Treasury Presentation to TBAC

Office of Debt Management

Fiscal Year 2016 Q3 Report

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Section I:
Executive Summary

Highlights of Treasury's August 2016 Quarterly Refunding Presentations to the Treasury Borrowing Advisory Committee (TBAC)

Receipts and Outlays

- Corporate taxes have been weaker than during the equivalent period last year, potentially attributable to the extension of bonus depreciation and smaller corporate profits.
- Fiscal year-to-date, Treasury net outlays were $106 billion higher than last year, mainly attributable to larger interest expenses ($28 billion) due to higher inflation compensation on TIPS and higher interest expense on Government Account Series (GAS) debt.
- Medicare outlays were higher by $27 billion, mostly due to a $11 billion increase in payments made to prescription drug plans.

Sources of Financing in Fiscal Year 2016

- Based on the Quarterly Borrowing Estimate, Treasury's Office of Fiscal Projections currently projects a net marketable borrowing need of $774 billion for FY 2016. This estimate includes a $151 billion year-over-year increase in the cash balance. In FY 2017, OMB projects that borrowing from the public will decline to $572 billion.

Projected Net Marketable Borrowing

- Between FY 2017 and 2018, Treasury's borrowing from the public could rise notably if the Federal Reserve allows the Treasury securities held in the SOMA portfolio to mature.
- There are $565 billion of Treasury securities in the SOMA portfolio that will mature between now and the end of FY 2018.

Bid-to-Cover Ratios (BTC)

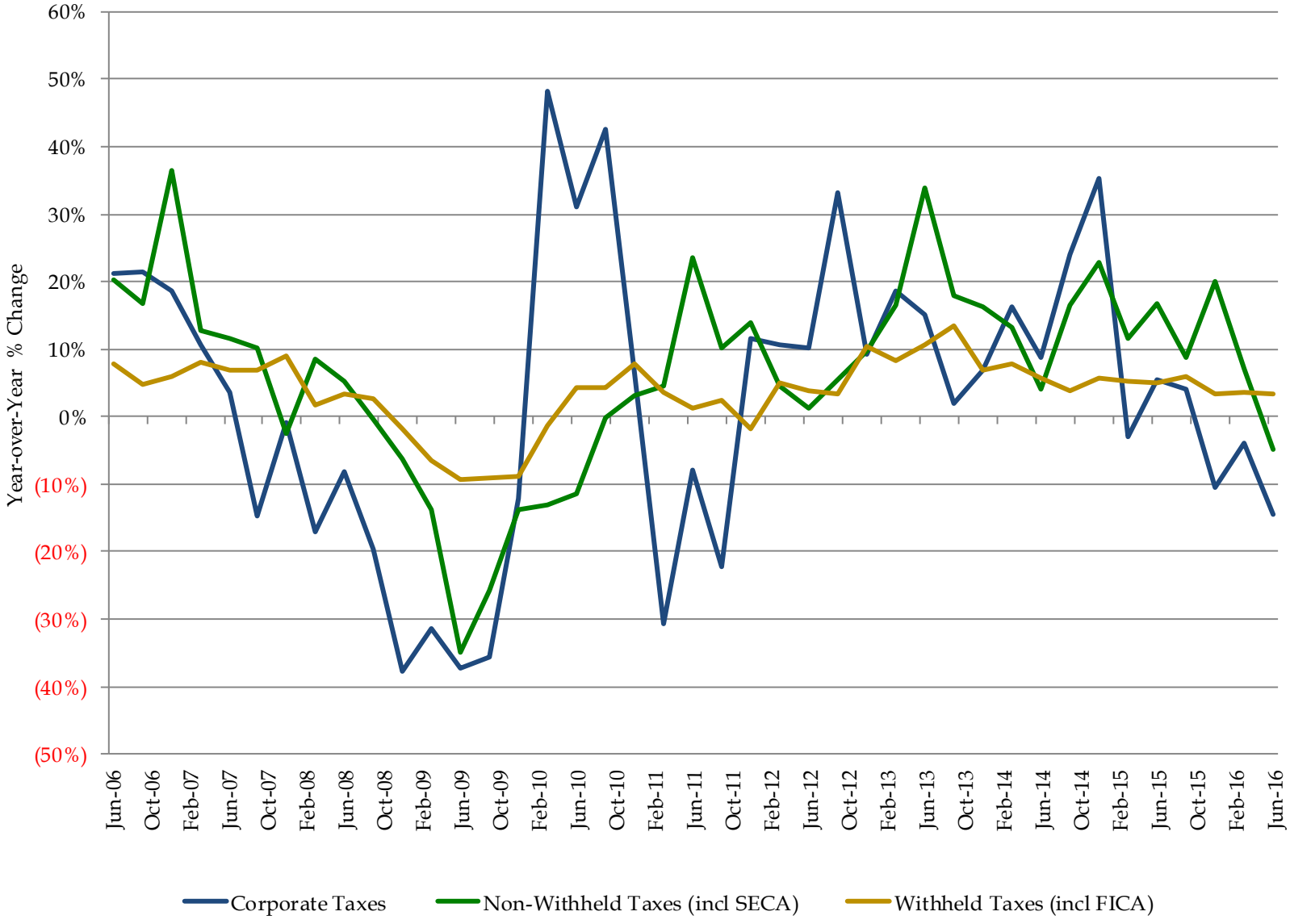
- BTC ratios for TIPS and shorter-dated coupons have fallen slightly in recent months, while bills have been little changed.
- Longer-dated coupon BTCs are broadly higher.

Investor Class Allotments

- Since the beginning of April, auction awards are lower for Other Dealers and Brokers, particularly in Bills. This is largely due to the addition of a new primary dealer. Accordingly, primary dealer awards increased in Bills.
- Direct bidder awards were modestly lower across most tenors.

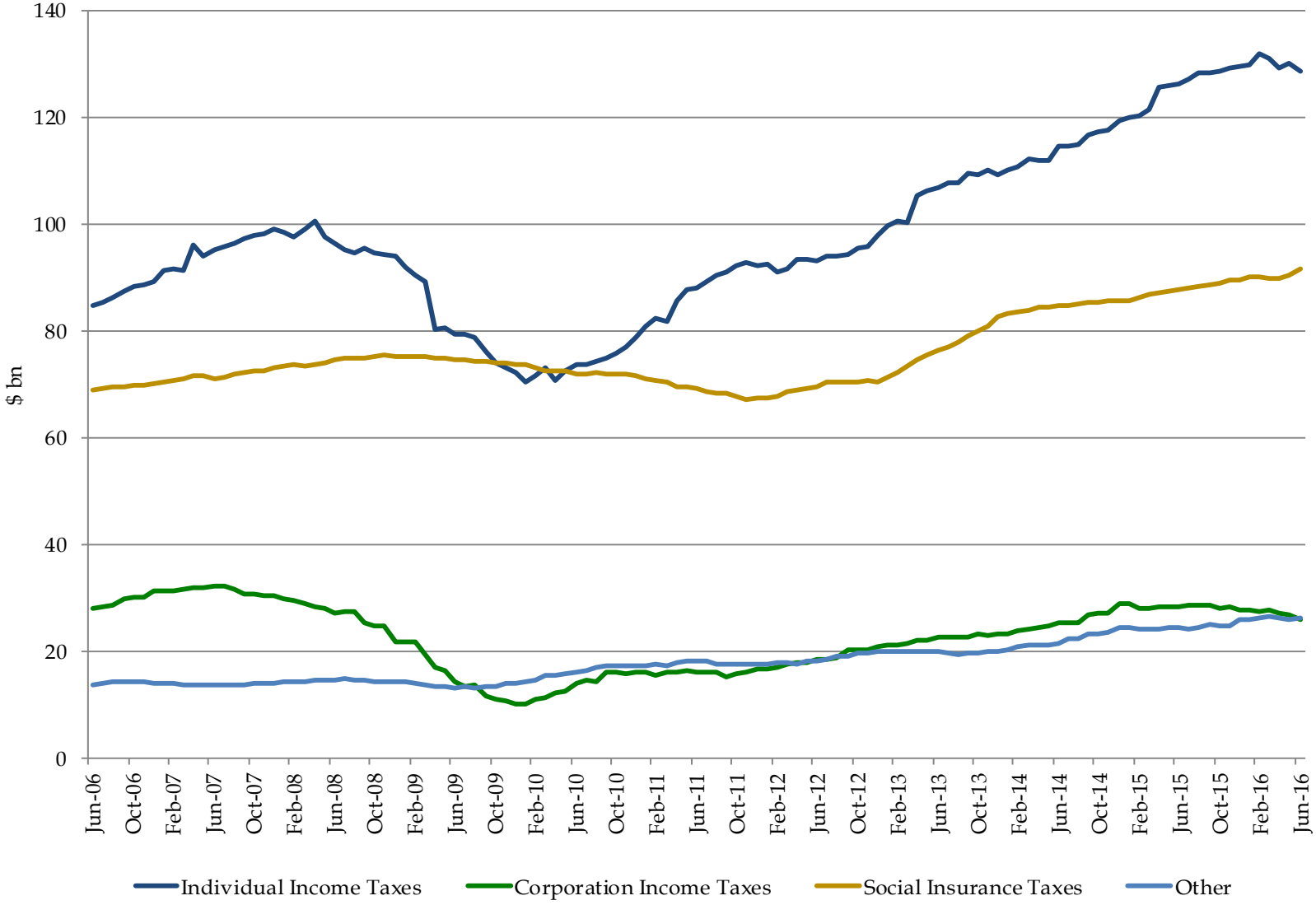
Section II: Fiscal

Quarterly Tax Receipts



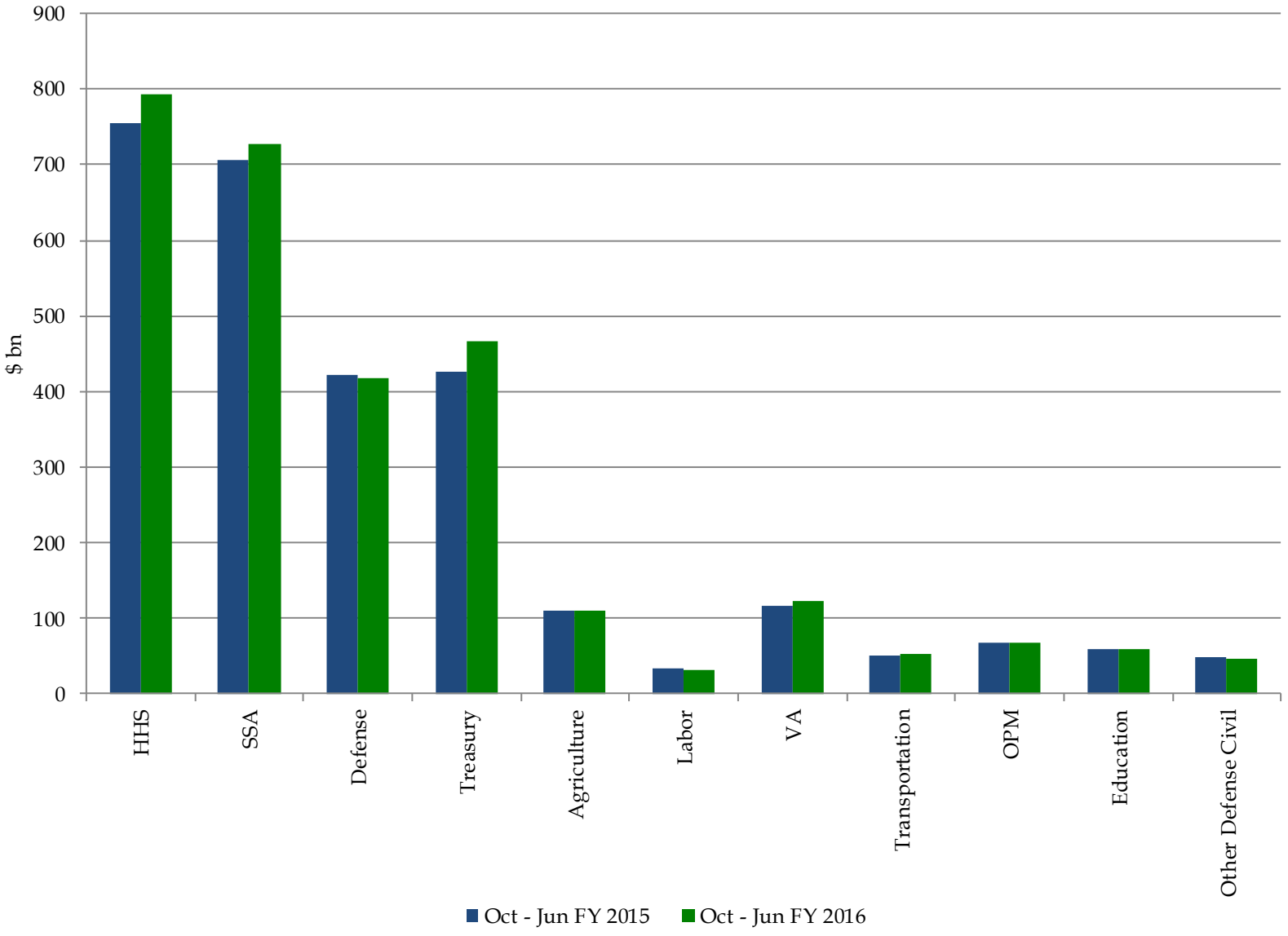
Source: United States Department of the Treasury

Monthly Receipt Levels
(12-Month Moving Average)



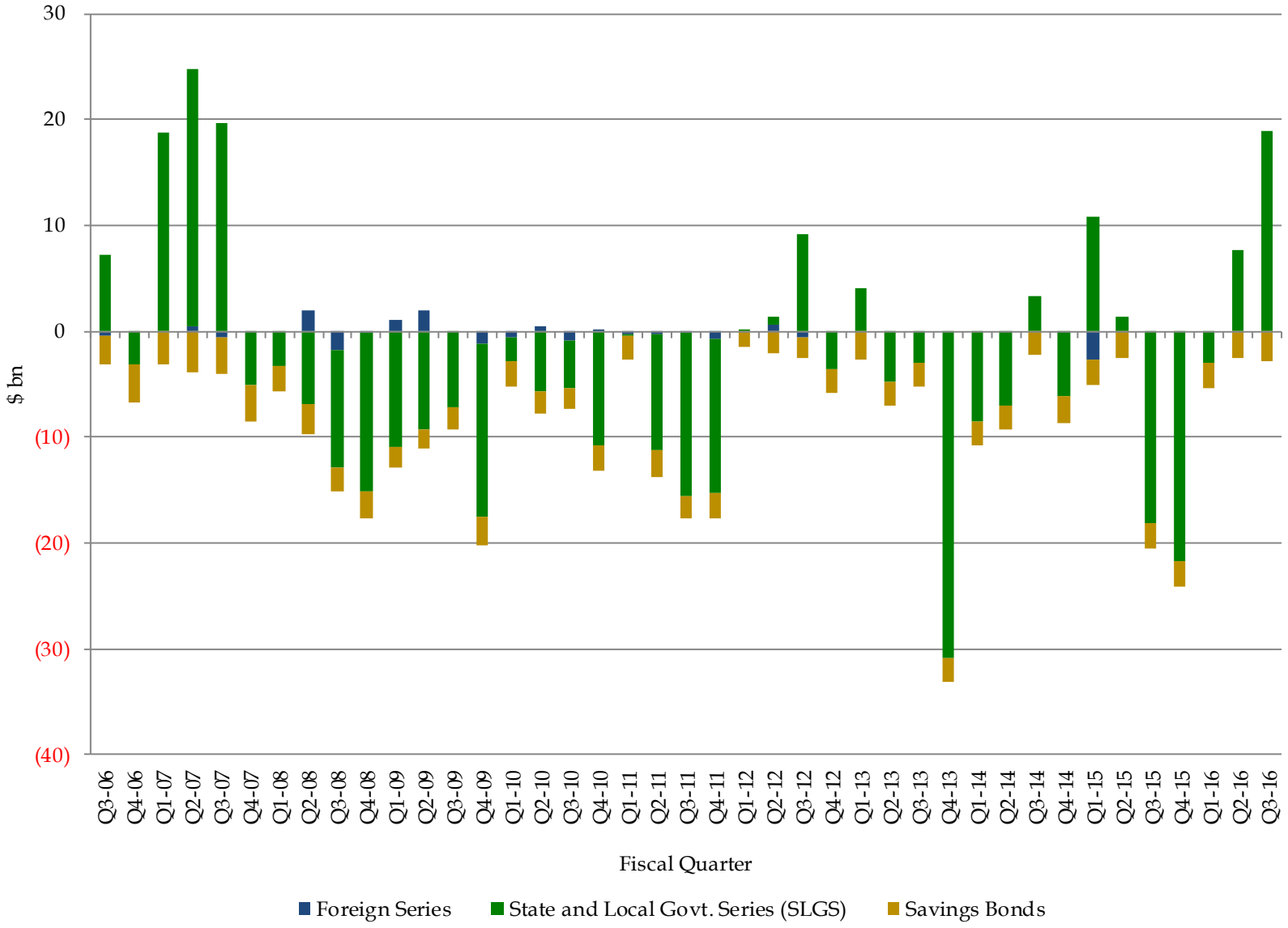
Individual Income Taxes include withheld and non-withheld. Social Insurance Taxes include FICA, SECA, RRTA, UTF deposits, FUTA and RUIA. Other includes excise taxes, estate and gift taxes, customs duties and miscellaneous receipts.
Source: United States Department of the Treasury

Eleven Largest Outlays



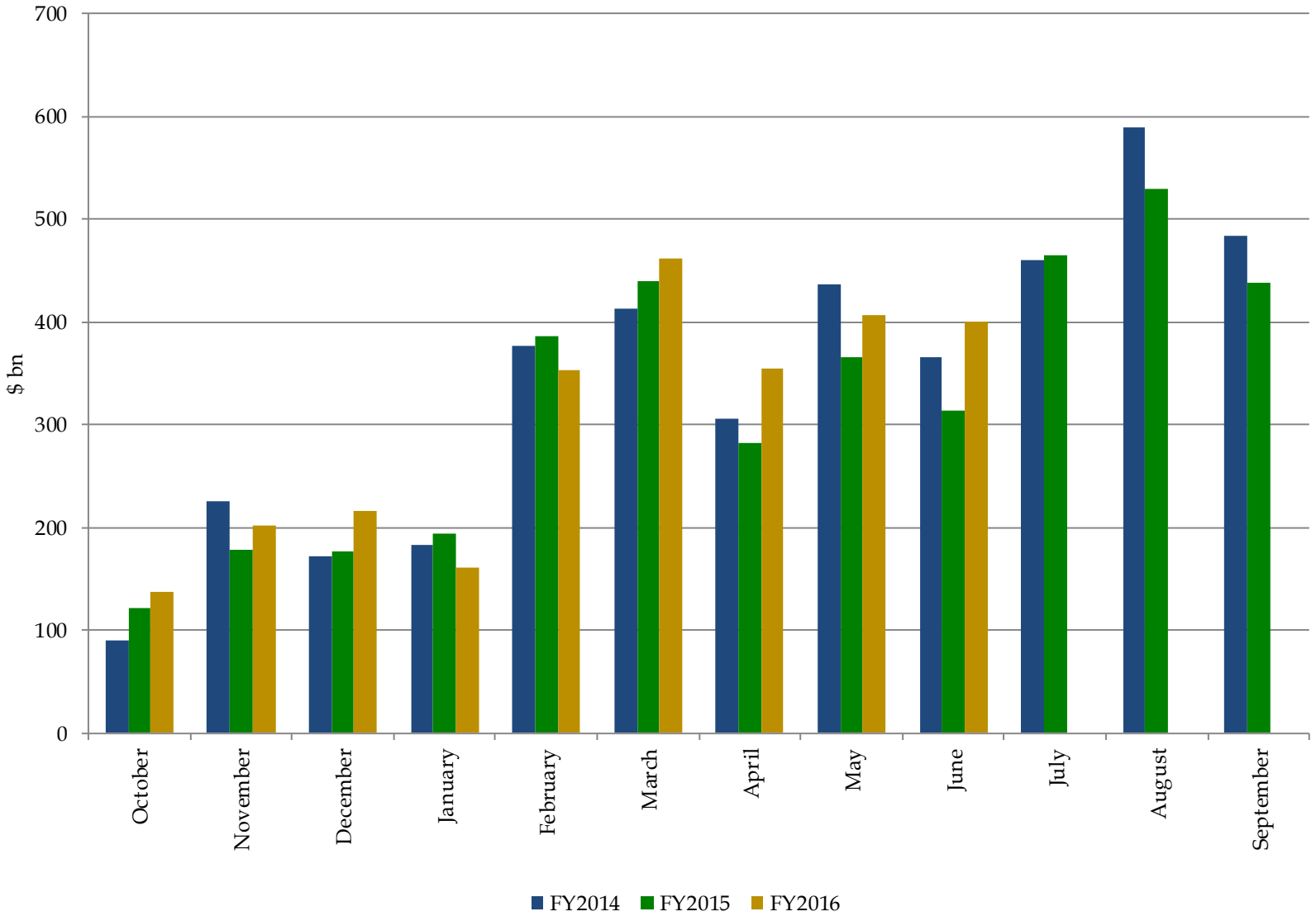
Source: United States Department of the Treasury

Treasury Net Nonmarketable Borrowing



Source: United States Department of the Treasury

Cumulative Budget Deficits by Fiscal Year



Source: United States Department of the Treasury

FY 2016-2018 Deficits and Net Marketable Borrowing Estimates

In $ billions

	Primary Dealers[1]	CBO[2]	CBO[3]	OMB MSR[4]	OMB[5]
FY 2016 Deficit Estimate	567	529	534	600	616
FY 2017 Deficit Estimate	592	433	550	437	504
FY 2018 Deficit Estimate	696	383	549	481	454
FY 2016 Deficit Range	504 - 650				
FY 2017 Deficit Range	522 - 700				
FY 2018 Deficit Range	550 - 800				
FY 2016 Net Marketable Borrowing Estimate	635	829	834	774*	774*
FY 2017 Net Marketable Borrowing Estimate	652	508	621	572	635
FY 2018 Net Marketable Borrowing Estimate	751	452	606	435	561
FY 2016 Net Marketable Borrowing Range	483 - 740				
FY 2017 Net Marketable Borrowing Range	550 - 760				
FY 2018 Net Marketable Borrowing Range	650 - 900				
Estimates as of:	Jul-16	Mar-16	Mar-16	Jul-16	Feb-16

[1]Based on primary dealer feedback on July 25, 2016. Estimates above are averages.

[2]Table 1 and 2 of CBO's "An Analysis of the President's 2017 Budget"

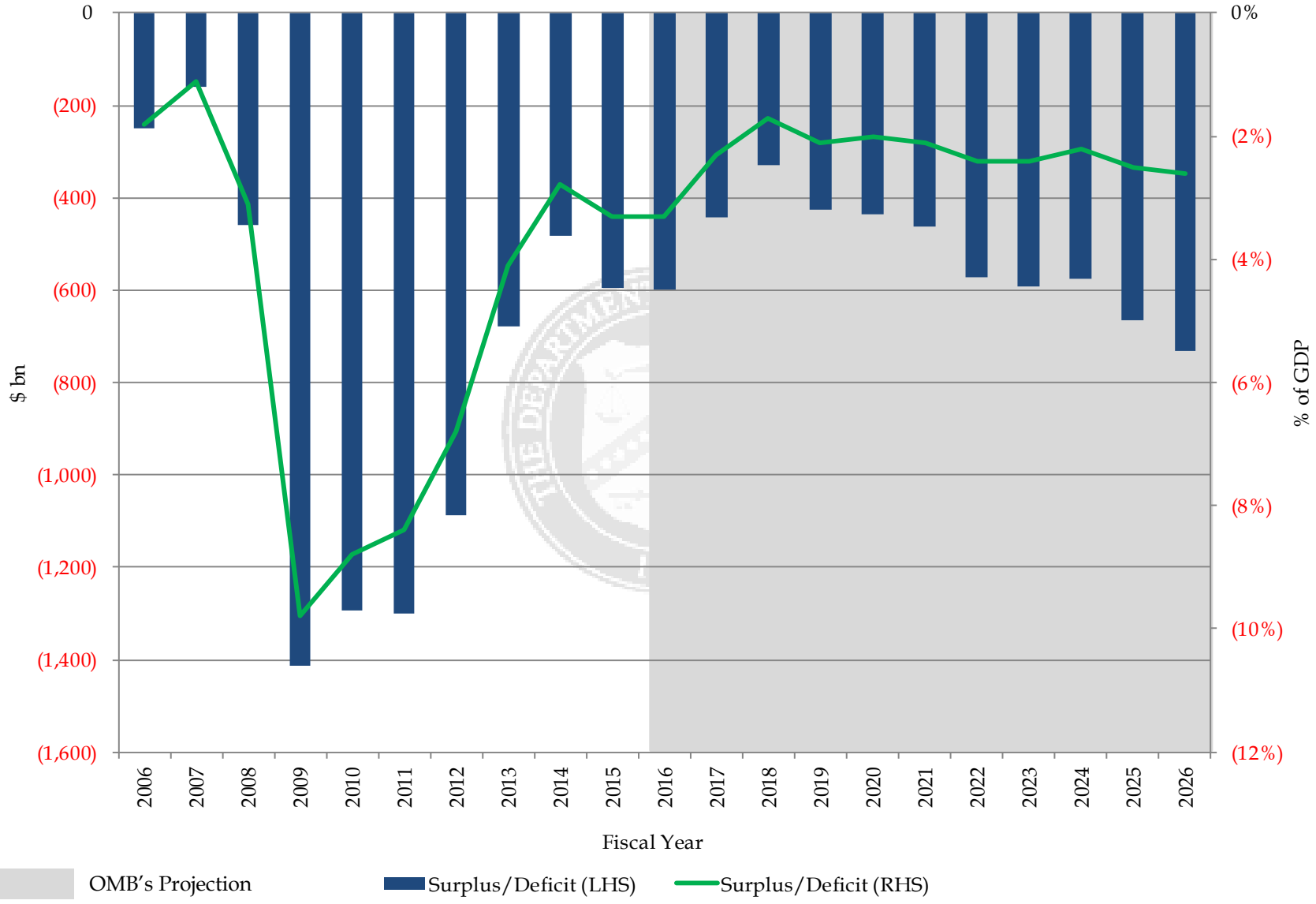
[3]Table 1 and 2 of CBO's "The Budget and Economic Outlook: 2016 to 2026"

[4]Table S-11 of OMB's "The FY2017 Mid-Session Review"

[5]Table S-13 of OMB's "Budget of the United States Government, Fiscal Year 2017"

*OFP's FY 2016 Net Marketable Borrowing Estimate

Budget Surplus/Deficit



Projections are from Table S-11 of "The FY2017 Mid-Session Review."

Section III: Financing

Assumptions for Financing Section (pages 15 to 22)

- Portfolio and SOMA holdings as of 6/30/2016.
- SOMA reinvestments until 2H CY2017, followed by SOMA redemptions until and including February 2022. These assumptions are based on Chair Yellen's December 2015 press conference and the median expectations from the June FRB-NY survey of primary dealers.
- Assumes announced issuance sizes and patterns constant for Nominal Coupons, TIPS, and FRNs as of 6/30/2016, while using an average of ~$1.5 trillion of Bills outstanding.
- The principal on the TIPS securities was accreted to each projection date based on market ZCIS levels as of 6/30/2016.
- No attempt was made to match future financing needs.

Sources of Financing in Fiscal Year 2016 Q3

April - June 2016	
Net Bill Issuance	(110)
Net Coupon Issuance	85
Subtotal: Net Marketable Borrowing	(25)
Ending Cash Balance	364
Beginning Cash Balance	314
Subtotal: Change in Cash Balance	50
Net Implied Funding for FY 2016 Q2*	(74)

Security	April - June 2016 Bill Issuance			Fiscal Year-to-Date Bill Issuance		
	Gross	Maturing	Net	Gross	Maturing	Net
4-Week	540	575	(35)	1,695	1,610	85
13-Week	388	445	(57)	1,200	1,114	86
26-Week	328	331	(3)	1,047	963	84
52-Week	60	75	(15)	170	250	(80)
CMBs	0	0	0	95	120	(25)
Bill Subtotal	1,316	1,426	(110)	4,207	4,057	150

Security	April - June 2016 Coupon Issuance			Fiscal Year-to-Date Coupon Issuance		
	Gross	Maturing	Net	Gross	Maturing	Net
2-Year FRN	45	41	4	127	82	45
2-Year	95	93	2	267	285	(18)
3-Year	78	96	(18)	224	288	(64)
5-Year	125	111	13	353	329	23
7-Year	103	82	21	291	130	161
10-Year	68	23	45	200	68	132
30-Year	42	19	24	126	30	96
5-Year TIPS	16	41	(25)	32	41	(9)
10-Year TIPS	14	0	14	55	20	35
30-Year TIPS	6	0	6	22	0	22
Coupon Subtotal	592	506	85	1,697	1,274	423

Total	1,908	1,932	(25)	5,904	5,331	573

*An end-of-June 2016 cash balance of $364 billion versus a beginning-of-April 2016 cash balance of $314 billion. By keeping the cash balance constant, Treasury arrives at the net implied funding number.
Gross issuance values include SOMA add-ons

Sources of Financing in Fiscal Year 2016 Q4

July - September 2016	
Assuming Constant Coupon Issuance Sizes*	
Treasury Announced Net Marketable Borrowing**	201
Net Coupon Issuance	52
Implied Change in Bills	149

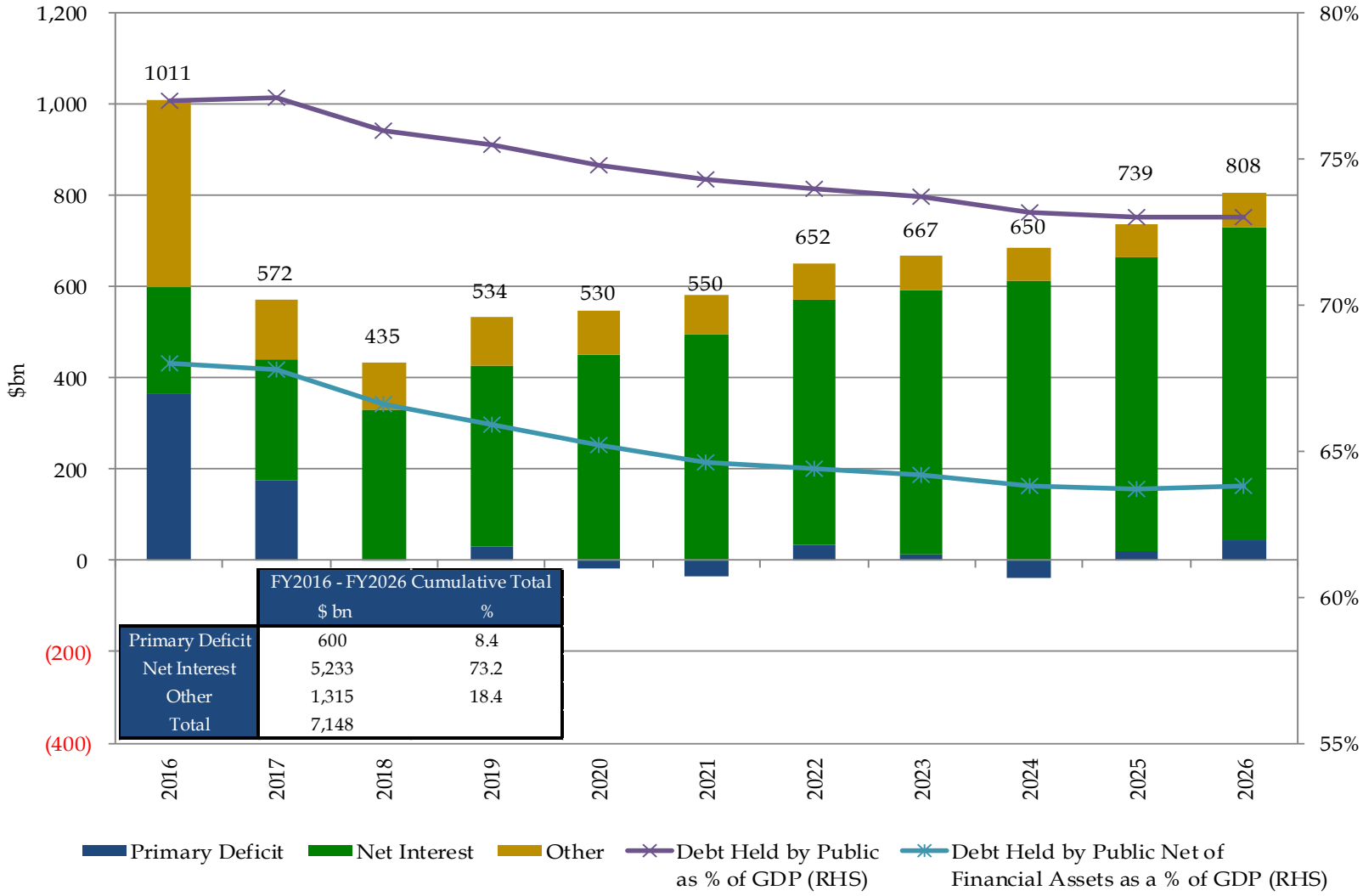
Security	July - September 2016 Coupon Issuance			Fiscal Year-to-Date Coupon Issuance		
	Gross	Maturing	Net	Gross	Maturing	Net
2-Year FRN	41	41	(0)	168	123	45
2-Year	78	87	(9)	345	372	(27)
3-Year	72	95	(23)	296	383	(87)
5-Year	102	108	(6)	455	438	17
7-Year	84	87	(3)	375	217	158
10-Year	63	23	40	263	91	172
30-Year	39	0	39	165	30	135
5-Year TIPS	14	0	14	46	41	5
10-Year TIPS	24	24	0	79	44	35
30-Year TIPS	0	0	0	22	0	22
Coupon Subtotal	517	465	52	2,214	1,739	476

*Keeping announced issuance sizes and patterns constant for Nominal Coupons, TIPS, and FRNs as of 6/30/2016. Gross issuance does not reflect SOMA reinvestments.

**Assumes an end-of-September 2016 cash balance of $350 billion versus a beginning-of-July 2016 cash balance of $364 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

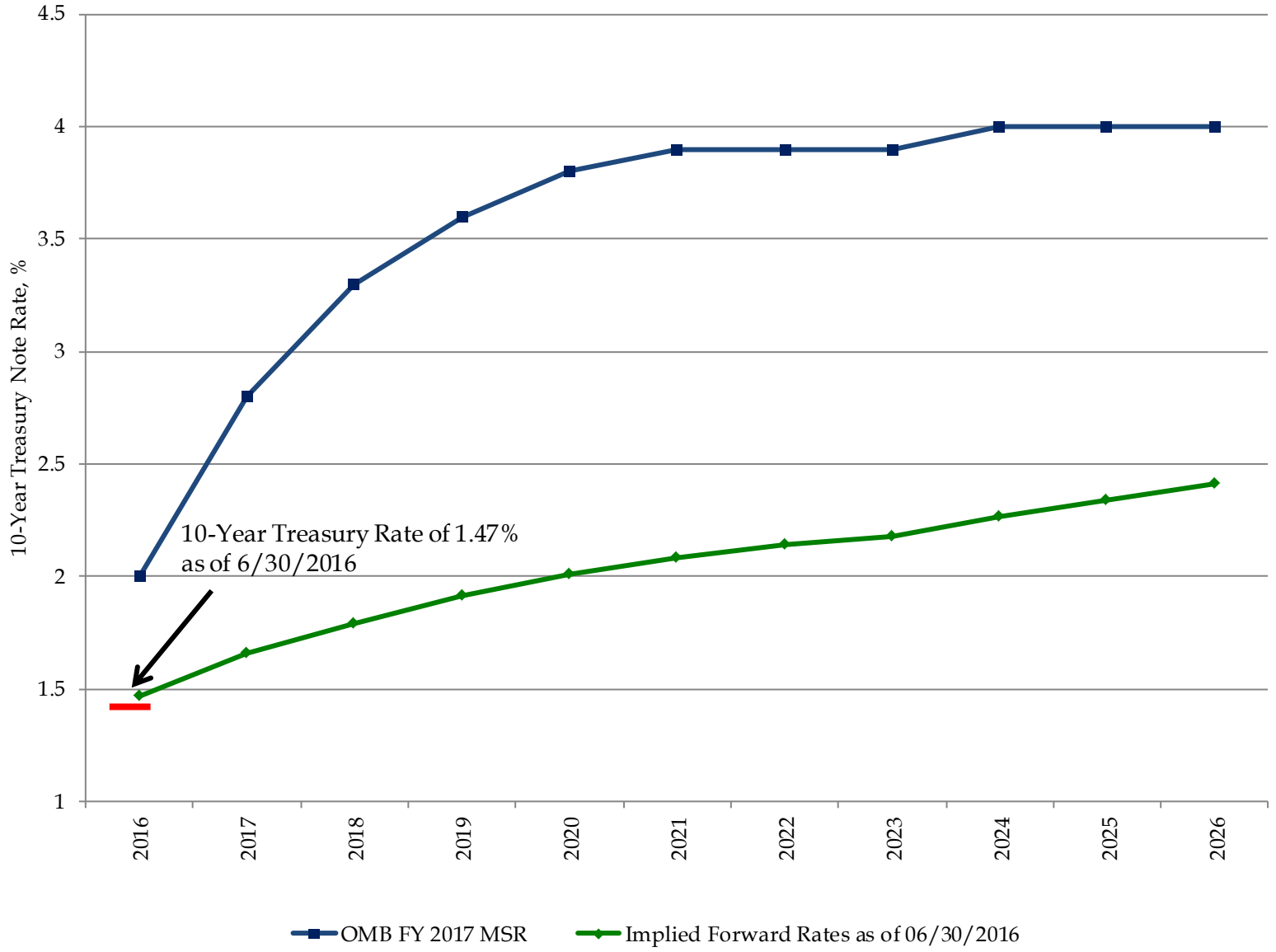
OMB's Projection of Borrowing from the Public



	FY2016 - FY2026 Cumulative Total	
	$ bn	%
Primary Deficit	600	8.4
Net Interest	5,233	73.2
Other	1,315	18.4
Total	7,148	

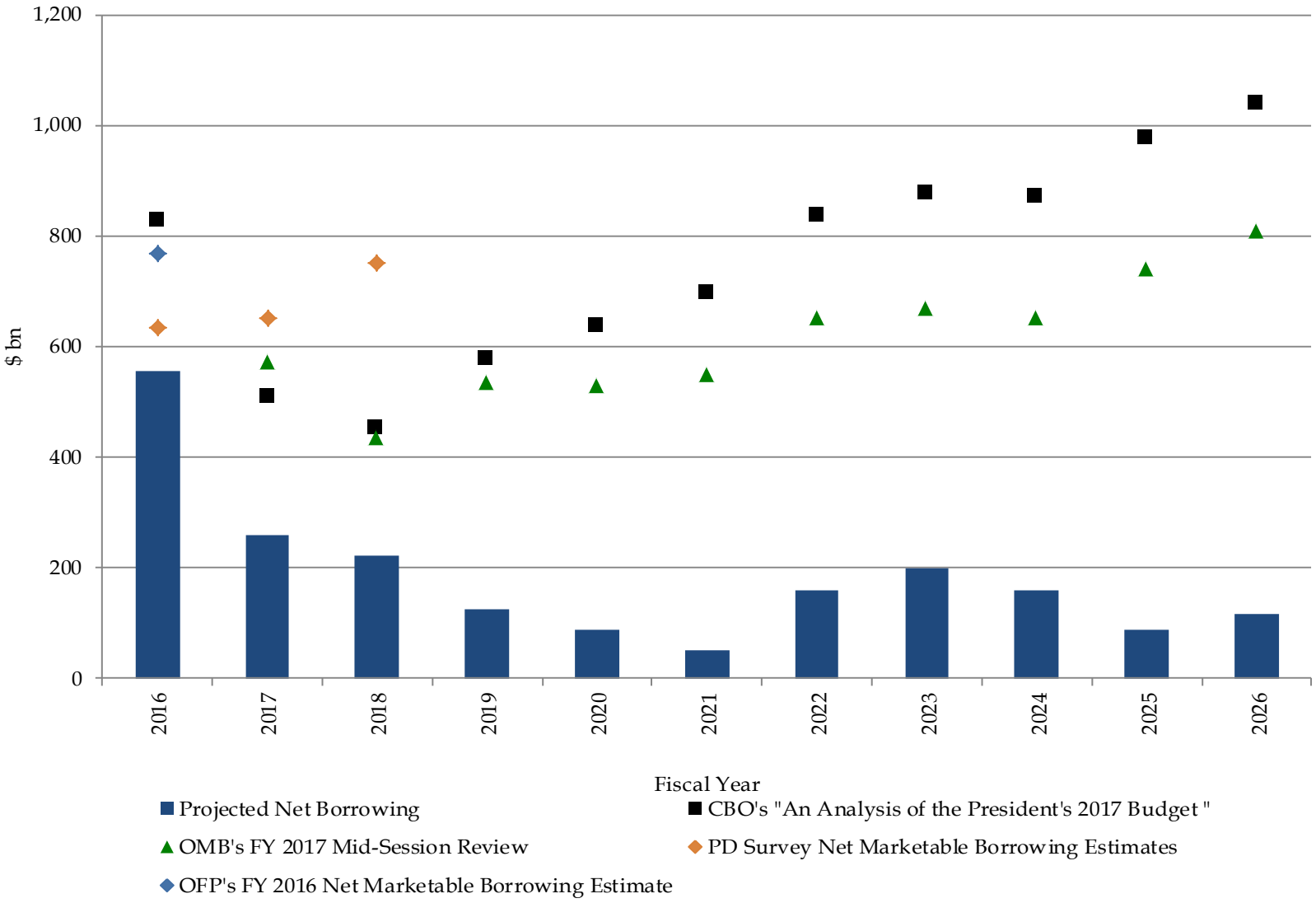
OMB's projections of net borrowing from the public are from Table S-11 of "The FY2017 Mid-Session Review." Data labels at the top represent the change in debt held by the public in $ billions. "Other" represents borrowing from the public to provide direct and guaranteed loans.
* 2016 estimate reflects adjustments to account for the unwind in extraordinary measures.

Interest Rate Assumptions: 10-Year Treasury Note



OMB's economic assumption of the 10-Year Treasury Note rates are from Table S-11 of "The FY2017 Mid-Session Review." The forward rates are the implied 10-Year Treasury Note rates on June 30 of that year.

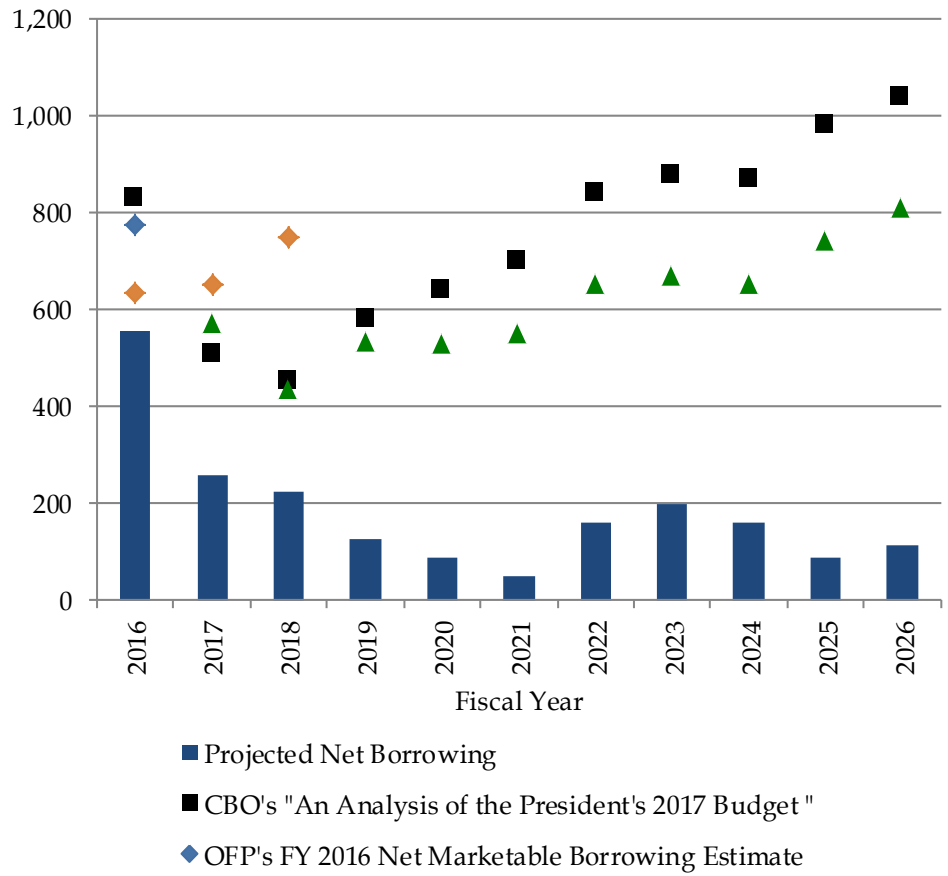
Projected Net Borrowing Assuming Constant Future Issuance



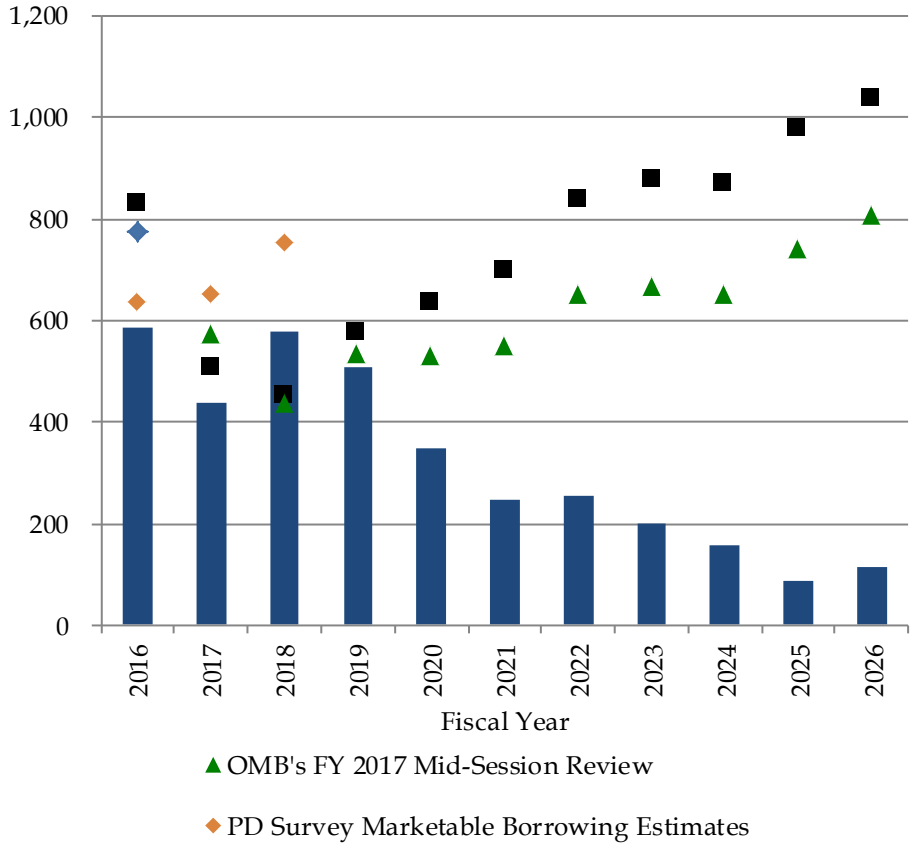
Treasury's primary dealer survey estimates can be found on page 11. OMB's projections of net borrowing from the public are from Table S-11 of "The FY2017 Mid-Session Review." CBO's estimates of the borrowing from the public are from Table 1 of "An Analysis of the President's 2017 Budget." See table at the end of this section for details.

Impact of SOMA Actions on Projected Net Borrowing Assuming Future Issuance Remains Constant

Without Fed Reinvestments ($ bn)



With Fed Reinvestments ($ bn)



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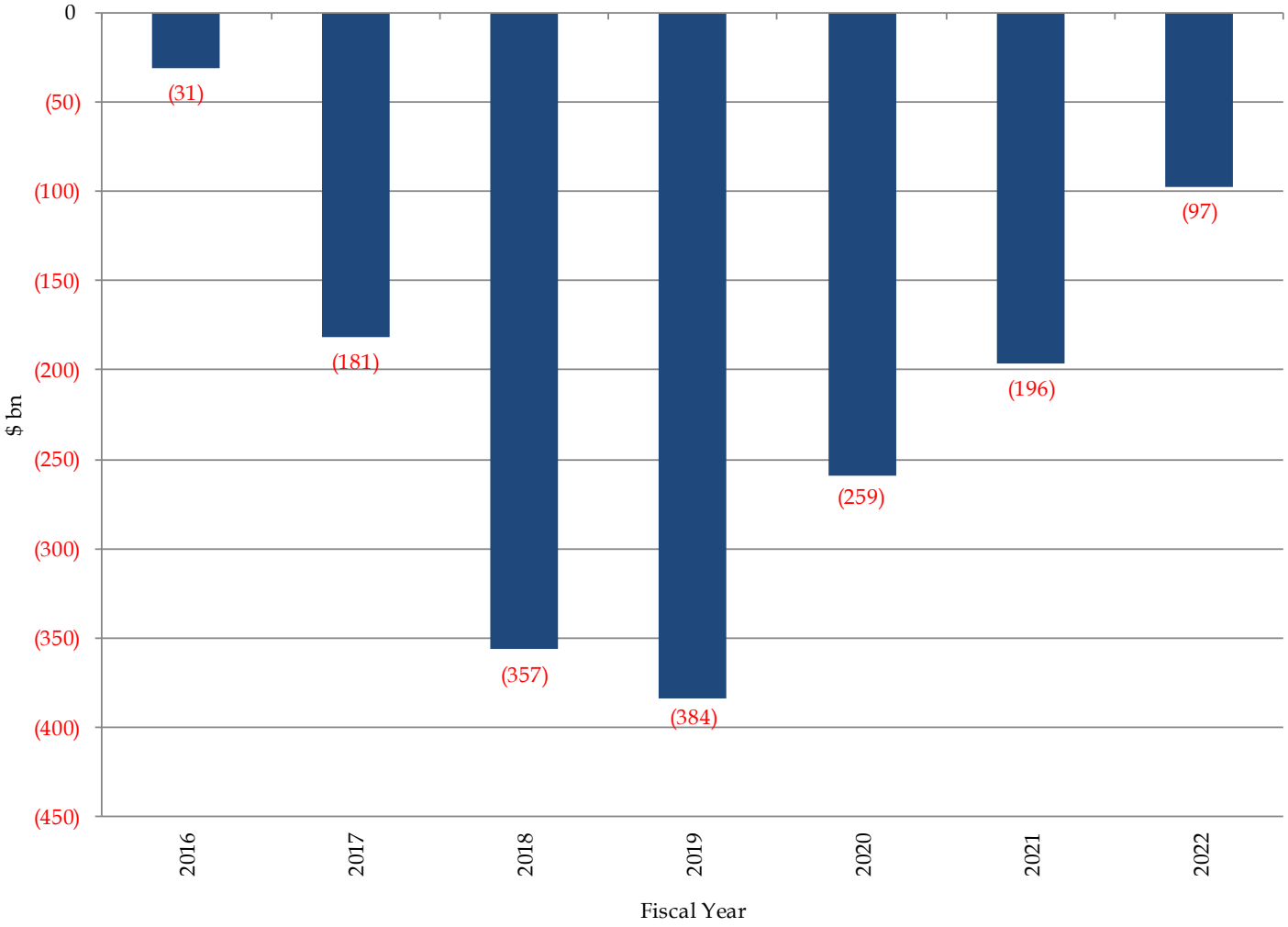
Additional Funding Gap Assuming No SOMA Roll



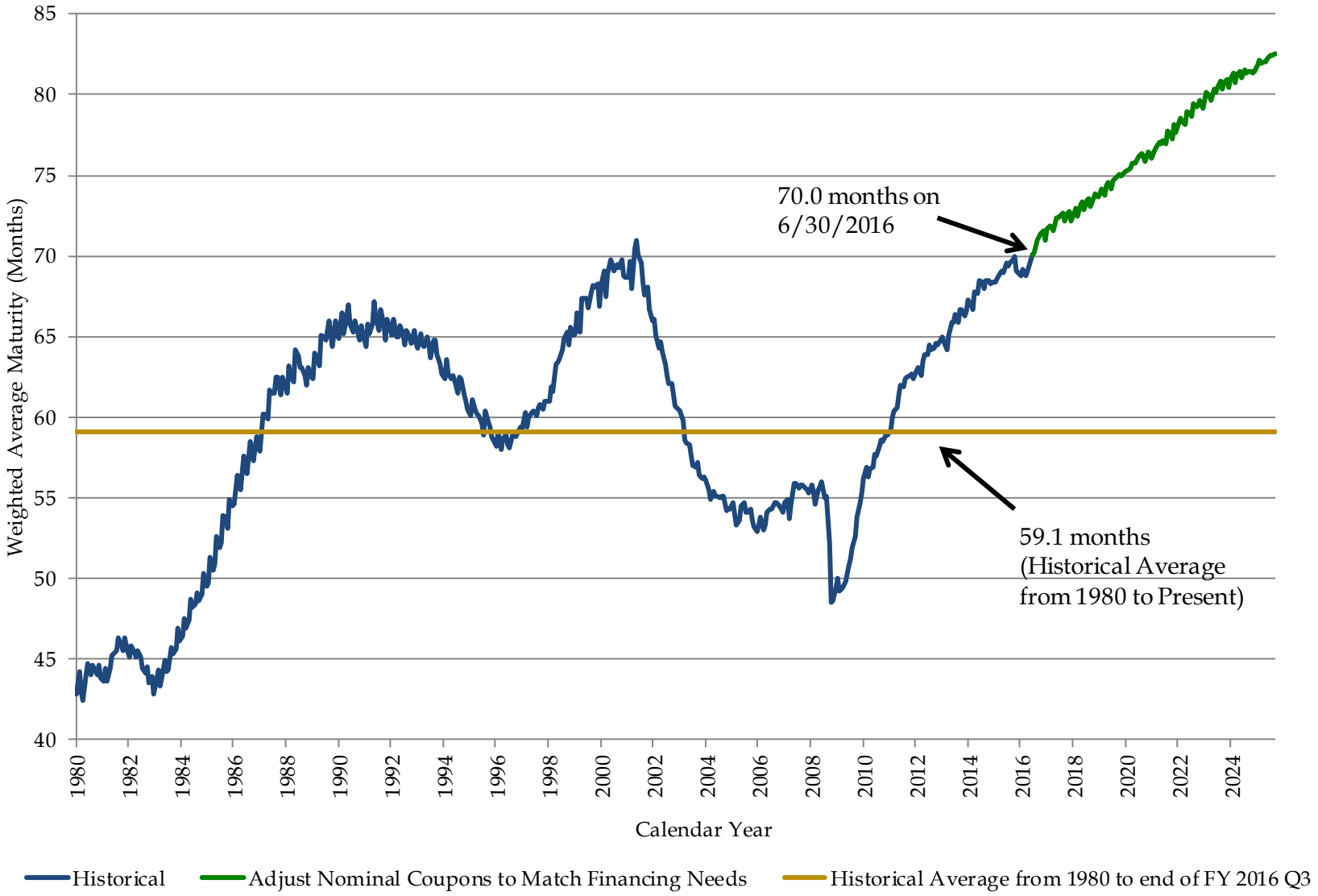
Historical Net Marketable Borrowing and Projected Net Borrowing Assuming Future Issuance Remains Constant, $ billions

Fiscal Year	Bills	2/3/5	7/10/30	TIPS	FRN	Historical/Projected Net Borrowing Capacity	OMB's FY 2017 Mid-Session Review	CBO's "An Analysis of the President's 2017 Budget "	Primary Dealer Survey
2011	(311)	576	751	88	0	1,104			
2012	139	148	738	90	0	1,115			
2013	(86)	86	720	111	0	830			
2014	(119)	(92)	669	88	123	669			
2015	(53)	(282)	641	88	164	558			
2016	79	(97)	466	62	45	554	774*	829	635
2017	76	(84)	221	47	(0)	259	572	508	652
2018	0	(17)	202	42	(4)	223	435	452	751
2019	0	14	67	43	0	124	534	578	
2020	0	(12)	83	17	0	88	530	637	
2021	0	(47)	99	(1)	0	51	550	697	
2022	0	36	133	(11)	0	158	652	838	
2023	0	66	140	(8)	2	200	667	876	
2024	0	10	160	(11)	(0)	159	650	870	
2025	0	(13)	155	(53)	(2)	88	739	977	
2026	0	(16)	169	(37)	(0)	115	808	1,038	

Net Borrowing capacity does not reflect SOMA reinvestments.
Treasury's primary dealer survey estimates can be found on page 11. OMB's projections of net borrowing from the public are from Table S-11 of "The FY2017 Mid-Session Review." CBO's estimates of the borrowing from the public are from Table 1 of "An Analysis of the President's 2017 Budget."
*OFP's FY 2016 Net Marketable Borrowing Estimate

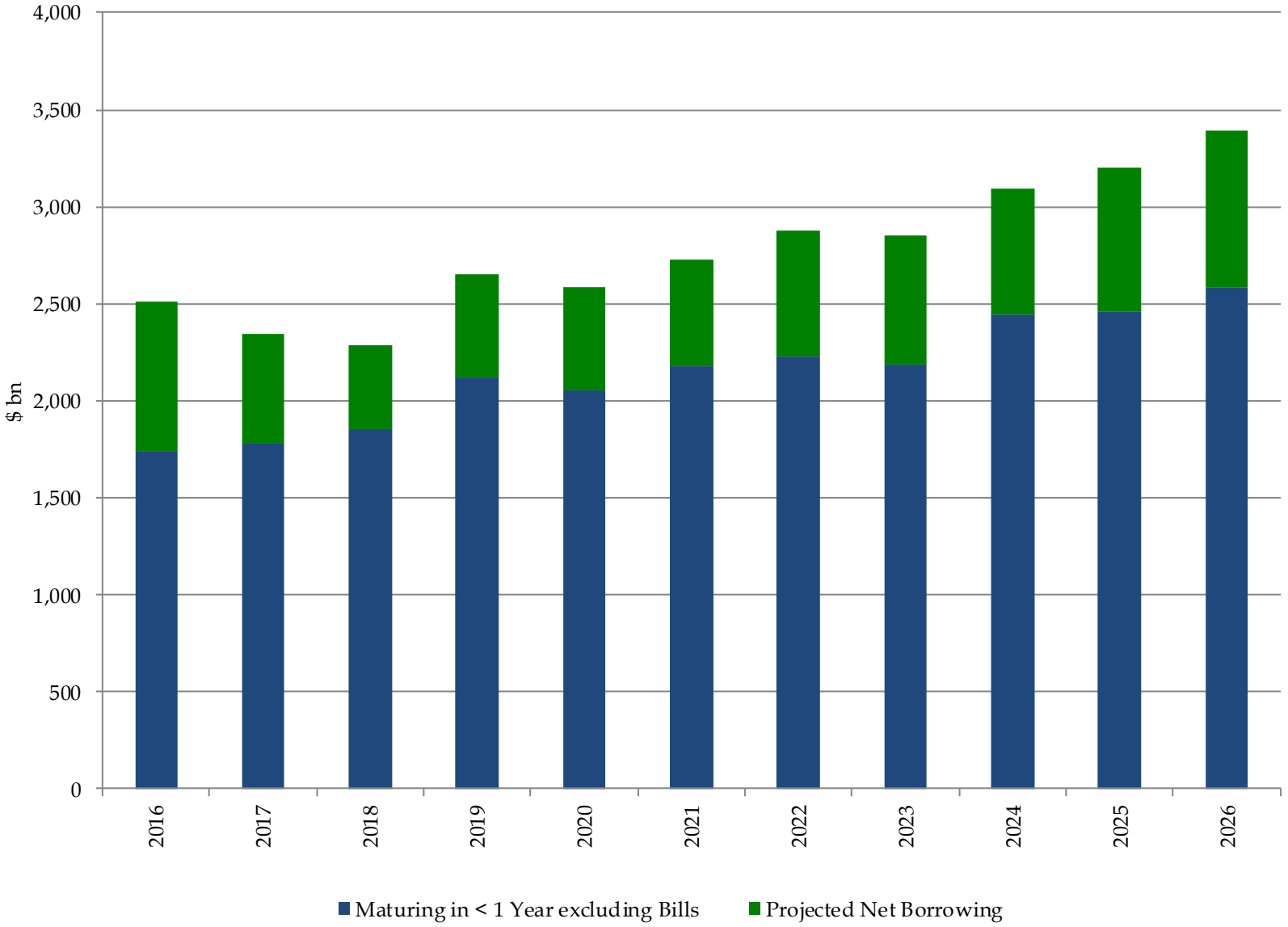
Section IV:
Portfolio Metrics

Weighted Average Maturity of Marketable Debt Outstanding



This scenario does not represent any particular course of action that Treasury is expected to follow. Instead, it is intended to demonstrate the basic trajectory of average maturity absent changes to the mix of securities issued by Treasury.

Projected Gross Borrowing excluding Bills for Fiscal Year



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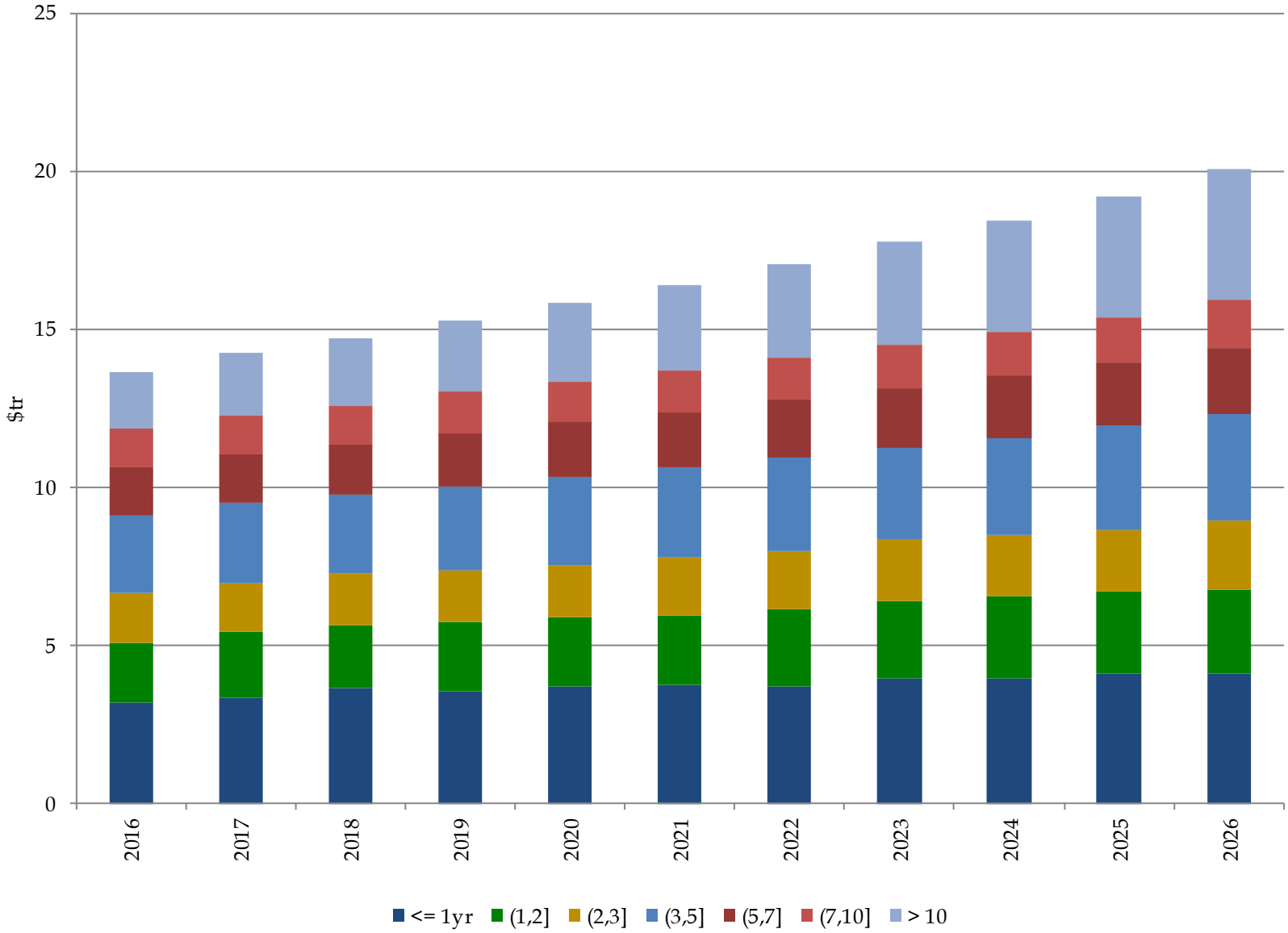
Projected Maturity Profile from end of Fiscal Year



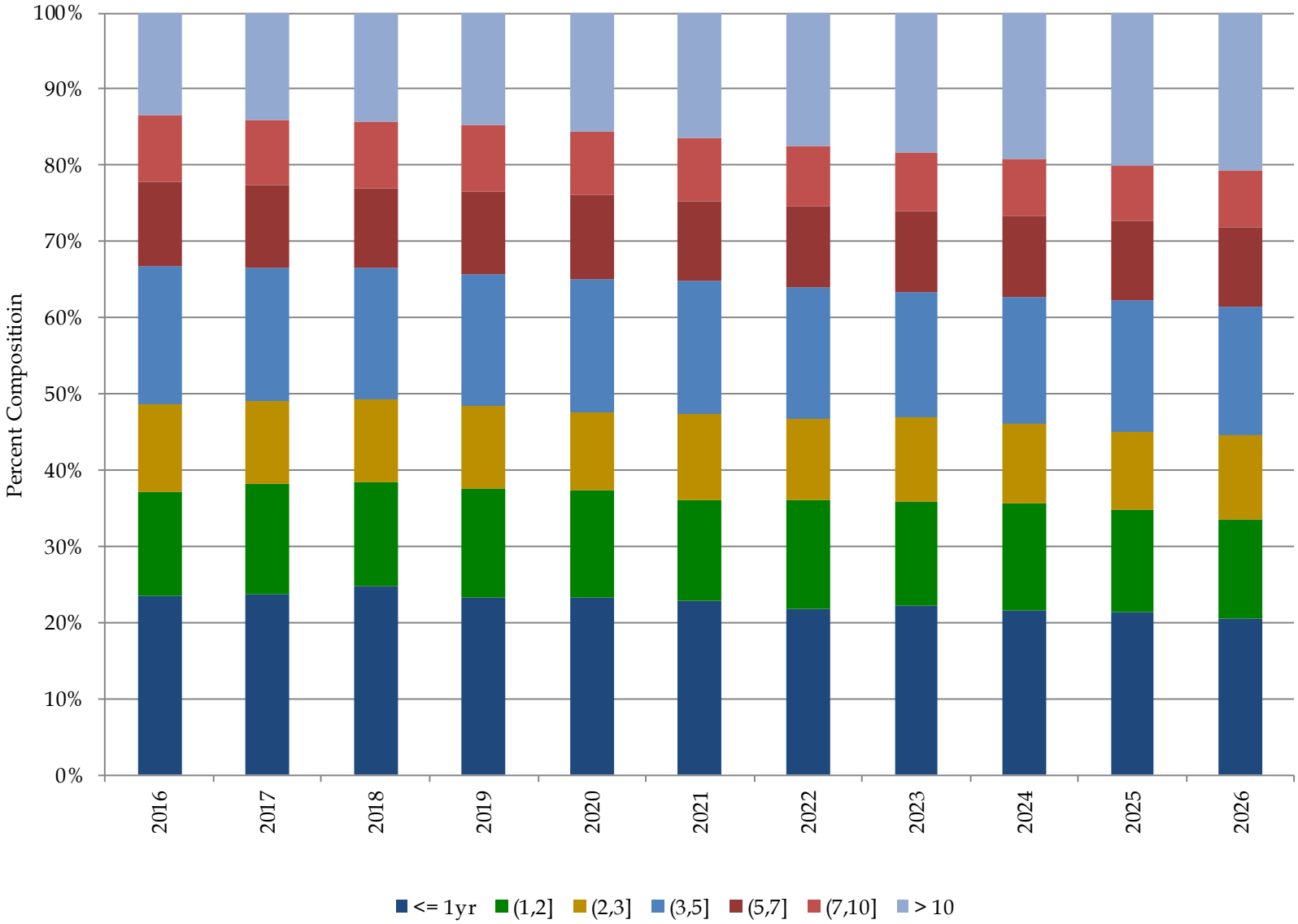
This scenario does not represent any particular course of action that Treasury is expected to follow. Instead, it is intended to demonstrate the basic trajectory of average maturity absent changes to the mix of securities issued by Treasury. See table on following page for details.

Recent and Projected Maturity Profile, $ billions

End of Fiscal Year	<= 1yr	(1,2]	(2,3]	(3,5]	(5,7]	(7,10]	> 10	Total	(0,5]
2008	2,152	711	280	653	310	499	617	5,222	3,796
2009	2,702	774	663	962	559	643	695	6,998	5,101
2010	2,563	1,141	895	1,273	907	856	853	8,488	5,872
2011	2,620	1,334	980	1,541	1,070	1,053	1,017	9,616	6,476
2012	2,951	1,373	1,104	1,811	1,214	1,108	1,181	10,742	7,239
2013	2,939	1,523	1,242	1,965	1,454	1,136	1,331	11,590	7,669
2014	2,935	1,739	1,319	2,207	1,440	1,113	1,528	12,281	8,199
2015	3,097	1,775	1,335	2,382	1,478	1,121	1,654	12,841	8,589
2016	3,213	1,852	1,587	2,456	1,529	1,200	1,823	13,659	9,108
2017	3,366	2,088	1,529	2,508	1,529	1,240	1,988	14,249	9,491
2018	3,632	2,019	1,611	2,511	1,554	1,266	2,112	14,705	9,773
2019	3,567	2,176	1,650	2,630	1,676	1,304	2,257	15,260	10,023
2020	3,691	2,222	1,623	2,767	1,734	1,306	2,470	15,812	10,302
2021	3,737	2,184	1,836	2,853	1,730	1,349	2,698	16,386	10,609
2022	3,699	2,442	1,829	2,955	1,828	1,346	2,964	17,063	10,925
2023	3,957	2,418	1,947	2,938	1,877	1,372	3,250	17,759	11,260
2024	3,974	2,581	1,930	3,072	1,962	1,396	3,524	18,438	11,556
2025	4,097	2,601	1,959	3,322	1,975	1,429	3,826	19,210	11,979
2026	4,117	2,616	2,190	3,400	2,092	1,512	4,125	20,051	12,323

This scenario does not represent any particular course of action that Treasury is expected to follow. Instead, it is intended to demonstrate the basic trajectory of average maturity absent changes to the mix of securities issued by Treasury. Portfolio composition by original issuance type and term can be found in the appendix (Page 45).

Projected Maturity Profile from end of Fiscal Year



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Recent and Projected Maturity Profile, percent

End of Fiscal Year	<= 1yr	(1,2]	(2,3]	(3,5]	(5,7]	(7,10]	> 10	(0,3]	(0,5]
2008	41.2	13.6	5.4	12.5	5.9	9.6	11.8	60.2	72.7
2009	38.6	11.1	9.5	13.7	8.0	9.2	9.9	59.1	72.9
2010	30.2	13.4	10.5	15.0	10.7	10.1	10.0	54.2	69.2
2011	27.2	13.9	10.2	16.0	11.1	10.9	10.6	51.3	67.3
2012	27.5	12.8	10.3	16.9	11.3	10.3	11.0	50.5	67.4
2013	25.4	13.1	10.7	17.0	12.5	9.8	11.5	49.2	66.2
2014	23.9	14.2	10.7	18.0	11.7	9.1	12.4	48.8	66.8
2015	24.1	13.8	10.4	18.5	11.5	8.7	12.9	48.3	66.9
2016	23.5	13.6	11.6	18.0	11.2	8.8	13.3	48.7	66.7
2017	23.6	14.7	10.7	17.6	10.7	8.7	14.0	49.0	66.6
2018	24.7	13.7	11.0	17.1	10.6	8.6	14.4	49.4	66.5
2019	23.4	14.3	10.8	17.2	11.0	8.5	14.8	48.4	65.7
2020	23.3	14.1	10.3	17.5	11.0	8.3	15.6	47.7	65.2
2021	22.8	13.3	11.2	17.4	10.6	8.2	16.5	47.3	64.7
2022	21.7	14.3	10.7	17.3	10.7	7.9	17.4	46.7	64.0
2023	22.3	13.6	11.0	16.5	10.6	7.7	18.3	46.9	63.4
2024	21.6	14.0	10.5	16.7	10.6	7.6	19.1	46.0	62.7
2025	21.3	13.5	10.2	17.3	10.3	7.4	19.9	45.1	62.4
2026	20.5	13.0	10.9	17.0	10.4	7.5	20.6	44.5	61.5

This scenario does not represent any particular course of action that Treasury is expected to follow. Instead, it is intended to demonstrate the basic trajectory of average maturity absent changes to the mix of securities issued by Treasury. Portfolio composition by original issuance type and term can be found in the appendix (Page 45).

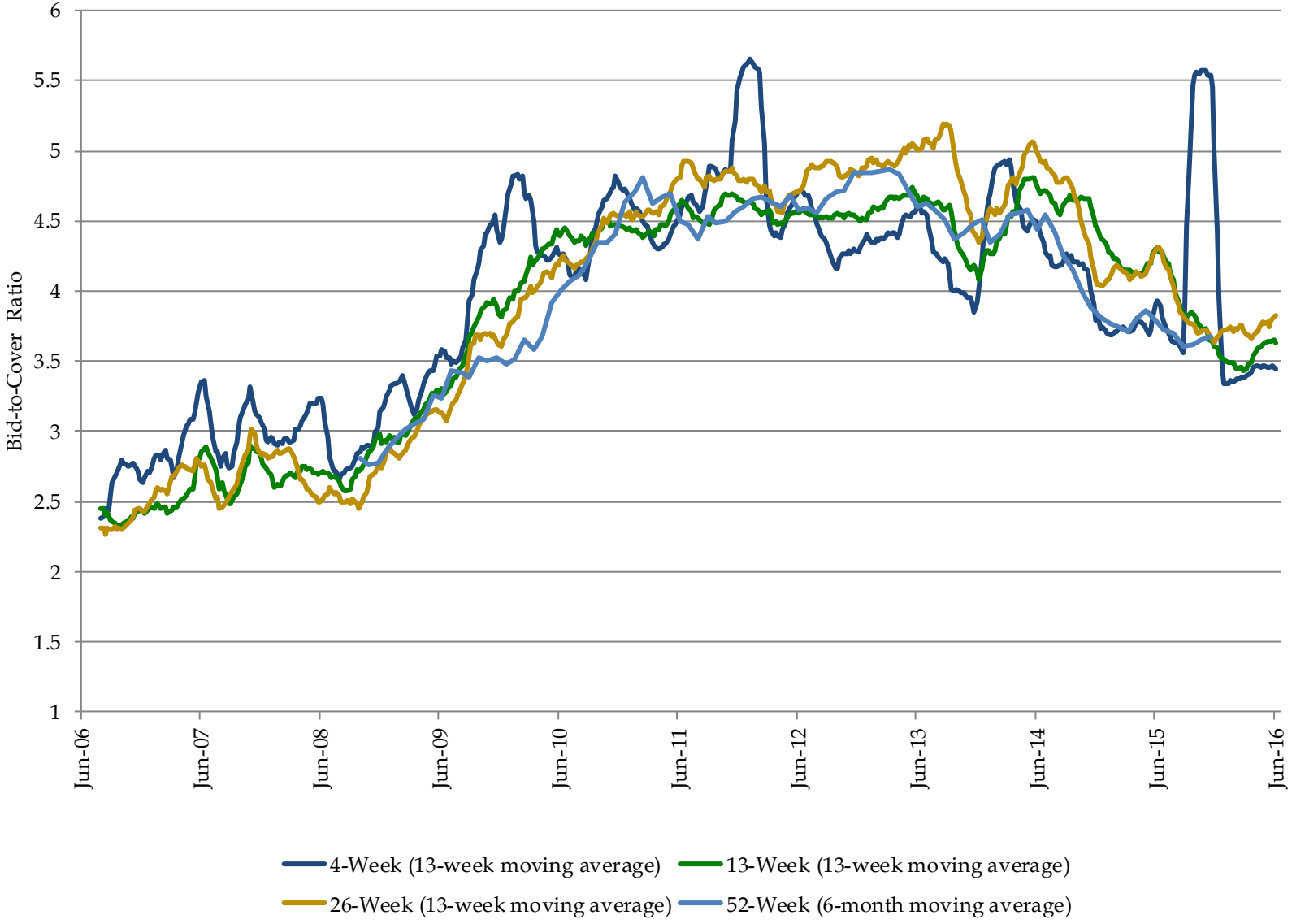
Section V: Demand

Summary Statistics for Fiscal Year 2016 Q3 Auctions

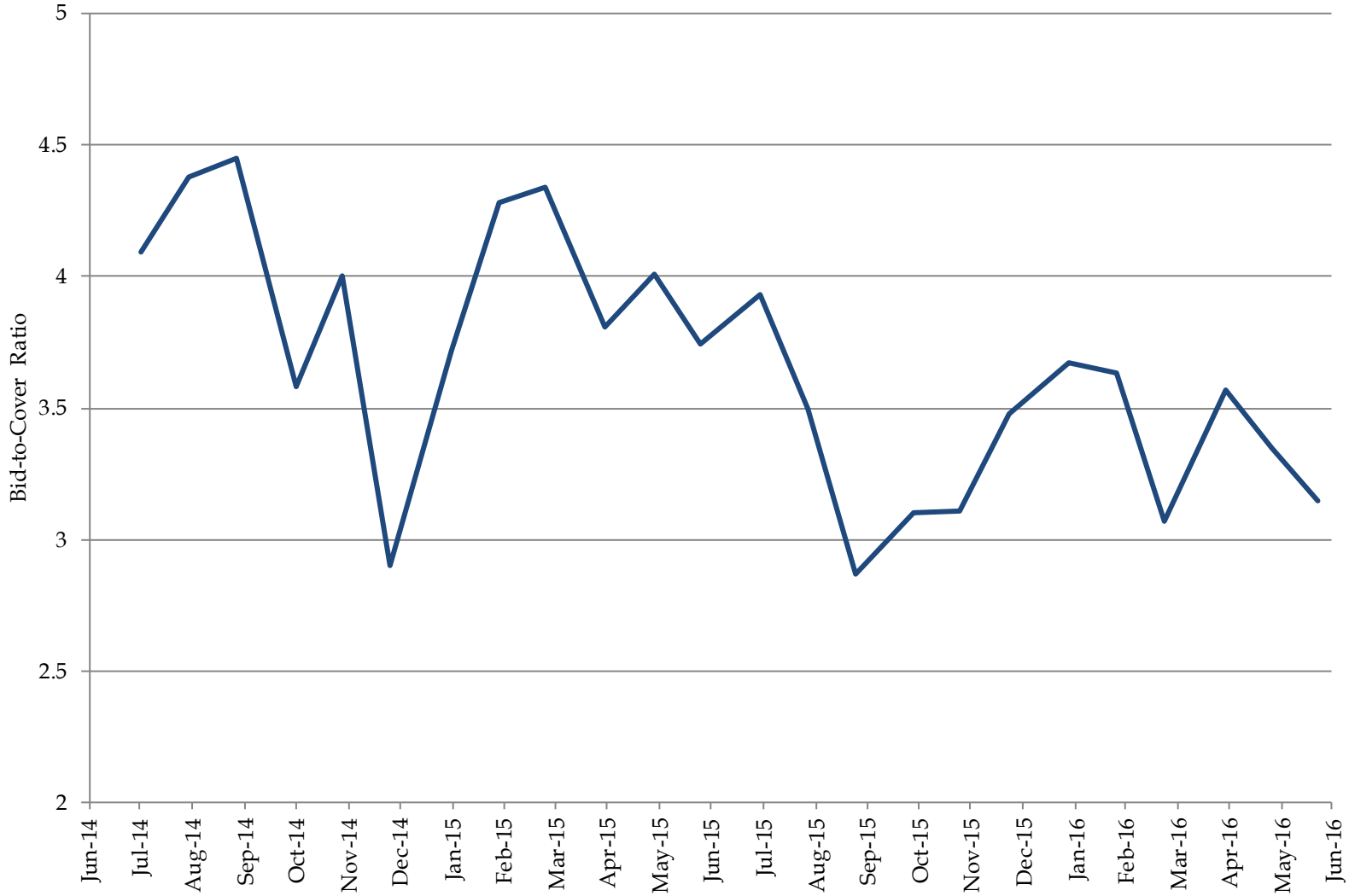
Security Type	Term	Stop Out Rate (%)*	Bid-to-Cover Ratio*	Competitive Awards ($bn)	% Primary Dealer*	% Direct*	% Indirect*	Non-Competitive Awards ($bn)	SOMA Add Ons ($bn)	10-Year Equivalent ($bn)**
Bill	4-Week	0.225	3.4	535.3	65.5	5.0	29.5	3.6	0.0	4.5
Bill	13-Week	0.266	3.6	379.3	62.5	5.8	31.7	4.9	0.0	10.6
Bill	26-Week	0.397	3.8	318.5	49.9	3.9	46.2	4.6	0.0	17.9
Bill	52-Week	0.616	3.7	59.1	52.7	2.3	45.0	0.6	0.0	6.6
Coupon	2-Year	0.836	2.8	77.5	32.9	19.0	48.1	0.5	17.3	20.8
Coupon	3-Year	0.898	2.8	71.7	33.9	10.9	55.2	0.2	5.6	25.4
Coupon	5-Year	1.341	2.4	101.9	30.2	7.4	62.4	0.1	22.7	66.3
Coupon	7-Year	1.594	2.6	83.9	21.3	13.4	65.2	0.1	18.7	74.8
Coupon	10-Year	1.725	2.7	62.9	19.3	11.4	69.2	0.1	5.3	69.0
Coupon	30-Year	2.566	2.3	39.0	27.8	9.2	63.0	0.0	3.5	98.3
TIPS	5-Year	(0.195)	2.4	15.9	32.8	8.2	59.1	0.1	0.0	8.8
TIPS	10-Year	0.275	2.3	11.0	32.5	4.1	63.4	0.0	2.8	14.1
TIPS	30-Year	0.905	2.7	5.0	23.0	0.0	77.0	0.0	0.7	16.1
FRN	2-Year	0.189	3.4	41.0	57.1	0.6	42.3	0.0	4.0	0.0
Total Bills		0.297	3.6	1,292.2	60.2	4.8	35.0	13.6	0.0	39.6
Total Coupons		1.392	2.6	437.0	27.8	11.9	60.3	0.9	73.1	354.6
Total TIPS		0.138	2.4	31.9	31.2	5.5	63.4	0.1	3.5	39.0
Total FRNs		0.189	3.4	41.0	57.1	0.6	42.3	0.0	4.0	0.0

*Weighted averages of Competitive Awards.
**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.

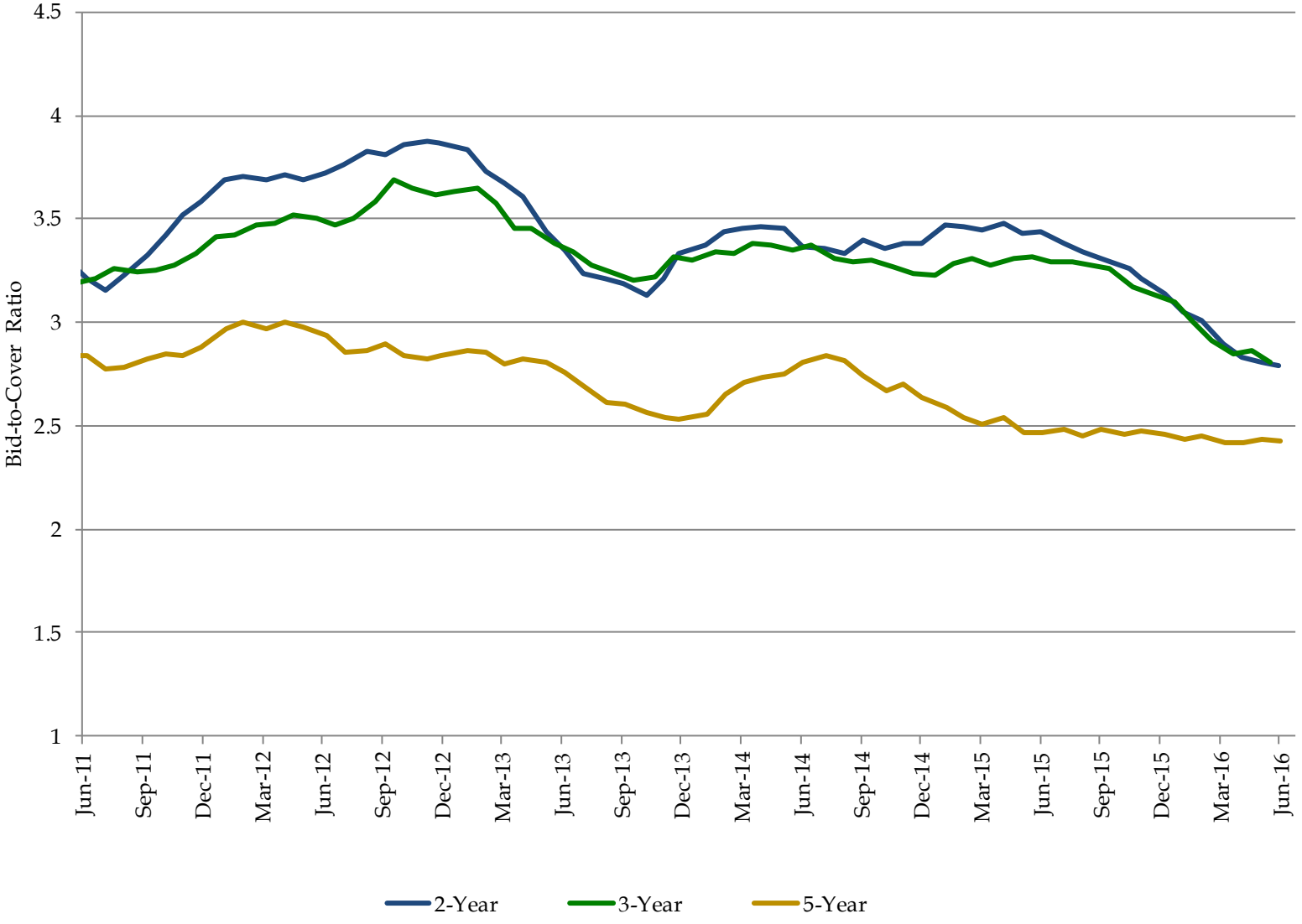
Bid-to-Cover Ratios for Treasury Bills



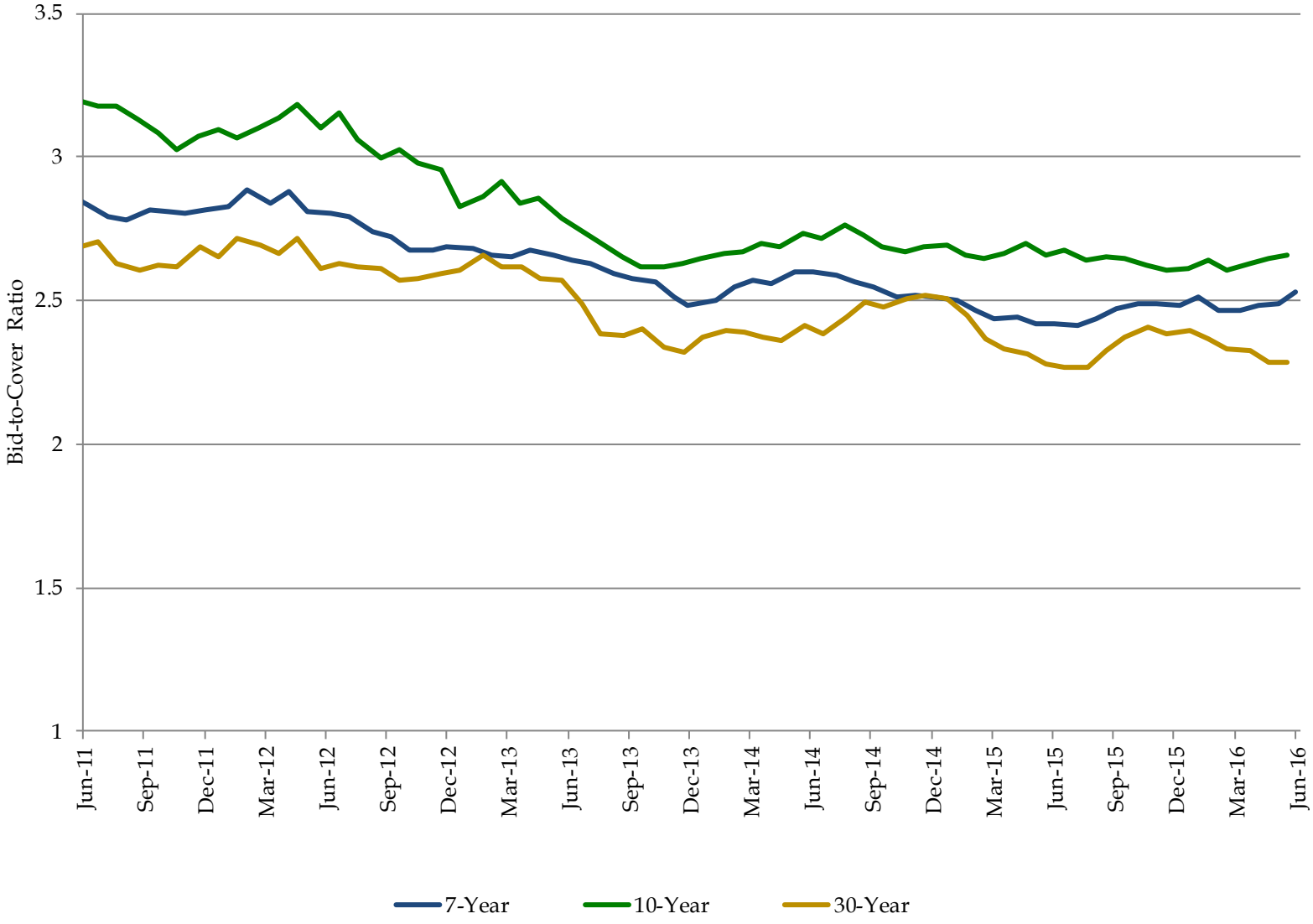
Bid-to-Cover Ratios for FRNs



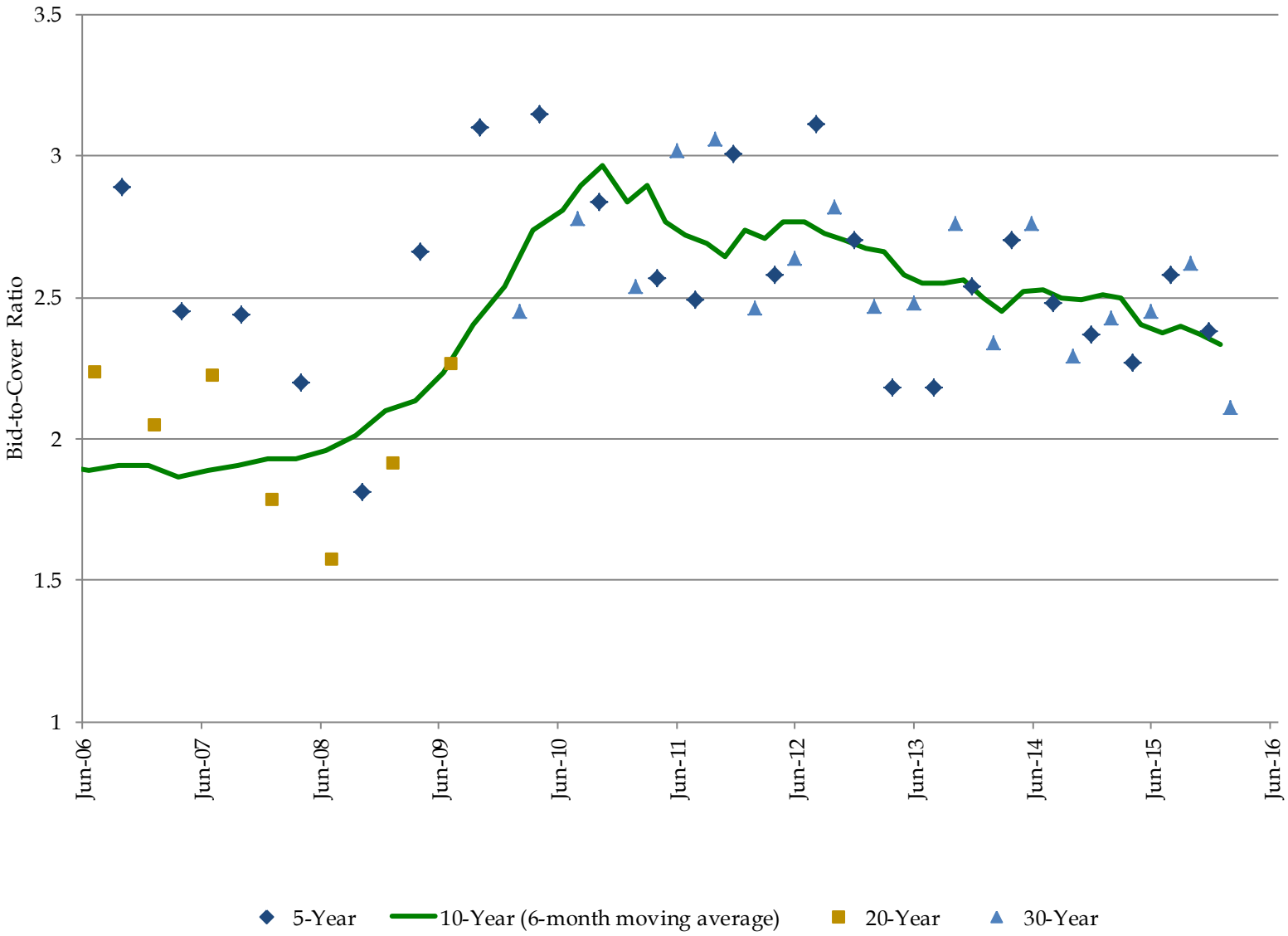
Bid-to-Cover Ratios for 2-, 3-, and 5-Year Nominal Securities (6-Month Moving Average)



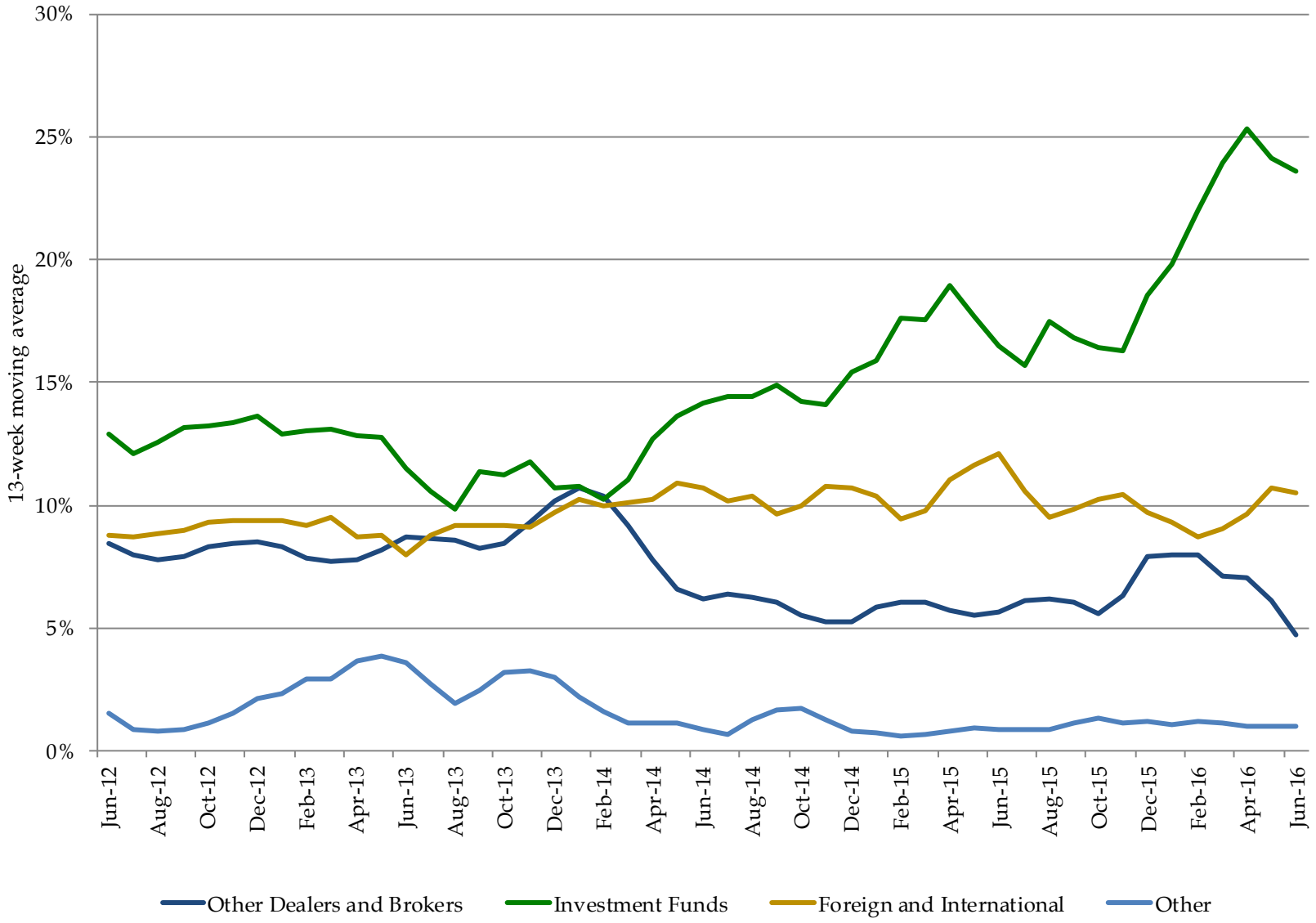
Bid-to-Cover Ratios for 7-, 10-, and 30-Year Nominal Securities (6-Month Moving Average)



Bid-to-Cover Ratios for TIPS

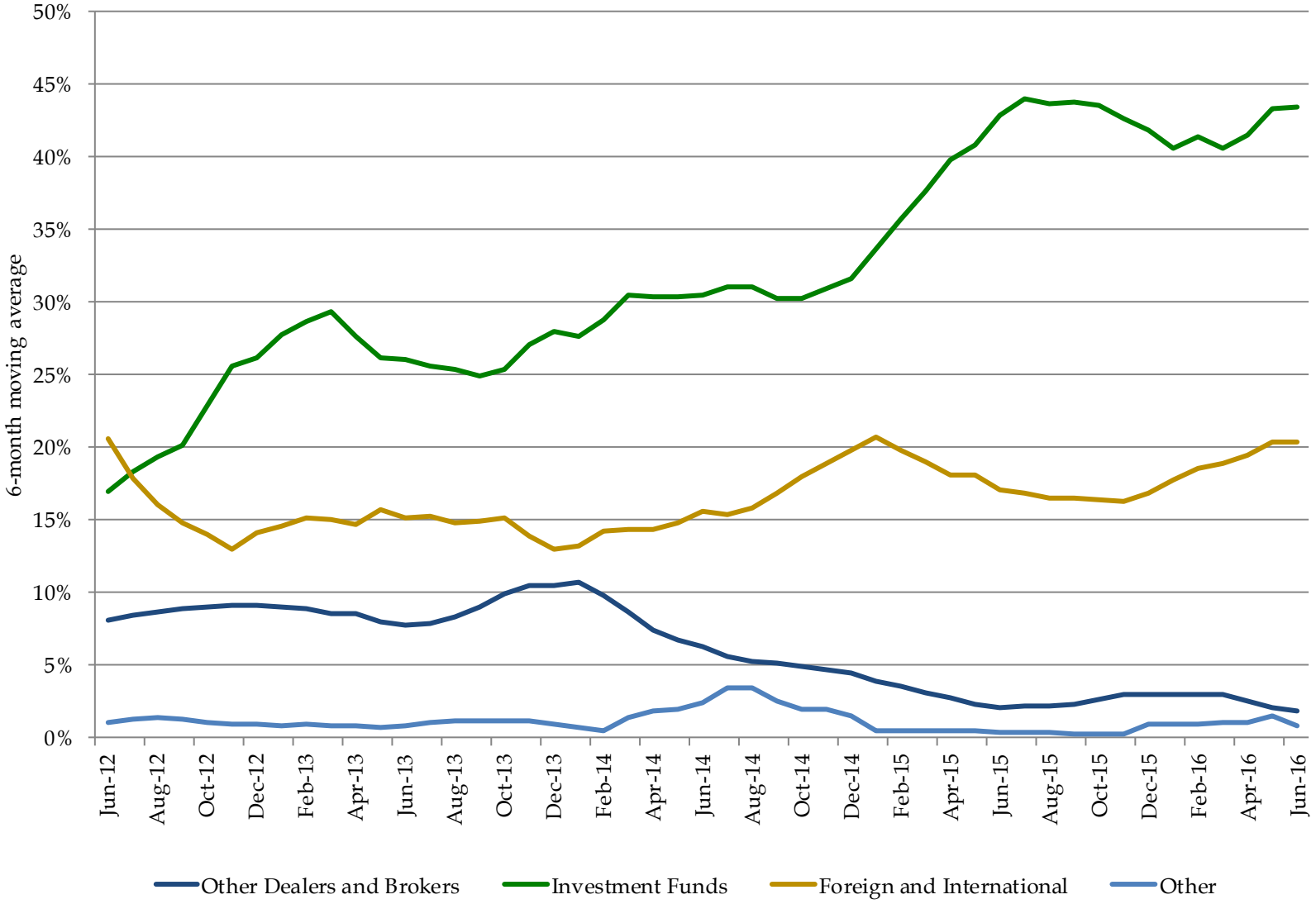


Percent Awarded in Bill Auctions by Investor Class (13-Week Moving Average)



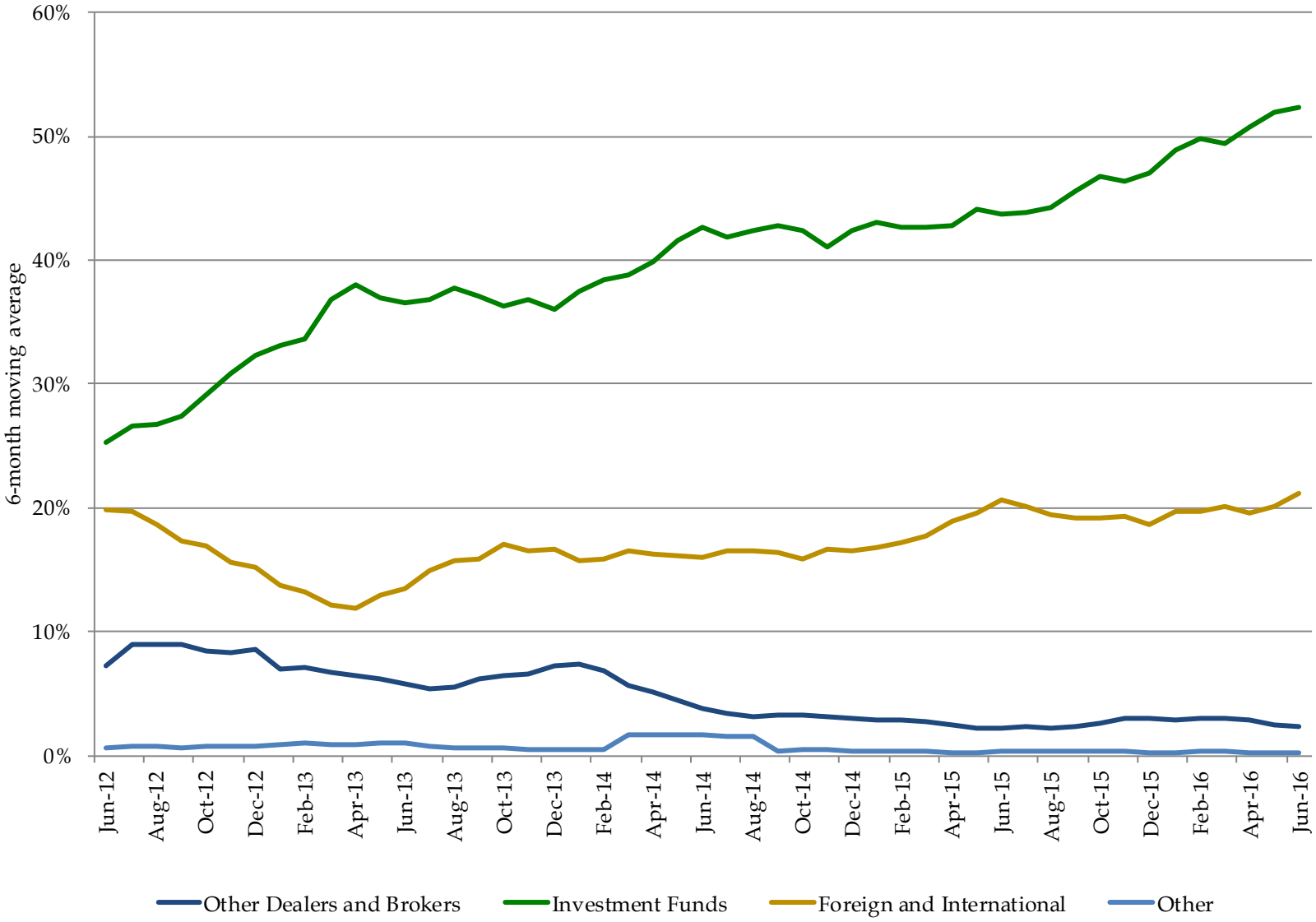
Excludes SOMA add-ons. The "Other" category includes categories that are each less than 2%, which include Depository Institutions, Individuals, Pension and Insurance.

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



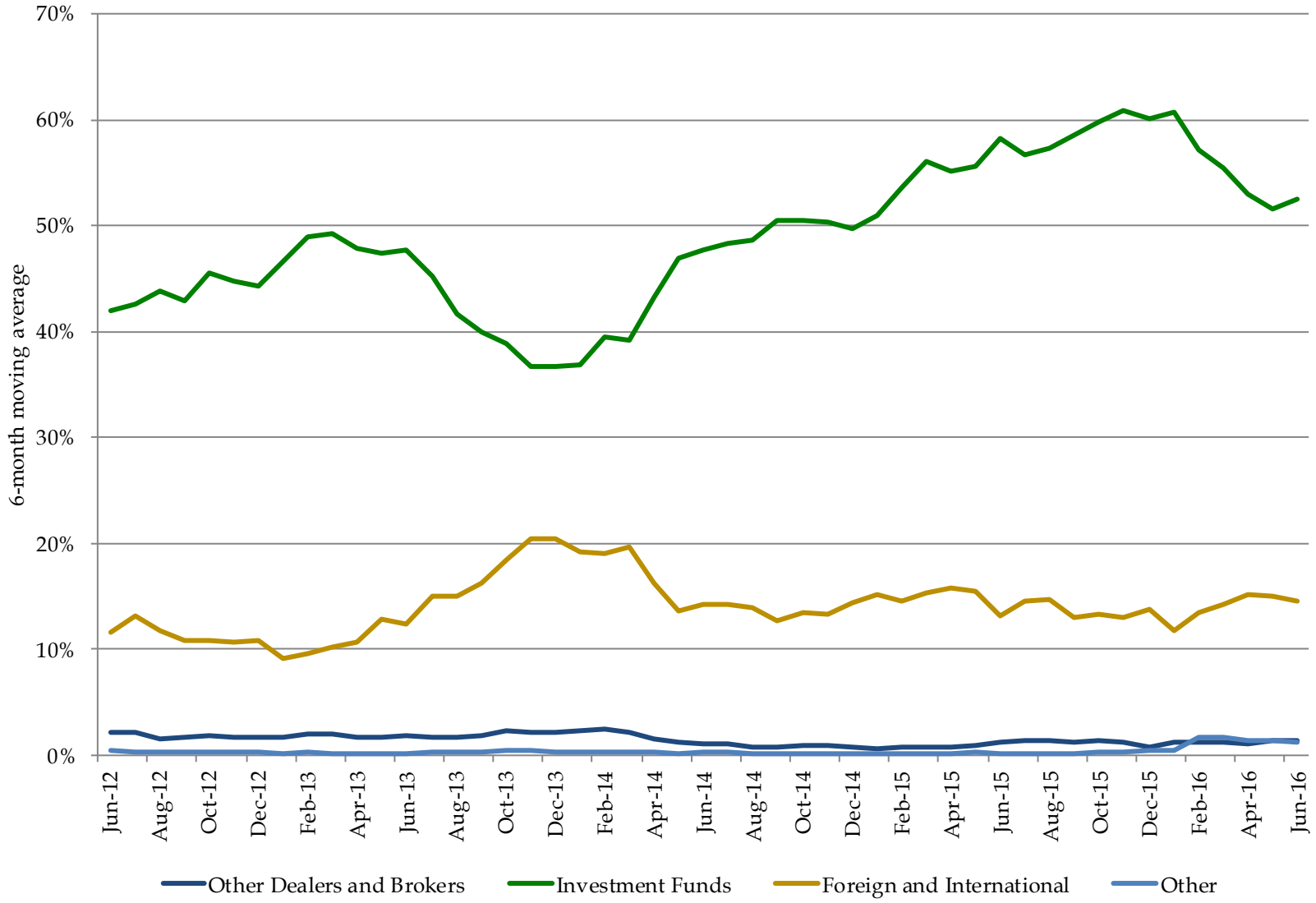
Excludes SOMA add-ons. The "Other" category includes categories that are each less than 2%, which include Depository Institutions, Individuals, Pension and Insurance.

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 2%, which include Depository Institutions, Individuals, Pension and Insurance.

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



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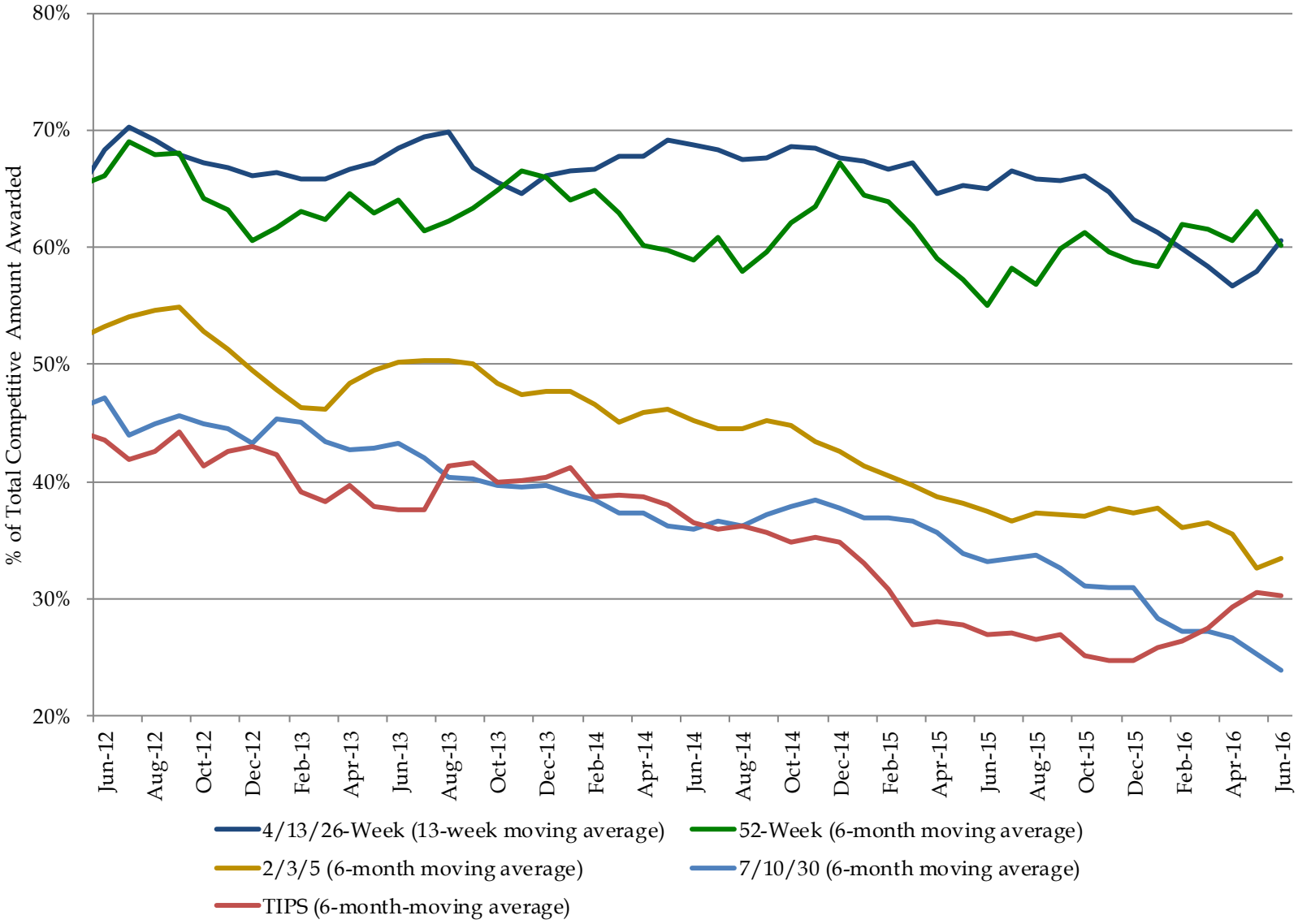
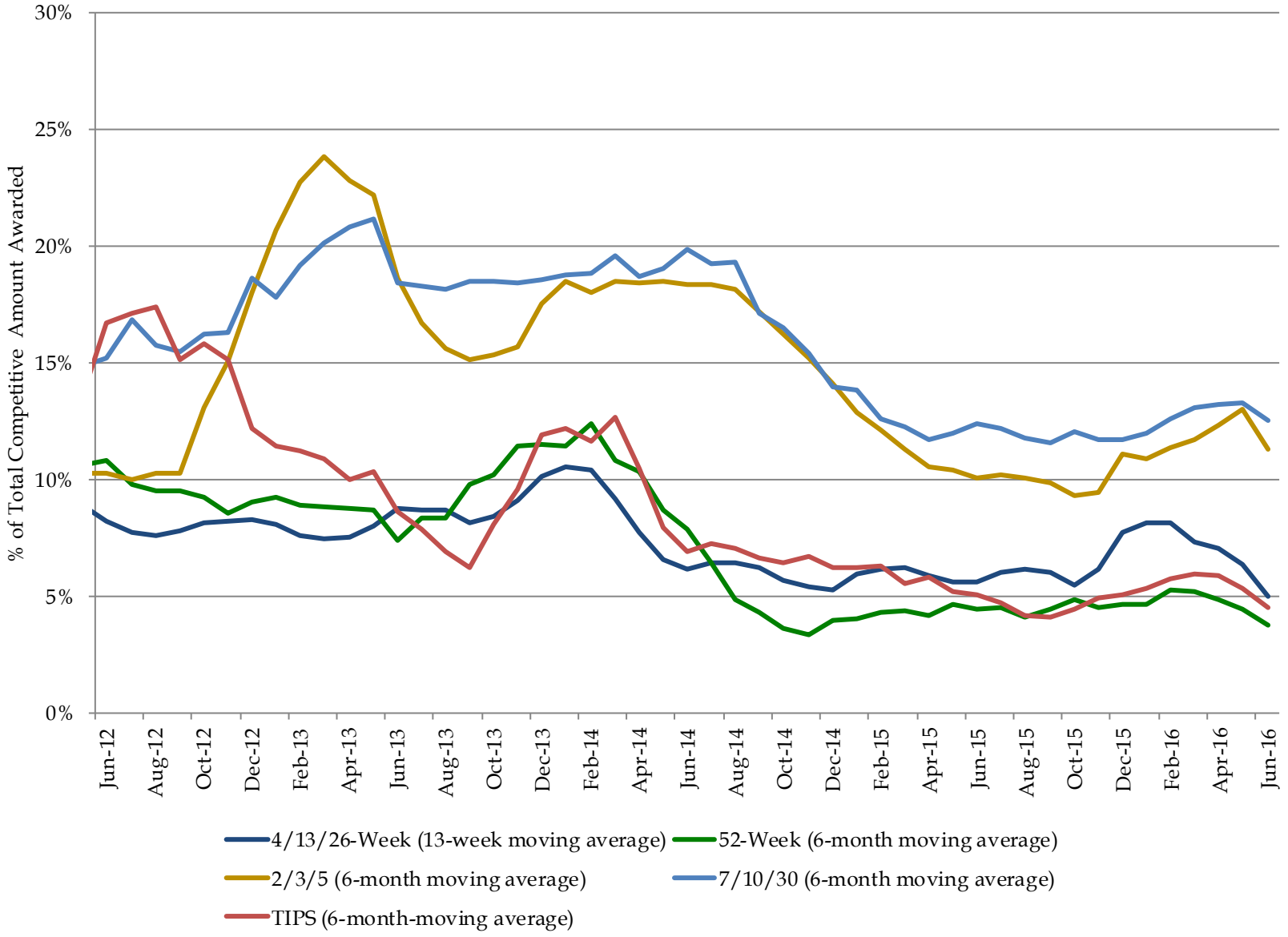
Primary Dealer Awards at Auction



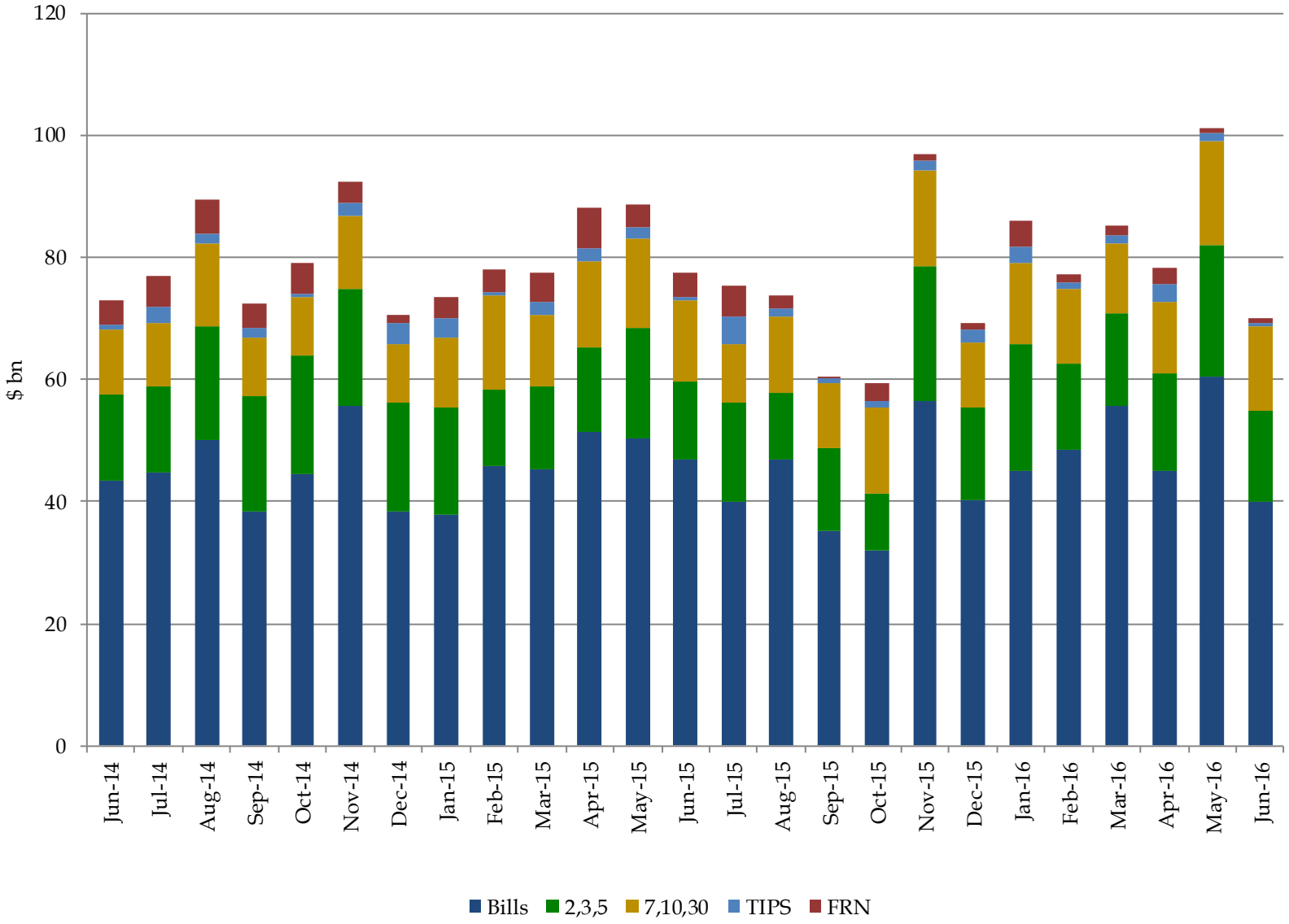
Excludes SOMA add-ons.

Direct Bidder Awards at Auction



Excludes SOMA add-ons.

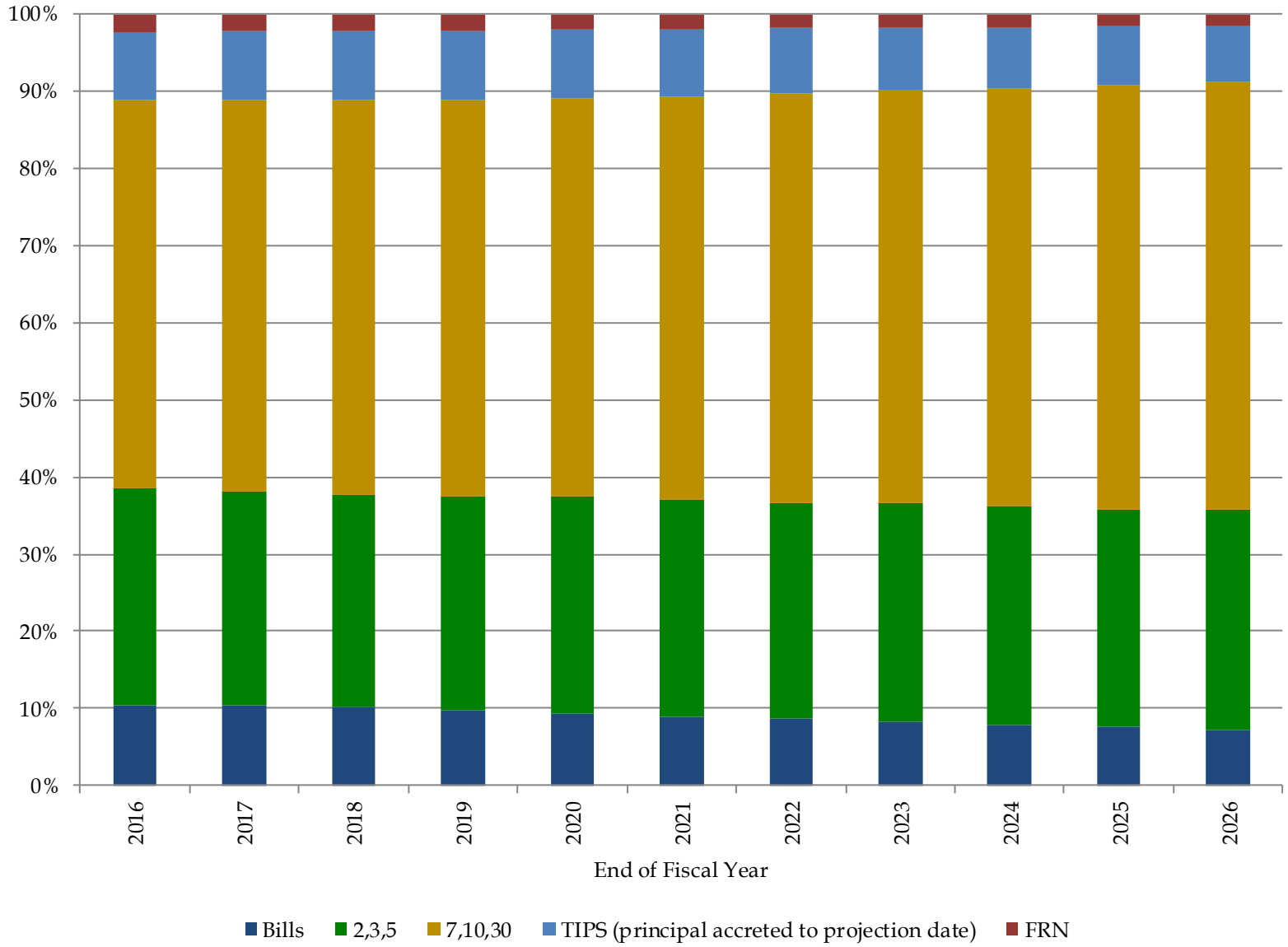
Total Foreign Awards of Treasuries at Auction, $ billions



Foreign includes both private sector and official institutions.

Appendix

Projected Portfolio Composition by Issuance Type



This scenario does not represent any particular course of action that Treasury is expected to follow. Instead, it is intended to demonstrate the basic trajectory of average maturity absent changes to the mix of securities issued by Treasury. See table on following page for details.

Recent and Projected Portfolio Composition by Issuance Type, Percent

End of Fiscal Year	Bills	2-, 3-, 5-Year Nominal Coupons	7-, 10-, 30-Year Nominal Coupons	Total Nominal Coupons	TIPS (principal accreted to projection date)	FRN
2008	28.5	34.5	26.9	61.4	10.0	0.0
2009	28.5	36.2	27.4	63.6	7.9	0.0
2010	21.1	40.1	31.8	71.9	7.0	0.0
2011	15.4	41.4	35.9	77.3	7.3	0.0
2012	15.0	38.4	39.0	77.4	7.5	0.0
2013	13.2	35.8	43.0	78.7	8.1	0.0
2014	11.5	33.0	46.0	79.0	8.5	1.0
2015	10.6	29.4	49.0	78.3	8.8	2.2
2016	10.5	27.9	50.3	78.2	8.8	2.4
2017	10.6	27.3	50.8	78.1	8.9	2.3
2018	10.3	27.1	51.3	78.4	9.1	2.2
2019	9.9	27.4	51.3	78.8	9.2	2.1
2020	9.6	27.7	51.6	79.3	9.1	2.1
2021	9.2	27.7	52.2	79.8	8.9	2.0
2022	8.9	27.8	52.8	80.6	8.6	1.9
2023	8.5	28.0	53.2	81.2	8.4	1.9
2024	8.2	27.9	53.9	81.8	8.2	1.8
2025	7.9	27.9	54.7	82.6	7.8	1.7
2026	7.5	28.1	55.3	83.4	7.4	1.6

This scenario does not represent any particular course of action that Treasury is expected to follow. Instead, it is intended to demonstrate the basic trajectory of average maturity absent changes to the mix of securities issued by Treasury.

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	4/7/2016	0.185	3.58	34.7	58.4	5.3	36.3	0.2	0.0	0.3
4-Week	4/14/2016	0.200	3.60	34.7	70.9	4.8	24.3	0.3	0.0	0.3
4-Week	4/21/2016	0.175	3.55	34.7	66.5	6.5	27.0	0.3	0.0	0.3
4-Week	4/28/2016	0.190	3.83	34.7	56.9	5.8	37.3	0.3	0.0	0.3
4-Week	5/5/2016	0.170	3.63	39.7	62.6	6.8	30.6	0.2	0.0	0.3
4-Week	5/12/2016	0.245	3.33	44.7	63.3	5.4	31.3	0.3	0.0	0.4
4-Week	5/19/2016	0.240	3.36	44.7	66.8	5.5	27.7	0.3	0.0	0.4
4-Week	5/26/2016	0.265	3.45	44.2	67.6	4.1	28.4	0.3	0.0	0.4
4-Week	6/2/2016	0.265	3.06	39.7	70.6	8.9	20.5	0.2	0.0	0.3
4-Week	6/9/2016	0.190	3.52	39.6	64.0	2.1	33.9	0.3	0.0	0.3
4-Week	6/16/2016	0.240	3.33	44.7	69.1	4.0	26.9	0.3	0.0	0.4
4-Week	6/23/2016	0.250	3.39	49.7	51.9	4.8	43.3	0.3	0.0	0.4
4-Week	6/30/2016	0.260	3.09	49.6	81.1	2.1	16.7	0.3	0.0	0.4
13-Week	4/7/2016	0.235	3.97	27.5	60.0	6.9	33.1	0.4	0.0	0.8
13-Week	4/14/2016	0.230	3.91	27.5	51.3	8.3	40.4	0.4	0.0	0.8
13-Week	4/21/2016	0.220	4.02	27.6	58.8	9.6	31.7	0.4	0.0	0.8
13-Week	4/28/2016	0.250	3.66	26.8	65.7	1.4	32.9	0.3	0.0	0.8
13-Week	5/5/2016	0.220	3.80	27.4	67.6	4.2	28.2	0.4	0.0	0.8
13-Week	5/12/2016	0.240	3.34	30.5	78.1	4.6	17.2	0.4	0.0	0.9
13-Week	5/19/2016	0.275	3.70	30.5	58.1	4.5	37.3	0.4	0.0	0.8
13-Week	5/26/2016	0.350	3.40	29.8	52.5	9.9	37.7	0.4	0.0	0.8
13-Week	6/2/2016	0.340	3.35	30.3	58.3	7.1	34.6	0.4	0.0	0.8
13-Week	6/9/2016	0.285	3.54	30.6	54.3	2.7	43.0	0.3	0.0	0.8
13-Week	6/16/2016	0.270	3.43	30.5	66.5	5.5	28.0	0.4	0.0	0.8
13-Week	6/23/2016	0.270	3.61	30.5	65.4	8.5	26.0	0.4	0.0	0.8
13-Week	6/30/2016	0.260	3.42	29.7	75.6	2.4	22.0	0.3	0.0	0.8
26-Week	4/7/2016	0.385	4.10	23.3	60.6	7.4	31.9	0.4	0.0	1.3
26-Week	4/14/2016	0.350	3.83	23.3	56.6	8.6	34.9	0.3	0.0	1.3
26-Week	4/21/2016	0.350	3.85	23.5	51.3	6.0	42.7	0.3	0.0	1.3
26-Week	4/28/2016	0.400	3.76	22.7	53.5	1.7	44.8	0.3	0.0	1.3
26-Week	5/5/2016	0.395	3.89	23.2	51.0	3.2	45.7	0.4	0.0	1.3
26-Week	5/12/2016	0.380	4.26	25.4	30.9	2.0	67.1	0.4	0.0	1.4
26-Week	5/19/2016	0.370	4.00	25.4	54.6	2.0	43.4	0.4	0.0	1.4
26-Week	5/26/2016	0.480	3.65	24.9	38.3	8.6	53.1	0.3	0.0	1.4
26-Week	6/2/2016	0.475	3.62	25.6	50.9	3.8	45.3	0.3	0.0	1.4
26-Week	6/9/2016	0.430	3.39	25.6	63.5	2.3	34.2	0.3	0.0	1.4
26-Week	6/16/2016	0.400	4.15	25.5	32.3	1.6	66.1	0.4	0.0	1.4
26-Week	6/23/2016	0.400	3.53	25.5	60.6	3.1	36.2	0.4	0.0	1.4
26-Week	6/30/2016	0.340	3.72	24.7	45.9	0.6	53.5	0.3	0.0	1.4
52-Week	4/28/2016	0.605	3.57	19.8	53.1	2.5	44.4	0.2	0.0	2.2
52-Week	5/26/2016	0.685	3.77	19.5	62.9	2.1	35.0	0.2	0.0	2.2
52-Week	6/23/2016	0.560	3.71	19.8	42.2	2.3	55.5	0.2	0.0	2.2

*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	5/2/2016	0.842	2.64	25.9	38.4	14.5	47.1	0.1	6.9	7.2
2-Year	5/31/2016	0.920	3.00	25.8	17.7	32.5	49.8	0.2	6.6	7.1
2-Year	6/30/2016	0.745	2.72	25.9	42.7	9.9	47.4	0.1	3.8	6.5
3-Year	4/15/2016	0.890	2.72	23.8	32.6	11.5	56.0	0.1	0.2	7.9
3-Year	5/16/2016	0.875	2.93	23.9	28.3	10.2	61.5	0.1	5.4	9.7
3-Year	6/15/2016	0.930	2.79	24.0	40.8	11.1	48.1	0.0	0.0	7.8
5-Year	5/2/2016	1.410	2.41	33.9	29.8	6.8	63.4	0.1	9.0	23.1
5-Year	5/31/2016	1.395	2.60	33.9	21.8	11.6	66.6	0.1	8.7	22.5
5-Year	6/30/2016	1.218	2.29	34.0	39.1	3.7	57.2	0.0	5.0	20.8
7-Year	5/2/2016	1.634	2.65	28.0	20.2	14.2	65.5	0.0	7.4	26.0
7-Year	5/31/2016	1.652	2.57	28.0	18.5	16.9	64.6	0.0	7.1	25.3
7-Year	6/30/2016	1.497	2.56	28.0	25.3	9.1	65.6	0.0	4.1	23.5
10-Year	4/15/2016	1.765	2.75	20.0	24.8	15.3	60.0	0.0	0.1	20.1
10-Year	5/16/2016	1.710	2.68	23.0	14.7	11.8	73.5	0.0	5.2	28.9
10-Year	6/15/2016	1.702	2.70	20.0	19.2	7.2	73.6	0.0	0.0	20.0
30-Year	4/15/2016	2.596	2.40	12.0	24.1	10.8	65.1	0.0	0.1	27.8
30-Year	5/16/2016	2.615	2.19	15.0	31.5	8.8	59.7	0.0	3.4	42.9
30-Year	6/15/2016	2.475	2.42	12.0	27.0	8.1	64.9	0.0	0.0	27.6
2-Year FRN	5/2/2016	0.190	3.57	15.0	46.8	0.0	53.2	0.0	4.0	0.0
2-Year FRN	5/27/2016	0.188	3.35	13.0	66.1	1.9	31.9	0.0	0.0	0.0
2-Year FRN	6/24/2016	0.188	3.15	13.0	59.9	0.0	40.1	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	4/29/2016	(0.195)	2.42	15.9	32.8	8.2	59.1	0.1	0.0	8.8
10-Year TIPS	5/31/2016	0.275	2.27	11.0	32.5	4.1	63.4	0.0	2.8	14.1
30-Year TIPS	6/30/2016	0.905	2.69	5.0	23.0	0.0	77.0	0.0	0.7	16.1

*Weighted averages of Competitive Awards.
**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.

TBAC CHARGE QUESTION: CYBERSECURITY

August 2016

Charge Question

August 2nd 2016

Recent cyber security related incidents have demonstrated that breaches in critical financial services IT infrastructure could have the potential to disrupt domestic and global business practices. What can Treasury and market participants learn from these incidents? What measures are market participants taking to counter these types of threats and what are cyber security best practices for operating critical IT infrastructure in the financial services industry? Please comment specifically on best practices as they relate to electronic trading, exchange platforms, clearing and settlement systems, and payment systems. What, if any, actions should Treasury contemplate to mitigate cyber threats specifically?

Cybersecurity Facts

- Cybersecurity is a critical risk today. It is estimated that there are over 80mm events per year with 70% of attacks thought to be undetected. Cybercrime is estimated to have cost the global economy over $400bn in 2014. (CSIS/McAfee Estimating the Global Cost of Cybercrime, June. 2014)
- 62% of firms with more than $1bn in annual revenues reported attempted or actual fraud in 2015 (AFP survey of Payment Fraud)
- Only 30% of companies are discovering breaches internally while 70% learned of the breach from an outside entity such as law enforcement. The median number of days that attackers were present on a victim's network before being discovered was 146 days in 2015 (Mandiant)
- Spending on cybersecurity, which is expected to reach $90 bn in 2016, has been growing at a 10% annual rate (ISI) . Meanwhile the number of attacks is growing exponentially with the number of records compromised in reported breaches more than tripling from 2013 to 2015 (Bernstein).
- The threat is dynamic and is rapidly changing. Four years ago, the majority of incidents appear related to social engineering; today they are primarily related to malware, email spoofing and business email compromise. Industry experts say there's been a 91% year over year increase in the number of targeted phishing attacks recorded globally.

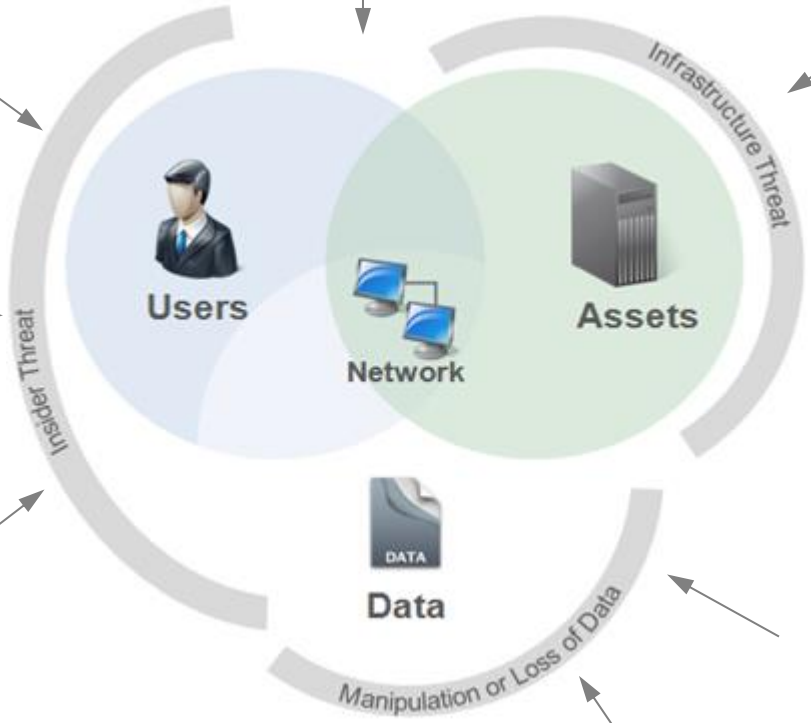
Source: The New Yorker

Cyber Threats We Face Today

Denial of Service
Denial-of-Service (DoS) attack is an attempt to make a machine or network resource unavailable to its intended users

Social Engineering
Non-technical (e.g phone or email) art of manipulating people into performing compromising actions for the purpose of divulging confidential information or circumventing normal security procedures

Reconnaissance
Activity meant to gather information about a network for purposes of understanding a network's layout and composition



Malicious Insiders
Malicious activity from insiders including current and former employees, and consultants/contractors

Malware
Malware is malicious software which is designed to access a computer system without the user's informed consent with the intent of compromising the confidentiality, integrity, or availability of the victim's data, applications, or operation system

Unauthorized Access
An attempt by an external or internal actor, to gain unauthorized access to restricted systems, by way of exploitation of vulnerabilities or failed internal technology controls

Data Exfiltration
Intentional or unintentional use of IT to disclose or steal intellectual property including industrial espionage involving outsiders

Information Tampering
Intended or unintended interference of data which causes damage or unauthorized alteration

Largest data breaches at Financial firms and Government Organizations

Data Sensitivity, Y Axis: **1:** Only email address / Online information, **2:** SSN/Personal details, **3:** Credit card information, **4:** Email password / Health records, **5:** Full bank account details

Source: informationisbeautiful.net database

Recent publicized breaches

Bangladesh Bank/SWIFT

- On February 4th 2016 hackers sent about three dozen requests to the Federal Reserve Bank of New York using the SWIFT credentials of Bangladesh Central Bank employees to transfer $951m to accounts in Sri Lanka and the Philippines
- The Federal Reserve Bank of New York blocked 30 transfers for $850m but 5 transfers were processed. $20m was recovered in Sri Lanka but $81m was lost in the Philippines where the funds were laundered through casinos

Actors /Attack vectors

- FBI suspects Bangladesh Central Bank (BCB) employees. Others suspect North Korea
- Malware, Social Engineering

Causes

BCB did not have proper firewalls. Hackers obtained valid credentials used by bank employees to initiate transactions as if they were legitimate bank employees

US Office of Personnel Management

- One of the largest known thefts of US government data started around March 2014 and was disclosed in June 2015
- Stolen data includes personal data records of 21.5 million individuals including social security numbers, addresses, financial and health histories , and fingerprints.

Actors /Attack vectors

- US intelligence believes the intrusion originated in China
- Malware

Causes

Poor security software. Data was not protected by practices like data masking, redaction, and encryption. Hackers obtained credentials from a contractor used by OPM to conduct background checks

Anthem

- In February 2014, Anthem, Inc. disclosed that personal data of 79 million current, and former members and employees was stolen. Customers names, social security numbers, birth dates, addresses and income data was stolen
- The breach may have been ongoing for about nine months before it was discovered.

Actors /Attack vectors

- The FBI is still investigating the attack. News reports link the attack to hackers from China
- Malware, Social Engineering

Causes

Network credentials of at least five IT employees were stolen. Employees had more access to the network than was required by their roles. Stolen data was not stored in encrypted format on the internal servers

JP Morgan Chase

- The 2014 cyber attack against JP Morgan Chase compromised data of over 76 million households. Account login information was not compromised but names, email and postal addresses were obtained
- The breach was discovered while investigating a breach on the Chase Corporate Challenge website that was not connected to the Bank's network

Actors /Attack vectors

- US federal indictments issued against five hackers. Four were arrested in July 2015
- Malware

Causes

Malware on an employee's personal computer gave hackers access to their login credentials. Failure to upgrade a network server with a dual password authentication scheme allowed hackers to access the network

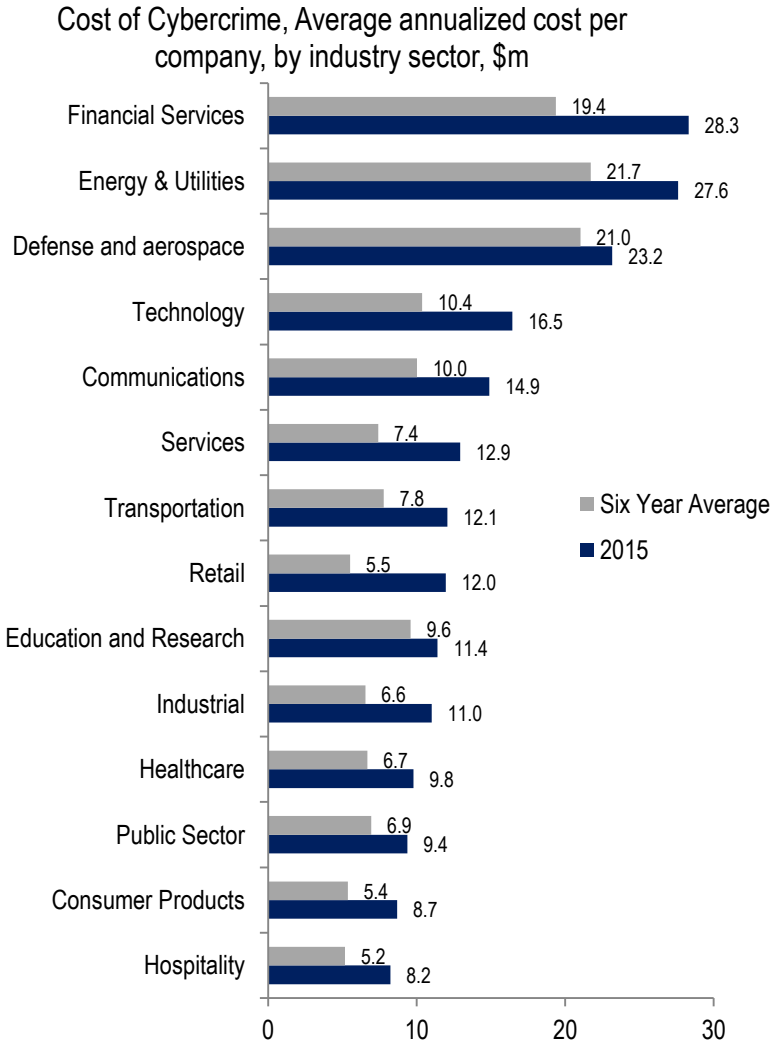
Costs

Financial Services

- Highest average cost of cybercrime across industries
- Attacked 300 times more frequently than businesses in other industries

Industry trends in spending

- According to the “Banking & Financial Services Cybersecurity: US Market 2015-2020 Report”, the 2015 U.S. financial services cybersecurity market reached $9.5 billion, making it the largest non-government cybersecurity market
- Increase of $2 billion expected over the next 2 years according to a recent PWC survey. Large banking institutions spending $300-500+ million in 2016 on cybersecurity



Based on a study of 58 organizations asked to report cyber crime spend over a four week period, which is then annualized. “2015 Cost of Cyber Crime Study: United States”, Ponemon Institute.

Lessons Learned

Multi-Faceted Risk	▪ Legal ▪ Financial ▪ Reputational ▪ Regulatory ▪ Market
Cross-Functional Impact	▪ Not solely an IT issue ▪ Serious risk across the organization ▪ Broader business challenge
Moving Target	▪ Threats continuously evolve ▪ Focus on detection and response ▪ Collaboration is critical
Risk Perimeter	▪ Insider and outsider risks ▪ 3rd party risk ▪ Identity (ensure people are who they say they are)

Best Practices

Identify
Protect
Detect
Respond
Recover

10 steps for better protection

1	Independent Assessment	Do a complete independent assessment of your firm's infrastructure and data identifying all the vulnerabilities around cybersecurity. Engage an experienced engineering firm that understands the technical risks and complexities of enterprise architecture.
2	Identity and access management	Track/control/prevent secure access to critical assets according to the formal determination of which persons, computers, and applications have a need and right to access these critical assets based on an approved classification
3	Security operations	Continuously collect, manage, and analyze threat intelligence and security events to prevent, detect, understand, mitigate, and recover from an attack
4	Secure data and infrastructure	Make security an inherent attribute of the enterprise by specifying, designing, and building-in features that allow high confidence systems operations while denying or minimizing opportunities for attackers.
5	Mandatory training	Establish a baseline training program for all employees that is mandatory and focuses on the specific actions employees need to take to protect the firm. Once you have trained your employees, actively test them. For example, send your employees targeted phishing emails; require those who click in the phishing emails to take additional training.
6	Attack yourself	Run simulations and drills to assess your capabilities. Create a Red Team and have them attack your systems using the same techniques bad guys do. Also consider establishing a program to harvest credentials and account numbers that might be in the underground related to your bank to detect compromises you may not otherwise be aware of. Learn lessons and repeat. Include colleagues from the business, in addition to technologists, in the table top exercises
7	Third parties	Understand your third party environment and upgrade your contract provisions to ensure they are following the same standards you are striving for in your own environments.
8	Government engagement	Ensure you have a clear engagement model with the government, including law enforcement. Who are you going to call? Which agency and under what circumstances? Have the relationship established up front and the engagement documented in a runbook.
9	Join FS-ISAC	Join an industry based sharing forum. If you are not already part of the FS-ISAC, join.
10	Cyber resiliency	Develop capabilities, controls and procedures to ensure continuity and recovery of operations in the event of an infrastructure disruption, which may range from mild routine failure of computing devices to severe cyber catastrophes

Resources

Financial Services Information Sharing and Analysis Center (FS-ISAC)

- https://www.fsisac.com/
- Nearly 7,000 members - up approximately 75% since December 2013
- Treasury is a major government sponsor
- Real time communication on threats
- Best practice publications: https://www.fsisac.com/news/industry_best_practices

National Institute of Standards and Technology (NIST)

- http://www.nist.gov/
- Collaboration of industry and government
- Standards, guidelines, practices to manage cyber risks
- 2014 Cybersecurity Framework for reducing cyber risks to critical infrastructure (Executive Order 13636)
- Regulators (SEC, FINRA, SIFMA, etc.) leveraging in their reviews

United States Computer Emergency Readiness Team (US-CERT)

- https://www.us-cert.gov/
- Broader public information sharing

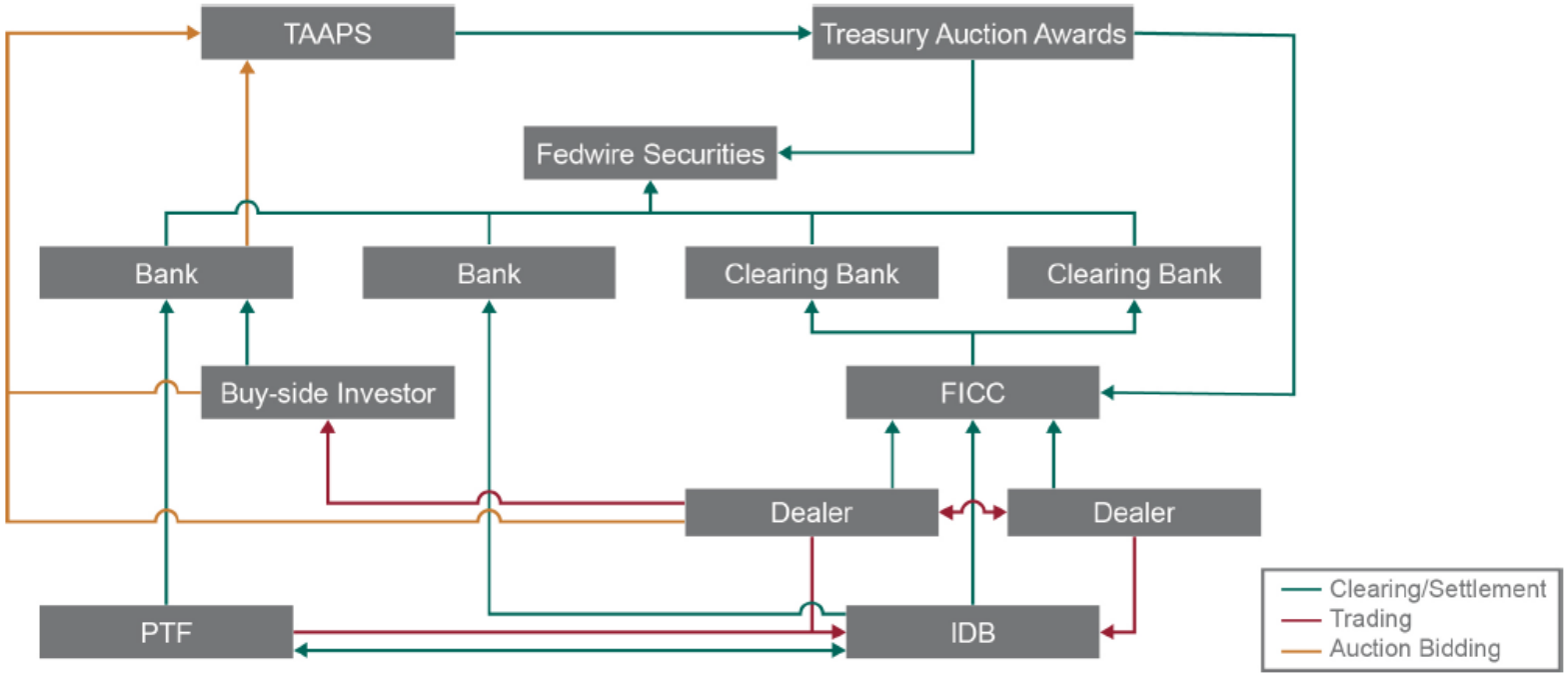
Cybersecurity risks and Treasury auctions

Unforeseen and tragic incidents have disrupted regular market operations in the past, leading to market access risk for Treasury

Incident	Disruption dates	# of days	Description	Auctions affected and sizes
September 11 attack	Sep 11, 2001 (market fully closed) Sep 12, 2001 (market fully closed) Sep 13, 2001 (open w/ limited trading)	2-3	Bond markets were closed on Sep 11 and Sep 12, and reopened with extremely limited trading on Sep 13 (equities were closed until Sep 17).	$10bn 4-week bill auction Sep 11, 2001 was rescheduled for Sep 12, 2001 and then finally cancelled
Super storm Sandy	Oct 29, 2012 (market closed early) Oct 30, 2012 (market fully closed)	1.5	Bond markets were closed for a day and a half – it closed early on Oct 29, 2012 and was fully closed on Tuesday Oct 30. (Note: Fed was open, so settlements could occur)	$25bn 4-week bill auction brought forward from Oct 30, 2012 to Oct 29, 2012
TAAPS (Treasury auction system) IT Issue	Dec 2, 2013 (auction postponed)	1	The noncompetitive and competitive portion of the 13- and 26-week bill auctions, originally scheduled to close on Dec 2, had to be rescheduled to the next day due to an error that occurred during a test of Treasury's auction system. Settlement date remained unchanged.	$32bn 13-week bills and $27bn 26-week bills postponed from Dec 2, 2013 to Dec 3, 2013
Technical issue	Feb 25, 2016 (auction postponed)	1	The noncompetitive and competitive portion of the 7-year note auction originally scheduled to close on February 25, had to be rescheduled to the next day due to a technical issue	$28bn 7-year notes postponed from Feb 25, 2016 to Feb 26, 2016

Treasury's TAAPS system was introduced in 1993 and has improved the efficiency of the Treasury auction process. Nevertheless, TAAPS remains exposed to potential cybersecurity risks

Current operational relationships in the Treasury market



Source: Emerging Issues in the functioning of the US Treasury Market, April 2016, Promontory Financial Group LLC.

- The **Treasury Auction Automated Processing System** (TAAPS) is a web-based system with an infrastructure that contains two channels for bid submission, a dealer private network and the capability to submit and receive bids over the public Internet.

Treasury's current resiliency plan involves multiple locations and annual testing with a manual phone-based contingency when TAAPs is unavailable

- For contingency purposes, Treasury and its fiscal agent, The Federal Reserve Bank of New York have developed and fully staffed four geographically dispersed auction operations sites; Treasury also requires primary dealers conduct a live auction from an alternative Disaster Recovery site at least once a quarter.
- At least once a year, primary dealers participate in a test of Treasury's capability to execute a same-day manual auction (announce, auction, and issue), with mock bids submitted over the phone to the Federal Reserve Bank of New York, and mock award notices prepared manually and forwarded by email or fax.
- If needed, the contingency also allows Treasury to use the Government Emergency Telecommunications System (GETS). GETS provides emergency access and priority processing in the Public Switched Telephone Network (PSTN), and is intended for use in an emergency or crisis situation where the PSTN is congested.
- One potential issue with conducting a phone-based manual auction is the speed with which the Treasury can manually process multiple bids from multiple primary dealers via the phone; the process likely requires dealers to submit bids well in advance of the auction deadline
    - Longer processing times (and restricting phone participation to primary dealers) likely mean less competitive pricing for Treasury. To be sure, this is a less important consideration in an emergency situation where TAAPs is unavailable for a prolonged period and Treasury cash balances are depleted
- **In addition to testing the phone-based contingency through mock auctions, Treasury should periodically conduct small-scale live auctions of its phone-based contingency.** This would be similar to what is done with buybacks where Treasury conducts small size repurchase operations as a test of its buyback program.
- **Treasury should also consider alternative independent secured communication systems for dealers to submit encrypted files as a contingency bidding process when TAAPs is unavailable**
    - This should be more efficient than a manual phone based system and allow for shorter processing times but will require additional investment on the part of Treasury

Lengthening the time period between auction and settlement

- Lengthening the time period between auction and settlement has the advantage of giving the Treasury more flexibility to delay auctions in the event of a cyber incident. However, extending the settlement period creates a longer un-margined credit exposure between the purchase/sale of the WI and settlement date.
- Treasury might consider splitting mid-month and end-of-month auctions across multiple weeks to gain additional flexibility (e.g. conducting the 2-year auction the week before the 5-year and 7-year auction). When keeping auction date and settlement date in the same calendar week, this can force Treasury to auction securities on a Monday. Market depth and trading volumes are lower on Mondays, and have resulted in lower auction coverage ratios, end-user share, and less negative auction tails

Auction statistics for 2- and 3-year Treasury note auctions, data over the last 2 years; units as indicated

	Bid to cover		End-user demand (%)		Tail (bp)	
Maturity	Monday auction	All other days	Monday auction	All other days	Monday auction	All other days
2y	2.96	3.28	56.2	61.5	0.06	-0.21
3y	3.01	3.12	57.5	60.4	0.14	-0.08

Source: Treasury, J.P. Morgan

Average Treasury trading volumes by day of the week for select on-the-run Treasuries, 2-year average; $bn

	2y	5y	10y	30y
Monday	16	38	32	8
Tuesday	20	47	39	10
Wednesday	22	53	43	11
Thursday	22	52	44	12
Friday	21	49	40	10

Source: Brokertec