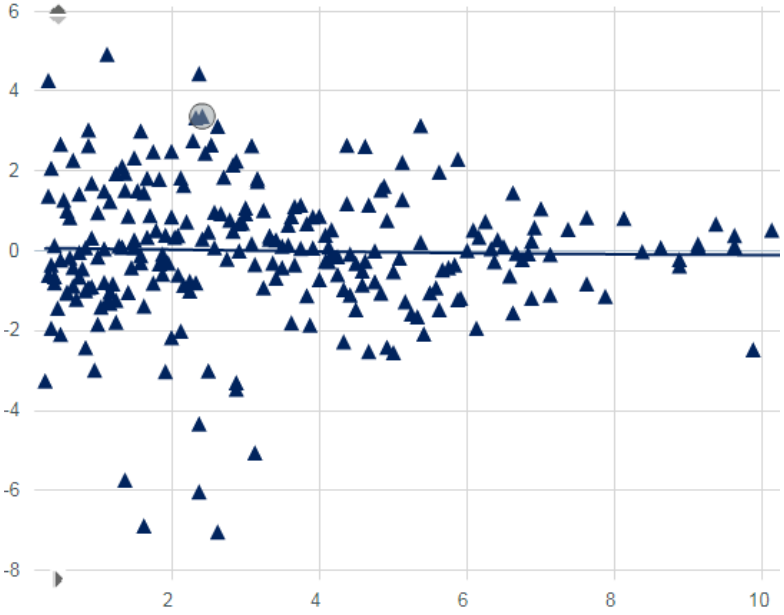
- Deviation from the 'regular and predictable' framework

Potential new process: Buyback operations

Spread to spline (bp) for Treasuries in the 1-10y sector in Jan 2009



Spread to spline (bp) for Treasuries in the 1-10y sector in Jan 2016



Source: Barclays

Recommendation

Consider buybacks as a tool to reduce the cost of issuing debt

- Treasury securities can deviate from "fair value" during heightened volatility
  - Issues with low amount outstanding tend to trade rich on the curve
  - Issues with low liquidity tends to trade cheap on the curve
  - Dislocations get amplified during periods of heightened volatility and flight to quality
  - The magnitude of these dislocations can be measured in 10s of basis points

Benefits

- Buying back (reopening) issues which trade persistently cheap (rich) on the curve would reduce the cost of issuing debt

Costs

- Ex-post savings are likely to be less as investors will anticipate the Treasury's actions. A formulaic approach is unlikely to generate long-term benefits to the Treasury

Potential new process: Syndication

Auction and syndication across OECD countries

	Auctions		Syndication
	Long-term	Short-term	
Australia	x	x	
Austria	x	x	x
Belgium	x	x	x
Canada	x	x	
Czech Republic	x	x	x
Denmark	x		x
Finland	x		x
France	x	x	x
Germany	x	x	
Greece	x	x	x
Hungary	x	x	
Iceland	x	x	x
Ireland	x	x	x
Italy	x	x	x
Japan	x	x	
Korea	x		x
Mexico	x	x	
Netherlands	x	x	
New Zealand	x	x	
Norway	x	x	
Poland	x	x	x
Portugal	x	x	x
Slovak Republic	x	x	x
Spain	x	x	x
Sweden	x	x	x
Switzerland	x	x	
Turkey	x	x	
United Kingdom	x	x	
United States	x	x	

Source: OECD (2010)

Recommendation

Consider setting up a robust and competitive syndication process

- Several of our key recommendations involve tapping specific investors
- These investors may not always be traditional auction process participants

Benefits

- Targeted new issuances might establish themselves easier via a syndication process
  - Provide a clearer gauge of potential demand through primary dealer's order book, particularly for instruments where pricing benchmarks are not available
  - Efficient tool to ensure firm prices in the secondary market
  - Once established, thematic issuances can subsequently be moved to the regular auction process
  - Syndications can also be complemented with re-openings through auctions
- Several other sovereign debt managers have successfully deployed syndication as a means of issuance, particularly for non-traditional securities such as ultra-long-bonds
- The Treasury's current issuance programs are well established and its position as a large sovereign issuer is unique
  - For the new programs that we recommend exploring, a program-wise analysis of syndication is recommended

Debt management practices in other countries

	General Gov debt /GDP*, %	General Gov debt securities, $bn	Debt management practices
France	85	2,309	Increased flexibility for better matching demand. On several occasions off-the-run bonds were issued since the 2nd half of 2007
Italy	113	2,296	More flexible procedures. The range of offered amounts for on-the-run bonds increased. The range of the maturity of bonds sold to PDs at non-competitive prices are also extended. Introduction of re- openings of old bonds
United Kingdom	75	2,062	Mini tenders are introduced as a more flexible supplementary distribution method alongside with the core auctions program
Germany	46	1,773	Tap for long term debt. More frequent auctions
Canada	73	1,226	Re-introduction of 3-year maturity. Introduction of switches. Additional benchmarks for 2-year and 5- year sectors
Belgium	87	450	Tap for long term debt. Increased issuance volumes
Australia	29	388	More flexible auction calendars
Mexico	31	351	Tap issues on both short and long term bonds
Austria	64	282	More emphasis on investor relations
Turkey	28	206	'Revenue indexed bonds'' are introduced in order to broaden the investor base
Ireland	46	167	Syndication has been added as funding tool. Auctions also in use for short term debt
Finland	47	125	Diversification of funding sources. More emphasis on investor relations. More coordination with PD's. Higher syndication fees. Active use of demand-supply windows.
Denmark	27	92	Use of private placement in foreign markets in 2008. T-bill program terminated in 2008. Greater use of auctions instead of tap sales
New Zealand	39	77	Introduction of new long term bond. Tap issues for short term debt. Monitoring foreign markets for finding attractive foreign borrowing opportunities. Introduction of a new facility of ''reverse tap tender''
Norway	16	67	Instead of both auction types, only single price auctions are now being used
Slovak Republic	46	47	Contemplation of following (future) operations: (a) Direct selling and buy backs in secondary market; (b) Underwriting auctions (single price based on price discovery via syndication); (c) buy backs and exchange auctions
Iceland	25	6	Single price auctions (for long term bonds) are used together with multiple price auctions

* Nominal value of general government debt securities, as % of GDP, as calculated by World Bank
Source: World Bank (as of Q3 2018 or latest available), OECD, Macrobond

Potential new process: Other process improvements considered

Process improvements	Comments
Multiple price auctions	• Evidence that participants bid less aggressively in multiple-price auctions due to "winners curse" • After experimenting with multiple-price auctions in early 1990s, the Treasury adopted the single-price format for all auctions by 1998 • We do not see value in reverting to multiple-price auctions • Possibility of cost-reduction via multi-price auctions does not out-weigh potential concerns around "squeeze"
Reverse inquiry	• Opportunistic and does not conform to 'regular and predictable' framework • Might result in market fragmentation with several small cusips • May impact demand at current auctions
Tap/mini-tender	• As discussed previously, we believe taps and mini-tenders are tools that can be judiciously deployed in times of stress or systemic failure • Optimal communication strategy would be necessary as ex-post savings are likely to be less as investors will anticipate the Treasury's actions
Greenshoe option	• This tool would increase uncertainty over Treasury cash flows and potentially complicate debt management around debt-ceiling constraints
Reserve price auctions	• Given diversified investor base with similar information set and with bid-cover ratio in excess of 2x, reserve price auctions are unlikely to offer additional benefits over uniform price auctions in terms of revenue maximization • Reserve price auctions might entail cash flow uncertainty without a corresponding offset in terms of better outcomes
Multiple window auctions	• Complex strategy with uncertain benefits. Potentially inconsistent with 'regular and predictable' framework and requires extensive study of (inflexible) demand windows from numerous buyer bases

TBAC Charge

The when-issued (WI) market plays an important role in price formation in advance of Treasury auctions. We would like the Committee to provide an overview of the WI market including liquidity, trading venues, clearing and settling, major participants, linkages to the cash and futures markets, effects of market conditions, and counterparty risks. What, if any, changes should be considered to improve the WI market?

Background on the when-issued market

- Pre-auction trading of US Treasury notes and bonds has been permitted since August 1981. It was also allowed from Feb 1975 to July 1977. Pre-auction trading in the bill market occurred prior to that point.
- Many other countries allow when-issued trading in their government bond market, including: Canada, UK, Germany, Italy, France, Switzerland, and New Zealand. The most recent addition to this list is Japan (since 2004).
- There have been a few academic studies dealing with the WI market, most of which appear to have focused on the "auction mark-up" (defined as the difference between the when-issued bid rate just before the auction and the auction average rate). Examples include: "Markups, quantity risk and bidding strategies at Treasury coupon auctions" by D Simon, JFE (1994) and "The Treasury Bill Auction and the When-Issued Market: Some Evidence" by Bikhchandani, Edsparr, and Huang (2000) and "When-Issued Markets and Treasury Auctions" by Coutinho (2013). Also, the WI market has been studied as part of an analysis of auction structure in papers such as "Discriminatory versus uniform Treasury auctions: Evidence from when-issued transactions" by Nyborg and Sundaresan, JFE (1996). In general, a lack of data availability seems to have been an impediment to research on the WI market.

WI market mechanics: Main players

Asset Managers	Dealers
• Use to secure levels and allocations prior to the auction. • Use to better match their month-end index duration requirements prior to settlement for the month-end auction cycle.	• Facilitate customer trading. • Expected to make markets in all Treasury auctions at reasonably competitive prices[2]. • Use to find fair clearing level for upcoming auction. • Facilitate price discovery of implied balance sheet costs and repo.
Levered Funds	**Banks, ALM, Foreign accts**
• Use to express view on duration. • Use to express view on the roll[1]. - Volatility - Spot and future funding - Credit conditions • Access leverage in Treasury market.	• Do not typically participate in a meaningful fashion in the WI market • Foreign accounts typically bid at auctions

[1]: Michael Fleming and Weiling Liu (2016) "Intraday Pricing and Liquidity Effects of U.S Treasury Auctions". Federal Reserve Bank of New York, Working Paper.
[2]: New York Fed, Expectations & Requirements for Primary Dealers. https://www.newyorkfed.org/markets/primarydealers

WI market mechanics: Treasury auction schedule

- Bills
  - 1m and 2m bills are announced on Tuesday, auctioned on Thursday, settled on Tuesday
  - Other bills are announced on Thursday, auctioned on Monday, settled on Thursday
  - **Length of WI Period: ~5 trading days**

- Coupons
  - Week 1 (generally, Thursday): Issues are announced. WI trading begins.
  - Week 2: Auctions are held.
  - Week 3: Settlement of auctions and WI trades.

- Guiding principles in establishing the specific announcement and auction dates for coupons:
  - Work backwards from the settlement date.
  - Leave at least one open day between auction and settlement.
  - To the extent possible, hold auctions on Tuesday, Wednesday or Thursday in order to garner maximum participation.

- **Length of WI Period: Typically between 5 to 10 trading days**

The benefits of when-issued trading prior to the auction

- WI period adds price discovery and reduces uncertainty around upcoming Treasury auctions.
  - Improved price discovery creates a more competitive and transparent auctions, reducing Treasury's costs.

Improve price discovery

Reduce uncertainty

- Provides the market's fair clearing level for new issues.
  - Allows the Treasury futures market to determine the likelihood of new note becoming the CTD prior to the auction.
  - The residual in the roll, or the excess spread beyond what's implied by repo and the yield curve, is often described by market participants as the 'current issue premium.' This premium typically reflects participants' outlook on balance sheet costs, expected auction performance, the prospects for volatility, futures deliverability, etc.

- The marketplace has more time to absorb and prepare for issuance with minimal price disruptions.

Prior TBAC recommendations

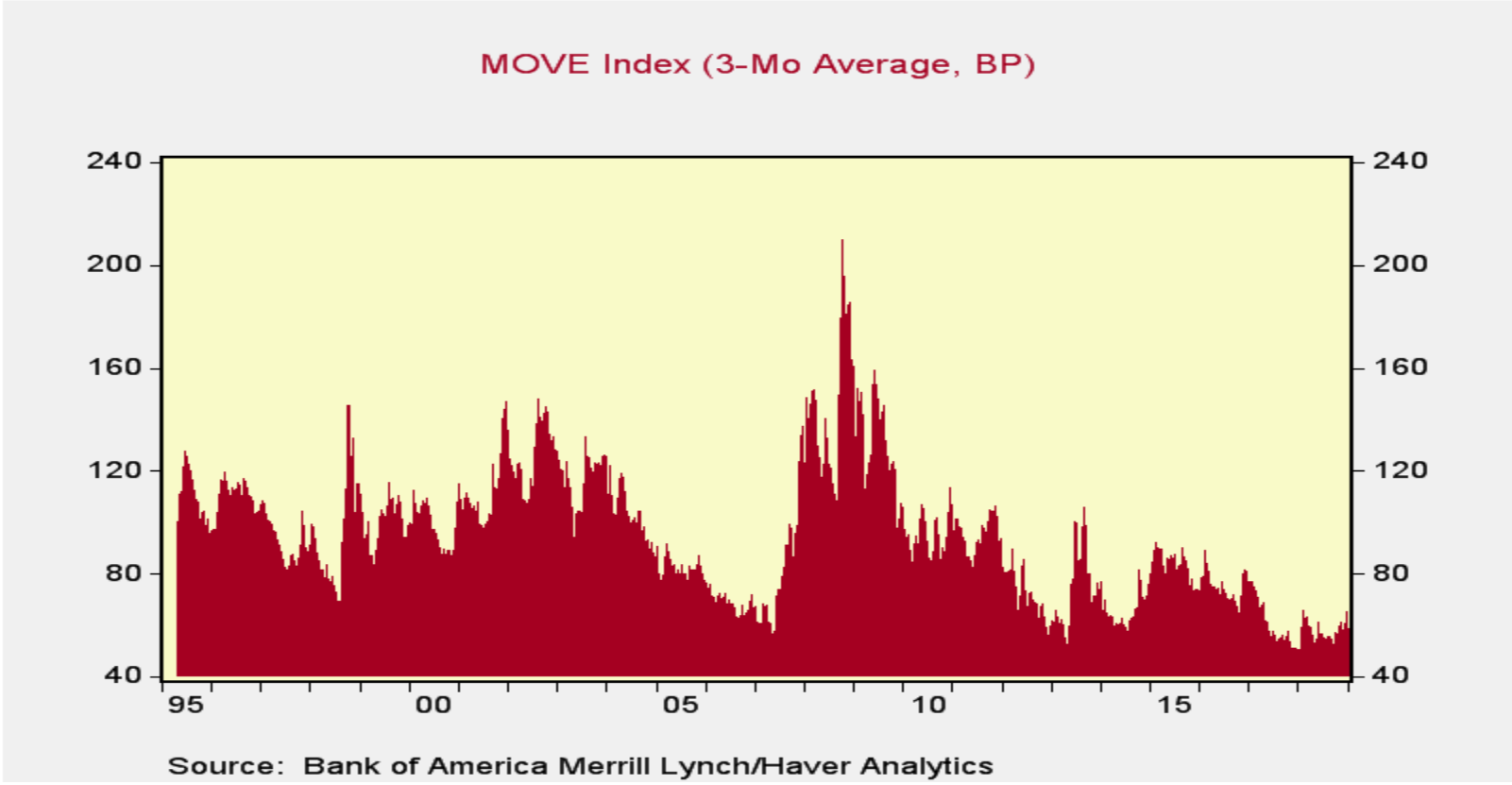
- There have been several occasions during the past few decades in which TBAC has weighed in on matters related to WI trading.
- These discussions involved: 1) WI trading in the TIPS market, 2) a reset of the weekly bill auction calendar, 3) a proposed shortening of the WI period for 2 year notes and 4) the possibility of a shorter WI for all coupon issues.
- A summary of these discussions based on the information contained in TBAC's "Report to the Secretary" appears in the Appendix to this presentation. All of these discussions occurred between 1996 and 2002.
- Since 2002, the only TBAC discussions related to WI trading involved the treatment of such trades under the 35% Rule. There were several meetings during the early and mid-2000's timeframe at which this topic was discussed.
- In general, TBAC has tended to favor as short a WI period as possible. The only exception involved the introduction of TIPS. During a discussion at the November 1996 meeting, there appeared to be a split among members with some expressing a view that this new type of security warranted a longer WI period while others felt that there would be limited activity in the WI market regardless of the duration of such trading.

What has changed as we re-examine the WI market?

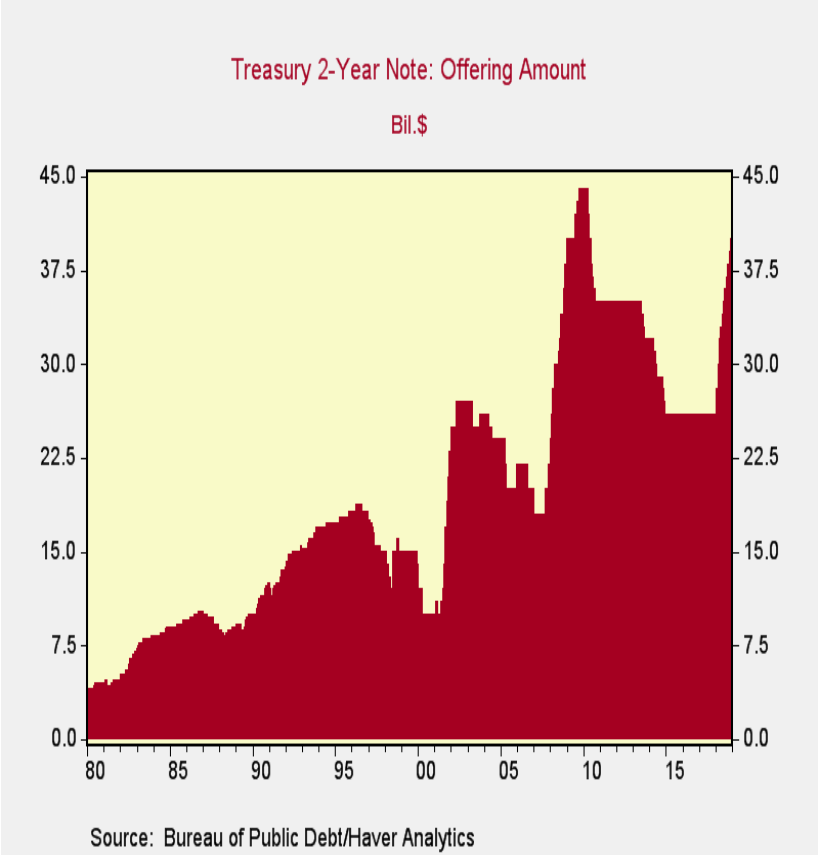
- A couple of decades ago, Treasury transitioned from multi-price to single-price auctions. Does the type of auction (single- vs multi-price) have an impact on the when-issued market? Academic research on this question is mixed:
  - Chari and Weber[1] argue that the incentives to collect information are larger with multi-price auctions than with single-price auctions and thus WI activity should be greater in multi-price auctions
  - Nyborg and Sunaresan[2] using broker data for a relatively brief sample period during the early-1990's, when both single- and multi-price Treasury auctions were conducted, find much larger WI trading volume in single-price auctions. They theorize that the elimination of the so-called winner's curse in single-price auctions increases the willingness of bidders to go short in the WI market ahead of the auction.
  - Fleming and Liu[3] found that there was no significant difference in intraday price effects between single-price or multi-price auctions.
- A lack of available data makes it difficult to gauge the amount of activity in the WI market today. Based on data from a large bond broker, Fabozzi and Fleming[4] find that WI activity once accounted for 6% of dealer-to-dealer Treasury market trading volume. Data recently obtained from a couple of large primary dealers suggest that pre-auction WI trading volume today probably accounts for closer to 1-2% of overall Treasury market volume[5].
- In our view, the decline in the relative share of WI activity in the Treasury market likely reflects the following factors:
  - Lower vol has reduced the need for price discovery
  - Offering sizes have been increasing leading to enhanced market liquidity
  - More frequent Treasury auctions: more consistency in OFR pricing
  - Dealer takedown in auctions has declined

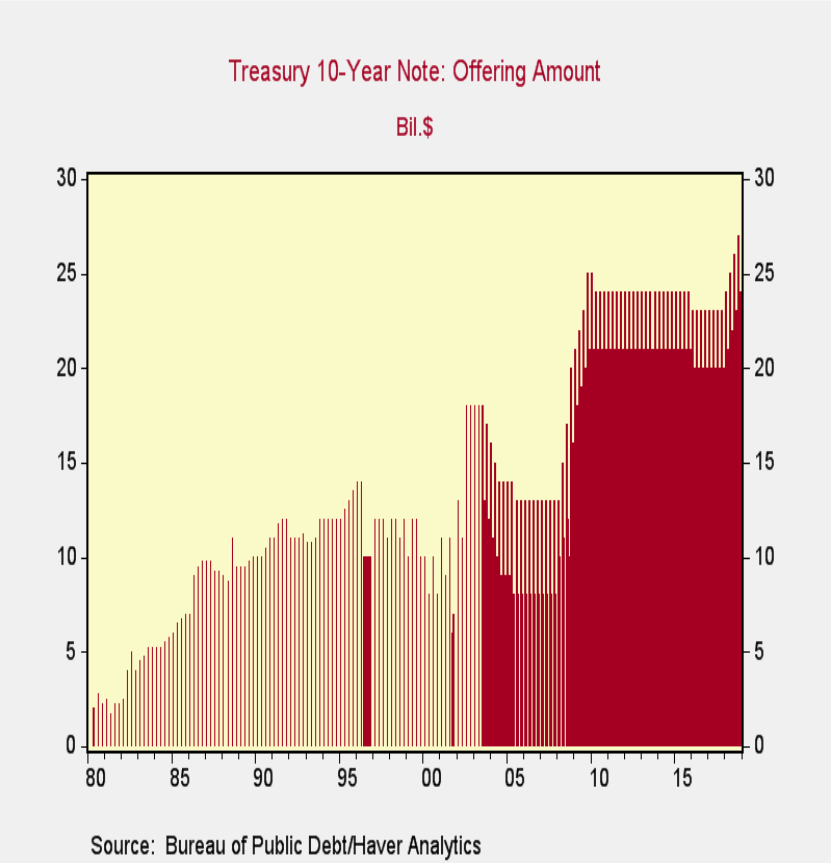
1: V.V. Chari and Robert J Weber (1992) "How Should the U.S.Treasury Auction Its Debt" FRB Minneapolis Quarterly Review.
2: Kjell G. Nyborg and Suresh Sundaresan (1996) "Discriminatory versus uniform Treasury auctions: Evidence from when-issued transactions" Journal of Financial Economics.
3: Fabozzi & Fleming, "U.S. Treasury Securities" in The Handbook of Fixed Income Securities. In both the 2004 and 2011 editions.
4: Michael Fleming and Weiling Liu (2016) "Intraday Pricing and Liquidity Effects of U.S Treasury Auctions". Federal Reserve Bank of New York, Working Paper.
5: WI % based on firm-only data in the period of Oct-Nov 2018, excluding Bills, TIPS and STRIPS. Uses market convention of WI (up to auction date only).

What has changed: Lower vol



What has changed: Offering sizes have been increasing





What has changed: Issuance pace and pre-auction preparation

- Since Treasury began increasing the frequency of benchmark issuance beginning in 2003, curve uncertainty has become less of a risk in price discovery for WI Treasuries.

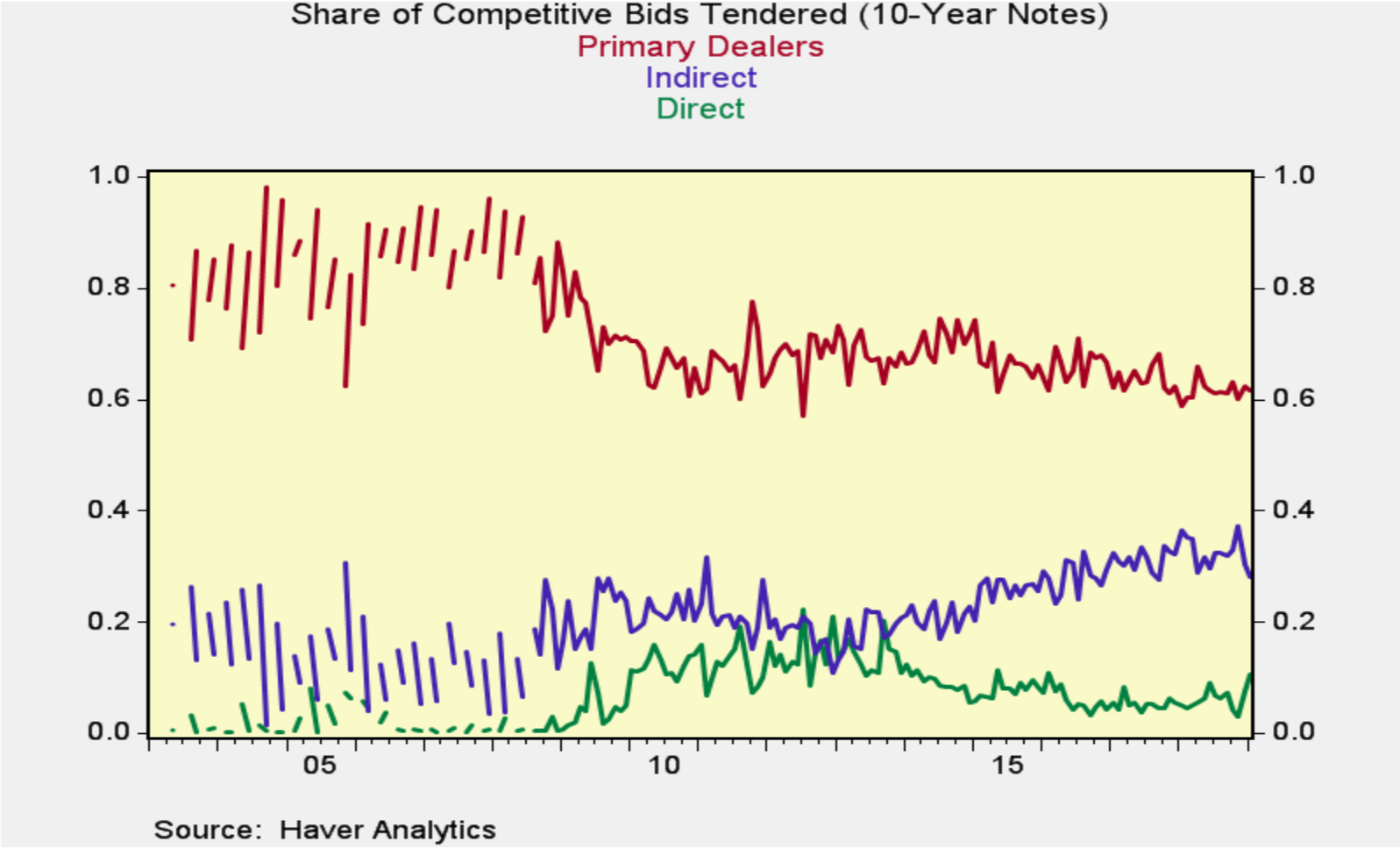
Off-the-run fitted error to the Treasury spline has fallen over the past few years

- On the other hand, an increasingly crowded Treasury issuance calendar is leading to a higher frequency of Treasury auctions that occur in close proximity to important market events, which raises risks to market participants.

- As such, there are some auctions when market participants only choose a narrow window to prepare their bids for the WI despite having some days to do so before the auction. For example, at 12:45pm on January 10, 2019 Fed Chairman Jerome Powell began a speech at the Economic Club of Washington. This speech occurred just 15 minutes before the 1pm auction of $16bn re-opened 30-year bonds. That auction came at 3.035% or 0.9bp above the 1pm level in the secondary market– despite the issue cheapening into the bidder deadline.

Source: Bloomberg

What has changed: Dealer's share in auctions has declined



Deep dive: Non-margined exposure

- When-issued securities begin trading after the auction announcements. After the auction they are generally consider to be the 'current' on the run security in the secondary market.
- Based on auctions from 2010 to 2018:
  - There are typically three to six business days between the announcement date and the auction date.
  - There are typically two to five business days between the auction date and the issue date.

Security	Days between announcement to auction	Days between auction to settlement
2-Year	2.8	4.1
3-Year	3.1	4.3
5-Year	3.6	3.4
7-Year	4.6	2.4
10-Year	4.9	3.7
30-Year	5.9	2.7
Notional weighted average	**3.6**	**3.6**

- On a notional weighted average basis there are 3.6 business days between announcement and auction date. Coincidently there are also 3.6 business days between auctions and settlement on a notional weighted average basis.
  - The front-end of the curve tends to have larger notional positions
  - The front-end tends to auction earlier in the cycle (i.e. 2y/3y)
- On a notional weighted basis the period of time in question, for margining purposes, appears short.

Source: Treasury, Anonymous primary dealer calculations

Deep dive: Non-margined exposure

Using MBS as a case study

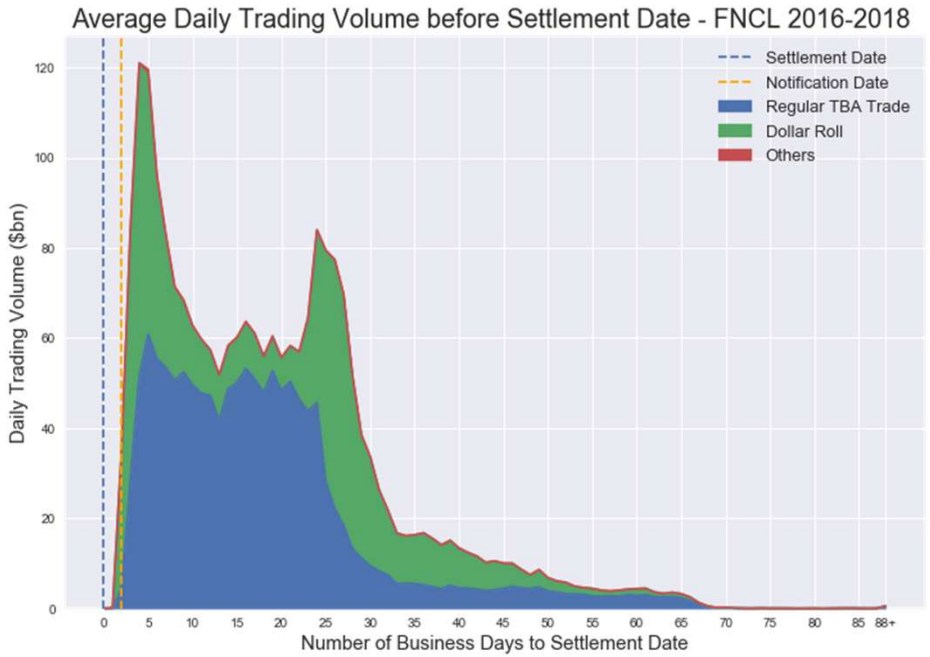
- In November 2012, the TMPG issued a recommendation that forward-settling agency MBS transactions be margined in order to prudently manage counterparty exposures[1].
- To help both parties mitigate counterparty risk owing to market value changes – and to reduce overall systemic risk – the TMPG recommended that two-way variation margin should be exchanged on a regular basis. Written master agreements should describe the parties' agreement on all aspects of the margining regime, including collateral eligibility, timing and frequency of margin calls and exchanges, thresholds, valuation of exposures and collateral, and liquidation.
- FINRA has proposed a revision to rule 4210 to include covered agency transactions with some deviation from TMPG best practices[2].
- Implementation of the margining requirement has evolved slowly in recent years. It is estimated that 80% of the TBA market is covered at present.
- Margining of agency MBS has served to reduce counterparty risk for market participants.
- However, there have also been challenges:
  - Increased capital
  - Operational risk
  - Real money investors
  - Uniformity of take-up

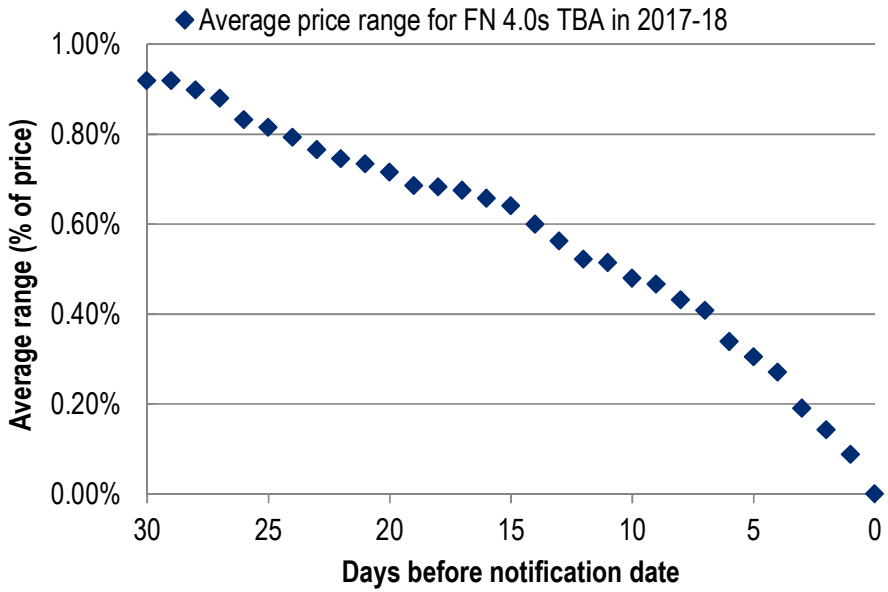
1: TMPG "Best Practices for Treasury, Agency Debt, and Agency Mortgage-Backed Securities Markets", https://www.newyorkfed.org/tmpg
2: FINRA "Regulatory Notice 16-31", https://www.finra.org/sites/default/files/notice_doc_file_ref/Regulatory-Notice-16-31.pdf

Deep dive: Non-margined exposure

The TBA market is a larger market than the Treasury WI market

- TBA contracts start trading more than two months ahead of the settlement date, although trading volume really picks up in the last 30 days when the contract is the closest-to-settle.
- The longer horizon to settlement date corresponds with a greater range of price movement in the contract.
- Taking FN 4.0s as an example, the 2017-18 average price range from 30 days before settle date to settle date was almost 1%. In contrast, this price range was only 0.3% on average for the last 5 days before settlement.



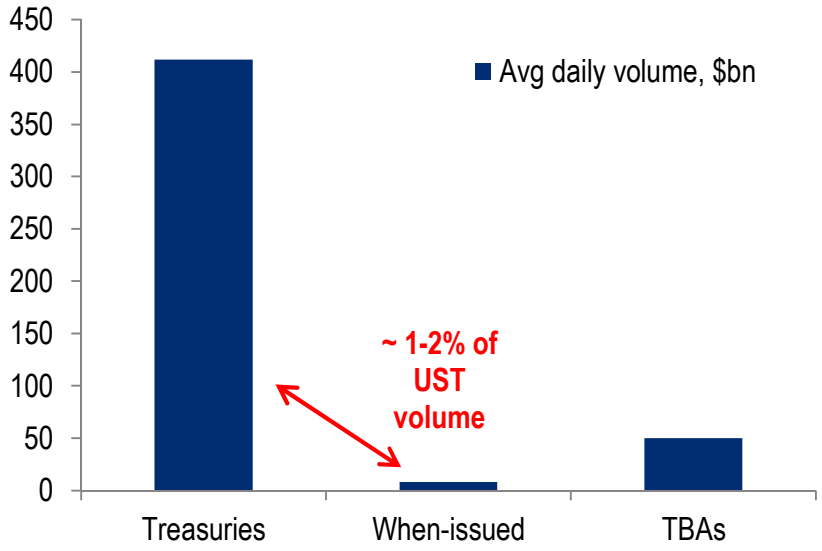


Source: TRACE, Anonymous primary dealer calculations

Deep dive: Non-margined exposure

WI exposure appears small when compared to TBAs

- We think the need for WI margining is low given the lower volumes in the WI market compared to the overall Treasury market or compared to the MBS market, which margins TBAs.
- We estimate when-issued volume is only about 1-2% of overall daily Treasury volume[1] (see Slide #7). SIFMA reports that average nominal daily trading volume for 2018 was $412bn. This would imply when-issued volume is approximately $5bn to $10bn per day.
- Using these assumptions:
  - ~$15bn to $30bn of WI trading volume between announcement to auction and between auction to settlement date.
- TBA volumes greatly eclipse WI volumes, with daily trading volume of regular TBAs ranging between $40bn to $60bn per day[2]. TBAs also trade for a significantly longer period of time, with most volume traded over a 30 day window.
- Over a 30 day period there me may be roughly $1.2tn to $1.8tn of traded notional in TBAs. This is significantly more than WI trading.



	Treasuries	When-issued	TBAs
avg days to settlement	1	3.6	15
Avg price chg %	0.18	0.35	0.63

Source: SIFMA, Anonymous primary dealer

Note[1]: WI % based on firm-only data in the period of Oct-Nov 2018, excluding Bills, TIPS and STRIPS. Uses market convention of WI (up to auction date only).

Note[2]: TBA volume represents the 30 day period prior to when the contract is closest to deliver. Price change over settlement days, calculated over 2018..

Note[3]: Treasury price changes based on realized daily changes in 2018. For WI we use UST data but extend the changes to 3.6 business days.

Deep dive: Potential challenges and benefits of a shortened WI period

Impact from shortening WI for new-issues

- A benefit from a shorter WI period would be reduced systemic counterparty risk.
- A challenge would be a negative impact to price discovery
  - At times, a newly auctioned note enters the delivery basket of a Treasury futures contract and becomes the new CTD. **The coupon of the new note, which is only known after the auction, typically determines whether the new note will be CTD**, with an effect on Treasury futures.
  - This has recently been seen with TY futures during the roll period where the newly issued 7y tends to become the CTD of the back-month contract. The 7y auction tends to fall close to the end of the futures roll cycle so the coupon level is not known with certainty during the entire roll period. In this example, **the WI market provides clear information on where the fair yield trades on the new 7y note which drives coupon estimates**.
  - Therefore a **shortened WI trading period may negatively impact information used by the Treasury futures market**. This could be mitigated using nearby issues on the Treasury curve combined with an estimate for the richness/cheapness of the new issue.

Impact from shortening WI for re-opening auctions

- Typically WI trading volume is significantly lower for regularly scheduled re-opening vs. new issues as the only difference is the settlement date. We estimate that the volume is just 5-10% of typical new issue WI volumes[1].
- Therefore we would expect little benefit or challenge to re-opening auctions should the WI trading period be shortened.

1. Anonymous primary dealer. WI % based on firm-only data in the period of Oct-Nov 2018, excluding Bills, TIPS and STRIPS. Uses market convention of WI (up to auction date only).

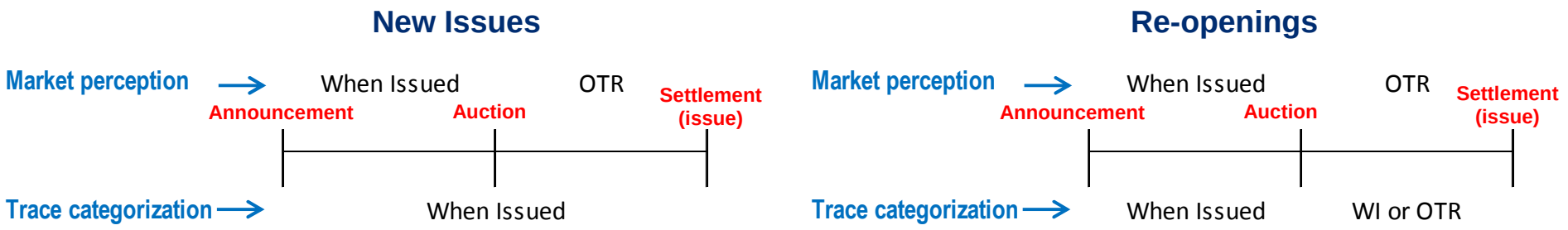
Deep dive: TRACE analysis

- FINRA FAQ 3.5.28 states the following with regard to WIs

> FINRA generally requires transactions in a U.S. Treasury Security that is subject of an auction to be reported with the When Issued (WI) indicator up until, but not including, issue date.
>
> FINRA recognizes that Treasury reopenings are unique given the fungibility of the WI and non-WI security, and that many firms' systems do not distinguish between WI and non-WI after the auction.
>
> Accordingly, FINRA will not require firms to append the WI indicator on transactions in a reopened CUSIP executed after an auction but prior to issue date

→ ***i.e. Settlement Date***

- Certain aspects may present challenges in reviewing overall WI TRACE data
  - Per FINRA, the WI flag should be added up to, but not including, issue date (i.e. settlement date), however many market participants view a WI only up to (and including) auction date.
  - The flexibility in WI classification of re-openings means that different firms may report differently, leading to inconsistent data.



Conclusions and recommendations for further study

- Data Availability: Improve access to trading activity data for the WI market using TRACE. Discuss WI reporting for re-openings under TRACE.
- Margining: Risk exposure for WI trading appears to be quite a bit less than for mortgage trading. The decision on whether to impose margining requirements on WI trades should weigh the potential impact on Treasury auction participation against the degree of risk reduction and the consistency of margining requirements across products.
- WI Calendar: Current system seems to work reasonably well. There are limited alternatives that would shorten the WI period without negatively impacting the auction calendar as a whole.
- WI for reopened issues: Treasury has gradually moved toward more frequent reopenings over time. The benefit of WI trading for reopenings is unclear (since there is no price discovery). Treasury may want to consider shortening the WI period for reopenings.

Appendix: Sample Treasury auction calendar

US TREASURY FINANCING SCHEDULE FOR 1st QUARTER 2018
Bill $

ISSUE COUPONS	ANNOUNCEMENT DATE	AUCTION DATE	SETTLEMENT DATE	OFFERED AMOUNT	CHANGE	MATURING AMOUNT	NEW MONEY
2-year note	12/21	12/26	1/2	26.00	0.00		
5-year note	12/21	12/27	1/2	34.00	0.00		
7-year note	12/21	12/28	1/2	28.00	0.00	73.95	14.05
3-year Note	1/4	1/9	1/16	24.00	0.00		
10-year Note (r)	1/4	1/10	1/16	20.00	0.00		
30-year Bond (r)	1/4	1/11	1/16	12.00	0.00	40.10	15.90
10-year TIPS	1/11	1/18	1/31	13.00	0.00		
2-year note	1/18	1/23	1/31	26.00	0.00		
2-year FRN	1/18	1/24	1/31	15.00	0.00		
5-year note	1/18	1/24	1/31	34.00	0.00		
7-year note	1/18	1/25	1/31	28.00	0.00	104.46	11.54
3-year Note	2/7	2/6	2/15	26.00	2.00		
10-year Note	2/7	2/7	2/15	24.00	1.00		
30-year Bond	2/7	2/8	2/15	16.00	1.00	46.64	19.36
2-year FRN (r)	2/15	2/21	2/23	14.00	2.00	0.00	14.00
30-year TIPS	2/15	2/21	2/28	7.00	0.00		
2-year note	2/15	2/20	2/28	28.00	2.00		
5-year note	2/15	2/21	2/28	35.00	1.00		
7-year note	2/15	2/22	2/28	29.00	1.00	68.24	30.76
3-year Note	3/8	3/12	3/15	28.00	2.00		
10-year Note (r)	3/8	3/12	3/15	21.00	1.00		
30-year Bond (r)	3/8	3/13	3/15	13.00	1.00	24.00	38.00
10-year TIPS (r)	3/15	3/22	3/29	11.00	0.00	0.00	11.00
				512.00		357.40	154.60

R = Reopening

Appendix: Summary of previous TBAC recommendations

- **November 1996**: *There were mixed views on the length of the when-issued trading period [for TIPS]. Some members felt that a longer-than-normal pre-auction trading period would facilitate price discovery and contribute to improved pre-auction distribution. Other members felt that, because this is an initial offering of an untested security, many investors would prefer to wait until the price was determined in the auction before trading actively in the securities. These members preferred a somewhat longer trading period between the auction and settlement dates.*

- **August 1998: ..***it was noted that the typical existing WI periods for weekly [bill] offerings was seven weekdays, and for the monthly 52-week bill offering, it was nine weekdays. Both periods were felt to be somewhat longer than was needed for distribution and price discovery and it was noted that a somewhat shorter period would provide the Treasury with more time and additional information on short-term cash flows to fine tune the size of these offerings. Based on these considerations, it was felt that the market could easily adjust to a standard, shorter cycle with all bill announcements on Thursday, with weekly 13-week and 26-week bill auctions remaining on Monday, with the monthly 52-week bill auction moving to Tuesday, and with all bill auctions settling on the Thursday immediately following auction days. The practical effect of this would be to shorten and standardize the WI periods for all regular bill offerings.*

- **May 1999**: *…it was noted that the Committee had recently recommended, and the Treasury had decided to implement, a shortening of the when-issued period for regular Treasury bill offerings. In evaluating this possibility for 2-year notes, there was recognition that there was no precise way to determine the optimal length of when-issued periods. Moreover, it was probably feasible to shorten those periods slightly, without adversely impacting pre-auction price discovery and distribution or post auction re-distribution and settlement preparation. When considering instead whether this might be viewed as desirable, there was concern among members of the Committee that the message implicit in shortening this period was the higher likelihood that there would be short term variability in the size of these coupon offerings, to fine tune them relative to recent cash flows. This was viewed as somewhat at odds with other efforts to preserve predictability and regularity in the regular coupon offering cycle. For this reason, the Committee was not inclined to recommend this change.*

- **August 2002**: *A reduction in time between the announcement and the settlement of securities was also discussed by the Committee. This is a topic the Committee has been in favor of in the past, as it reduces systemic counterparty risk as a result of a narrower time frame for the underwriting and auction processes. It was suggested that the amount of when-issued trading volume (ex-rolls) has been contracting consistently over the past several quarters, making this period less relevant. As a result a shorter period could be considered. With treasury bills, the time period between announcement and auction has successfully been shortened, and the Committee felt the announcement to auction period for coupons could be shortened as well. The result would reduce systemic risk without sacrificing adequate underwriting opportunity.*