TBAC CHARGE

"In the May 2023 quarterly refunding announcement, Treasury indicated it may need to modestly increase auction sizes as early as the August 2023 refunding announcement. If Treasury begins increasing coupon issuance, in which tenors and sectors should Treasury change auction sizes? Do certain tenors or sectors show greater demand or capacity for increased auction sizes than others? How should the outlook for Treasury bill demand affect Treasury's approach to increasing coupon issuance?"

Executive Summary

This presentation addresses a variety of considerations that Treasury should assess when determining how and where they increase issuance to meet future financing needs:

- Optimal Treasury Debt Structure Model refreshed for current market conditions, including additional analysis under different term premium scenarios
  - Highlights the increased cost to Treasury relative to 2019 and 2022 updates
- Demand for coupon Treasuries, through a review of Treasury auction performance across tenors
  - Highlights generally strong auction demand; however secondary market conditions warrant some caution around increasing 7y and 20y auction sizes relative to other tenors
- Current market functioning
  - Examines relative volume metrics, market depth as well as secondary market pricing efficiency across tenors
- Demand for increased Bill issuance for remainder of the year
  - Highlights that Money Market Funds are well positioned to absorb the expected issuance
- Different issuance scenarios
  - Shows how WAM, TIPS and Bills-share evolves across various issuance scenarios

**Key findings from the analysis include:**

- Treasury should increase coupon issuance across the curve, including in TIPS
- Some tenors exhibit better liquidity and support in the secondary market, including 5s, 10s and 30s, and should be considered to absorb a higher percentage of issuance increase than other tenors, such as 7s and 20s
- If TIPS share is increased at a rate of 1bn per auction, TIPS share will decline below the TBAC recommended range. Higher increases in TIPS issuance will be needed to maintain TIPS share in 7%-9% range. Further study to consider options like adjustment in TIPS calendar schedule to accommodate higher total issuance could be helpful

Optimal Treasury Debt Structure Model and Term Premium Considerations

Optimal Debt Structure Model* – Comparison as of 2023 vs 2019 of Macroeconomic and Fiscal Variable Behavior Model Projections

- After an initial COVID induced dislocation, major macro-economic variables (Unemployment gap, Real GDP, Core PCE) revert to the pre-COVID trend
- The 2023 projection anticipates significantly higher deficits compared to the 2019 projection due to the significant fiscal expansion during COVID
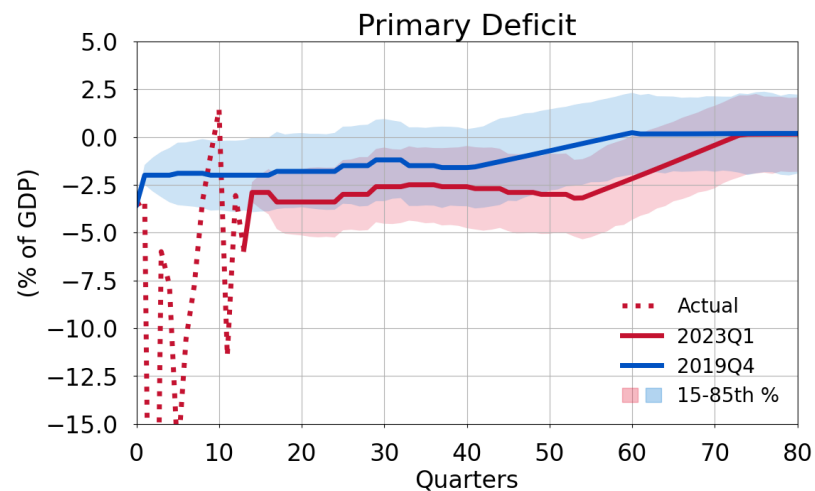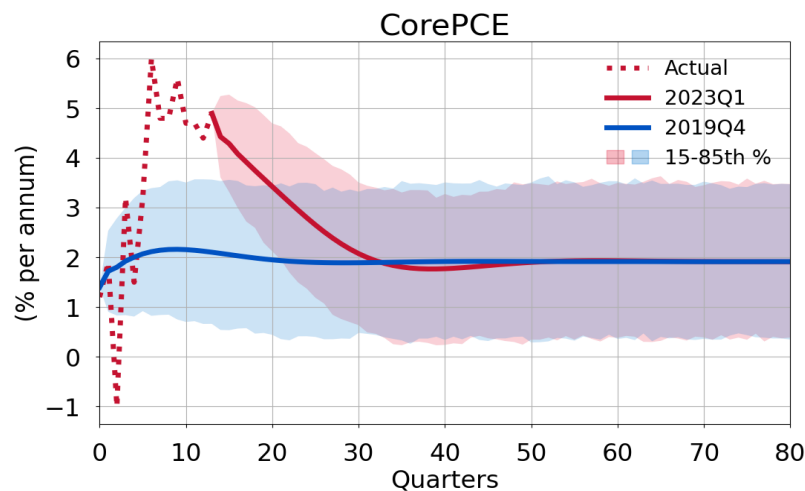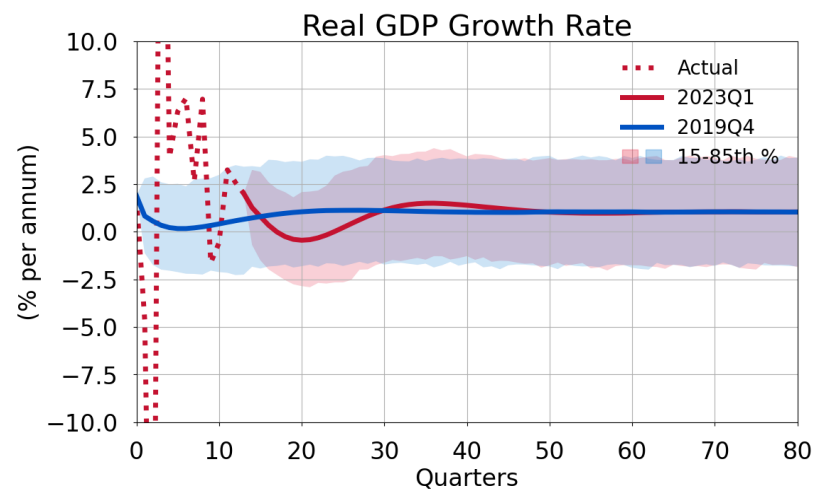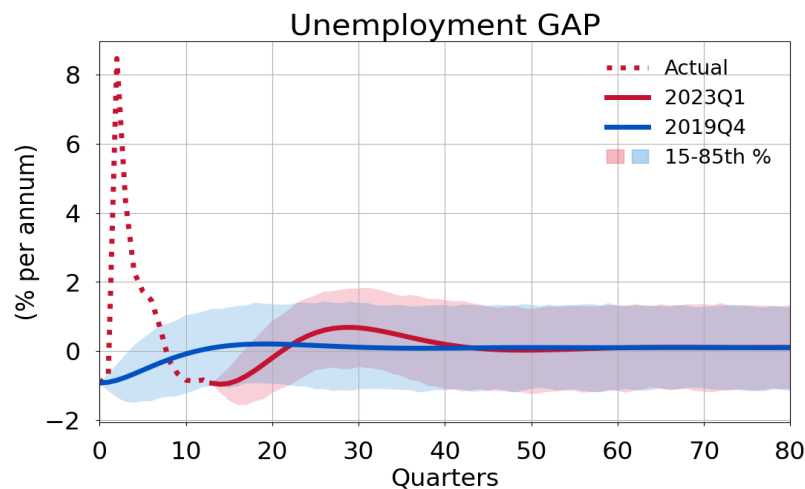
Optimal Debt Structure Model – Comparison as of 2023 vs 2019 of Model Rate Projections

- Different initial conditions have a strong effect on the path of main variables in the model, but terminal distributions are similar

- Cost and variability of each issuance strategy depends upon the entire path. So it is important to note the significantly different evolutions implied by the two sets of initial conditions

- While these macroeconomic and rates models are useful for analyzing long term effects of debt management decisions, they are not sophisticated forecasting models and these outputs should not be understood as taking a meaningful view on the near-term outlook for either rates or the economy
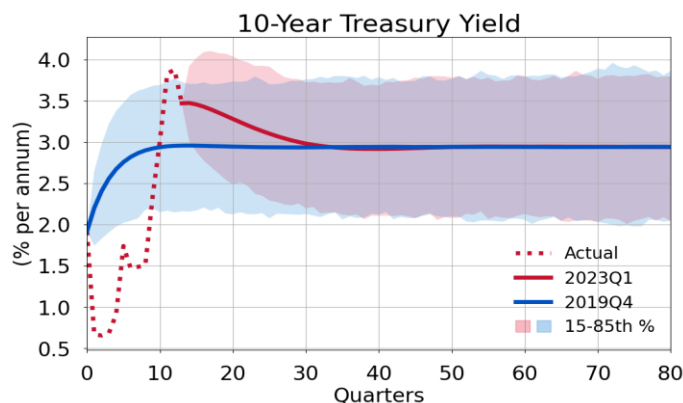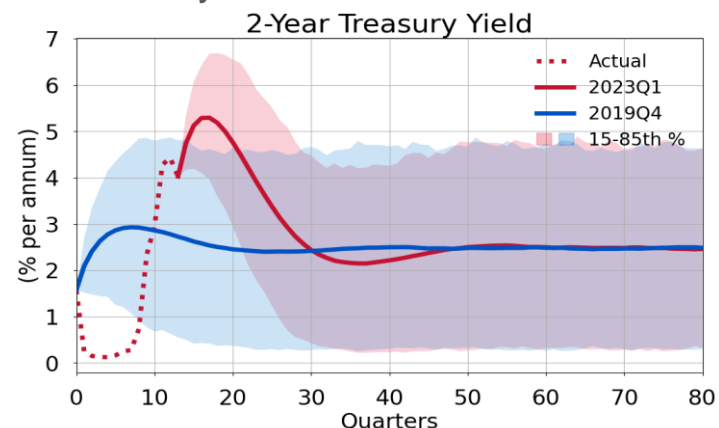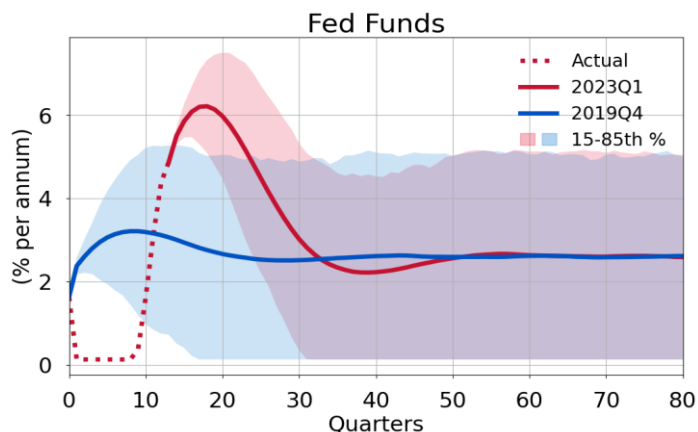
Model Output: Comparisons as of 2019, 2022, and 2023 of Model Cost and Volatility for Each Individual Security that Treasury Issues

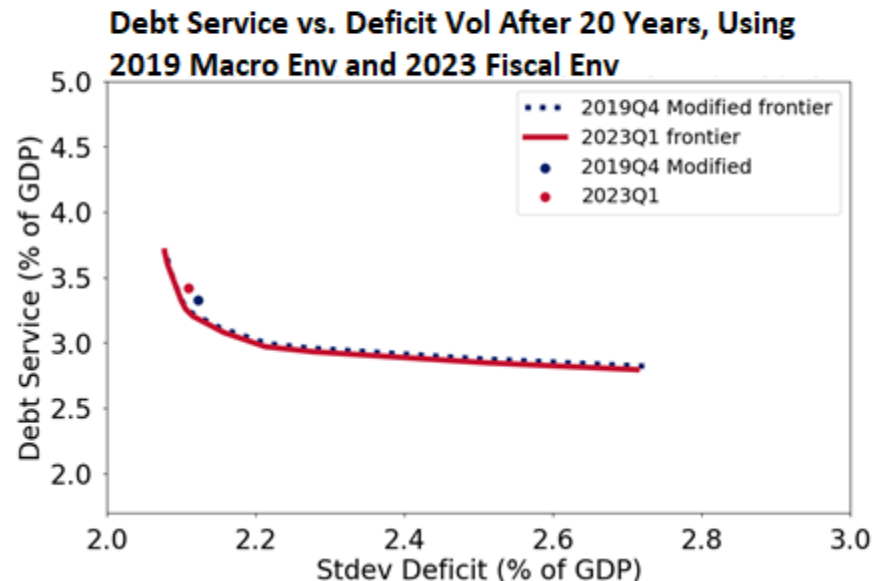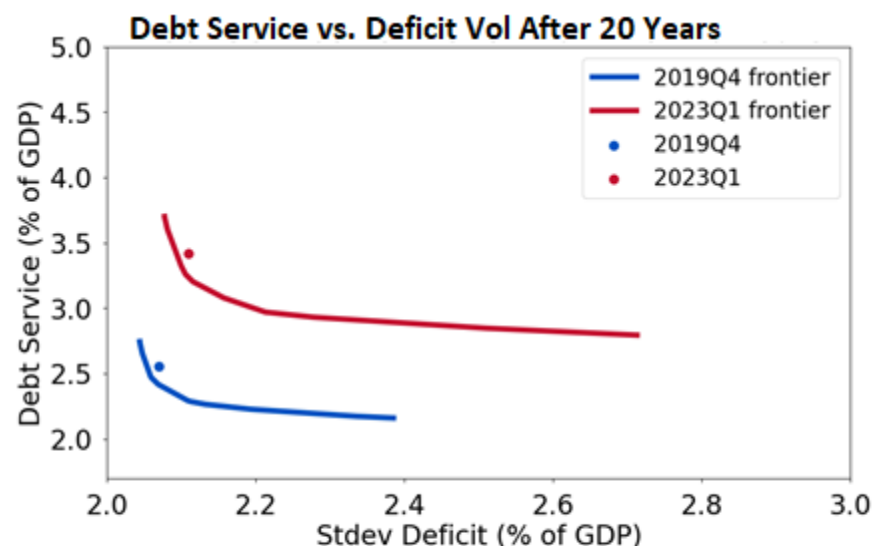- Single security issuance model output has been shifting up and to the right over the past several years (i.e. more cost and more volatility), primarily due to increased size of the stock of Treasury Debt
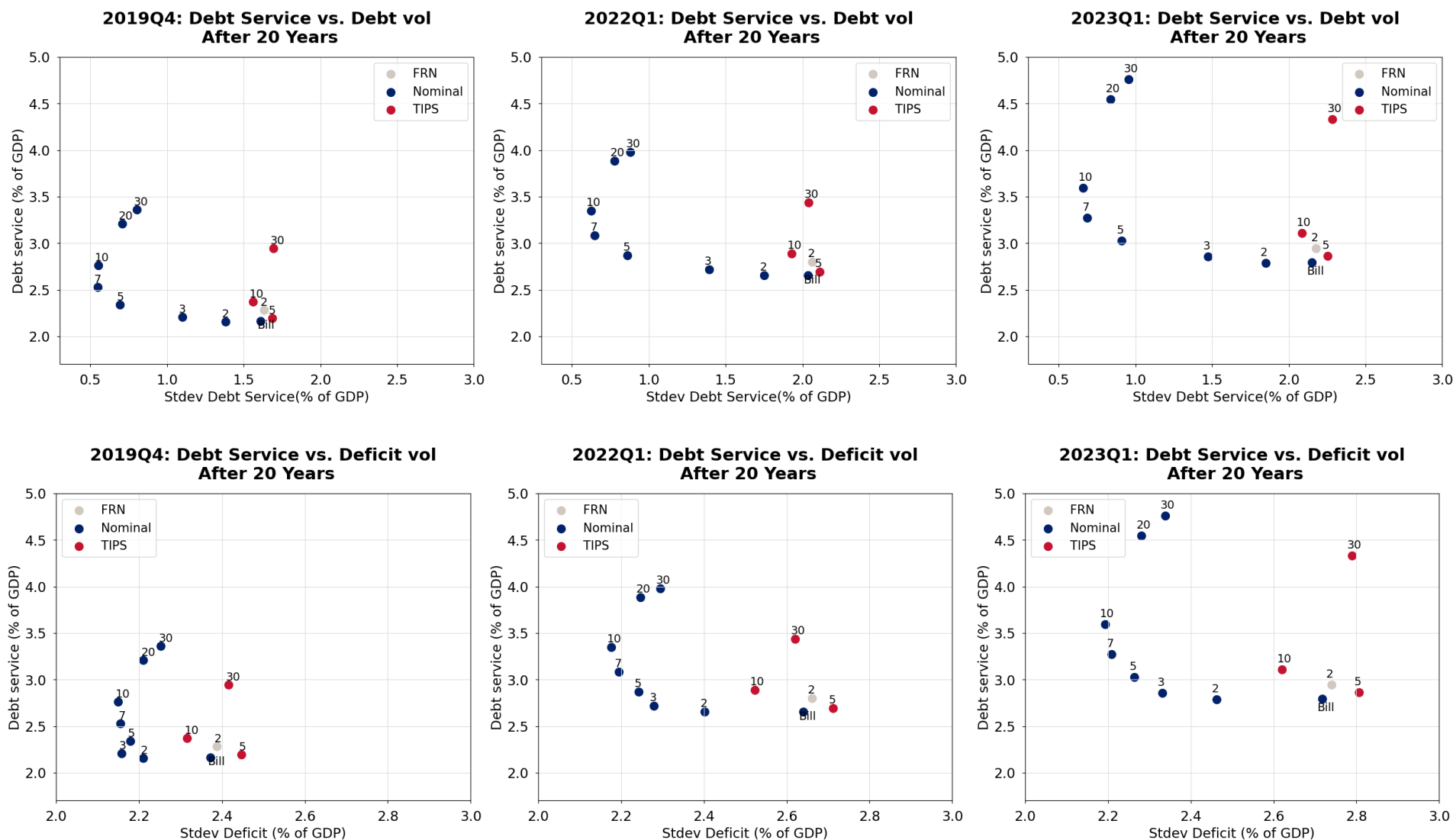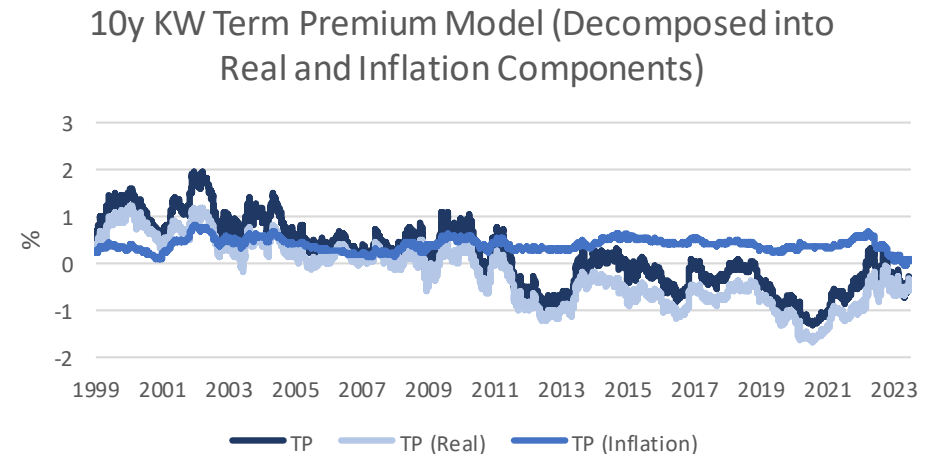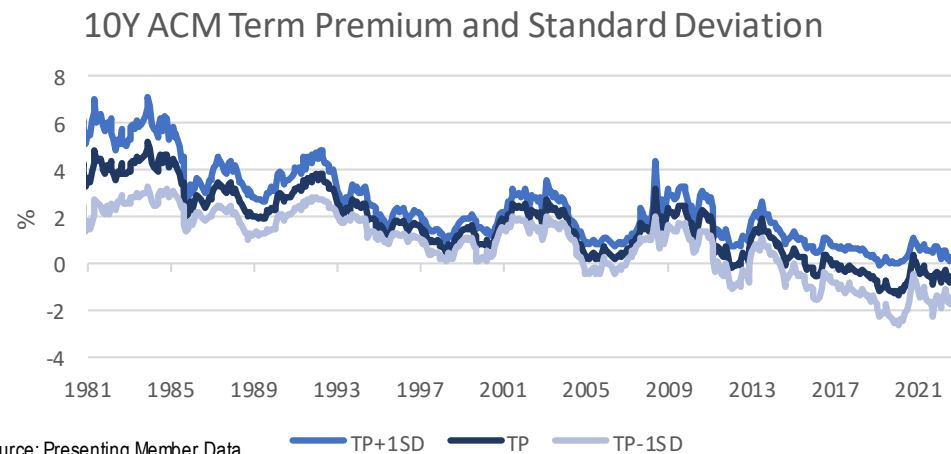
Efficient Frontiers and Historical Issuance

- Efficient frontiers are calculated by comparing the trade-off between debt service costs and the volatility in the size of the deficits over time

- Here we compare the model efficient frontier using macroeconomic and fiscal environments observed at the end of 2019Q4 (blue line), to those observed at the end of 2023Q1 (red line)

- The efficient frontier has moved up (higher cost) and to the right (higher volatility). This is largely driven by change in fiscal environment

- The blue and the red dots in the upper right represent Treasury's issuance kernel as of 2019Q1 and 2023Q1 respectively. The degree to which issuance lies off the model efficient frontier has remained about the same

- The graph on the lower right shows the efficient frontier using the macroeconomic environment in 2019Q4, but fiscal environment from 2023Q1. To do this, we use debt stock from 2023Q1 shifted back 17 quarters and rescaled to nominal GDP. We also use the primary deficit as percentage of GDP from 2023Q1

- The modified 2019Q4 frontier lies almost on top of the 2023Q1 frontier, implying that most of the difference in the frontiers is attributable to the shift in fiscal environment

Debt Service vs. Deficit Vol After 20 Years

Debt Service vs. Deficit Vol After 20 Years, Using 2019 Macro Env and 2023 Fiscal Env

Term Premium

- While historically Term Premium (TP) has tended be positive, more recently ACM and KW models TP has stayed negative
- The ACM TP Model shows that even after making a 1 StdDev adjustment higher to the current TP level, TP would still be flat to negative
- Kim-Wright (KW) model shows that most of the decline in TP is coming from decline in real term premium
- If one measures TP as difference between current 10y and average expected FF rate over the next 10 years then, based upon the NY Fed dealer survey*, TP has been positive and moved higher more recently
- TP is an important variable for Optimal Debt Structure Model. Note, there are many factors that have played a role in lower TP. It could move higher from levels seen in last 10y years given increase in aggregate debt outstanding, potential increase in inflation risk premium and if QE programs are less ambitious during future downturns

5Y ACM Term Premium and Standard Deviation

5y KW Term Premium Model (Decomposed into Real and Inflation Components)

10Y ACM Term Premium and Standard Deviation

10y KW Term Premium Model (Decomposed into Real and Inflation Components)
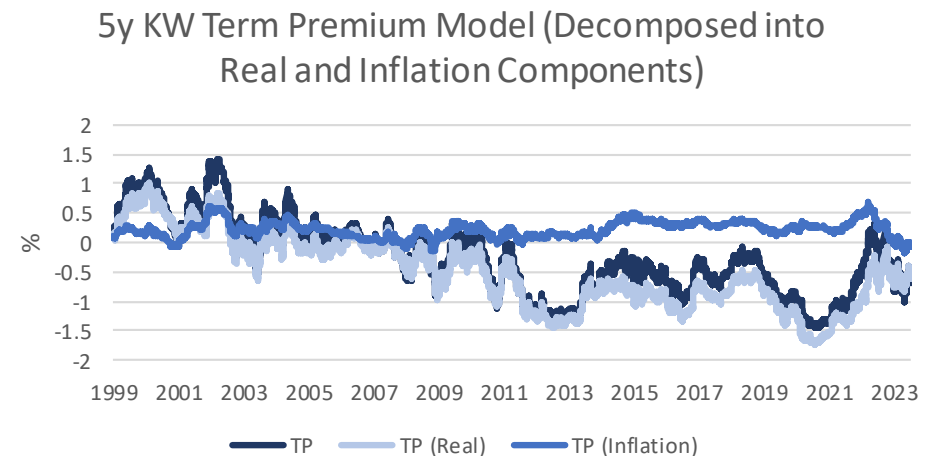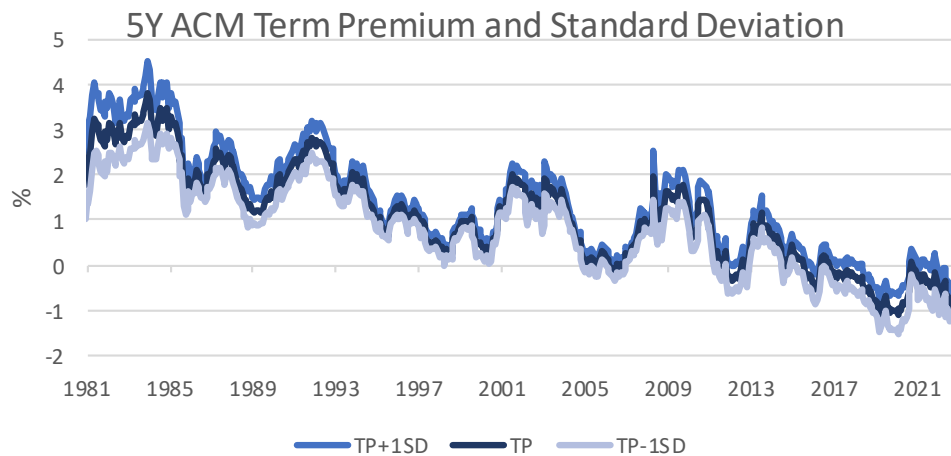
Source: Presenting Member Data

* Refer Q2b under https://www.newyorkfed.org/medialibrary/media/markets/survey/2023/jun-2023-spd-results.pdf

Term Premium Across 2y, 10y, and 30y Tenors, Using Standard and Lower TP Assumptions
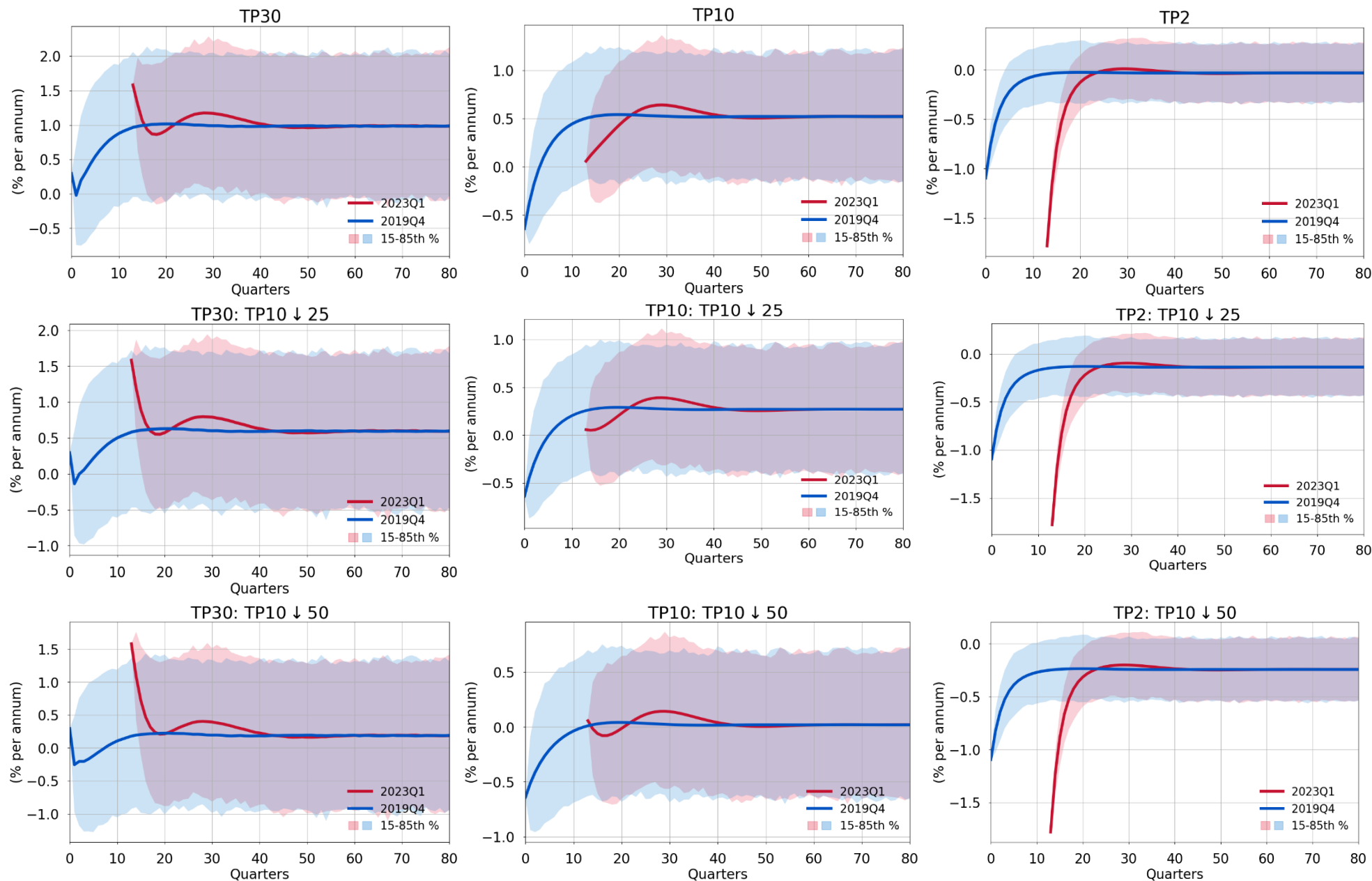
Sensitivity of Model Cost and Volatility for Lower Term Premium Scenarios

- In the plots below, we show outputs as of 2023 using the standard model assumption, and then scenarios if 10y term premium is 25bps or 50bps lower than the standard assumption (with term premium for rest of the curve adjusted per the Model)
- Model continues to favor belly issuance under lower term premium assumptions, but also shows a significant reduction in the relative cost of longer-dated issuance in the lower term premium scenarios
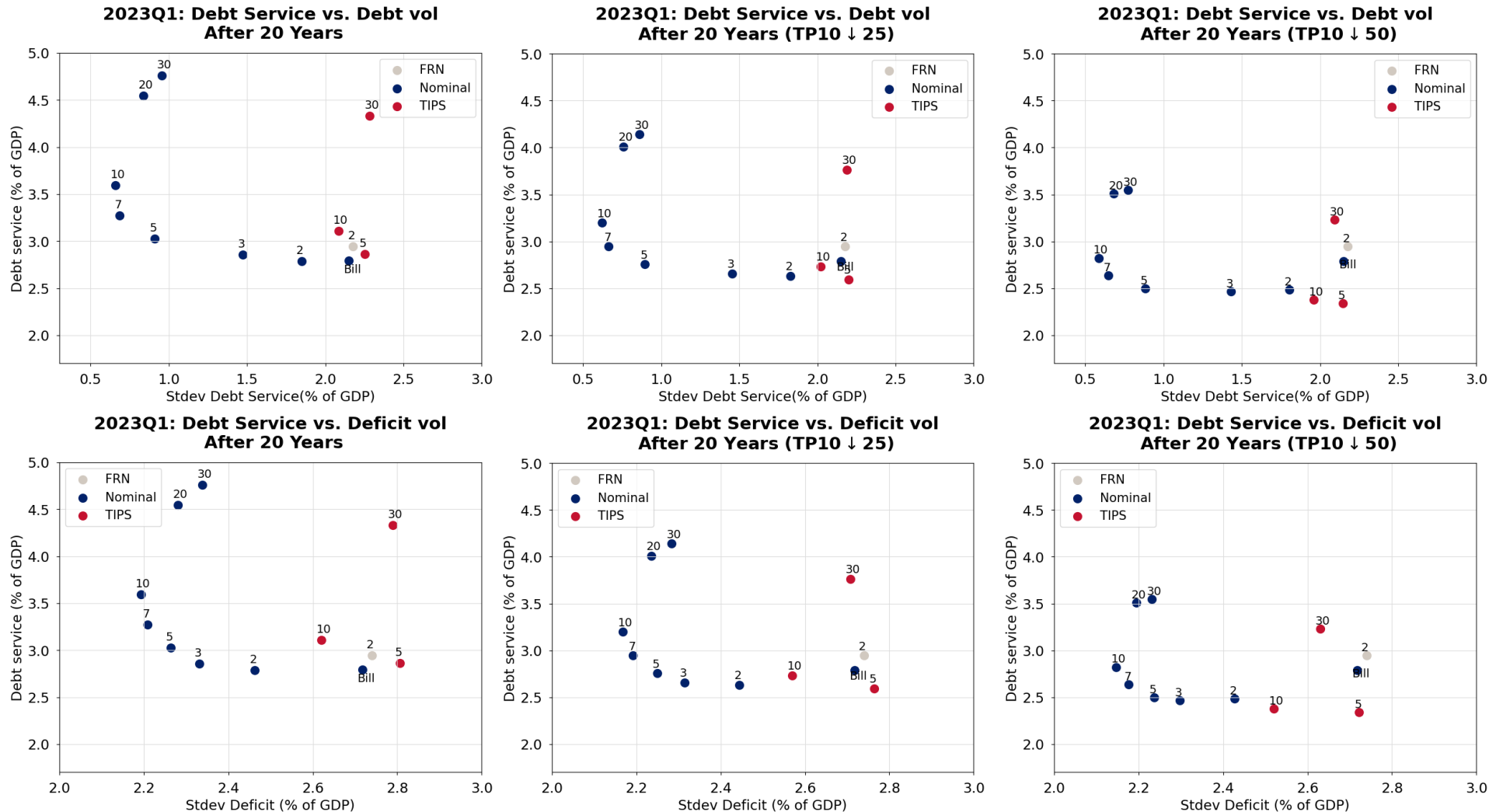
Efficient Frontier under Lower Term Premium (TP) Scenarios

- Under lower Term Premium scenarios, current issuance kernel moves further away from the efficient frontier. This is because a sustained reduction in Term Premium would call for more issuance further out the curve
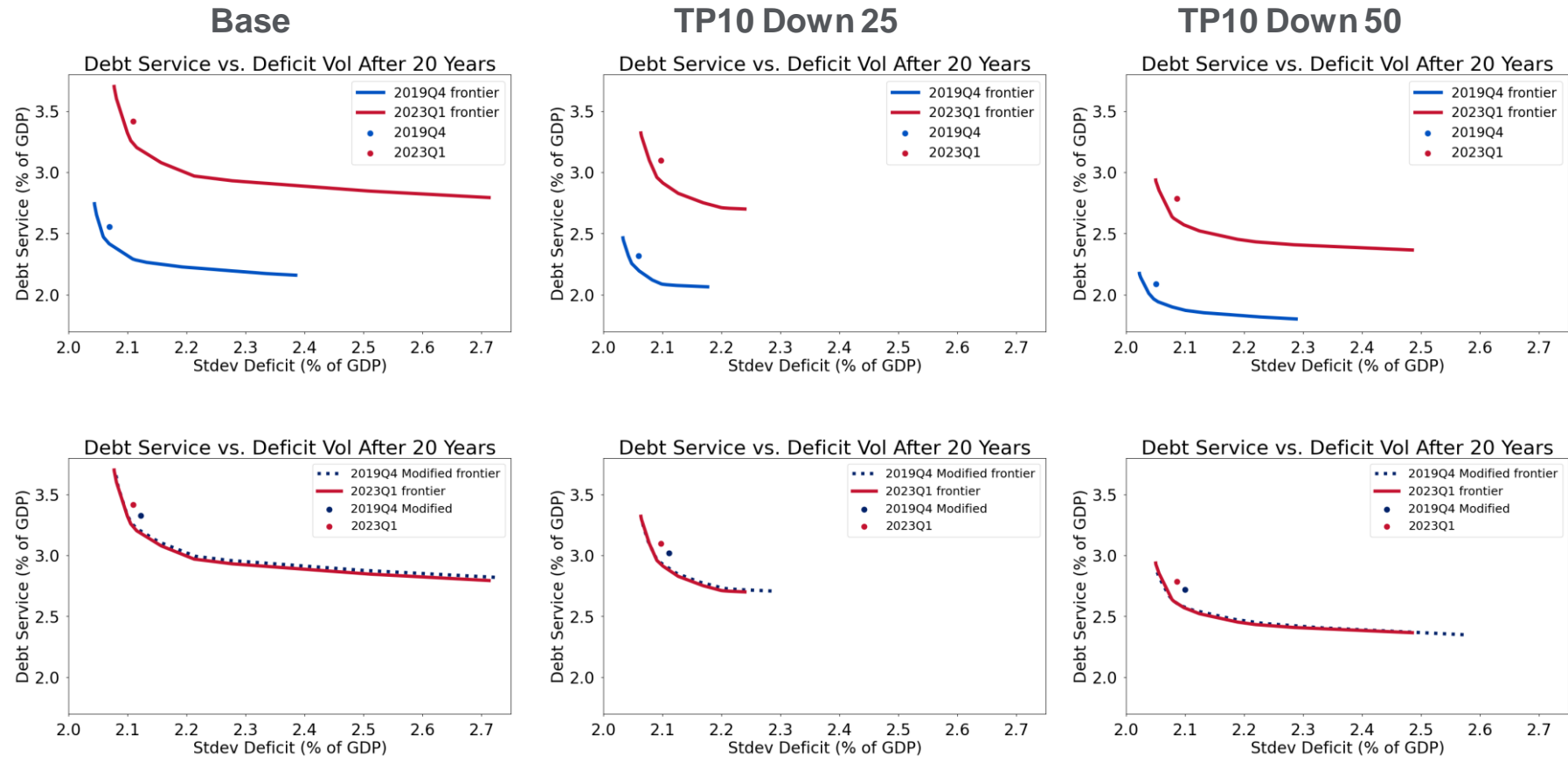
Insights for Future Issuance

- Fundamental conclusions remain similar to Q3-2022 TBAC study. The model continues to favor more belly, Bill, TIPS and FRN issuance, and favors increasing issuance less in the longer end relative to the current issuance mix

    - When risk is measured as volatility in the deficit (right chart), increasing TIPS issuance is a small positive, as it lowers expected cost and does not increase risk (hence, it moves the issuance pattern closer to the efficient frontier)

    - When risk is measured by the variation in funding costs (left chart), expected cost can only be reduced if more risk is assumed. However, that trade-off appears reasonably attractive, especially if achieved by increasing belly issuance
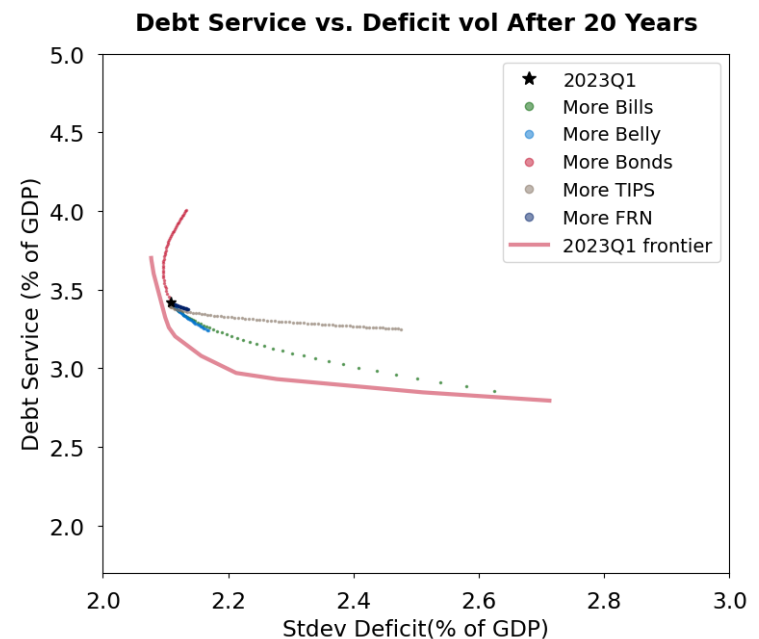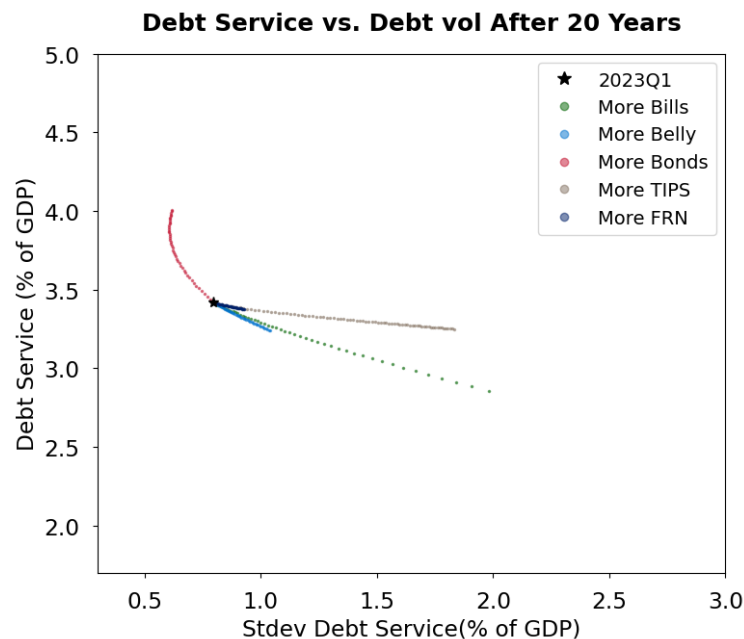
Insights for Future Issuance under Lower Term Premium Scenarios

- Increasing issuance of longer maturities reduces both volatility of debt service costs as well as volatility in the size of future deficits. This doesn't increase debt service costs significantly, especially when considering scenarios assuming reduced future term premium

Base   **TP10 Down 25**   **TP10 Down 50**
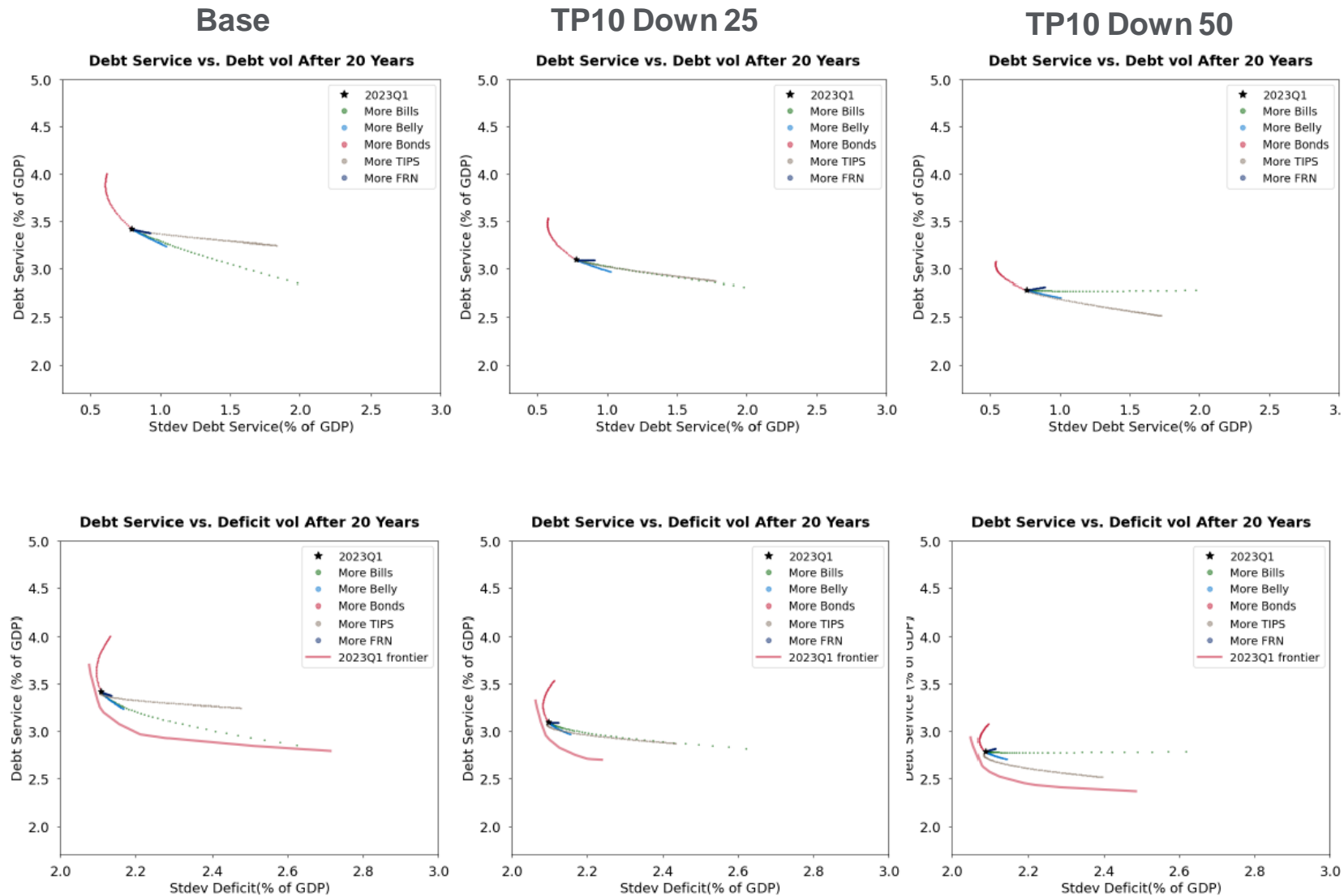
Sensitivity of Model Cost and Volatility for Higher Term Premium Scenarios

- In the plots below, we show outputs as of 2023 using the standard model assumption, and then scenarios if 10y term premium is 25bps or 50bps higher than the standard assumption (with term premium for rest of the curve adjusted per the model)
- Model continues to favor belly issuance under higher term premium assumptions, and also shows a significant additional increase in the relative cost of longer-dated issuance in the higher term premium scenarios
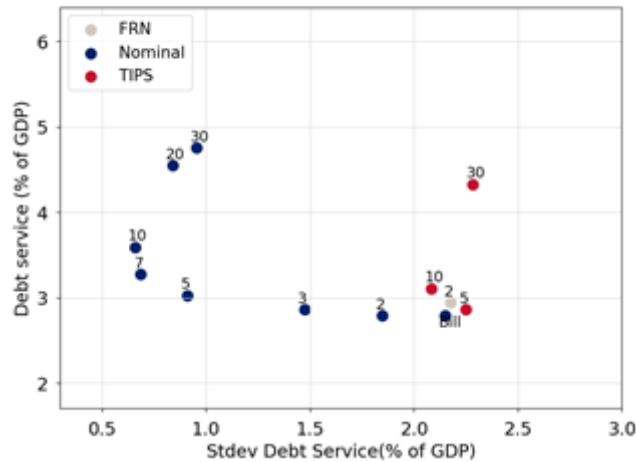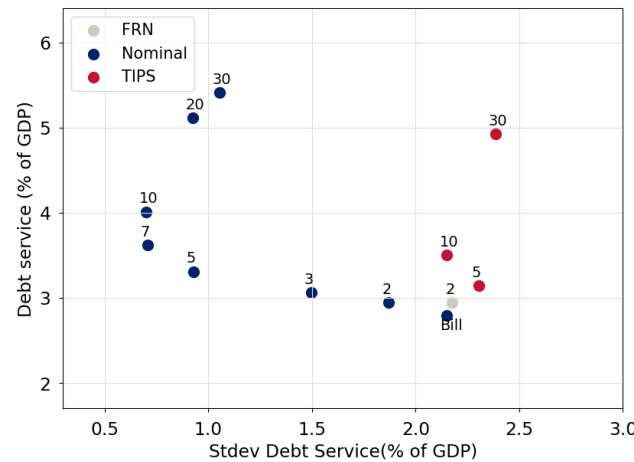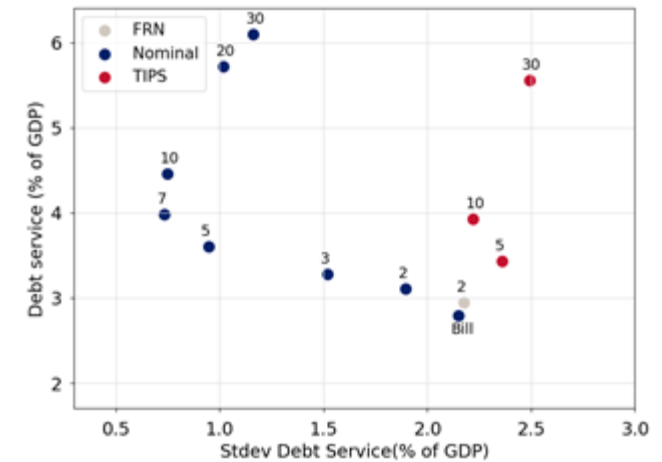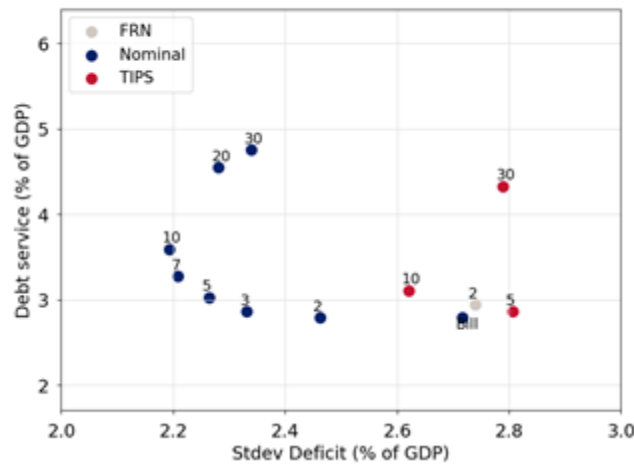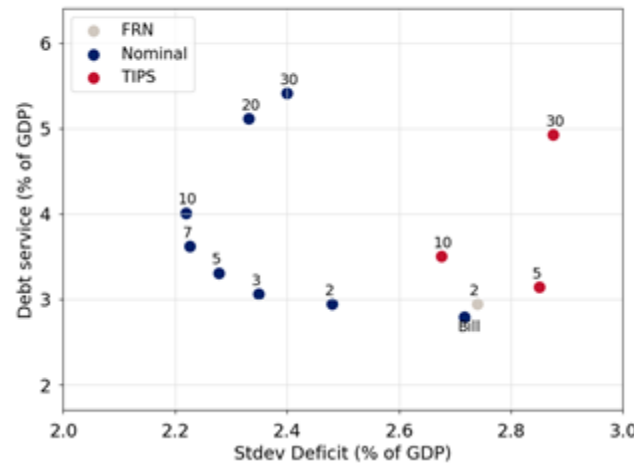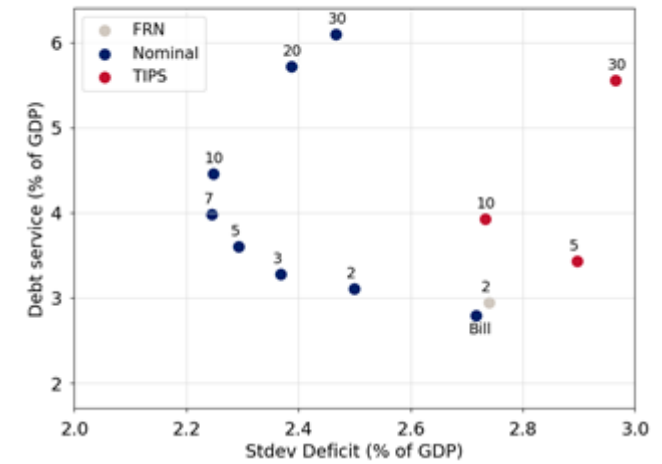
Efficient Frontier Under Higher Term Premium Scenarios

- Under higher Term Premium scenarios, the current issuance kernel is even closer to the efficient frontier, suggesting proportionate increases in future debt issuance if this is the expected future term premium

Base	TP10 Up 25	TP10 Up 50
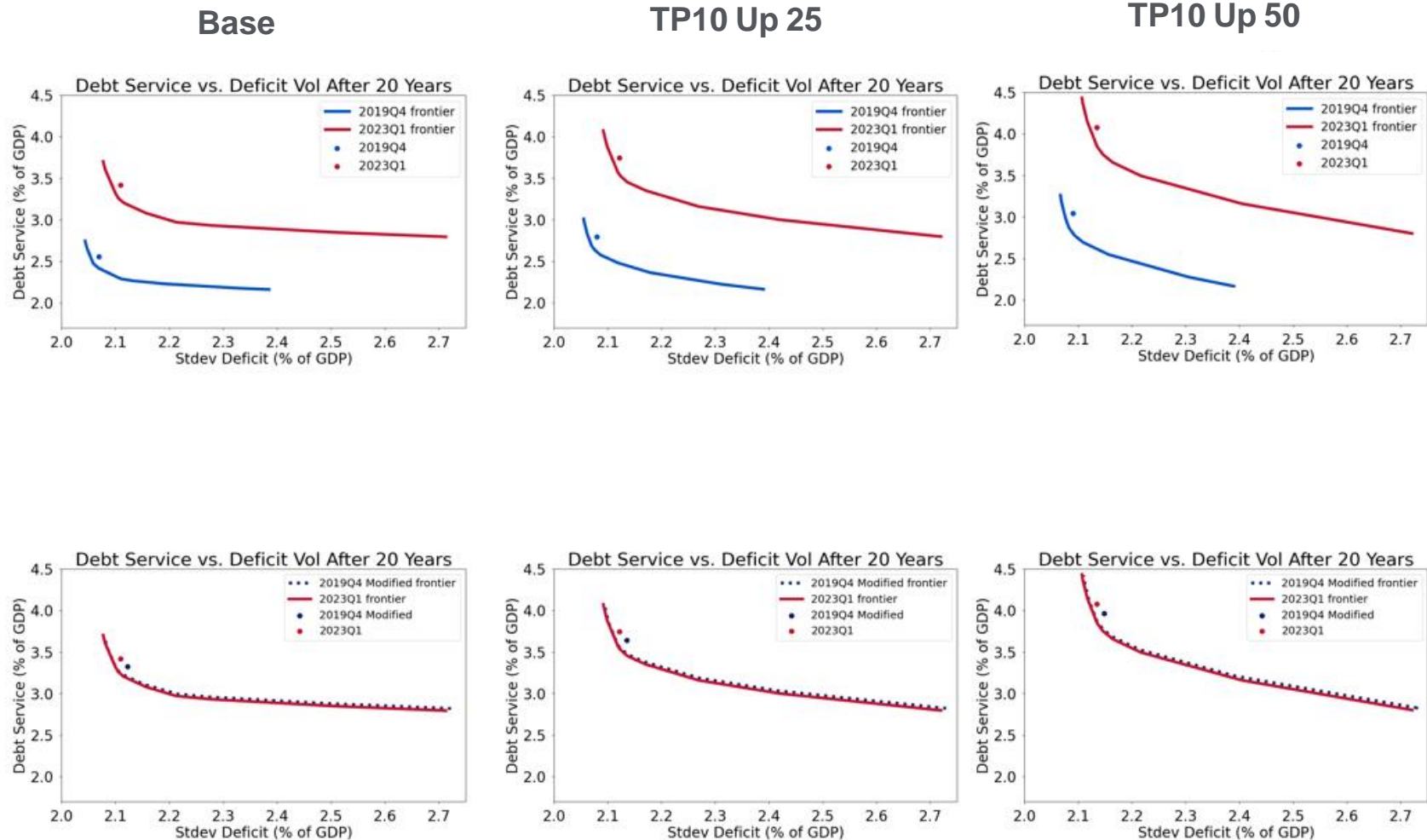
Demand Assessment

Auction Statistics over Time

- Customer takedown trending higher over past decade across all sectors points to broadly robust demand for issuance
- Less variability in bid-to-cover among tenors over the past decade points to a more balanced demand picture

Customer Takedown per Tenor (Average per Year)
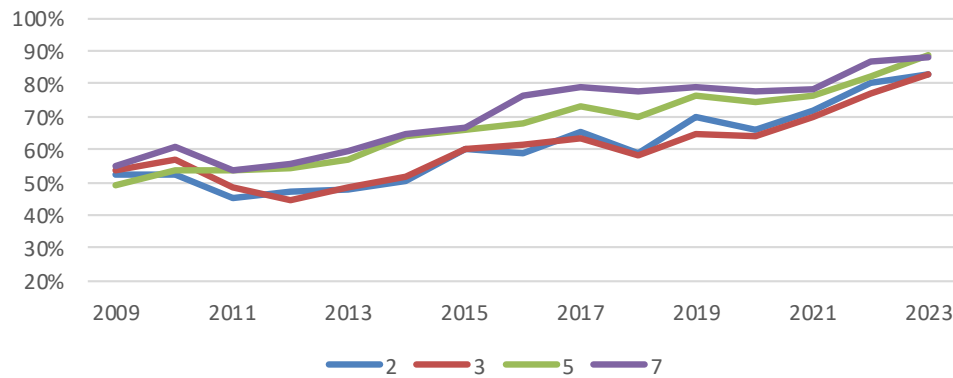
Customer Takedown per Tenor (Average per Year)
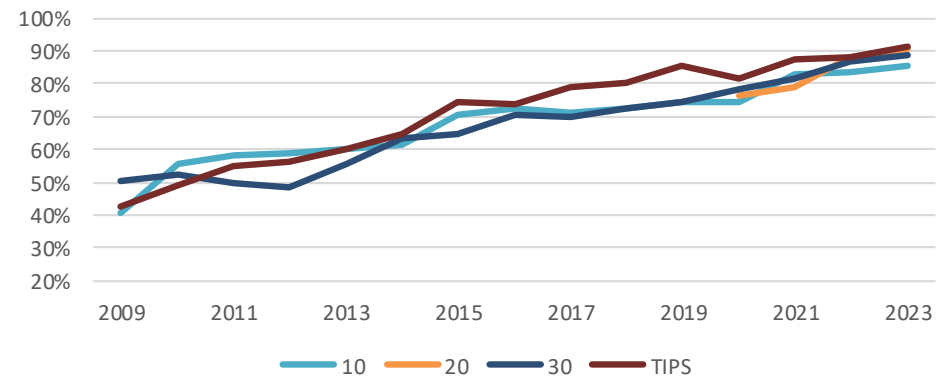
Bid-to-Cover (Average per Year)
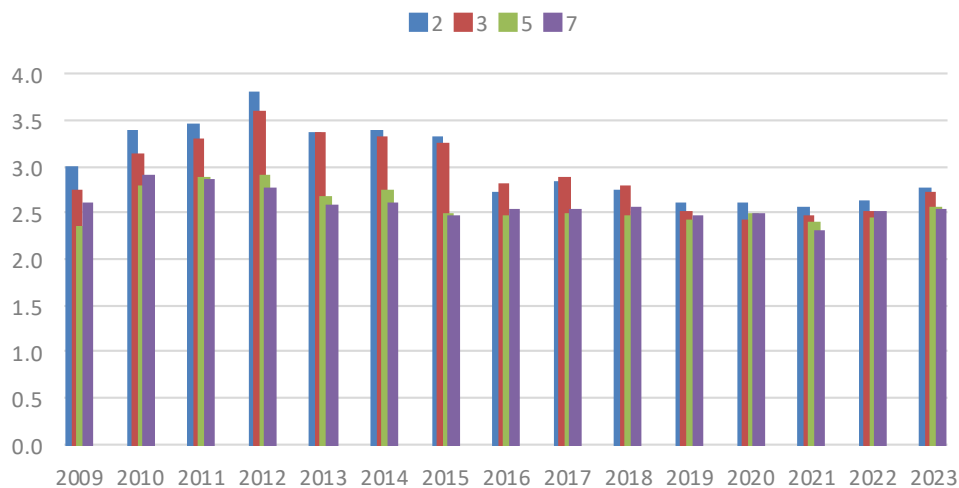
Bid-to-Cover (Average per Year)
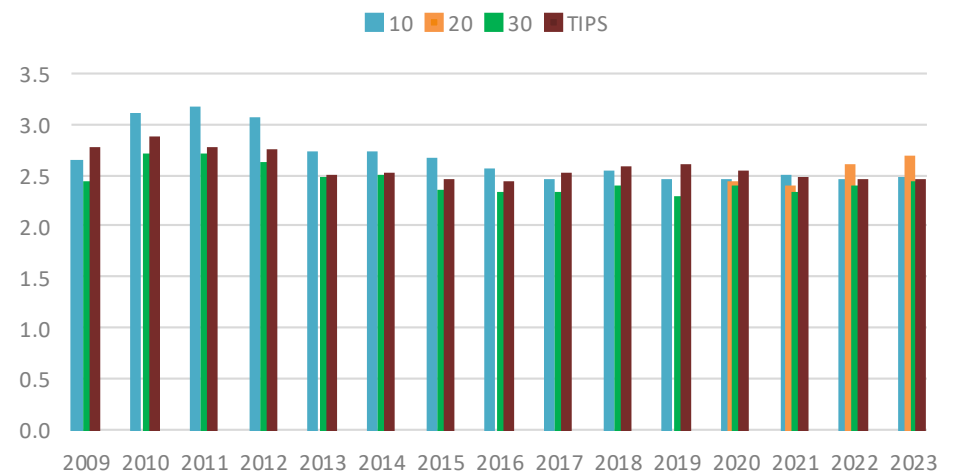
Source: Bloomberg

Source: Bloomberg

Auction Allotment over Time

- Dealer participation in issuance has steadily declined over the past decade

- Increased percentage of supply is being absorbed by investment funds while foreign participation has remained range bound

- Increased reliance on investment funds implies:
  - Larger tails when those funds are less enthusiastic to provide liquidity
  - Stops way through the pre-auction levels when those funds are motivated to buy

All Issuance Excluding Bills

Legend: Depository institutions | Individuals | Dealers and brokers | Pension and Retirement funds and Ins. Co. | Investment funds | Foreign and international | Other

Auction Allotment over Time – Split by Tenor

2s

Legend: Depository institutions | Individuals | Dealers and brokers | Pension and Retirement funds and Ins. Co. | Investment funds | Foreign and international | Other

5s

Legend: Depository institutions | Individuals | Dealers and brokers | Pension and Retirement funds and Ins. Co. | Investment funds | Foreign and international | Other

3s

Legend: Depository institutions | Individuals | Dealers and brokers | Pension and Retirement funds and Ins. Co. | Investment funds | Foreign and international | Other

7s

Legend: Depository institutions | Individuals | Dealers and brokers | Pension and Retirement funds and Ins. Co. | Investment funds | Foreign and international | Other

Source: Treasury

Auction Allotment over Time – Split by Tenor

10s

20s

30s

Source: Treasury
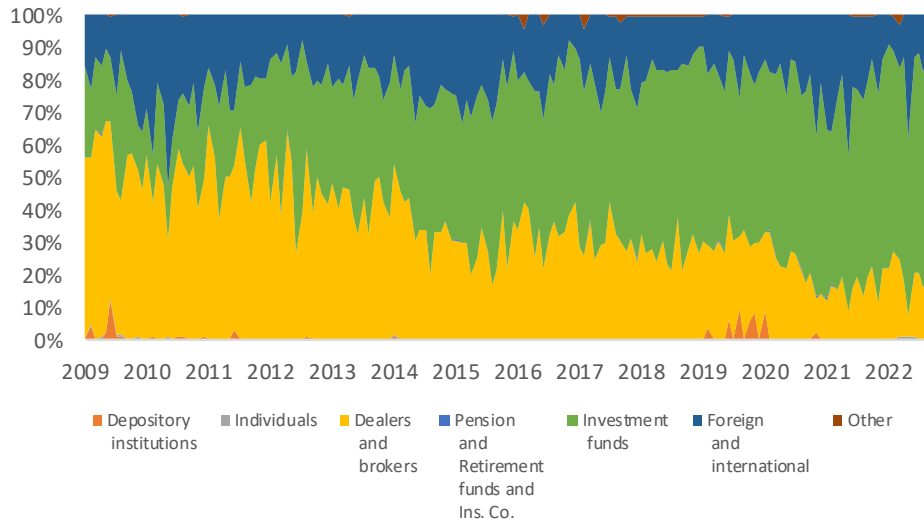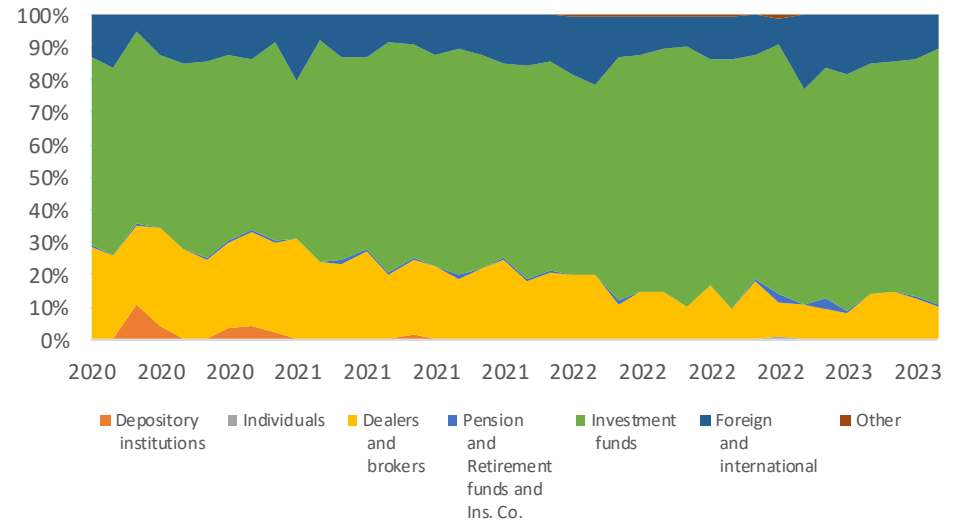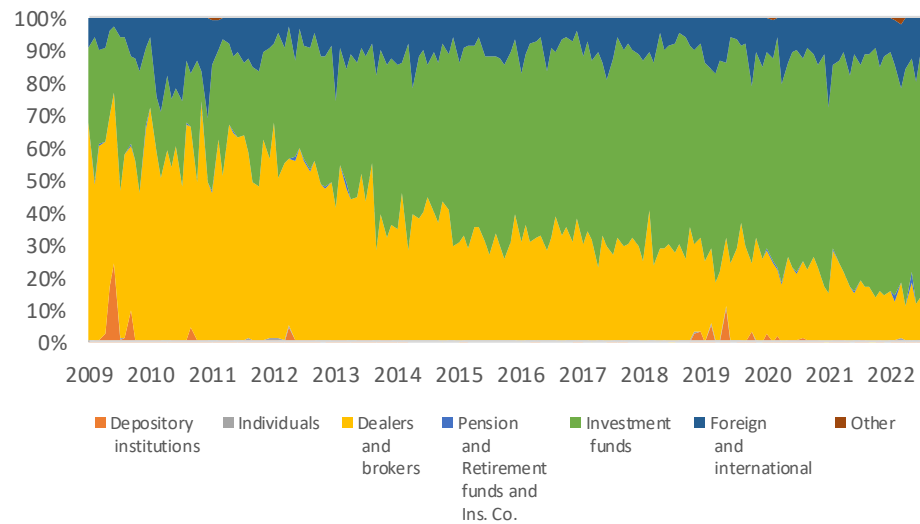
Historical Auction Tails

- On average, auctions have cleared very close to pre-auction levels indicating the market is well suited at time of auction to take down supply

- COVID-related fiscal increases in 2020-2021 resulted in larger auction sizes, but Fed buying also increased, absorbing much of that issuance

- More recently, as the Fed is reducing balance sheet, auctions have continued to clear in line with pre-auction yields but that has coincided with a modest reduction in auction sizes

  - It remains to be seen how auctions will perform as issuance sizes increase while the Fed continues to reduce balance sheet

- The auction process can demonstrate unintuitive results:

  - 20y auctions have averaged well through the deadline yield, pointing to the market using the auction as a liquidity event

  - While 10s are the most liquid coupon in the secondary market, they have cleared on average at a small tail more recently. This shouldn't be interpreted as a lack of demand in the 10y sector, rather that investors are less reliant on the auction process to source liquidity for 10s

Average Tail (+=Tail)

Source: Presenting Member Data
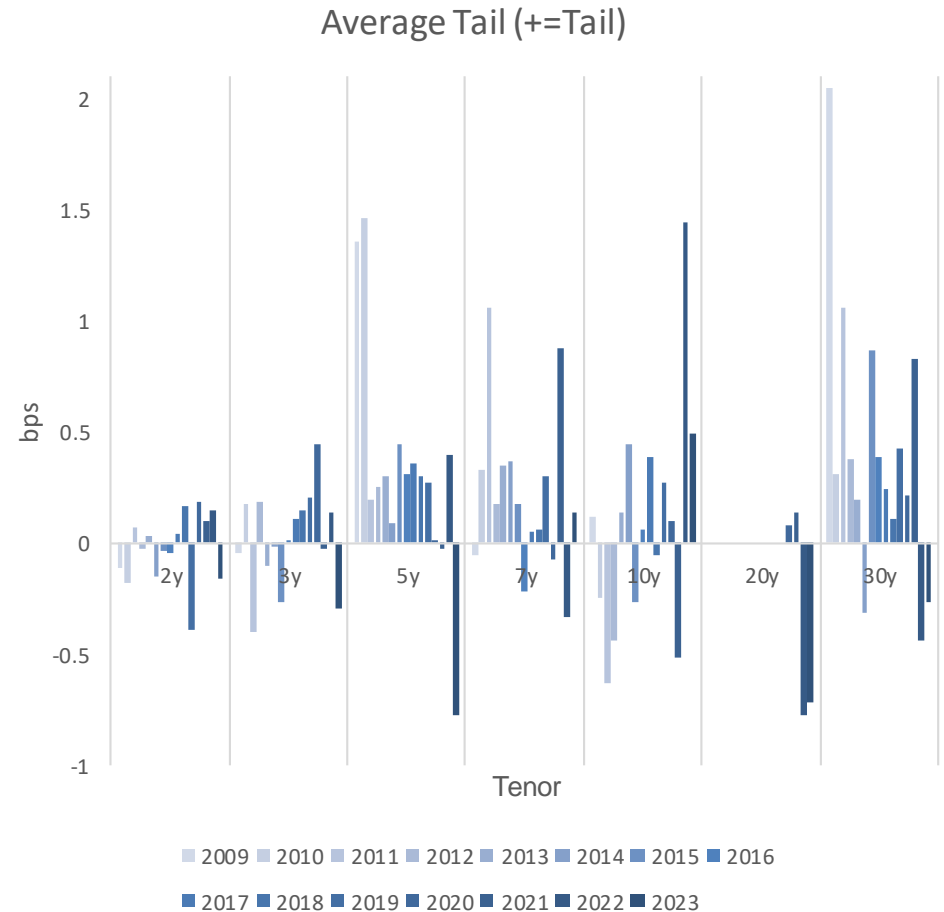
Intraday Performance Before and After Auction

- 2s/3s/5s have shown a propensity over time to require an intraday concession to clear supply

- 7s/10s/20s/30s exhibit more mixed performance in the hours surrounding the auction

- Similarly, auctions seem to be good liquidity events for 20s and 30s as evidenced by negative concession and negative tails on average

- Both intraday performance and tail data generally demonstrate that there is consistent strong demand for Treasury auctions

- The small tail and intraday concession in the 10y both likely indicate that there is less need for end users to tap auction liquidity in this sector. Secondary liquidity and relative valuation metrics both point to healthy end-user demand for the 10y sector

- Auction statistics and concessions are just a few of the many metrics to consider when evaluating issuance, and should be observed in the context of overall valuations and secondary liquidity

Concession +/-2hrs from Auction Clearing Time
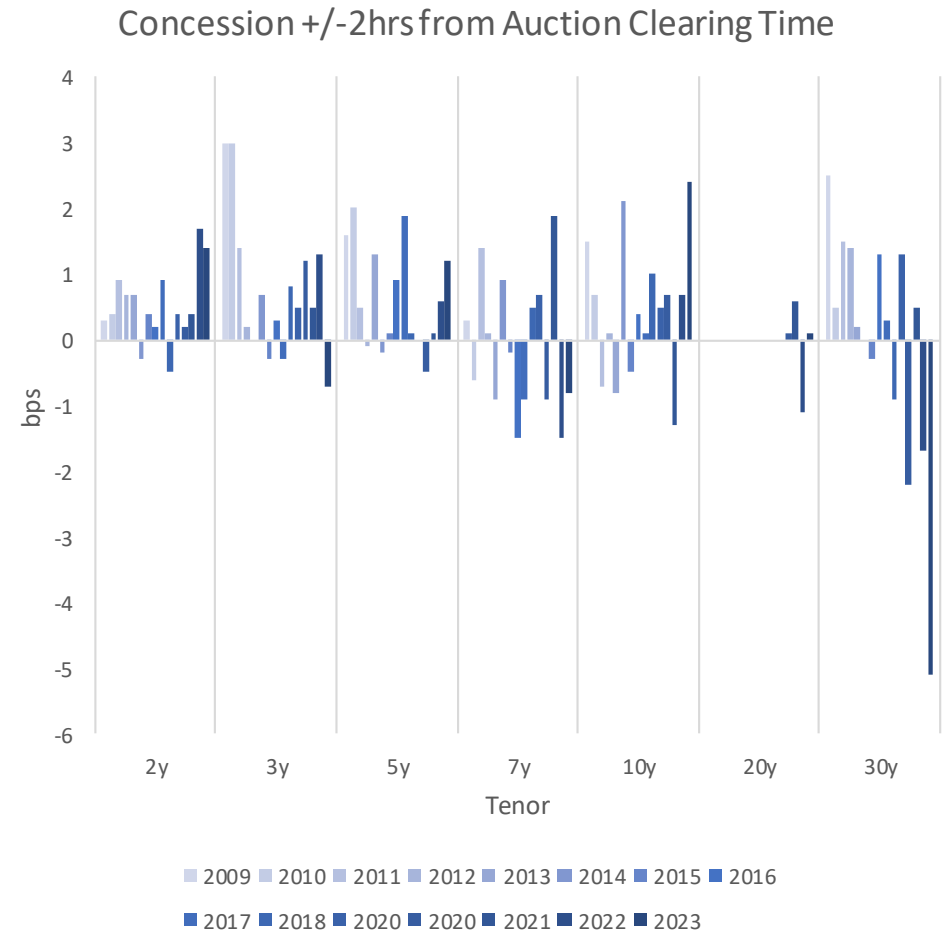
*Source: Presenting Member Data
*Total gross concession in the 2hrs preceding auction and 2hrs post auction
Higher the number, more the intraday concession required to clear supply

Relative Value Considerations Using Swap Spreads

- Duration neutral swap spread butterflies indicate that:
  - On-the-run 7s have generally been cheap vs 5s and 10s

  - On-the-run 20s have generally been cheap vs 10s and 30s

  - On-the-run 3s could be somewhat volatile locally relative to 2s and 5s but have not exhibited consistent cheapness as exhibited by 7s and 20s

2s3s5s Matched Maturity Asset Swap Spread Fly
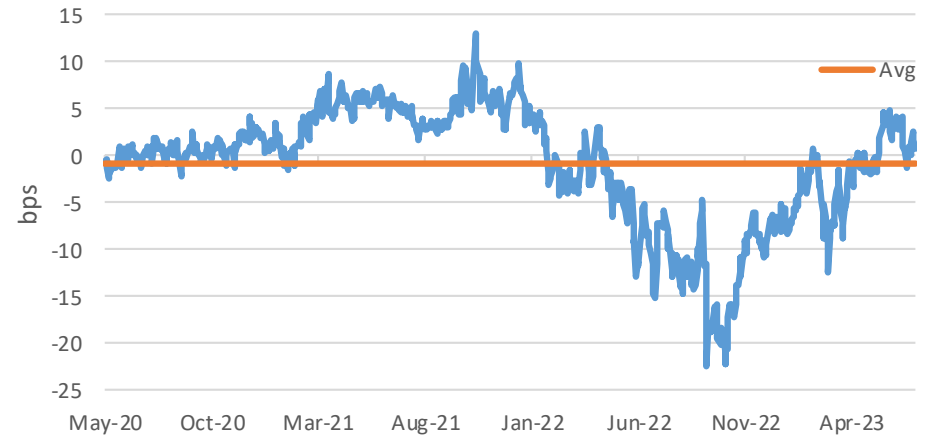
5s7s10s Matched Maturity Asset Swap Spread Fly
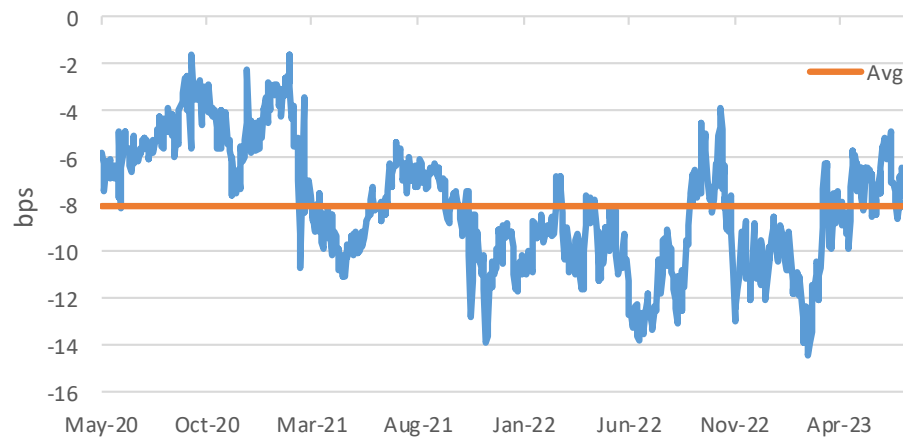
10s20s30s Matched Maturity Asset Swap Spread Fly

this is when 20y auction sizes dropped to current steady state of 15bn/12bn/12bn

Source: Riskval; Fly weights: -1/2/-1; more negative the number cheaper the belly vs wings

Relative Value Considerations Using Cash Butterflies

- Duration neutral butterflies support the assessment from the swap spread analysis :

  - On-the-run 7s have generally been cheap vs 5s and 10s. More recently 7s have normalized on the 5s7s10s fly, but they are at the rich end of their history

  - On-the-run 20s have generally been cheap vs 10s and 30s

  - On-the-run 3s have no discernable cheapness vs 2s and 5s

2s3s5s Duration Neutral Treasury Butterfly Yield

5s7s10s Duration Neutral Treasury Butterfly Yield

10s20s30s Duration Neutral Treasury Butterfly Yield
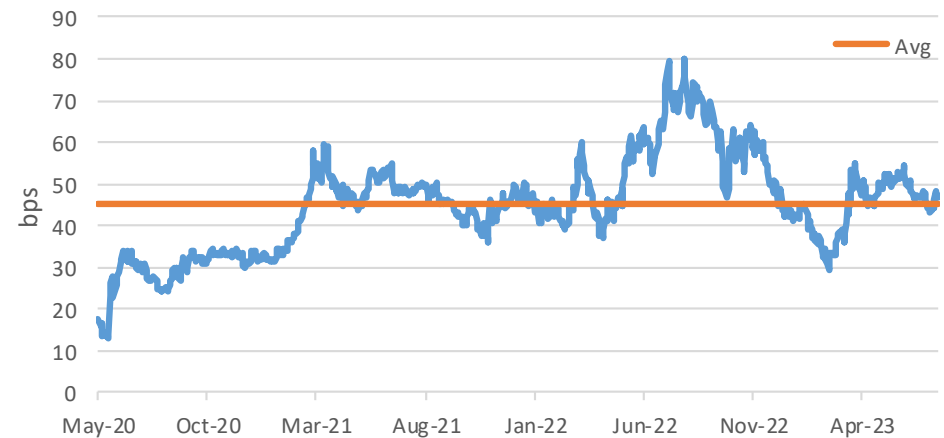
Source: Riskval; Fly duration weights: -1/2/-1; more positive the number cheaper the belly vs wings

Relative Value Considerations Across Broad Curve Segments

- Swaps spreads have materially declined post the GFC (USTs cheapened). The swaps spread curve trades very inverted – UST curve steeper than swap curve

- There are structural reasons behind demand for off-balance sheet long duration needs. There is no indication of this dynamic disappearing. The decline in long end swap spreads is more likely a function of the off-balance sheet supply/demand imbalance, rather than an indication of excessive Treasury supply

- Swap spreads have become significantly less correlated to Treasury supply.

- Refer to Q-1 2021 TBAC charge* for a more detailed discussion on swap spread dynamics

30y Swap Spreads vs Fwd Looking Total Coupon Issuance(Pre & Post 2009)

$R^2 = 0.5142$

$R^2 = 0.0018$

Swap spreads (bps)

6M Forward looking coupon issuance in $bln (10y equivalents)

- Pre 2009 - Post 2009
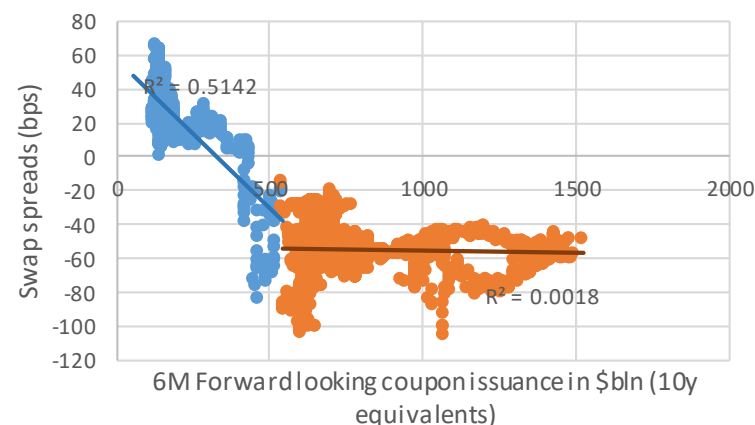
Source: JP Morgan Research

SOFR swap spreads prior to 2019 are estimated using post-2019 relationship between SOFR & OIS swap spreads and historical OIS swap spreads.

Above chart assumes that Treasury is transparent with their refunding needs and that 6M look ahead expectations are mostly in line with actual subsequent issuance

Spread of Libor Swap Curve to Treasury Curve

bps

2y 5y 7y 10y 30y
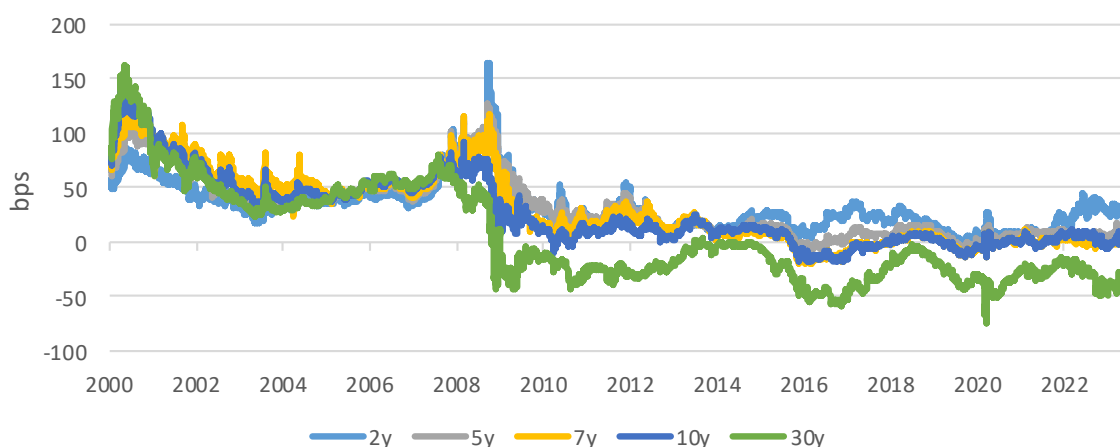
Spread of SOFR Swap Curve to Treasury Curve (More Recent History)

bps

2y 5y 7y 10y 20y 30y

Source: Bloomberg

* https://home.treasury.gov/system/files/221/CombinedChargesforArchivesQ12021.pdf(page 68 onwards)

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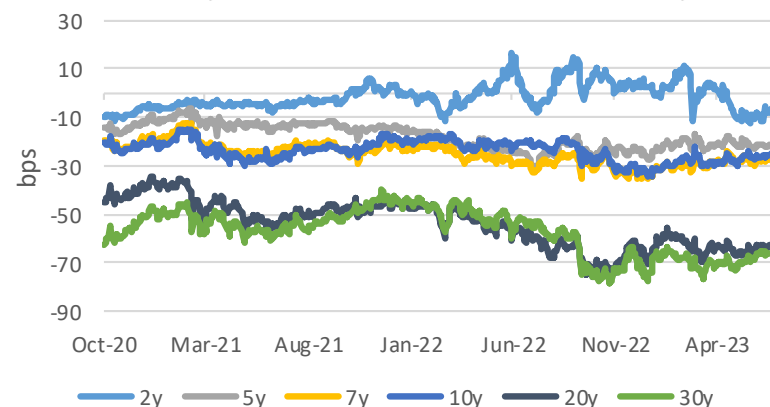
Assessing Market Demand Using Trading Volumes Relative to Auction Size

- While 5s and 10s constitute >50% of trading volumes, they only make up 31% of annual issuance

- On the other hand 7s and 20s constitute only 11% of trading volumes, while they make up 21% of annual issuance

- Pension and Insurance investors, who tend to trade less frequently, have a bigger footprint in longer tenors than shorter on the curve. Additionally, 30y on-the-run trading volumes are distorted lower relative to shorter on-the-run tenors because 30y corporate bonds are traded off of once-old 30yrs, while shorter tenor corporates are traded off of on-the-run issues

- 5s and 10s are preferred hedging points for IG and MBS community, garnering more volumes

- The trading volume data suggests there is capacity for Treasury to concentrate more of its issuance in 5s, 10s, and 30s, while making smaller increases in issue sizes of 7s and 20s

Trading Volumes and Issuance Split Across Benchmark Points (Jan 2022 - May 2023)

	Treasury Volume	Treasury Issuance	Trading $/ Issuance $*
2s	16%	18%	31
3s	13%	17%	26
5s	29%	18%	54
7s	8%	15%	18
10s	23%	13%	58
20s	3%	6%	15
30y	6%	8%	27
5y TIPs	1%	2%	15
10y TIPs	1%	3%	9
30y TIPs	0.2%	1%	12

*Based on on-the-run trading volumes during the period (TRACE data)

TIPS Discussion

- TIPS share is currently 7.6%. Under current auction sizes, TIPS share declines further - driven by original issue 20y TIPS maturing in the coming years. TIPS share generally declines further during recessions

- Investor demand, especially for shorter duration TIPS, has increased over past decade. However, more recent data is showing outflows from such funds which could indicate a less favorable backdrop relative to the prior two years for a larger increase in TIPS issuance

- The growth of Target Date Funds (TDFs) continues to add to TIPS demand, with an estimated 2% allocation to TIPS

- TBAC charges from Q2 2023* and Q4 2021** discuss TBAC's assessment of recommended TIPS share and demand assessment. Treasury should also further explore options like adjustment in TIPS calendar schedule and sizes to incorporate larger total TIPS issuance as total Treasury debt increases

TIPS Share of Marketable Debt

NBER Recessions
TBAC Recommended TIPS Share
TIPS Share of Marketable Debt

TIPS Assets Under Management

Short-dated TIPS   Broad TIPS

Target Date Funds Assets Under Management ($B, log scale)
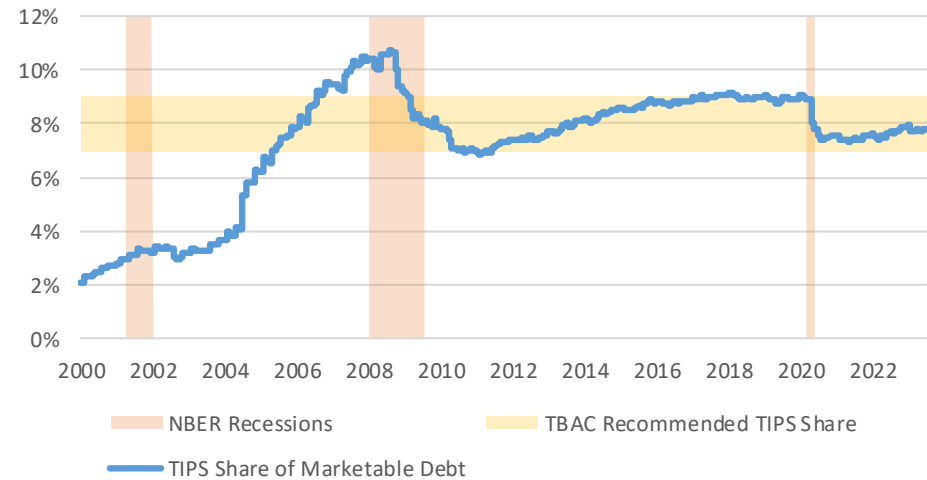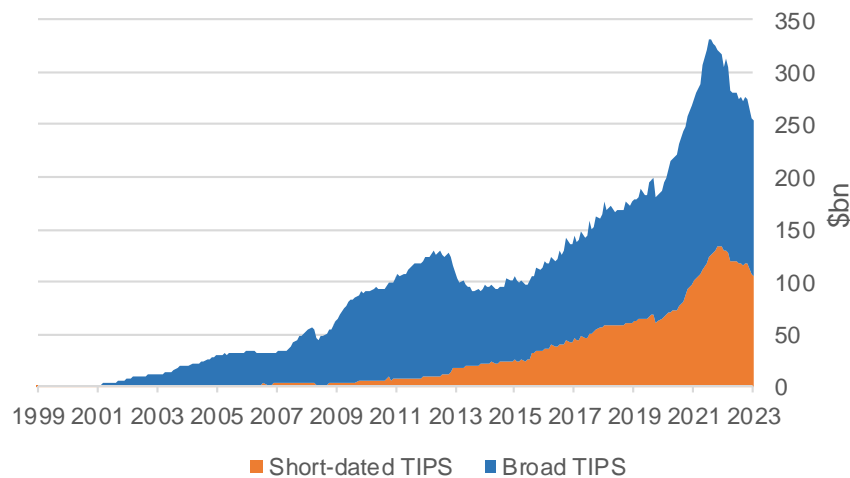
Source: Morningstar; Above AUM only includes dedicated TIPS funds
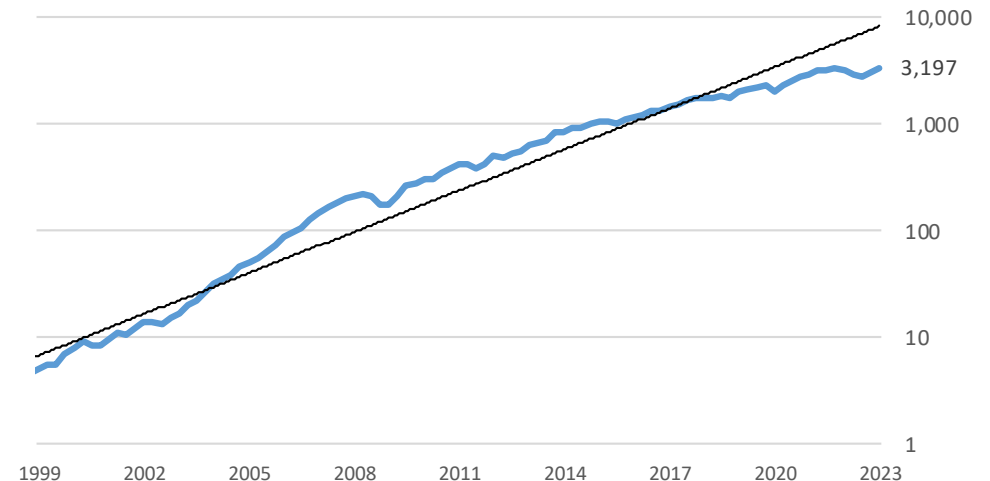
Market Functioning and Liquidity Analysis

Market Functioning – Market Depth

- Even with a modest improvement relative to 2022, market depth remains lower versus pre-COVID period, pointing to somewhat tighter liquidity conditions

- Market depth is generally a function of volatility. When volatility is elevated market depth is generally shallow

- As issuance has picked up post-COVID, market depth as percentage of issuance has receded

10y Market Depth vs 3m10y Daily Implied Vol

—— 10y cash market depth 3M MA (LHS)
—— Implied daily volatility from 3m10y swaption market in basis points RHS (Inverted)

10y Market Depth vs 10y Auction Size

—— 10y cash market depth 3M MA   —— 3M MA 10y auction size

Ratio of 10y Auction Size to 10y Market Depth

—— Ratio
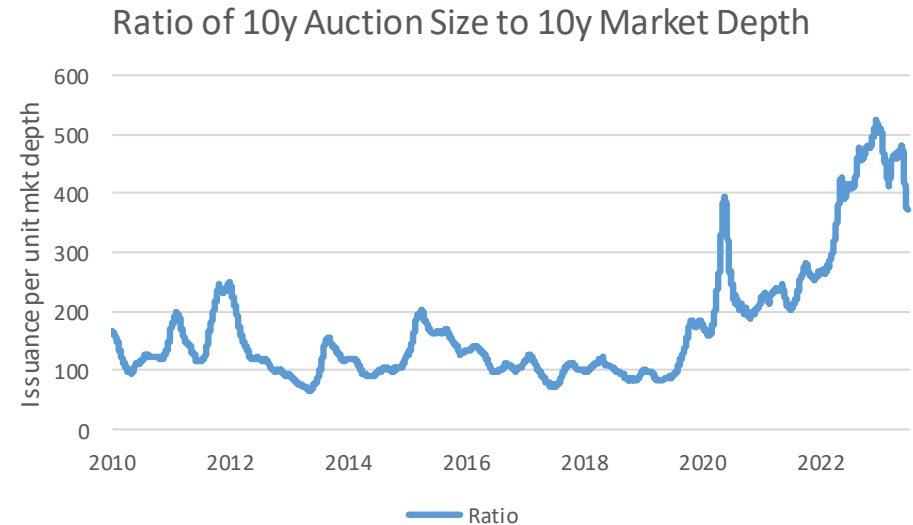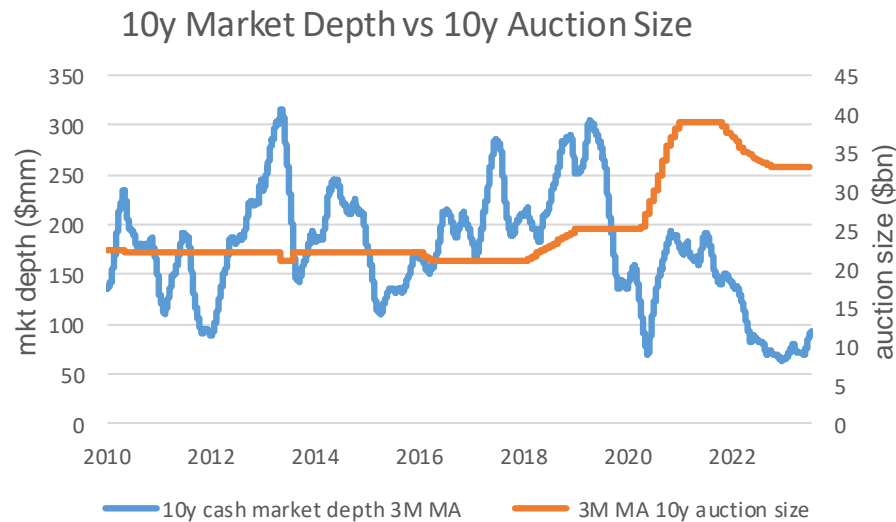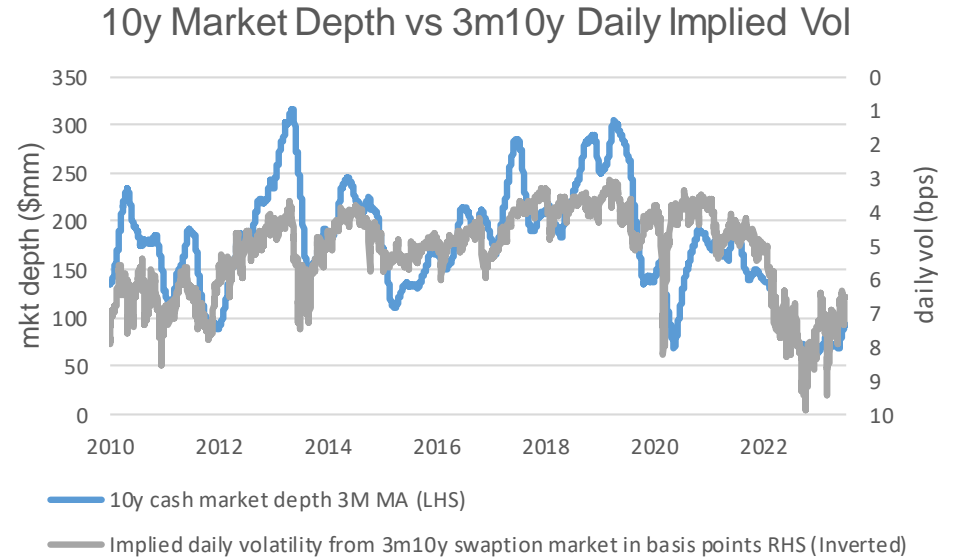
Source: JPM DataQuery
Market depth: cash market depth is the average of the top 3 bids and offers on hotrun Treasuries in the inter-dealer broker CLOB, averaged between 8:30am ET and 10:30am ET daily

Market Functioning – UST Yield Error vs Spline

- Local dislocations, as measured by yield error vs fitted spline, have come down from peak levels observed in 2022 but remain wider than the pre-COVID period

- Yield error vs spline, sector comparison:

  - If we look at different maturity sectors, yield errors (mkt vs fitted spline) are more stretched in the front end of the curve than the very long end of the curve (with the exception of the 20y sector)

  - Due to aged issues rolling down, there are more issues with wider range of coupons and issue size per maturity window as time to maturity shrinks, i.e. there are more issues per sector in the 0-7yr range than the 7y+ range

  - 20y sector continues to exhibit higher yield error even as yield error has improved vs last year

Average Yield Error vs Spline (>1y USTs)
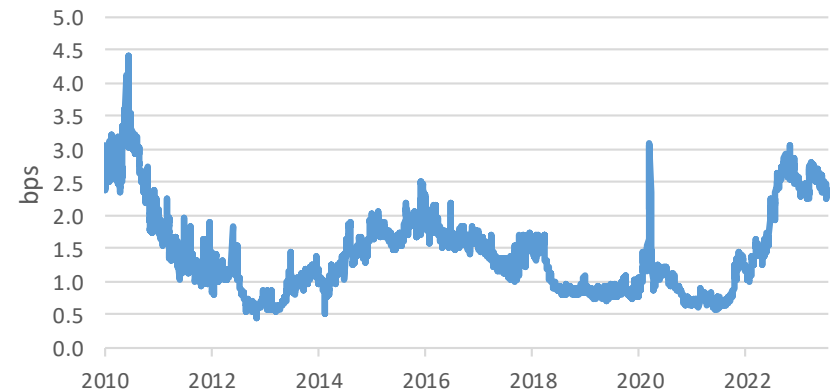
Source: Bloomberg

Average Yield Error vs Spline Split by Sector
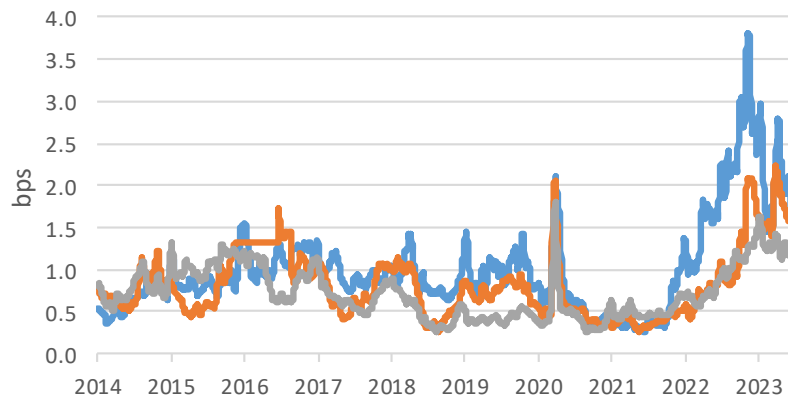
Source: Barclays research

0.5-2y   2-3y   3-6y

Average Yield Error vs Spline Split by Sector
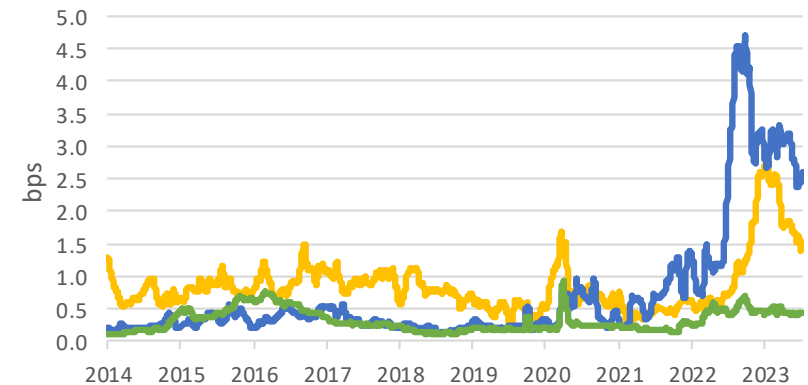
Source: Barclays research

6-11y   11-21y   21y+

Market Functioning – Bid-Ask Spreads

- At the start of the year, bid-ask spreads widened to levels similar to those experienced during pandemic stress. Bid-ask spreads are off the highs of the year but still elevated vs pre-COVID levels

- Both yield error vs spline and bid-ask spread data suggest that the 7y and 20y are more challenged than other points on the curve

Duration Weighted Bid-Ask Across Tenors

Source: Barclays Research

Bid-Ask Spreads for On-the-Run 2y/3y/5y Notes

Source: Barclays Research

Bid-Ask Spreads for On-the-Run 7y/10y Notes

Source: Barclays Research

Bid-Ask Spreads for On-the-Run 20y/30y Bonds

Source: Barclays Research
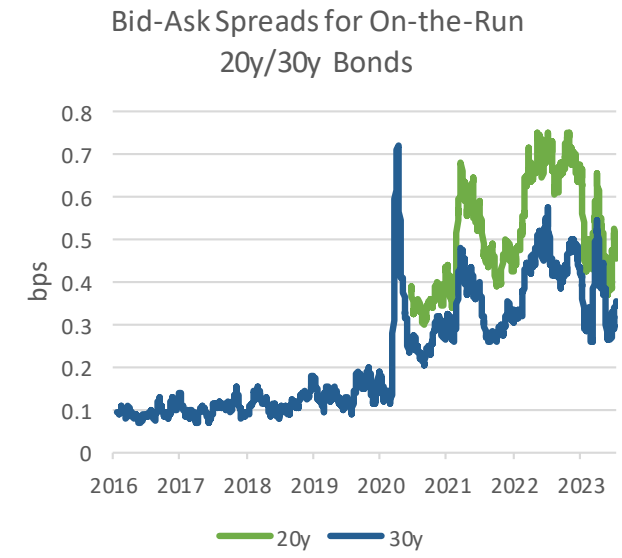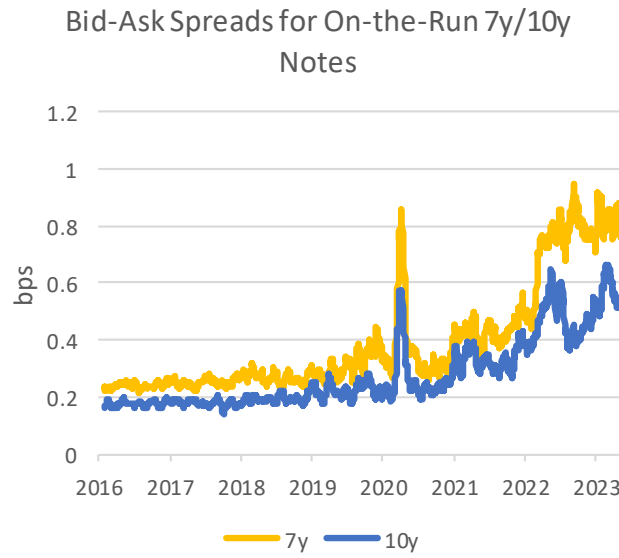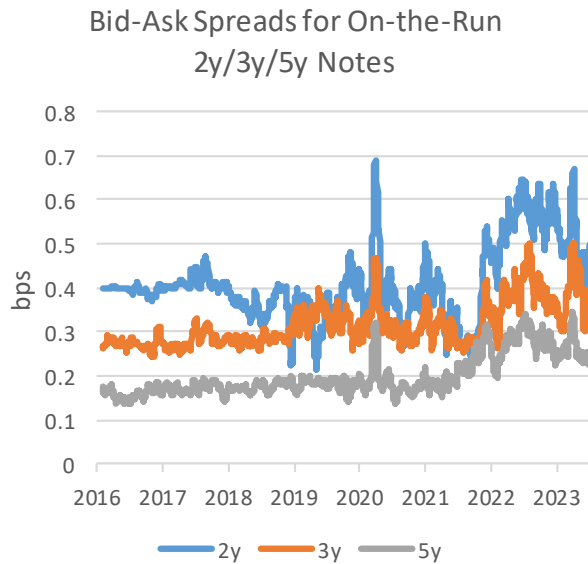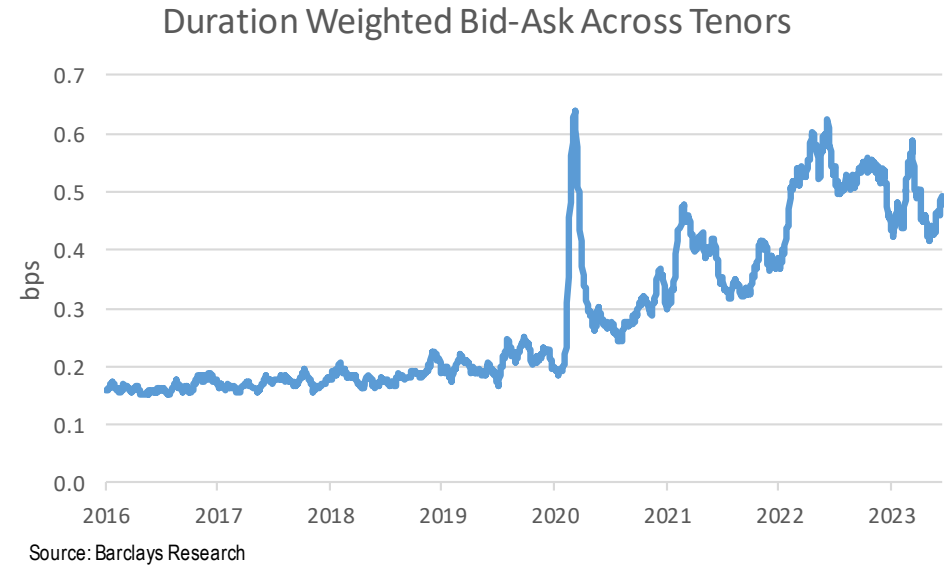
Assessment of Market Functioning

- Market conditions can sustain additional coupon issuance increases but metrics such as relative value and bid-ask spreads warrant caution when increasing auction sizes more meaningfully in 7s and 20s and also favor relative increases in 5s, 10s and 30s

- Treasury market liquidity is driven by many factors: exogenous ones like elevated uncertainly in the macro outlook causing higher realized volatility, as well as micro ones such as aggregate dealer balance sheet size relative to the overall US Treasury market and a lack of true all-to-all platform

- Measures of liquidity such as market depth, yield error, and bid-ask spreads have improved from their most stretched metrics in 2022 but have not returned to their pre-COVID levels

- Trading and liquidity conditions are hard to gauge precisely. In periods of stress, intermediation demand has sometimes exceeded capacity. Treasury should remain vigilant, but we do not see an issue with market functioning at present as it pertains to increases in Treasury coupon issuance

Bills Discussion

Bills – Ownership Breakdown

- Over the last two years the biggest migration has been from Govt MMF to "Other" which is a catchall for a variety of participants including individuals, investment funds, and corporate treasury accounts

T-Bill Ownership as of 3/31/23

T-Bill Ownership 3/31/21
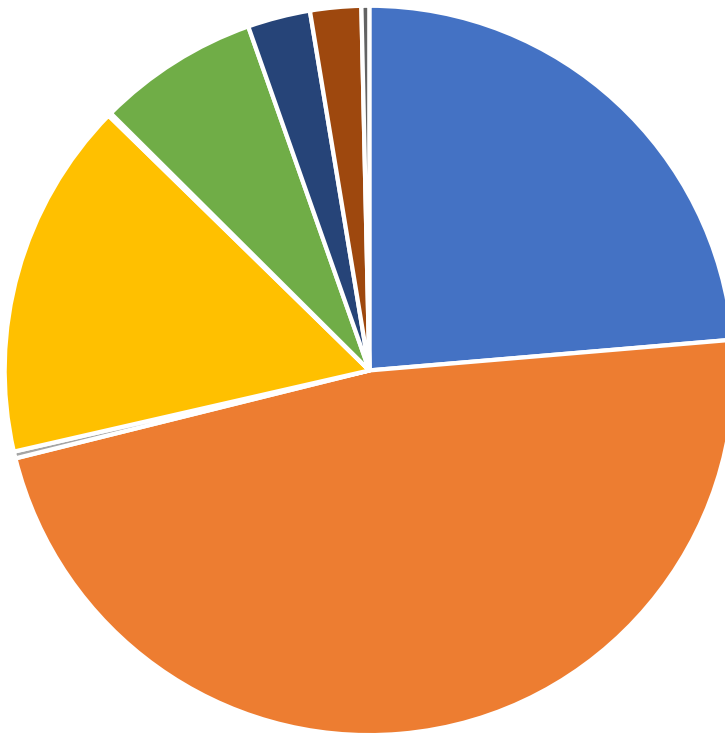
Legend:
- Foreign
- Other
- Prime MMF
- Govt MMF
- Primary Dealers
- Fed
- Local Govts
- Stablecoins
- Offshore MMF

Bills – Recent Demand

- Since the debt ceiling resolution, the inflow of recent T-Bill issuance has been well absorbed

- Money Market Funds (mainly Government Only MMFs) have been supportive of absorbing this new issuance (uptick from near low % of ownership of bills outstanding)

- MMFs likely to help absorb the estimated additional $250bn-$800bn bill supply over the second half of 2023. Currently Gov MMFs ~500bn under their average UST holdings as % of AUM
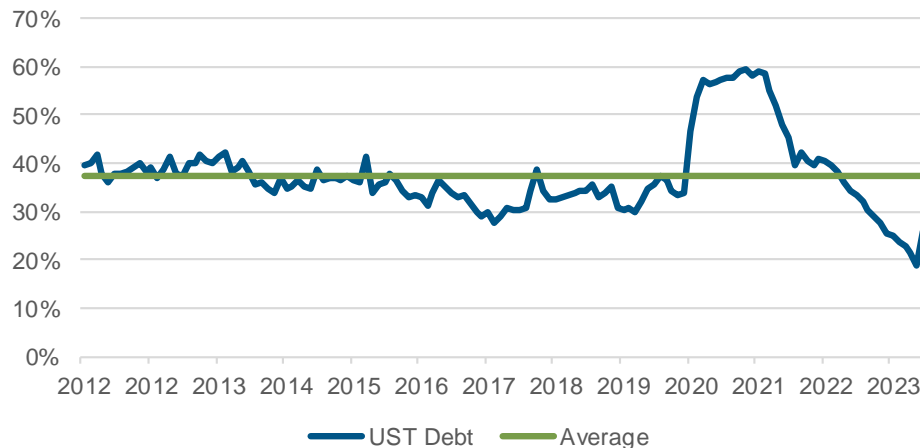
Bills as % of Total UST Outstanding

US Tsys as % of Gov MMF AUM

Cumulative Net T-Bill June through December (Realized and Expected*)
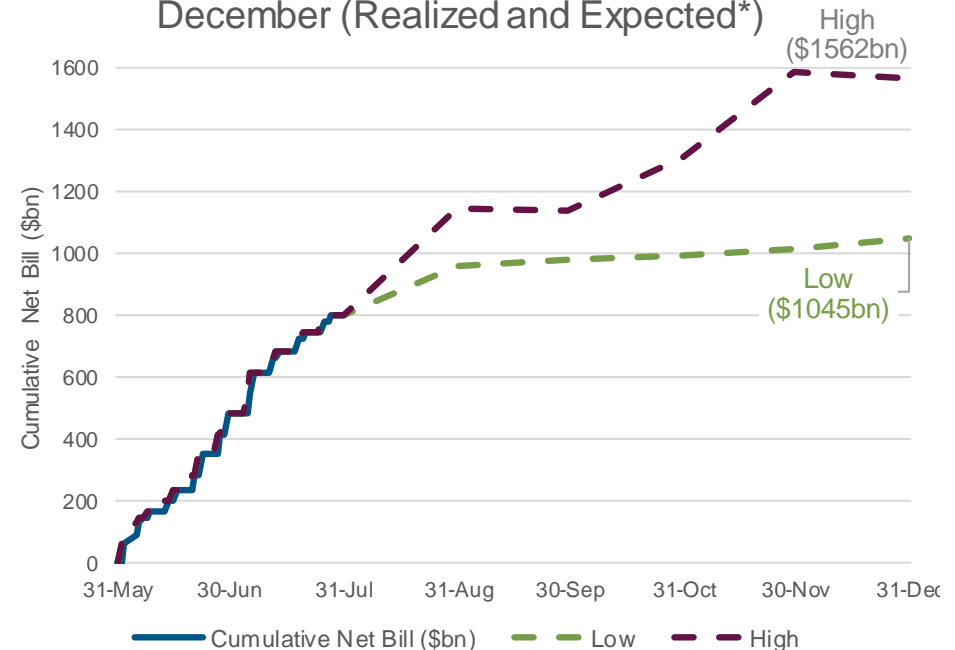
Source: IMoneyNet, Bank of America Research, Bloomberg, committee member data, committee member dealer survey
*committee member dealer survey

Bills – MMF Capacity and WAM

- Government only MMFs have gradually lengthened WAM over the course of 2023, but are still well below the historical average of about 30.5 days WAM

- The bills absorbed by MMFs since debt ceiling resolution have largely been funded by reductions in ON RRP

- As MMFs perceive that we are nearing the end of the Fed's hiking cycle, they have capacity to increase both their WAM and their allocation to bills to more historically typical levels. If MMFs move back to their average WAM while buying bills with an average tenor of 85 days, they would need to need to buy ~$600bn* (estimated by extrapolating capacity of Top 15 RRP Counterparties based upon their share of AUM)

Money Market Fund WAMs

Legend:
— WAM 15 Largest RRP Counterparties (Days)
- - - 5y Average (30.5 Days)

MMF AUM ($bn)	5458
Top 15 RRP Counterparty AUM ($bn)	2519
Top 15 RRP Counterparty RRP ($bn)	1192
Current WAM	21
Average WAM	30
Max WAM	48

$bn to Buy	Days to Add for Top 15 RRP Counterparties						
	4	8	12	16	20	24	28
75	134	269	403	537	672	806	940
80	126	252	378	504	630	756	882
85	119	237	356	474	593	711	830
90	112	224	336	448	560	672	784
95	106	212	318	424	530	636	742
100	101	202	302	403	504	605	705
105	96	192	288	384	480	576	672

(Issuance WAM (days) labels the rows; Days to Add header spans columns 4–28)

*Current WAM of Issuance ~84 Days/Week excluding 52-Week

**Top 15 RRP Counterparties represent ~46% of MMF AUM as of May 31st

MMF AUM and RRP

Legend:
— RRP (LHS, $bn)
— MMF AUM (LHS, $bn)
— RRP/MMF AUM (RHS, %)
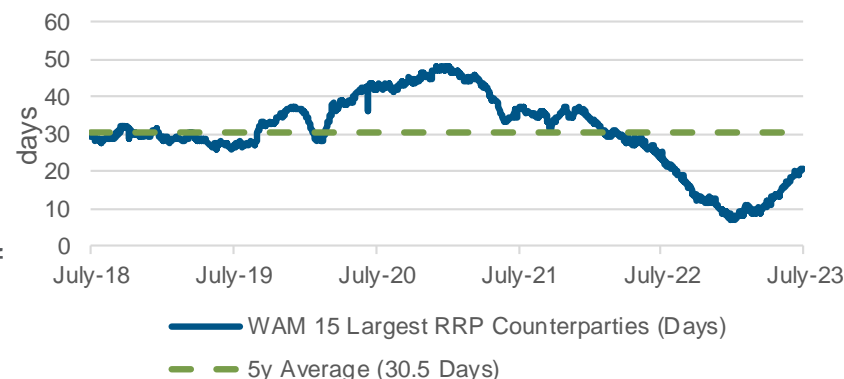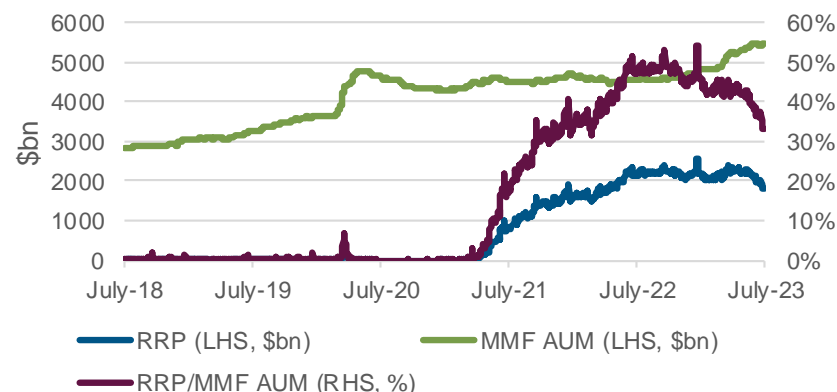
Bills – Valuation Sensitivity to Issuance Changes

- 3m Bills spread to 3m OIS shows very little sensitivity to issuance changes

- In 2020 when issuance went up ~2.5T, 3m bills widened ~10bps to 3m OIS

- During the 2022 aggressive hiking cycle, bills remained rich to what the market was pricing for Fed action

- Net, there appears to be sufficient demand from MMFs to further increase Bills supply slated for rest of the year. Over the medium to longer term, Bills issuance should be looked at in context of overall WAM as well as Bills as a percentage of Treasury Debt Outstanding, generally staying within the TBAC recommended range of 15-20% bill share

Change Bills Outstanding vs Change 3m Bill OIS

Bills Out vs 3m Bill - 3m OIS
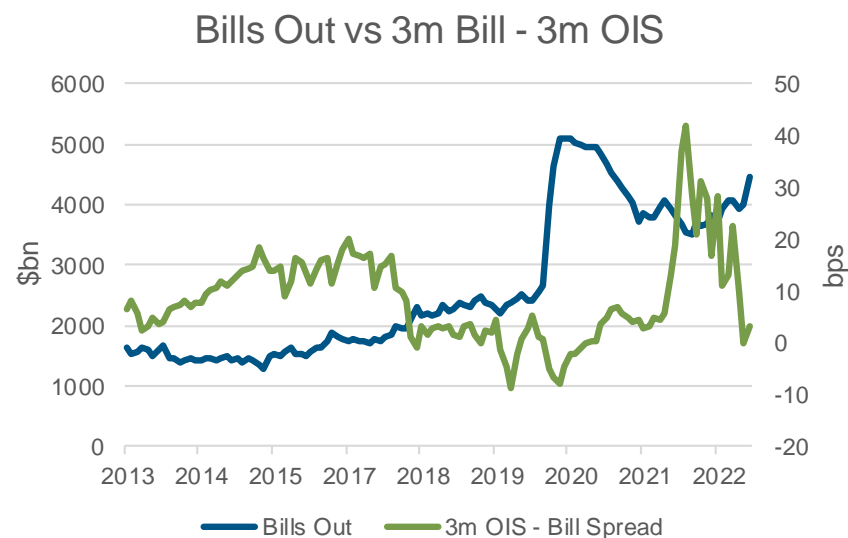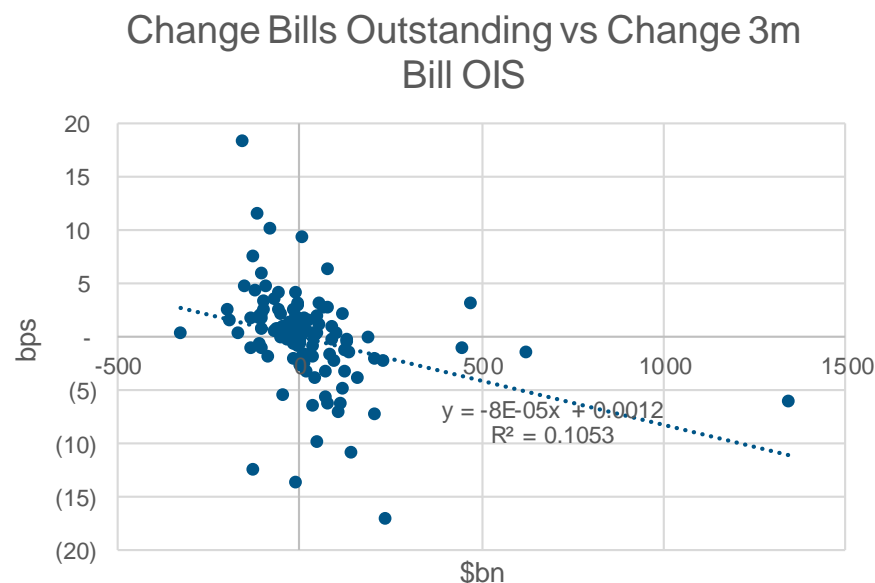
Source: Bloomberg

Issuance Scenarios

Issuance Scenarios

We analyze different issuance scenarios to better understand the impact on WAM, Bills share & TIPS share

- Baseline - Status Quo Scenario where issuance increases in line with the TBAC recommendations to the Treasury from Q2-2023* and then stays static

- Scenario 1: Neutral Issuance Scenario – Coupon issuance increases proportionately along the curve including in TIPS with smaller increase in 7s and 20s with the objective of keeping bills in the 15-20% range long term. Under this scenario, we incorporate the need to increase coupon issuance across the curve as demonstrated by the output of Status Quo. We take into consideration concerns about the relative liquidity of 7s and 20s by increasing those sectors proportionately less vs surrounding sectors

- Scenario 2: Longer Tenors – Here we incorporate the history suggesting that term premium could be less steep than assumed in the Optimal Debt Structure Model & increase issuance in longer tenors while reducing issuance in shorter tenors proportionately. Per the output of the Optimal Debt Structure model, this reduces deficit volatility while incurring only a small increase in cost

- Scenario 3: Shorter Tenors – Here we adopt a strategy focused on cost minimization & increase issuance in shorter tenors while proportionately reducing issuance in longer tenors. While expected costs are reduced, this increases deficit volatility

Issuance Scenarios Details

Status Quo Scenario (in $bn)

MM	YY	2Y	3Y	5Y	7Y	10Y	20Y	30Y	5Y TIP	10Y TIP	30Y TIP	2Y FRN
5	2023	42	40	43	35	35	15	21	0	15	0	22
6	2023	42	40	43	35	32	12	18	20	0	0	22
7	2023	42	40	43	35	32	12	18	0	17	0	24
8	2023	44	42	45	36	37	16	23	0	0	8	22
9	2023	46	44	47	37	34	13	20	0	15	0	22
10	2023	46	44	47	37	34	13	20	22	0	0	24
11	2023	46	44	47	37	37	16	23	0	15	0	22
12	2023	46	44	47	37	34	13	20	20	0	0	22

Status Quo Scenario Increases (in $bn)

MM	YY	2Y	3Y	5Y	7Y	10Y	20Y	30Y	5Y TIP	10Y TIP	30Y TIP	2Y FRN
5	2023	0	0	0	0	0	0	0		0		0
6	2023	0	0	0	0	0	0	0	0			0
7	2023	0	0	0	0	0	0	0		0	0	0
8	2023	2	2	2	1	2	1	2			0	0
9	2023	2	2	2	1	2	1	2		0		0
10	2023	0	0	0	0	2	1	2	0			0
11	2023	0	0	0	0	0	0	0		0		0
12	2023	0	0	0	0	0	0	0	0			0

Scenario 1: Neutral Issuance (in $bn)

MM	YY	2Y	3Y	5Y	7Y	10Y	20Y	30Y	5Y TIP	10Y TIP	30Y TIP	2Y FRN
7	2023	42	40	43	35	32	12	18	0	17	0	24
8	2023	45	43	46	37	38	17	24	0	0	8	22
9	2023	48	46	49	39	35	14	21	0	15	0	22
10	2023	51	49	52	41	35	14	21	23	0	0	25
11	2023	54	52	55	43	41	19	27	0	15	0	23
12	2023	57	55	58	45	38	16	24	21	0	0	23
1	2024	59	57	60	46	38	16	24	0	18	0	26
2	2024	61	59	62	47	43	20	29	0	0	10	24
3	2024	63	61	64	48	40	17	26	0	16	0	24
4	2024	65	63	66	49	40	17	26	24	0	0	27
5	2024	67	65	68	50	45	21	31	0	16	0	25
6	2024	69	67	70	51	42	18	28	22	0	0	25
7	2024	69	67	70	51	42	18	28	0	19	0	27
8	2024	69	67	70	51	45	21	31	0	0	9	25
9	2024	69	67	70	51	42	18	28	0	17	0	25

Scenario 1: Neutral Issuance Increases (in $bn)

MM	YY	2Y	3Y	5Y	7Y	10Y	20Y	30Y	5Y TIP	10Y TIP	30Y TIP	2Y FRN
7	2023	0	0	0	0	0	0	0		0		0
8	2023	3	3	3	2	3	2	3			0	0
9	2023	3	3	3	2	3	2	3		0		0
10	2023	3	3	3	2	3	2	3	1			1
11	2023	3	3	3	2	3	2	3		0		1
12	2023	3	3	3	2	3	2	3	1			1
1	2024	2	2	2	1	3	2	3		1		1
2	2024	2	2	2	1	2	1	2			1	1
3	2024	2	2	2	1	2	1	2		1		1
4	2024	2	2	2	1	2	1	2	1			1
5	2024	2	2	2	1	2	1	2		1		1
6	2024	2	2	2	1	2	1	2	1			1
7	2024	0	0	0	0	2	1	2		1		0
8	2024	0	0	0	0	0	0	0			1	0
9	2024	0	0	0	0	0	0	0		1		0

Issuance Scenarios Details

Scenario 2: Longer Tenors (in $bn)

MM	YY	2Y	3Y	5Y	7Y	10Y	20Y	30Y	5Y TIP	10Y TIP	30Y TIP	2Y FRN
7	2023	42	40	43	35	32	12	18	0	17	0	24
8	2023	44	42	45	36	39	17	25	0	0	8	22
9	2023	46	44	47	37	36	14	22	0	15	0	22
10	2023	48	46	49	38	36	14	22	23	0	0	25
11	2023	50	48	51	39	43	19	29	0	15	0	23
12	2023	52	50	53	41	40	16	26	21	0	0	23
1	2024	54	52	55	42	40	16	26	0	18	0	26
2	2024	56	54	57	43	46	21	32	0	0	10	24
3	2024	58	56	59	44	43	18	29	0	16	0	24
4	2024	60	58	61	45	43	18	29	24	0	0	27
5	2024	62	60	63	46	49	23	35	0	16	0	25
6	2024	64	62	65	47	46	20	32	22	0	0	25
7	2024	64	62	65	47	46	20	32	0	19	0	27
8	2024	64	62	65	47	49	23	35	0	0	9	25
9	2024	64	62	65	47	46	20	32	0	17	0	25

Scenario 2: Longer Tenors Increases (in $bn)

MM	YY	2Y	3Y	5Y	7Y	10Y	20Y	30Y	5Y TIP	10Y TIP	30Y TIP	2Y FRN
7	2023	0	0	0	0	0	0	0		0		0
8	2023	2	2	2	1	4	2	4			0	0
9	2023	2	2	2	1	4	2	4		0		0
10	2023	2	2	2	1	4	2	4	1			1
11	2023	2	2	2	1	4	2	4		0		1
12	2023	2	2	2	2	4	2	4	1			1
1	2024	2	2	2	1	4	2	4		1		1
2	2024	2	2	2	1	3	2	3			1	1
3	2024	2	2	2	1	3	2	3		1		1
4	2024	2	2	2	1	3	2	3	1			1
5	2024	2	2	2	1	3	2	3		1		1
6	2024	2	2	2	1	3	2	3	1			1
7	2024	0	0	0	0	3	2	3		1		0
8	2024	0	0	0	0	0	0	0			1	0
9	2024	0	0	0	0	0	0	0		1		0

Scenario 3: Shorter Tenors (in $bn)

MM	YY	2Y	3Y	5Y	7Y	10Y	20Y	30Y	5Y TIP	10Y TIP	30Y TIP	2Y FRN
7	2023	42	40	43	35	32	12	18	0	17	0	24
8	2023	46	43	47	37	38	16	23	0	0	8	22
9	2023	50	46	51	39	35	13	20	0	15	0	22
10	2023	54	49	55	41	35	13	20	23	0	0	25
11	2023	58	52	59	43	41	17	25	0	15	0	23
12	2023	62	55	63	45	38	14	22	21	0	0	23
1	2024	65	57	66	46	38	14	22	0	18	0	26
2	2024	68	59	69	47	43	17	26	0	0	10	24
3	2024	71	61	72	48	40	14	23	0	16	0	24
4	2024	74	63	75	49	40	14	23	24	0	0	27
5	2024	77	65	78	50	45	17	29	0	16	0	25
6	2024	79	67	81	51	42	14	24	22	0	0	25
7	2024	79	67	81	51	42	14	24	0	19	0	27
8	2024	79	67	81	51	45	17	29	0	0	9	25
9	2024	79	67	81	51	42	14	24	0	17	0	25

Scenario 3: Shorter Tenors Increases (in $bn)

MM	YY	2Y	3Y	5Y	7Y	10Y	20Y	30Y	5Y TIP	10Y TIP	30Y TIP	2Y FRN
7	2023	0	0	0	0	0	0	0		0		0
8	2023	4	3	4	2	3	1	2			0	0
9	2023	4	3	4	2	3	1	2		0		0
10	2023	4	3	4	2	3	1	2	1			1
11	2023	4	3	4	2	3	1	2		0		1
12	2023	4	3	4	2	3	1	2	1			1
1	2024	3	2	3	1	3	1	2		1		1
2	2024	3	2	3	1	2	0	1			1	1
3	2024	3	2	3	1	2	0	1		1		1
4	2024	3	2	3	1	2	0	1	1			1
5	2024	3	2	3	1	2	0	3		1		1
6	2024	2	2	3	1	2	0	1	1			1
7	2024	0	0	0	0	2	0	1		1		0
8	2024	0	0	0	0	0	0	0			1	0
9	2024	0	0	0	0	0	0	0		1		0

Issuance Scenarios

- If Coupon issuance is not increased beyond 2023Q2 TBAC recommendations, Bills share increases significantly and WAM declines

- Bills share exceeds 20% for a period before stabilizing within recommended range in all increased coupon issuance scenarios but begins to decline below the 15%-20% range sooner under Scenario 3 (higher shorter tenor issuance)

- Without further increases to TIPS auction sizes, TIPS share falls in all issuance scenarios. Stabilizing TIPS issuance within the 7-9% range requires increasing TIPS auction sizes by 2bn at each auction

- Further study to consider options like adjustment in TIPS calendar schedule to accommodate higher total TIPS issuance could be helpful

WAM

Bills as a %age of Treasury Debt Outstanding

TIPS as a %age of Treasury Debt Outstanding
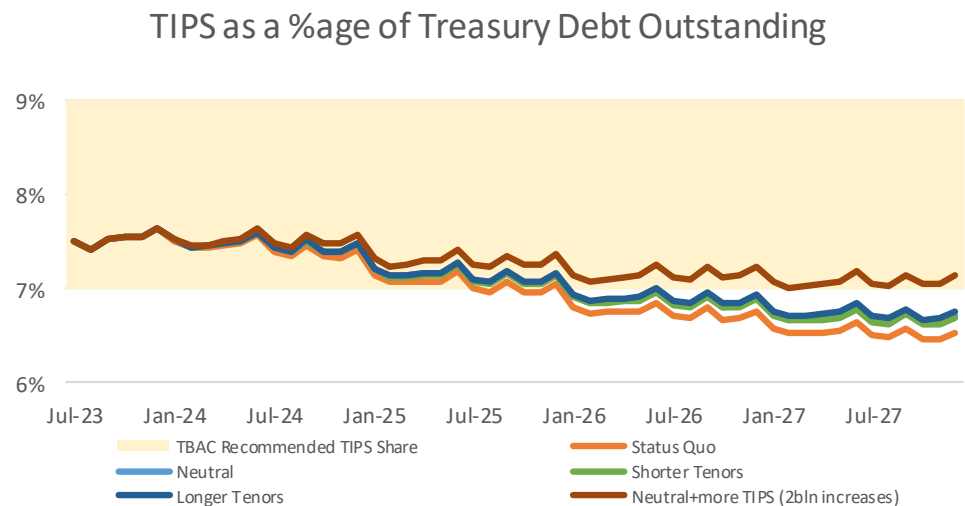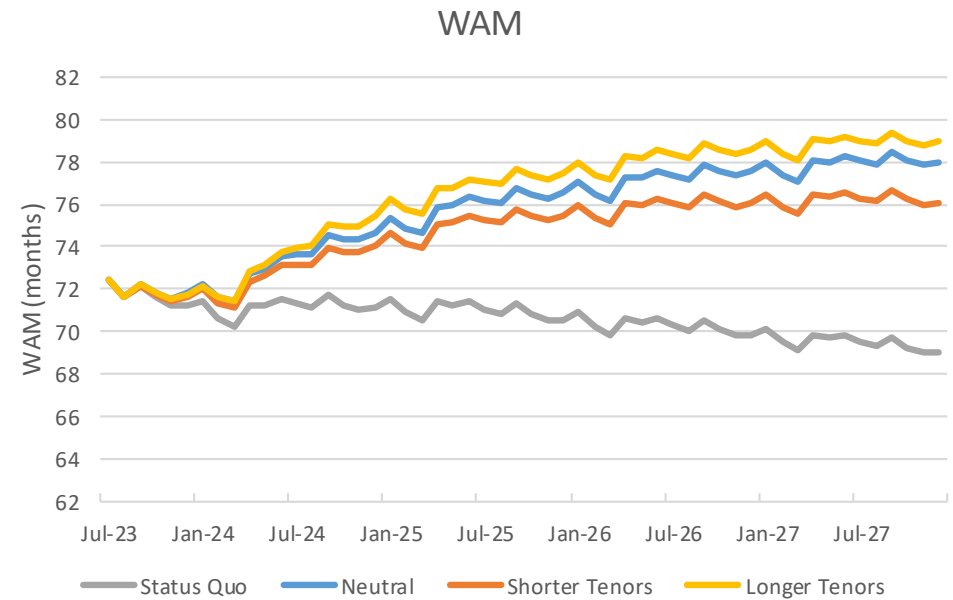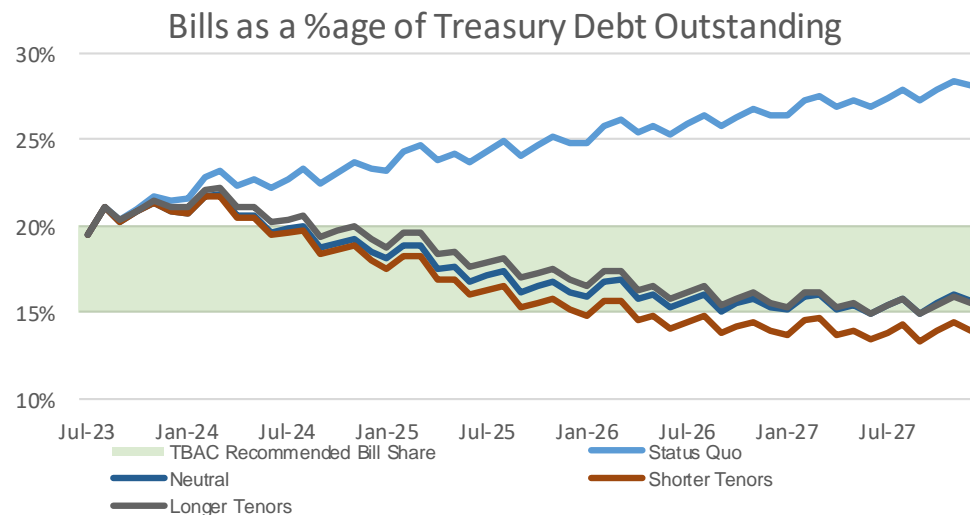
Conclusions

- Optimal Debt Structure Model highlights elevated debt service cost, primarily due to increased size of the stock of Treasury debt

  - Model preferences include belly issuance, small TIPS issuance increases, and if lower term premium persists, increases in longer dated issuance, which would reduce deficit volatility at small incremental costs

- While demand for Treasury issuance remains strong across all tenors, some segments bear watching:

  - Cheapness in 7s has reduced recently, but could reemerge as auction sizes increase

  - Cheapness in 20s has been persistent and supports lower relative increases in issuance

- Given its funding needs, Treasury should increase coupon issuance in a regular and predictable manner across the curve, including in TIPS, while making less than proportionate increases in 7s and 20s.(Scenario 1)

- Decline in Term Premium, if it persists, supports additional incremental issuance in longer tenors vs shorter tenors (Scenario 2). Note, some of the factors that have lead to decline in term premium can reverse

- Treasury should continue to focus on Bills share, TIPS share, WAM and relative sector valuation when analyzing its auction choices, and will need to make trade-offs recognizing the increase in coupon issuance needed

- TIPS demand has declined somewhat more recently as shorter dated TIPS ETFs have seen outflows. Nonetheless, we think the market can absorb increases of at least 1bn per auction across TIPS tenors due to generally healthy demand. Further study to consider options like adjustment in TIPS calendar schedule to accommodate higher total TIPS issuance could be helpful

- The recent rapid increase in Bills supply has been well absorbed. MMFs have significant room to absorb additional Bills supply particularly as we approach the late stages of the hiking cycle, when MMFs may find it desirable to extend WAM toward prior averages, which can be facilitated by adding more Bills

- Market functioning analysis continues to point towards weaker liquidity environment relative to pre-COVID period with elevated volatility as the largest driver. Treasury should remain vigilant, but we do not see an issue with market functioning at present as it pertains to increases in Treasury issuance