



RESEARCH

Insights

Fixed Income Market Structure Compendium

2023 Market Metrics & Themes

April 2024

A Conversation with Coalition Greenwich: Electronic trading – Treasuries ~2/3 notional volume; IG corporates 42%, HY 30%. **Surprise** – corporate bond trade count +20% in 2023, due to retail investors. **Trends** – Treasury clearing/big market change, AI/sophisticated screeners, Basel III Endgame/constraining capital allocation. **Dealer positions** – primary dealer corporate bond holdings dropped 77% between 2017 and 2022, while trading volume grew 29%. **Treasury volumes** – breaking \$900B ADV; market dynamics keep volumes high. **Volatility** – MOVE index sustainably high but has come down; 2021 = 61.84, 2022 = 120.23, 2023 = 121.66, YTD 106.84.

Market Themes: UST Issuance – issuance estimated to be almost \$4T for FY23 + 1Q24, +305.7% to historical average. Treasuries outstanding at \$26.4T (U.S. government interest payable at \$81.5B, +17.4% Y/Y). **UST Holders** – Treasury demand has shifted. Fed holds 18.1%, now selling. Foreign holds 31.2%, top two (Japan, China) now selling. Demand is now taken up by asset managers & hedge funds, which are price sensitive. **Federal Debt** – now \$34.0T, +54.4% in five years and the trend is increasing (Y/Y changes): +3.5% in 1Q23, +5.8% in 2Q23, +7.2% in 3Q23, and +8.2% in 4Q23. An unsustainable trajectory. **MOVE vs. VIX** – correlations b/t equity (VIX) & bond (MOVE) volatilities shifted from 0.6238 since 2000 to 0.2276 since 2001 (-63.5%) & 0.5640 in 2023 (-9.6%). Equity investors more complacent around market movements.

Market Metrics (2023 average, Y/Y change): Total – issuance \$8.3T, -6.3%; ADV \$1.1T, +9.0%; outstanding \$43.0T, +6.5%. **UST** – issuance \$3.5T, -8.1%; ADV \$760.5B, +11.0%; outstanding \$26.4T, +10.2%. **Corporates** – issuance \$1.4T, +5.4%; ADV \$42.5B, +6.6%; outstanding \$10.6T, +1.6%

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A Report from Coalition Greenwich & SIFMA Insights: Understanding Fixed Income Markets in 2023

Fixed-income markets are the lifeblood of the global economy. Access to credit—in other words, the ability to borrow money—played a major role in society's evolution over the past 500 years and continues to support innovation for economic and social advancement today.

Modern fixed-income markets are multifaceted, with lending made available in many forms (i.e., bonds and loans) and via a variety of lenders, from traditional banks to long-term investors to emerging technology companies. While the underpinnings of these markets can feel complex, understanding why they exist, how they have evolved over time and how these markets operate today is crucial to ensure they remain robust and effective going forward.

To that end, this research examines the core segments of the fixed income markets, with a focus on bond markets, the size of those markets, their market participants, and the mechanisms in place to both invest in and trade those products.

You can find this fixed income primer at: <https://www.sifma.org/wp-content/uploads/2023/05/Understanding-Fixed-Income-Markets-2023-23-2007.pdf>

Executive Summary

A Conversation with Coalition Greenwich

To learn more about key trends in fixed income markets in 2023, we sat down with Kevin McPartland, Head of Market Structure and Technology Research at Coalition Greenwich. This is an edited summary of Coalition Greenwich's responses.

Electronic trading: In 2023, overall electronic trading of Treasuries was roughly flat, and we've been at roughly two-thirds of the notional volume traded electronically for the better part of the last decade. The shift we've seen over the last three to four years is electronic trading is increasingly done between dealers and clients. We now have dealer and client each trading now over 60%. On the corporate bond side, we have seen a very strong growth story over the last ten years from an electronic trading perspective. 2023 investment grade electronic trading accounted for 42% of notional volume versus low teens a decade ago; high yield 30% of total volume versus low single digits.

Surprising trend: In corporate bonds, at the end of 2022 after the Fed started to raise rates, volumes really started to grow. It was less about the notional volumes and more about the average daily trade count, signifying a huge influx of retail interest in the bond market. From 2021 to 2022, the average daily trade count effectively doubled – hitting almost 100,000 trades a day – and growth continued in 2023. We were up another 20% from a trade count perspective in 2023, and, so far in 2024, the trend continues.

Key Trends: It's hard to not talk about regulations – the mandate for clearing of Treasuries and Treasury repo is going to have a big impact on the market, a huge, huge move for the marketplace. It's hard to not talk about AI. In the bond market, there's been AI underpinning a lot of evaluated pricing for a number of years that's only getting more sophisticated, specifically the ability to use Generative AI for searching large sets of data. Then, as the last theme, the Basel III Endgame rules could have a very big impact on how banks allocate capital and the cost of that capital, which, ultimately can impact liquidity in the bond market.

Dealer positions vs. ADV: We looked at the role of dealers in the bond market and how they provide liquidity. The take away there was this is clearly increasingly an agency market, whether that's because dealers can't commit the capital, they don't want to commit the capital, or they feel they don't need to commit the capital. The average daily bond value (traded) continues to go up and up and up. And, in that same period, largely speaking, dealer net positions continue to go down. Primary dealer corporate bond holdings dropped 77% between 2017 and 2022, while trading volume grew 29%.

Treasury volumes: The electronic trading side of this story is that the market structure that has been developed has allowed the market to trade at these high volumes (reaching over \$900+ billion ADV). But the real drivers of volume are definitely macro – we're in one of those states where everybody's waiting to figure out what the Fed is going to do next and trying to position around that. There's a lot more uncertainty and disagreement as to what direction the market will go. This is great because that's what really makes active capital markets – you have people willing to be on both sides of every trade. I think those dynamics are definitely helping to keep these volumes as high as they've been.

Volatility: Equity market volatility (VIX) has been very low while the interest rate market volatility (MOVE) has been sustainably high. It does seem like it has calmed down slightly in the last couple of weeks yet remains much higher

than in 2021. (MOVE average price: 2021 = 61.84, 2022 = 120.23, 2023 = 121.66, YTD 106.84.) We're going to continue to watch volatility, which speaks to the to the health and next steps in markets.

Recapping 2023: Market Themes

Never Ending Treasury Issuance: On average for the last ten years prior to COVID, Treasury issued around \$1 trillion in privately held net marketable securities. Issuance is estimated to be almost \$4 trillion for full year 2023 plus only one quarter of 2024, +305.7% to the historical average. This puts Treasuries outstanding at \$26.4 trillion (and accrued interest payable for the U.S. government at \$81.5 billion, +17.4% Y/Y).

Shifting Treasury Holders Composition: At the same time, the demand picture and therefore the composition by investor type for Treasuries have shifted. Currently, the Fed holds 18.1% of total Treasuries outstanding. Foreign holders represent 31.2%, and other holders represent 51.3%. The Fed is now a net seller of Treasuries, with its balance sheet down 15.6% since the April 2022 peak. The top two foreign holders of U.S. Treasuries – Japan and China, accounting for almost one-fourth of foreign holdings – have been backing away from buying. Treasury supply take up is now resting in the hands of asset managers and hedge funds, which are sensitive to prices (the Fed and foreign buyers were not).

Creating an Unsustainable Trajectory for Federal Debt? Never ending fiscal spending leading to significantly elevated levels of Treasury issuance. The shifting composition of Treasury holders to more price sensitive buyers. A Debt/GDP ratio over 120% and rising. The federal debt level is now at \$34.0 trillion, a 54.4% increase in just five years (from the start of 2019 to the end of 2023). And the trend is increasing (Y/Y changes): +3.5% in 1Q23, +5.8% in 2Q23, +7.2% in 3Q23, and +8.2% in 4Q23. Many in markets have deemed this an unsustainable trajectory.

A Tale of Two Volatilities: Comparing the implied volatilities for equities and bonds – the VIX and the MOVE indices, sentiment gauges for market uncertainty or risk – we see a shift in directional correlations between the two indices, which was 0.6238 since 2000. Starting in 2021, you can see the correlation loosening – a 0.2276 correlation since 2021, -63.5% to the full time series correlation. This shows that while equity investors have been complacent around equity market movements, bond investors still expect significant future volatility in interest rates. This picture shifted somewhat in 2023, with the correlation increasing to 0.5640, still -9.6% to the full time series correlation. Bond investors continue to expect future volatility in interest rates, but to a lesser extent since the back half of last year.

Recapping 2023: Market Metrics

Inside this note, we analyze 2023 trends for fixed income markets issuance, trading average daily volume (ADV), and outstanding across the total market, U.S. Treasuries (UST), corporate bonds (corporates), mortgage-backed securities (MBS), federal agency securities (agency), municipal bonds (munis), and asset-backed securities (ABS).

We highlight the following metrics and themes for the year:

(Annual averages, Y/Y change is annual average/annual average)

- **Total**
 - Issuance (long-term only) \$8.3T, -6.3% Y/Y
 - ADV \$1.1T, +9.0% Y/Y
 - Outstanding \$43.0T, +6.5% Y/Y
- **UST**
 - Issuance (long-term only) \$3.5T, -8.1% Y/Y
 - ADV \$760.5B, +11.0% Y/Y
 - Outstanding \$26.4T, +10.2% Y/Y
- **Corporates**
 - Issuance \$1.4T, +5.4% Y/Y
 - ADV \$42.5B, +6.6% Y/Y
 - Outstanding \$10.6T, +1.6% Y/Y
- **MBS**
 - Issuance \$1.4T, -35.4% Y/Y
 - ADV \$256.1B, +4.2 % Y/Y
- **Agency**
 - Issuance \$1.3T, +57.3% Y/Y
 - ADV \$3.6B, +42.5% Y/Y
 - Outstanding \$1,935.7B, +1.4% Y/Y
- **Munis**
 - Issuance \$380.5B, -2.6 Y/Y
 - ADV \$13.2B, -5.7% Y/Y
 - Outstanding \$4.0T, +0.2% Y/Y
- **ABS**
 - Issuance \$263.2B, -13.1% Y/Y
 - ADV \$1.7B, +5.9% Y/Y

A Conversation with Coalition Greenwich

Katie Kolchin: To learn more about key trends in fixed income markets in 2023, we sat down with Kevin McPartland, Head of Market Structure and Technology Research at Coalition Greenwich. This section is an edited summary of that conversation.

Welcome, Kevin.

Kevin McPartland: Thanks for having me, Katie.

Katie Kolchin: Let's begin with electronic trading. Coalition Greenwich provides good data in this area, updating your numbers monthly. Where are we in electronic trading for Treasuries?

Kevin McPartland: The U.S. Treasury market has obviously been the center of attention for a variety of reasons over the last few years, and changes in electronic trading are definitely on the list. What I found interesting in 2023 was if we look at overall electronic trading of Treasuries, it was roughly flat. And we've been at about the same level, at roughly two-thirds of the notional volume traded electronically, for the better part of the last decade, which I think surprises some people. It feels like we've only recently seen this push, but Treasuries have actually been quite electronic for some time. What changed, though, over the last few years is that about a decade ago, most of the electronic trading was done in the interdealer market. The shift we've seen over the last three to four years is that electronic trading is increasingly done between dealers and clients.

If we look at the dealer-to-client electronic trading, for the full year of 2023, it came in at 58% of volume, which was up three percentage points from 2022. Now that we're up through the first quarter of 2024, that's continued to move forward even more. We have both dealer and client trading now over 60%, which had never been the case before. An interesting comparison point – February was a record volume month for U.S. Treasuries. The average daily volume was just shy of \$920 billion per day, which is incredible. It was second only to March 2020, where the average daily volume was \$940 billion per day. If we zoom in on the electronic trading of clients in those periods in March 2020, electronic trading was only about 1/3 of volume. Fast forward to now, and it was, as I said, about 60%. That is an incredible shift, even in these very high-volume periods. Clients are more and more are looking to the screen to get those orders done.

Katie Kolchin: Interesting. What about on the corporate bond side, across both investment grade and high yield?

Kevin McPartland: Corporate bonds have really been a very strong growth story over the last 10 years from an electronic trading perspective. To summarize, 2023 investment-grade electronic trading accounted for 42% of the notional volume, which is up two percentage points from the year before. High-yield electronic trading accounted for 30% of the total volume, which was roughly flat from the year before. Again, go back a decade to truly understand the growth. About a decade ago, high-yield electronic trading was almost non-existent. It was low single-digit percentages at best, with investment grade in the low teens.

Now we're at a point where we are getting very, very close to the day when half of investment-grade activity will be done electronically, which really is pretty amazing. There was a period of growth right at the beginning of the pandemic, as people were working from home and needed that automation. Then we had a big plateau in 2022 and 2023 where it felt like trading had hit a ceiling – we really weren't growing. That is now behind us. In the fourth

quarter of last year and the first quarter of 2024, we're seeing that growth come back. In February, we hit 46% of electronic trading in investment grade, which is again incredible, and I do think we're quickly getting to that 50% number. Only two or three years ago, I think many people would have felt it was effectively an impossibility. We're very much getting there.

Katie Kolchin: Very interesting. Let's move onto some of the key trends and themes that you identified for last year. I'm going to start with what surprised you – if anything – last year?

Kevin McPartland: In corporate bonds specifically, one thing that was really shocking when it happened was at the end of 2022 after the Fed started to raise rates, the volumes in the corporate bond market really started to grow. It was less about the notional volumes and more about the average daily trade count. What that signified was a huge influx of retail interest in the bond market, as yields were starting to look attractive for the first time in many years. From 2021 to 2022, the average daily trade count effectively doubled, hitting almost 100,000 trades a day, which felt really incredible. Now what surprised me in 2023 was that this growth continued. It had felt like the retail demand would flood in and people would get positioned, and then we would come back down to a normal state. It appears that that sort of high trade count is the new normal state. We were up another 20% from a trade count perspective in 2023, and, so far in 2024, the trend continues.

Notional volumes and average daily trade counts are both up in the first quarter. We saw multiple record volume days in the corporate bond market, again on both counts and notional perspectives. The busiest notional volume day in the corporate bond market ever was on February 29th – a good leap year record – where \$81 billion traded, which is more than double the total ADNV for all of 2023. Really, there is just incredible interest and activity in the corporate bond market, I think largely based around expectations of what the Fed will do next.

Katie Kolchin: It looks like the diamond hands have moved into the fixed income markets.

Kevin McPartland: Yes. We shall see if retail continues to see that interest there. And I think a lot of the retail demand is both from separately managed accounts now that trading in those accounts can be largely automated, whereas that wasn't the case before electronic trading. And then we really can't ignore ETFs. Fixed income ETFs are a huge outlet for retail demand to catch income exposure. While trading in ETFs doesn't necessarily require the underlying bonds to trade, the activity keeps those prices in line from the institutional part of the world, which forms a big component of total market volumes.

Katie Kolchin: Fascinating. Now, let's move on. What are some of the other trends you saw?

Kevin McPartland: Every year we think about the big trends to watch going forward based on what we saw in the previous year. It's hard to not talk about regulations, particularly from the SEC. The big news towards the end of 2023 – what's going to consume us likely for the next few years – is the mandate for clearing of Treasuries and Treasury repo. It is super interesting and definitely going to have a big impact on the market. It's anybody's guess what those impacts will ultimately be, but certainly a huge, huge move for the marketplace.

It's hard to not talk about AI. It feels a little cliché at this point, but it is genuinely impactful on many parts of the capital markets. In the bond market, there's been AI underpinning a lot of evaluated pricing for a number of years that's only getting more sophisticated. The trend we pulled out specifically for capital markets is the ability to use Generative AI for searching large sets of data. Think about trying to unearth certain bonds based on criteria rather

than having to do a lot of tick boxes and drop downs. You can just search in plain English for what you want, which for a trader or portfolio manager, can be very helpful as a screener tool.

Katie Kolchin: This is, “I only want corporate bonds that are investment grade, in the technology sector, with a certain yield?”

Kevin McPartland: Correct. And then it (the AI model) will come back with a list as screeners, and you can say, “Actually, I don't really like that one and I want a yield that's five basis points higher.” Then it can calculate that list. Even if the data set is the same as it was before, it should be much easier to parse and then, hopefully, be more impactful on the results you'll get.

Then, as the last theme, what's hard to ignore when you're talking about bond markets is the cost of capital. The Basel III Endgame rules we're expecting to come and hit U.S. banks could have a very big impact on how banks allocate capital and the cost of that capital. This ultimately can impact liquidity in the bond market. Exactly what that will mean is very hard to tell, but it definitely is something to keep a very close eye on for the capital markets as a whole, but particularly in the bond market¹.

Katie Kolchin: Right. To follow on to the cost of capital and what that means for the dealers and their ability to provide liquidity to markets. You published a report on that in the fall of last year. Can you speak about what you saw with dealer net positions versus ADNV and the differences you identified in Treasuries versus corporate bonds?

Kevin McPartland: Yes, we have research we published in the fourth quarter of last year. We looked at the role of dealers in the bond market and how they provide liquidity. The metrics that helped us to understand that were the total volume being traded in the market over time as compared to the net positions dealers were holding. The take-away there was this is clearly increasingly an agency market, whether that's because dealers can't commit the capital, they don't want to commit the capital, or they feel they don't need to commit the capital. I think it's probably different from bank to bank, but the trend was most acute in the corporate bond market.

As we just talked about, the average daily notional bond volume (traded) continues to go up and up and up. And, in that same period, largely speaking, dealer net positions continue to go down. Their ability to recycle risk more quickly through electronic trading and through the use of ETFs is changing the nature of the market. And, perhaps again, this could be because of any of those three reasons (noted above). It could also be dealers continuing to see that capital is only going to get more expensive and they need to find more efficient ways to satisfy client demand. (“Primary dealer corporate bond holdings dropped 77% between 2017 and 2022, while trading volume grew 29%.”)

Katie Kolchin: Interesting. Another follow on. You mentioned Treasury volumes reaching over \$900+ billion ADNV. What do you think is driving that and are we going to see sustained elevated levels like this? Could we go higher? And on the other side of that, is there anything concerning that could put a crimp in this volume growth, whether it's the continued high Treasury issuance? The unsustainable path of federal debt? Or anything else you're seeing?

Kevin McPartland: Yes, the electronic trading side of this story is that the market structure that has been developed has allowed the market to trade at these high volumes. If we didn't have the efficiency built across the platforms that

¹ We note that, in early March, Fed Chairman Powell testified to Congress that officials have begun reconsidering the Basel III endgame proposal and are aware of industry complaints about costs and potential economic impacts.

can handle this volume, then the market wouldn't be able to keep up with the demand. I think that's an important point. But the real drivers of volume, as you point out, are definitely macro. It's pretty hard to predict, but it does feel like the market has gone through cycles since 2020 of wondering what the Fed is going to do and then eventually finding out. And then things settled in for a little while, when people felt like they knew what's coming next.

In the beginning of 2024, it feels like we're in one of those states where everybody's waiting to figure out what the Fed is going to do next and trying to position around that. And that's healthy. We had so many years of low rates in the bond market, where really there was only one direction that people were investing. Now, there's a lot more uncertainty and disagreement as to what direction the market will go. This is great because that's what really makes active capital markets – you have people willing to be on both sides of every trade. I think those dynamics are definitely helping to keep these volumes as high as they've been. We'll see what happens once the Fed decides they're going to cut or raise rates – but probably cut – in the coming months and what that does to long-term volumes.

Katie Kolchin: Yes, I think that's a general theme across all markets – what is the Fed going to do and when. Let's end with a forward-looking note – other than just what is the Fed going to do – on the key theme you are watching. What would be one area you would pick out that you're watching for in 2024?

Kevin McPartland: Volatility is always a fascinating metric for the market as a whole. The equity market volatility (measure, the VIX) has been very low. The interest-rate market volatility – as seen through the MOVE Index – has been sustainably high. It does seem like it has calmed down slightly in the last couple of weeks. Even still, at the levels seen at the end of the first quarter of 2024, it's still much higher than in 2021. The Index value is almost double. We've seen pretty sustained higher volatility for a good number of years. (MOVE average price: 2021 = 61.84, 2022 = 120.23, 2023 = 121.66, YTD 106.84)

It does feel like an interesting metric to watch when thinking about the health of the trading part of the market. We're going to continue to watch the MOVE, the VIX, and there's new indices that watch volatility in investment grade in high yield (corporate bonds). CME launched a new index that focuses on intraday volatility and rates; that will be an interesting one to keep an eye on as it evolves. There's lots of good volatility data that I do think talks to the health and the next steps of the markets.

Katie Kolchin: OK. We'll all have to add these volatility indexes to our watch lists.

Kevin McPartland: Yes indeed.

Katie Kolchin: All right, we'll end here. Thank you for joining us, Kevin.

Kevin McPartland: Thanks so much for having me.

Fixed Income Themes

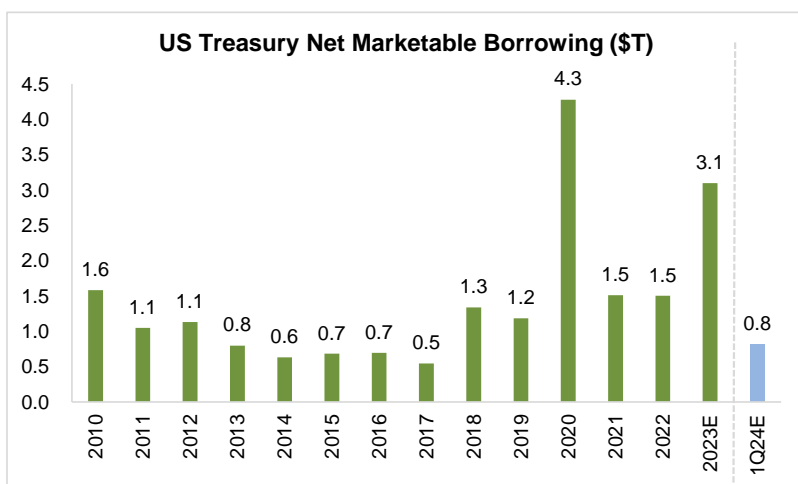
Never Ending Treasury Issuance

On average for the last ten years prior to COVID, Treasury issued around \$1 trillion in privately held net marketable securities per annum. In 2020, issuance understandably increased, +343.5% to the annual historical average. The level settled back down in 2021 and 2022 but was still elevated at around \$1.5 trillion per annum, +56.3% to the annual historical average.

What is less understandable is the \$3.1 trillion issuance in 2023. In a non-pandemic or recession year, issuance increased 221.1% to the annual historical average. When including Treasury's projections for 1Q24, issuance is estimated to be almost \$4 trillion for full year 2023 plus only one quarter of 2024, +305.7% to the annual historical average.

Treasury Privately Held Net Marketable Borrowing

	Market \$B	to Pre COVID	to 2021/2022
Avg Pre COVID	965		
COVID (2020)	4,281	343.5%	183.8%
Avg 2021/2022	1,509	56.3%	
2023E	3,100	221.1%	105.5%
2023E/1Q24E	3,916	305.7%	159.6%



Source: U.S. Treasury, SIFMA estimates

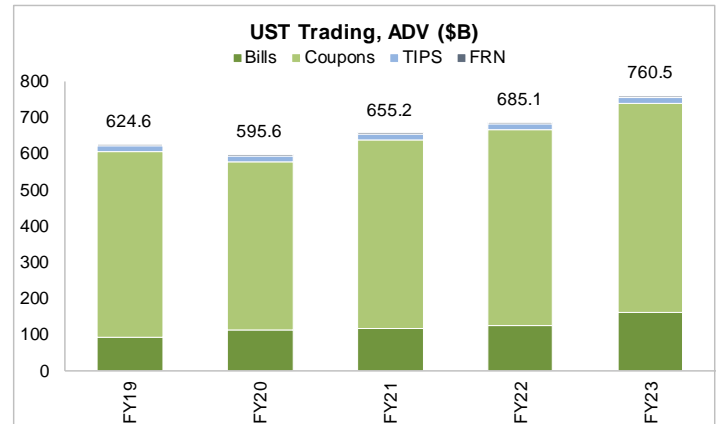
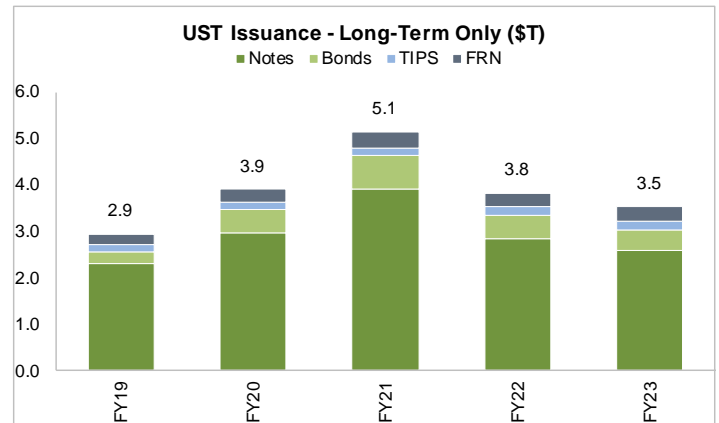
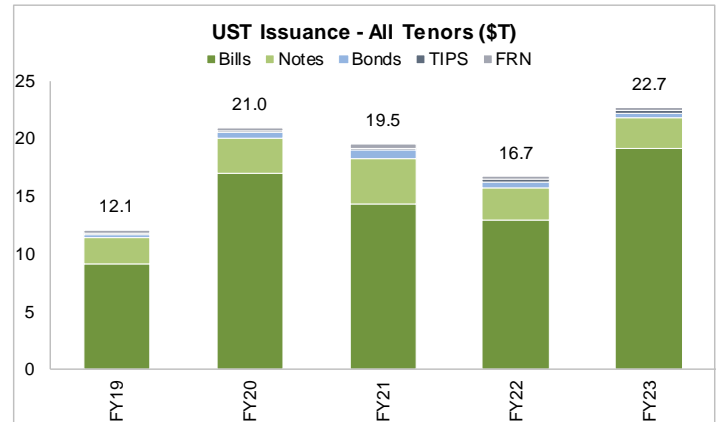
Note: Privately held net marketable borrowing. Actuals except 4Q23 and 1Q24 (estimates as of October 2023)

And it looks like fiscal spending will continue to flow freely. What could this mean for issuance? Using Treasury’s estimates for the first quarter figure and the quarterly issuance split from 2023, 2024 issuance could reach \$3.9 trillion, +298.9% to the historical annual average and +24.2% to an already elevated 2023.

This is on top of an already crowded issuance and trading picture. We note the following increases since 2019 (as of end 2023):

- Issuance – all tenors +88.0%
- Issuance – long-term only +19.8%
- Trading (ADV) +8.5%

Issuance trends are far outpacing growth in ADV, even on a long-term only basis, issuance/ADV 10.4x for all tenors and 2.3x for long term only.



Source: FINRA, NY Fed, US Treasury, SIFMA estimates
 Note: All tenors include bills and cash management balances which roll over quickly. FRN = floating rate note, TIPS = Treasury inflation-protected securities.

Where does that leave the U.S. government? As of the end of 2022 (the financial statements for 2023 were not available as of the writing of this report), total marketable Treasuries had grown at a +13.2% three-year CAGR, reaching \$23.7 trillion. Additionally – and importantly – accrued interest payable grew 17.4% Y/Y to \$81.5 billion.

Federal Debt: Outstanding

\$B	2017	2018	2019	2020	2021	2022	Y/Y	3Y CAGR
Treasury bills	1,799.6	2,239.5	2,376.4	5,028.1	3,712.9	3,643.7	-1.9%	15.3%
Treasury notes	8,798.9	9,150.3	9,756.0	10,655.9	12,570.5	13,696.5	9.0%	12.0%
Treasury bonds	1,948.4	2,115.0	2,311.5	2,668.1	3,340.8	3,867.7	15.8%	18.7%
Treasury inflation-protected securities (TIPS)	1,286.1	1,376.2	1,454.7	1,522.4	1,652.0	1,839.8	11.4%	8.1%
Treasury floating rate notes (FRN)	342.6	369.1	424.1	478.3	579.3	625.9	8.0%	13.9%
Total marketable Treasury securities	14,175.6	15,250.1	16,322.7	20,352.8	21,855.5	23,673.6	8.3%	13.2%
Nonmarketable securities	497.8	511.1	486.4	666.0	427.4	625.6	46.4%	8.8%
Net unamortized premiums/(discounts)	(39.2)	(44.8)	(42.7)	(26.7)	(26.8)	(71.7)	167.5%	18.9%
Total Treasury securities, net (public)	14,634.2	15,716.4	16,766.4	20,992.1	22,256.1	24,227.5	8.9%	13.1%
Tennessee Valley Authority	23.9	22.4	21.0	19.8	19.3	19.0	-1.6%	-3.3%
All other agency securities	0.1	0.1	0.1	0.1			na	na
Total agency securities, net	24.0	22.5	21.1	19.9	19.3	19.0	-1.6%	-3.4%
Accrued interest payable	65.9	73.8	73.5	70.9	69.4	81.5	17.4%	3.5%
Total	14,724.1	15,812.7	16,861.0	21,082.9	22,344.8	24,328.0	8.9%	13.0%

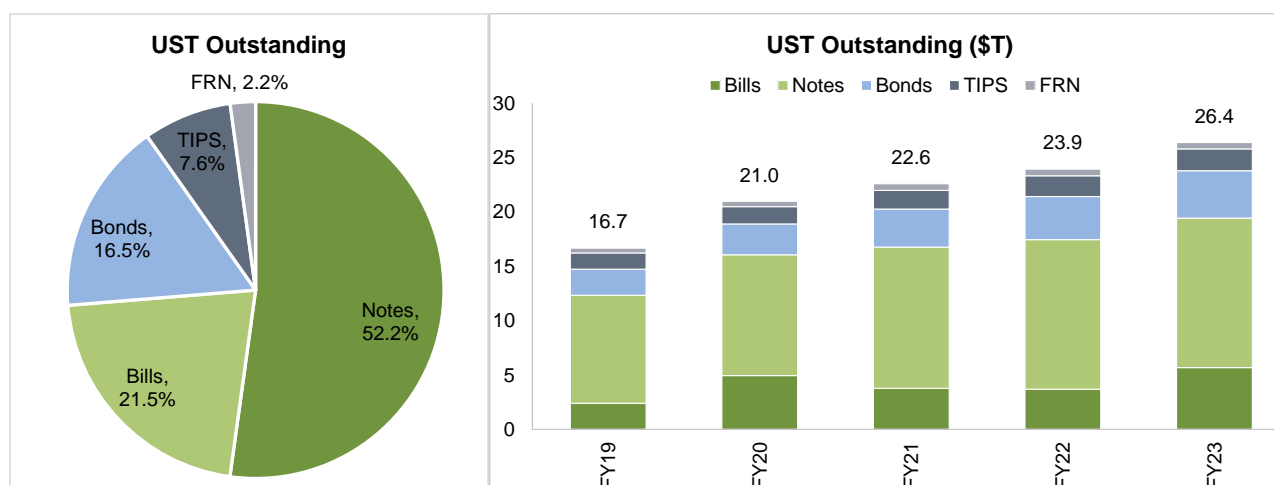
Types of marketable securities: Bills-Short-term obligations issued with a term of 1 year or less. Notes-Medium-term obligations issued with a term of 2-10 years. Bonds-Long-term obligations of more than 10 years. TIPS-Term of 5 years or more. FRN-Term of 2 years.

Federal debt held by the public consists of securities outside the government by individuals, corporations, state or local governments, FRBs, foreign governments, and other non-federal entities. The above table details government borrowing primarily to finance operations and shows marketable and nonmarketable securities at face value less net unamortized premiums and discounts including accrued interest.

Securities that represent federal debt held by the public are issued primarily by Treasury and include: Interest-bearing marketable securities (bills, notes, bonds, inflation-protected, and FRN). Interest-bearing nonmarketable securities (Government Account Series held by fiduciary and certain deposit funds, foreign series, state and local government series, domestic series, and savings bonds). Non-interest-bearing marketable and nonmarketable securities (matured and other). Total agency securities = net of unamortized premiums and discounts.

Source: U.S. Treasury, SIFMA estimates

SIFMA Research has data updated through FY23, indicating Treasuries outstanding at \$26.4 trillion.



Source: FINRA, NY Fed, US Treasury, SIFMA estimates

Note: FRN = floating rate note, TIPS = Treasury inflation-protected securities

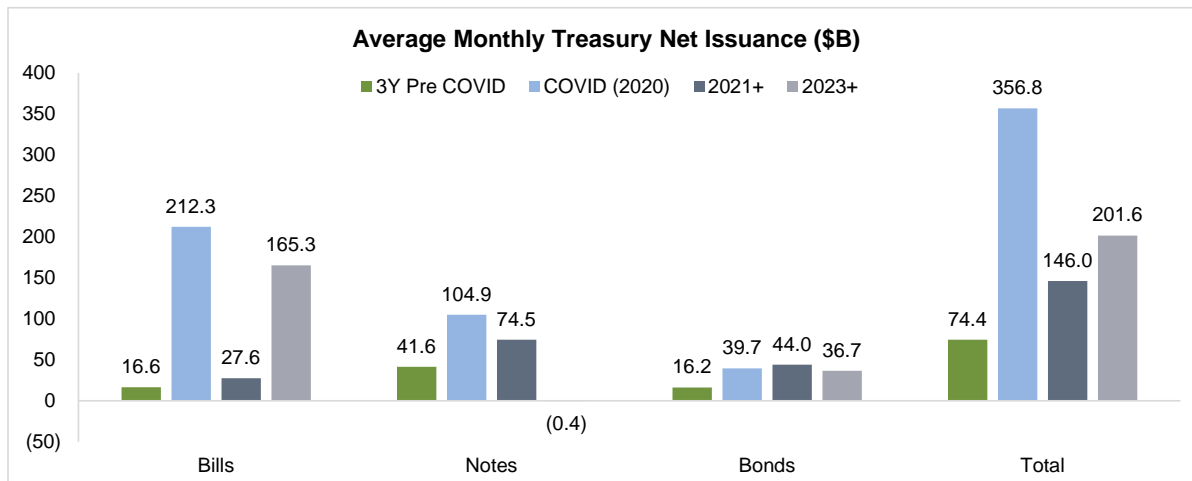
Net Treasury Issuance Trends

We thought it would be interesting to look further at gross versus net Treasury issuance trends across tenors. Gross Treasury issuance for 2023 was \$22.7 trillion, broken out across: bills \$19.2 trillion, notes \$3.1 trillion, and bonds \$0.5 trillion. On a net basis, this figure falls to \$2.4 trillion, broken out across: bills \$2.0 trillion, notes -\$0.02 trillion, and bonds \$0.4 trillion.

What this shows is that Treasury has been using short-dated securities to fund fiscal spending. For bills, the gross issuance number is 9.7x the net issuance figure. Notes issuance was actually net negative, and bonds gross issuance was only 1.1x net issuance. Total gross issuance was, therefore, 9.6x net issuance.

Some may argue that the numbers do not matter, since the gross to net gap in bills shows how quickly these instruments rollover. The flip side to that is in the picture painted by bills net issuance. As shown below, even the net issuance numbers for bills are significantly out of line to historical levels. The three-year pre-COVID average monthly net bills issuance was \$16.6 billion. At \$165.3 billion, the 2023+ (though February 2024) net bills issuance number was \$165.3 billion, +893.5% to the three-year pre-COVID average.

To many, even net issuance appears to be on an unsustainable path.



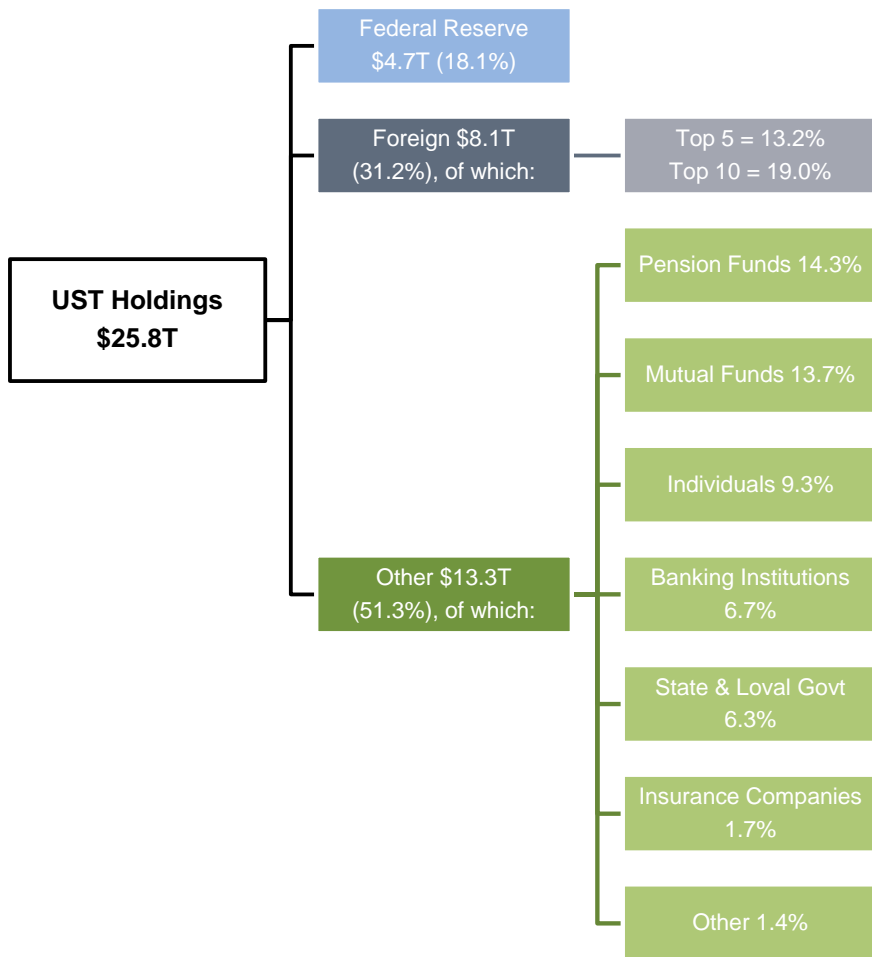
Source: U.S. Department of the Treasury, Bureau of the Fiscal Service, SIFMA estimates

Note: As of February 2024. Bills = Cash management balances (CMBs), 4-week, 8-week, 13-week, 17-week, 26-week, and 52-week. Notes = 2-year, 3-year, 5-year, 7-year, 10-year, FRNs, and TIPS notes. Bonds = 20-year, 30-year, and TIPS bonds.

Shifting Treasury Holders Composition

Despite those substantial increases to its balance sheet and fiscal responsibilities, i.e. interest payable, the federal government keeps on spending. This means Treasury will need to keep on issuing – the 1Q24 estimates are already out, at \$0.8 trillion. Primary dealers have already expressed concerns about capacity issues around Treasury auctions. Questions abound over how much capacity the system has to absorb the new issuances.

At the same time, the demand picture and therefore the composition by investor type have shifted. As it stands today, the Fed holds 18.1% of the total \$25.8 trillion Treasuries outstanding (based on Bloomberg data). Foreign holders represent 31.2%, and other holders represent 51.3%.



Source: Bloomberg, Federal Reserve, SIFMA estimates
 Note: Total as of 9/30/23 & 3/31/18. Foreign holders as of 12/31/23 & 1/31/18. Other as of 3Q23.
 Percentages may not add due to differences in data sets.

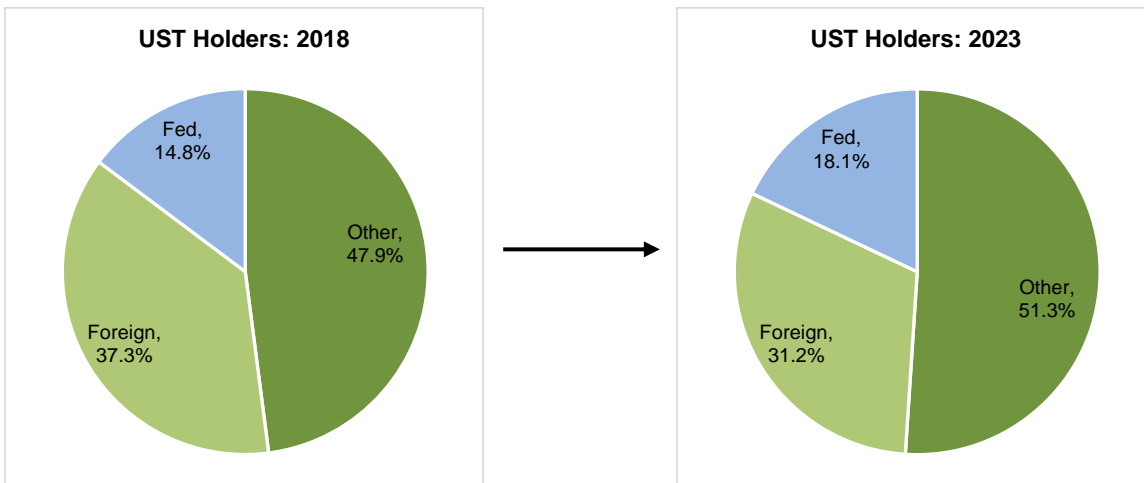
How has this picture changed over the years? From 2018 to 2023, the Fed's percentage of total holdings increased 3.3 pps. Over the same time period, the other holders category increased 3.4 pps and foreign holders paired back, -6.1 pps.

Total UST Breakout

	2023	2018	Change	
			\$	%
Total UST	25,820.0	16,613.9	9,206.1	55.4%
Other Holders	13,256.9	7,965.6	5,291.3	66.4%
Foreign Holders	8,056.1	6,194.6	1,861.5	30.1%
Federal Reserve	4,661.3	2,452.5	2,208.8	90.1%
Category % Total				
Other Holders	51.3%	47.9%		3.4%
Foreign Holders	31.2%	37.3%		-6.1%
Federal Reserve	18.1%	14.8%		3.3%

Source: Bloomberg, SIFMA estimates

Note: Total as of 9/30/23 & 3/31/18. Foreign holders as of 12/31/23 & 1/31/18



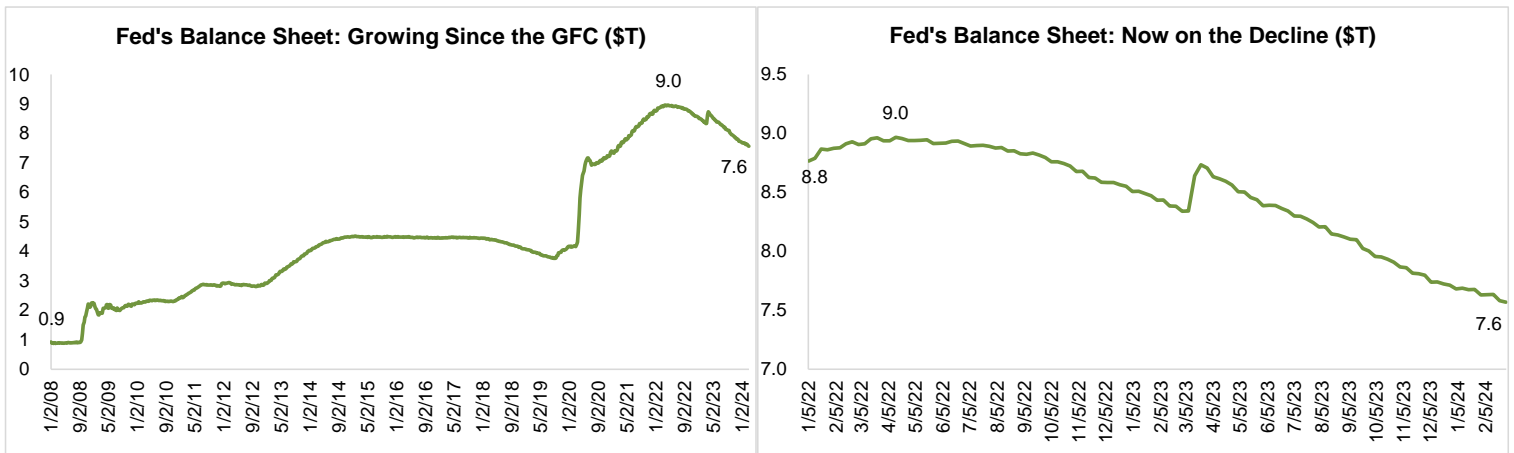
Source: Bloomberg, SIFMA estimates

Note: Total as of 9/30/23 & 3/31/18. Foreign holders as of 12/31/23 & 1/31/18

Fed Shifting Its Position

The Fed still owns 18.1% of total Treasuries. It had been a top buyer of Treasuries under its Quantitative Easing (QE) program, ongoing since the global financial crisis (GFC). From the start of 2008 to the peak in April 2022, the Fed’s balance sheet grew to \$9.0 trillion from \$0.9 trillion, +872.2%.

However, the Fed is now a net seller of Treasuries, undertaking Quantitative Tightening (QT)². Its balance sheet is down 15.6% since the peak, at \$7.6 trillion as of February of this year. Though we note that this is still +720.6% from pre GFC levels.



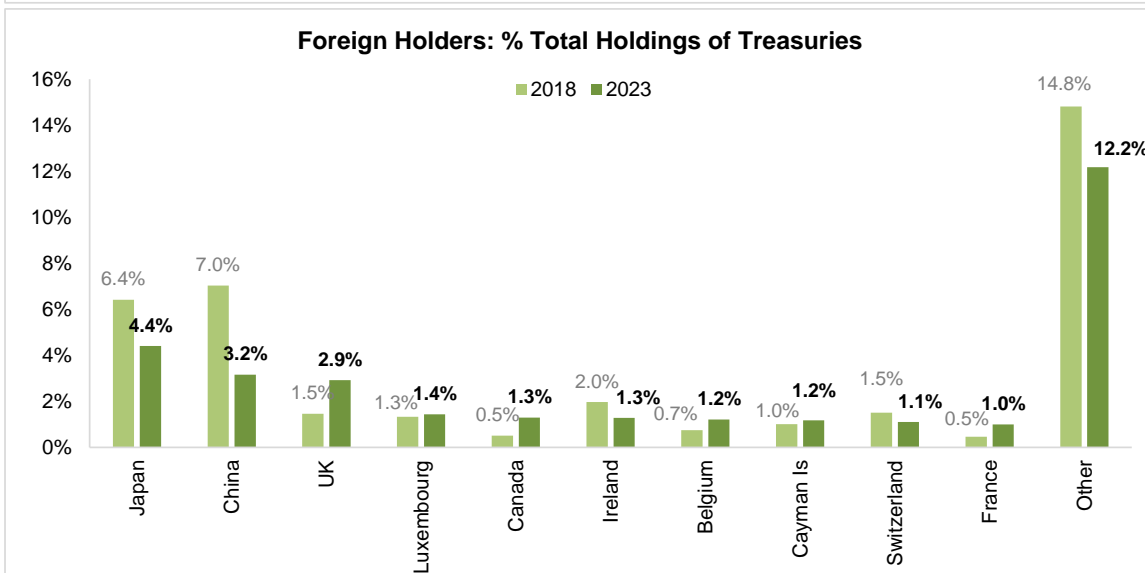
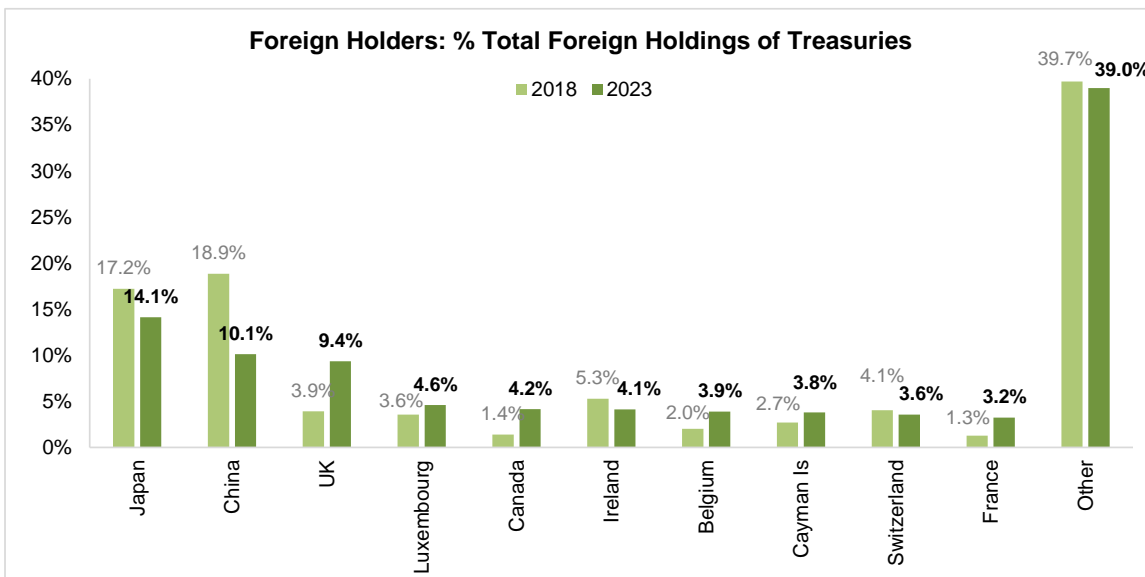
Source: FRED, SIFMA estimates (as of February 2024)

² QE is used to stimulate the economy by reducing interest rates; the Fed purchases Treasuries and mortgage-backed securities. QT is used to cool the economy by raising interest rates; the Fed sells Treasuries and mortgage-backed securities or allows securities to mature off its balance sheet.

Foreign Holders Pulling Back

Foreign holders have also been pulling back. Specifically, the top two foreign holders of U.S. Treasuries – accounting for almost one-fourth of foreign holdings – have been backing away from buying. Both Japan and China have focused on supporting their own currencies, which are battling against the strong U.S. Dollar. Japanese investors also have an investment alternative in their own government bonds, after its central bank moved away from yield curve control, thereby increasing yields. As to China, the slowing economy means there is less money to invest in these (and other) securities. With the Fed and foreign holders reducing holdings, questions abound over who will buy future issuance.

- Japan 14.1% of foreign holdings, -3.1 pps since 2018 (4.4% of total holdings, -2.0 pps)
- China 10.1% of foreign holdings, -8.7 pps since 2018 (3.2% of total holdings, -3.9 pps)

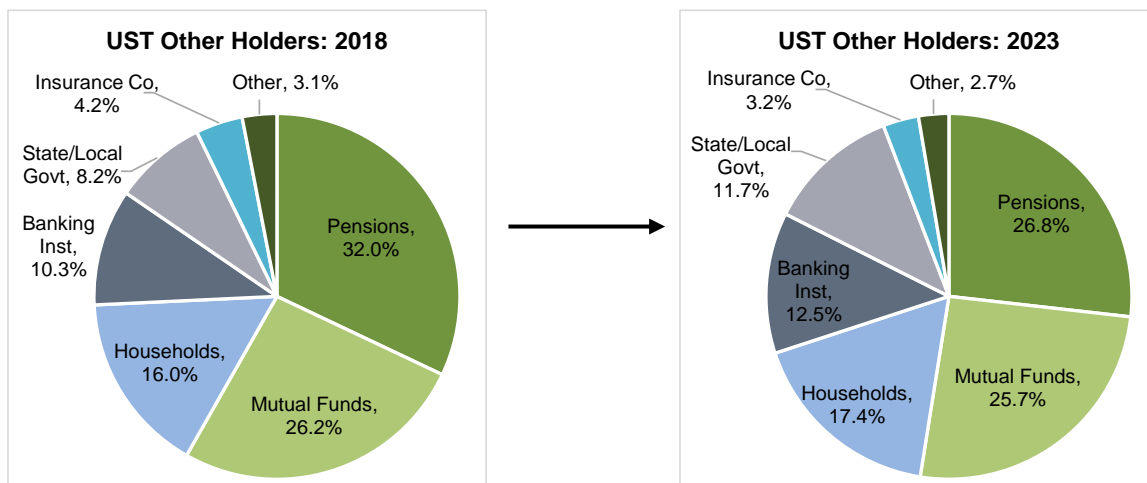


Source: U.S. Treasury, SIFMA estimates (as of December 2023)

Price Sensitive Holders Increasing

Treasury supply take up is now resting in the hands of asset managers and hedge funds. We note that these types of investors are categorized as households – really an “other” bucket – in the Fed’s Flow of Funds data. Households have grown from 16.0% in 2018 to 17.4% in 2023, +1.4 pps. Banking institutions have also increased holdings, +2.2 pps to 12.5%. Conversely, pension funds (-5.2 pps to 26.8%) and mutual funds (-0.5 pps to 25.7%) have declined as a percent of holdings.

While hedge funds and asset managers have always bought Treasuries, it has not been to the extent as seen lately. This has shifted Treasury demand to investors that are sensitive to prices, whereas the Fed and foreign buyers were not. This price sensitivity increases term premiums.

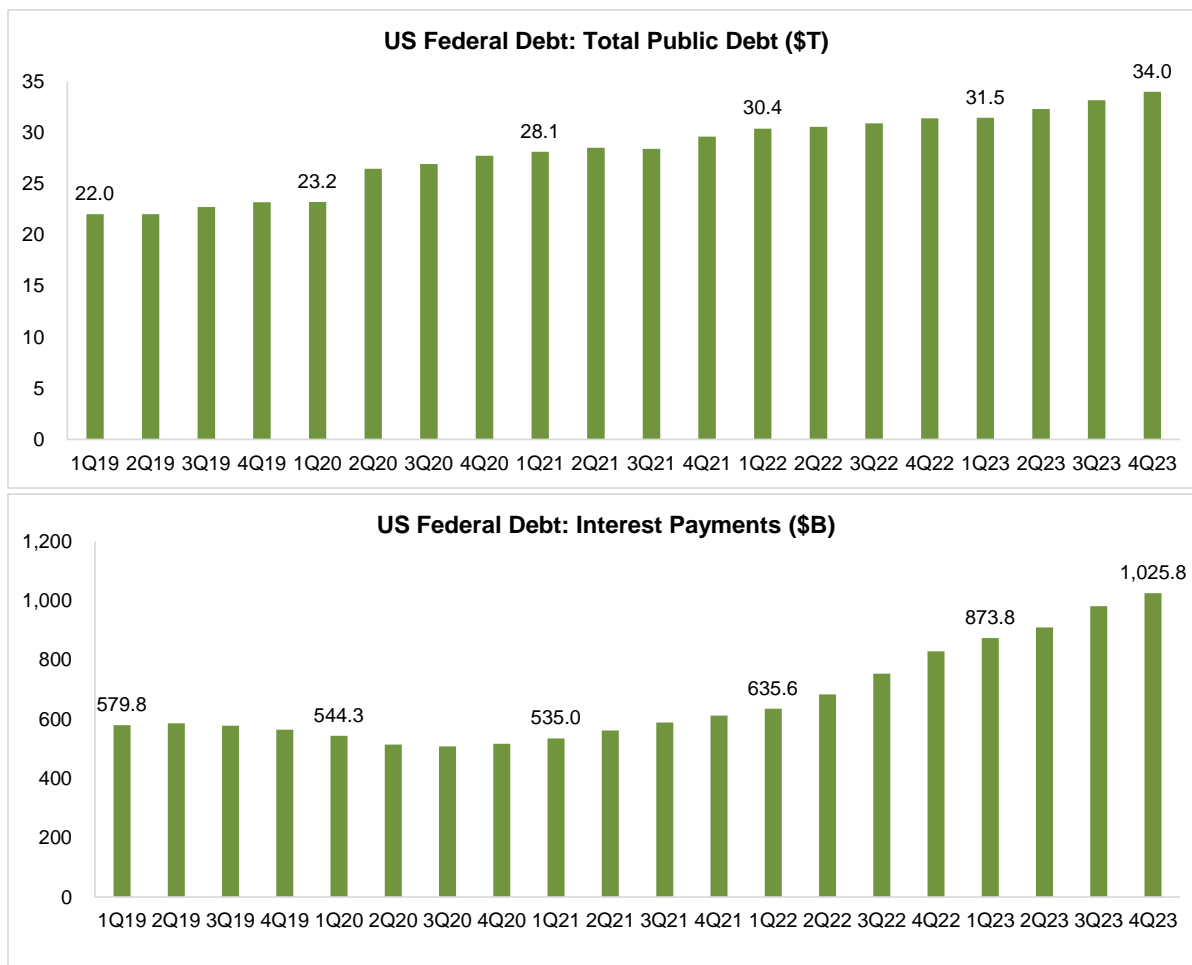


Source: Federal Reserve, SIFMA estimates

Creating an Unsustainable Trajectory for Federal Debt?

Never ending fiscal spending leading to significantly elevated levels of Treasury issuance. The shifting composition of Treasury holders to more price sensitive buyers. A Debt/GDP ratio over 120% and rising. The federal debt level is now at \$34.0 trillion, a 54.4% increase in just five years (from the start of 2019 to the end of 2023). And the trend is increasing (Y/Y changes): +3.5% in 1Q23, +5.8% in 2Q23, +7.2% in 3Q23, and +8.2% in 4Q23. Many in markets have deemed this an unsustainable trajectory.

Further, with the Fed raising rates, debt servicing costs continue to increase. In 4Q23, this expense crossed the \$1 trillion mark, +23.7% Y/Y and +61.4% since the \$635.6 billion level seen prior to the start of Fed rate hikes in 1Q22. Two of the top credit ratings agencies have already downgraded the rating for U.S. government debt – S&P in 2011 and Fitch last year, both to AA+ from AAA – and Moody’s put the U.S. on negative watch last year. Depending on that outcome, the U.S. could solidly be an AA+ rated country. This will put further pressure on debt servicing costs.



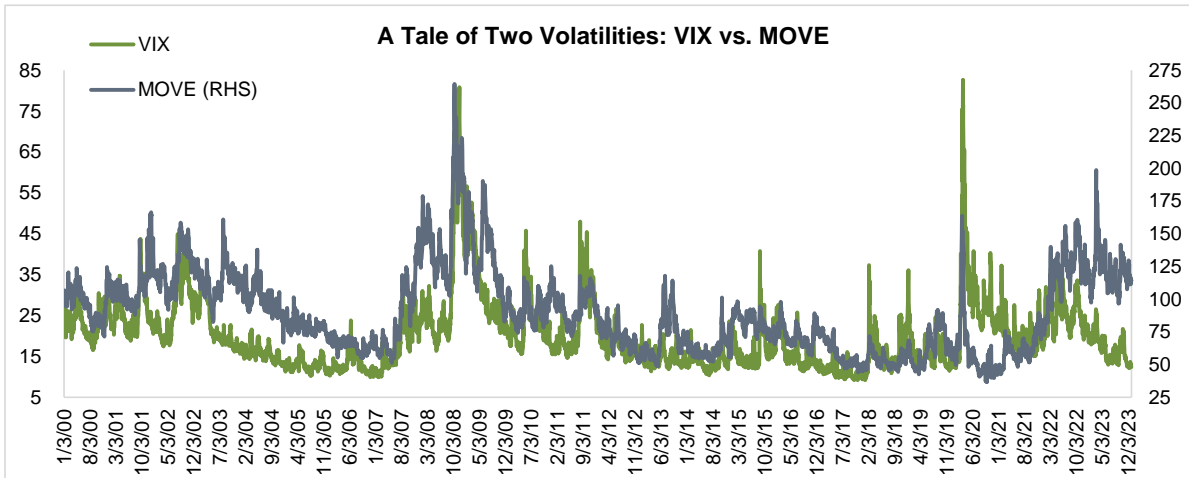
Source: FRED, SIFMA estimates

A Tale of Two Volatilities

We looked at the implied volatilities for equities and bonds, the VIX versus the MOVE indices. These implied volatility indices use options contracts – options on stocks for the VIX, options on U.S. Treasuries for the MOVE – to measure the expected price movements of securities, reflecting market participants’ aggregate expectations of future volatility.

They are essentially sentiment gauges. An increasing index implies rising volatility, signaling expectations for heightened market uncertainty or risk. A decreasing index implies declining volatility, signaling expectations for less market uncertainty or risk (also a more stable interest rate environment for the MOVE).

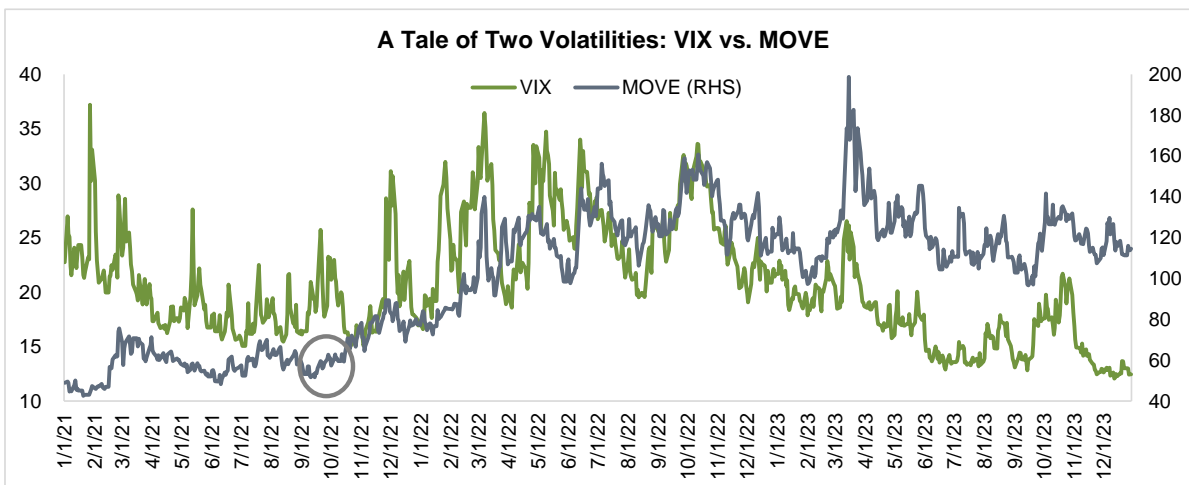
Historically, movements in the two indices were correlated in direction – a 0.6238 correlation since 2000 – albeit varying in peaks/troughs and exact timing of directional shifts.



Source: Bloomberg, SIFMA estimates

This correlation shifted. Starting in 2021, you can see a directional break in the correlation. In the fall of 2021, bond markets priced in that inflation was not transitory – even though the Fed was still calling it such – and, therefore, interest rate hikes were coming. As such, the correlation between the MOVE and VIX decreased to 0.2276 since 2021, -63.5% to the full time series correlation.

This picture changed somewhat in 2023. The correlation between the MOVE and the VIX for just 2023 increased to 0.5640, with both volatility gauges elevated during the regional bank turmoil. Both indices came down after the spring, but with the VIX declining at a much faster pace. This left the correlation -9.6% to the full time series correlation.



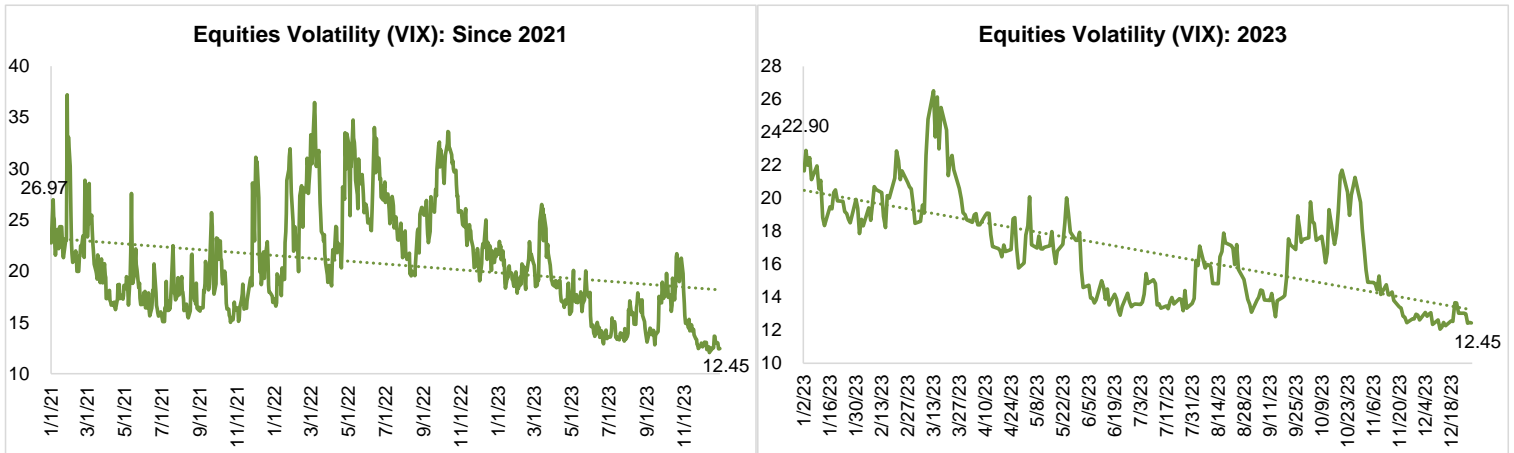
Source: Bloomberg, SIFMA estimates

What is driving these differences in patterns across the VIX versus the MOVE? These indices show that while equity investors have been complacent around equity market movements, bond investors still expect significant future volatility in interest rates.

Equities – Volatility on the Decline in 2023

The VIX ended 2023 at 12.45, -45.3% to the start of 2021 and -45.6% to the start of 2023. The VIX’s trendline is downward sloping from 2021 through 2023. Markets did weather a few storms like the meme stock event in early 2021 and the start of the Fed’s rate hikes – inclusive of that unprecedented four 75 bps hikes in a row – in 2022. Then we saw a noticeable decline occurring last year – excluding the regional bank turmoil in March – with a substantial decline occurring in the last few months of the year. 2023 finished down 13.5% to the three-year pre COVID average VIX of 14.40.

Equity investors seem to be comfortable with the economic environment and direction of monetary policy as it feeds into stock valuations and market movements. This keeps expectations of future volatility in check.

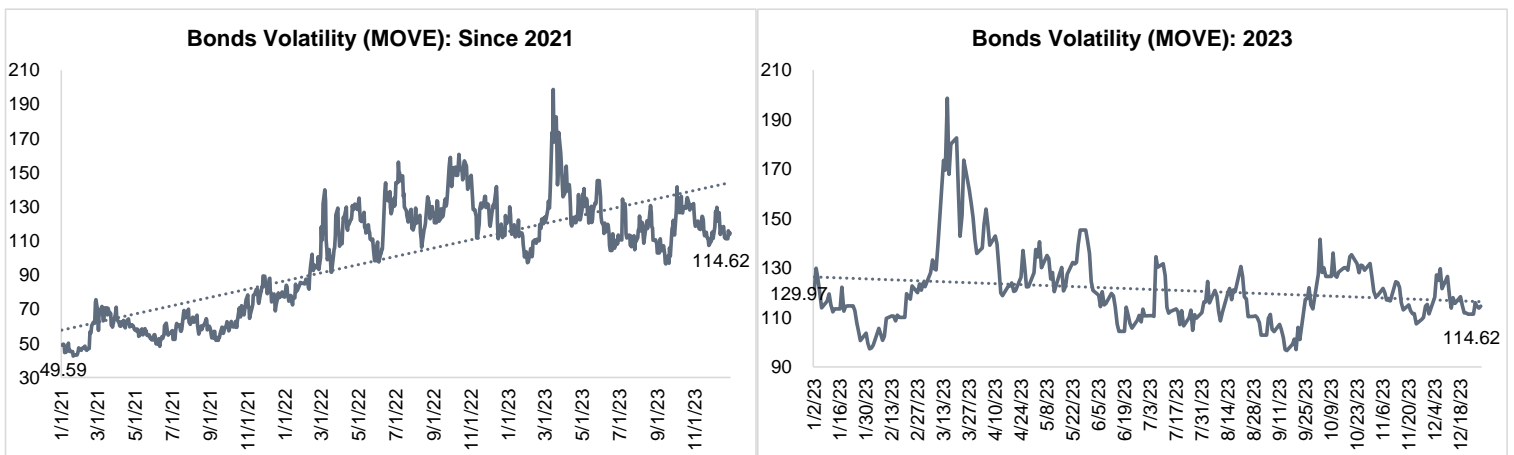


Source: Bloomberg, SIFMA estimates

Bonds – Volatility Remains High in 2023

The MOVE ended 2023 at 114.62, +134.0% to the start of 2021 but -11.8% to the start of 2023. The MOVE's trendline is upward sloping from 2021 through 2023, turning slightly downward sloping just for last year (excluding the regional bank turmoil in March). 2023 remains significantly above the three-year pre COVID average MOVE of 58.00, +97.6%.

Bond investors continue to expect future volatility in interest rates, but to a lesser extent since the back half of last year.

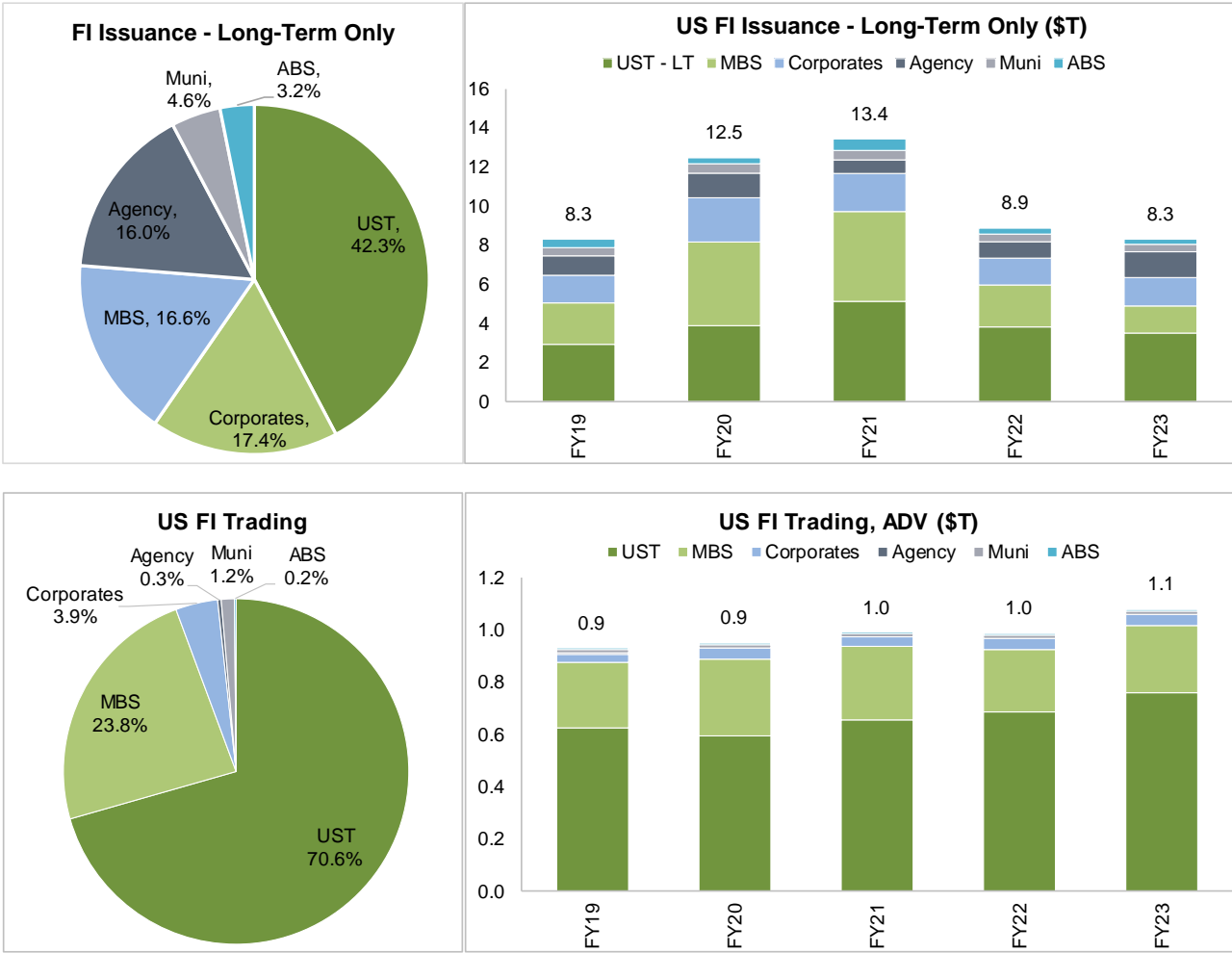


Source: Bloomberg, SIFMA estimates

Fixed Income Market Metrics

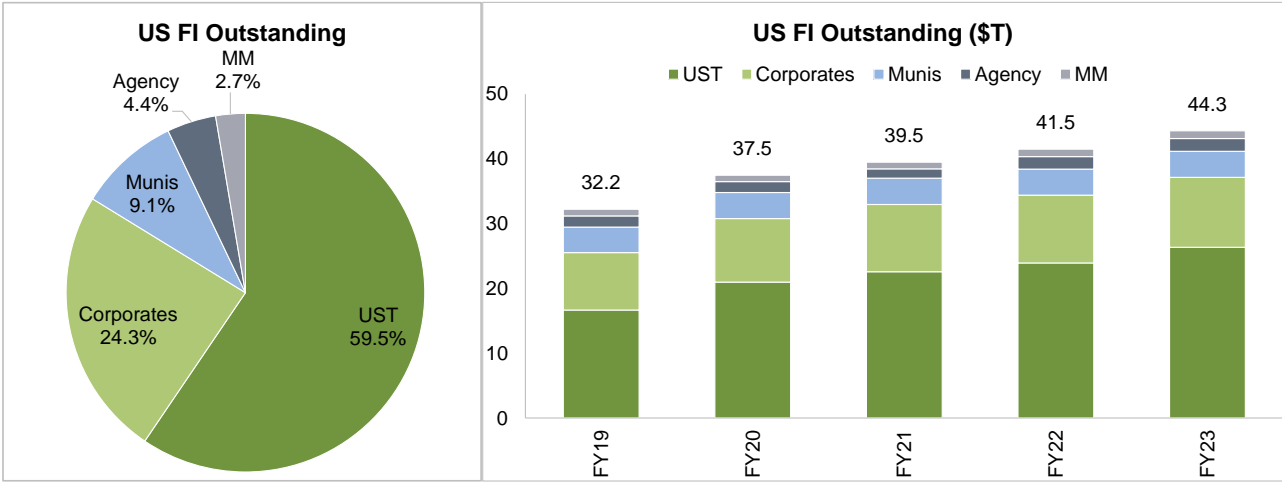
Total US Fixed Income

- Issuance: \$8.3T; -6.3% Y/Y
- ADV: \$1.1T; +9.0% Y/Y



Source: Bloomberg, The Federal Reserve, Federal Reserve Bank of New York, FINRA, Municipal Securities Rulemaking Board, Refinitiv, US Agencies, US Treasury, SIFMA estimates
 Note: UST = U.S. Treasury securities, MBS = mortgage-backed securities, Corporates = corporate bonds, Agency = federal agency securities, Munis = municipal bonds, ABS = asset-backed securities.

- Outstanding: \$44.3T; +6.8% Y/Y

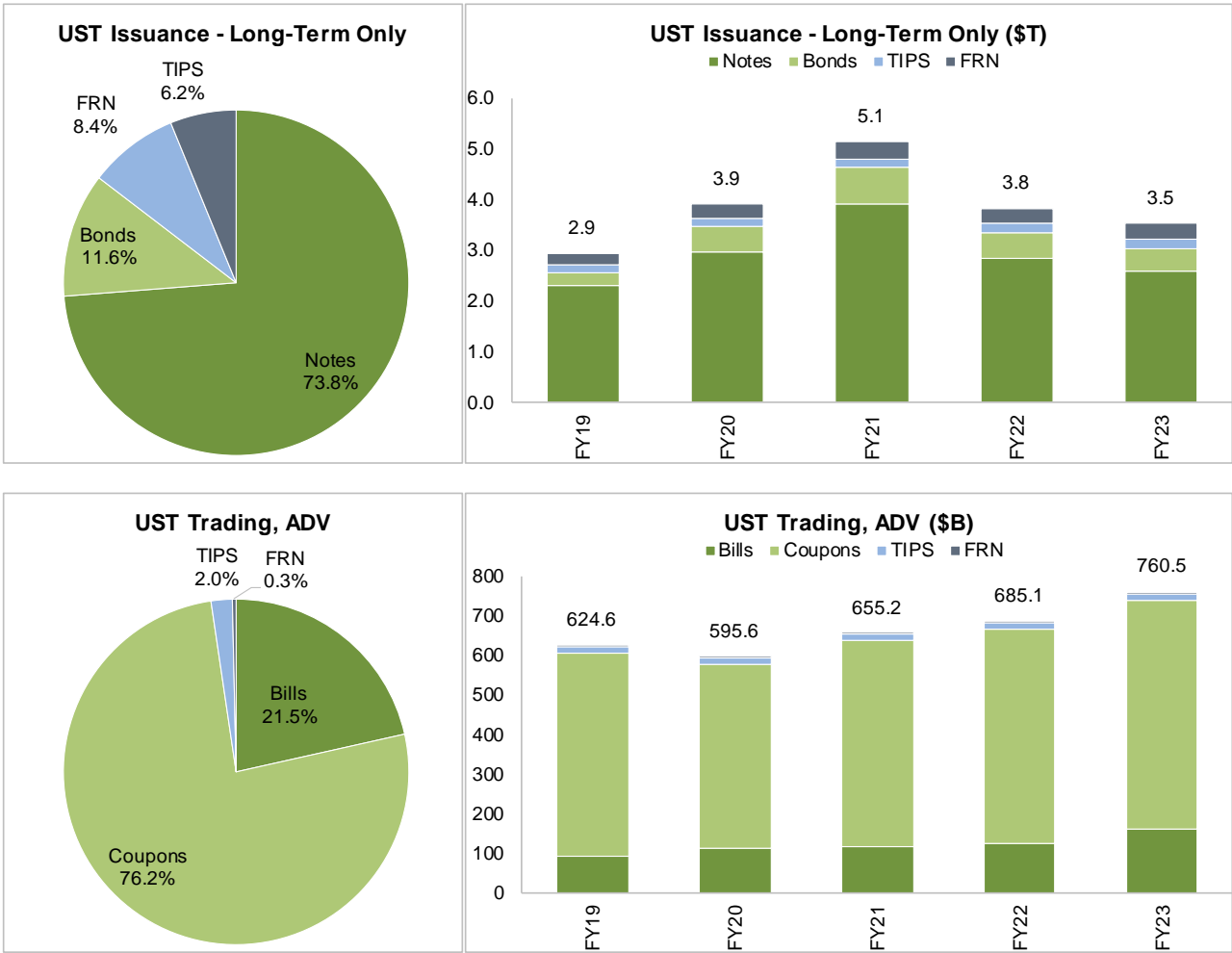


Source: Bloomberg, The Federal Reserve, Federal Reserve Bank of New York, FINRA, Municipal Securities Rulemaking Board, Refinitiv, US Agencies, US Treasury, SIFMA estimates

Note: UST, Agency as of 4Q23, Corporates, Munis as of 3Q23. UST = U.S. Treasury securities, MBS = mortgage-backed securities, Corporates = corporate bonds, Agency = federal agency securities, Munis = municipal bonds, ABS = asset-backed securities.

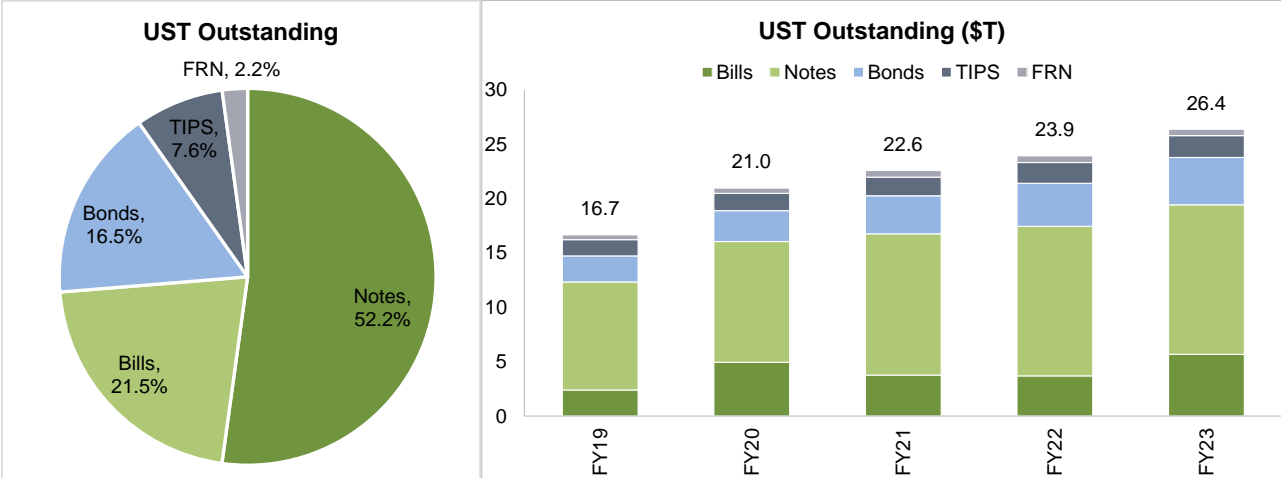
US Treasuries (UST)

- Issuance (long-term only): \$3.5T; -8.1% Y/Y
- ADV \$760.5B; +11.0% Y/Y



Source: FINRA, NY Fed, US Treasury, SIFMA estimates
 Note: FRN = floating rate note, TIPS = Treasury inflation-protected securities

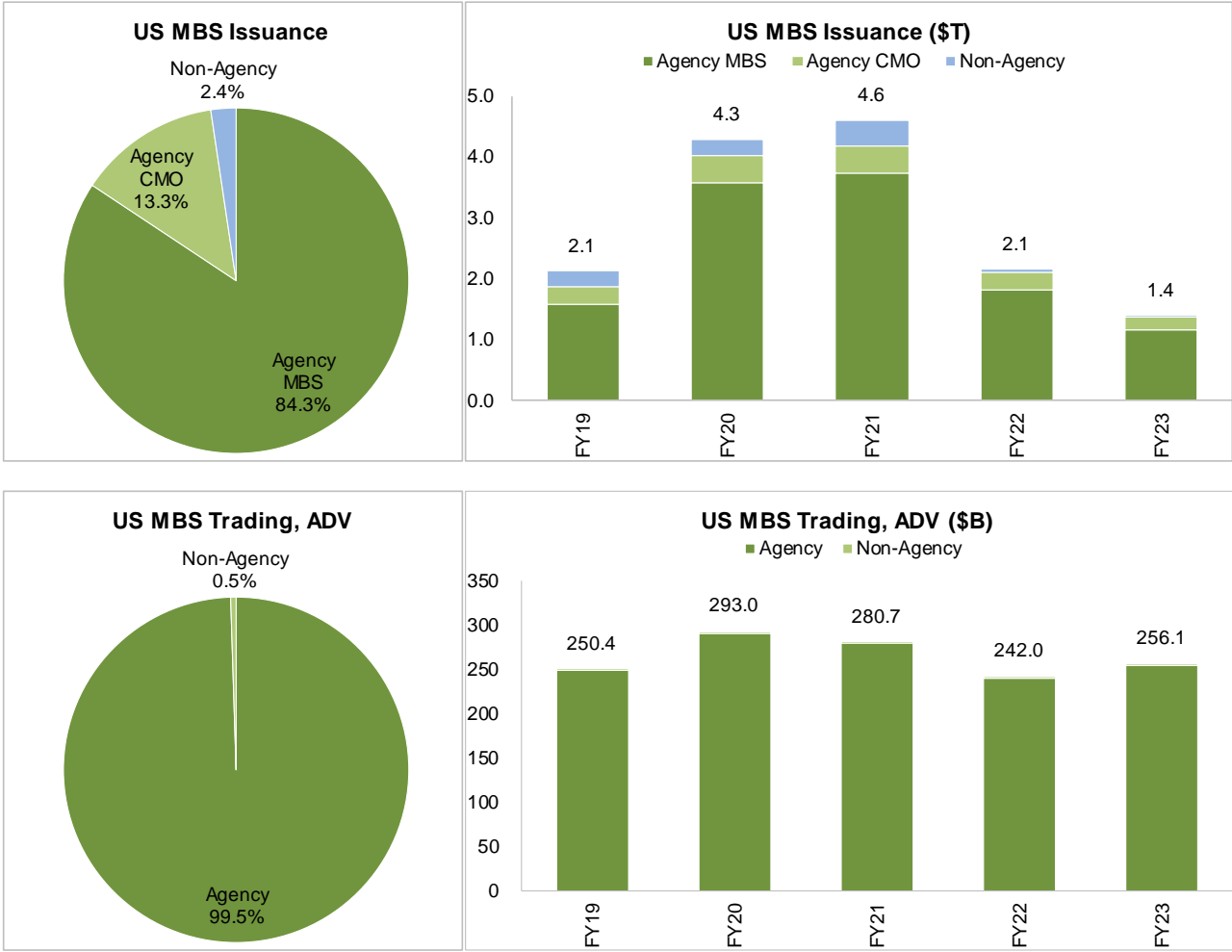
- UST Outstanding: \$26.4T; +10.2% Y/Y



Source: FINRA, NY Fed, US Treasury, SIFMA estimates
 Note: FRN = floating rate note, TIPS = Treasury inflation-protected securities

Mortgage-Backed Securities (MBS)

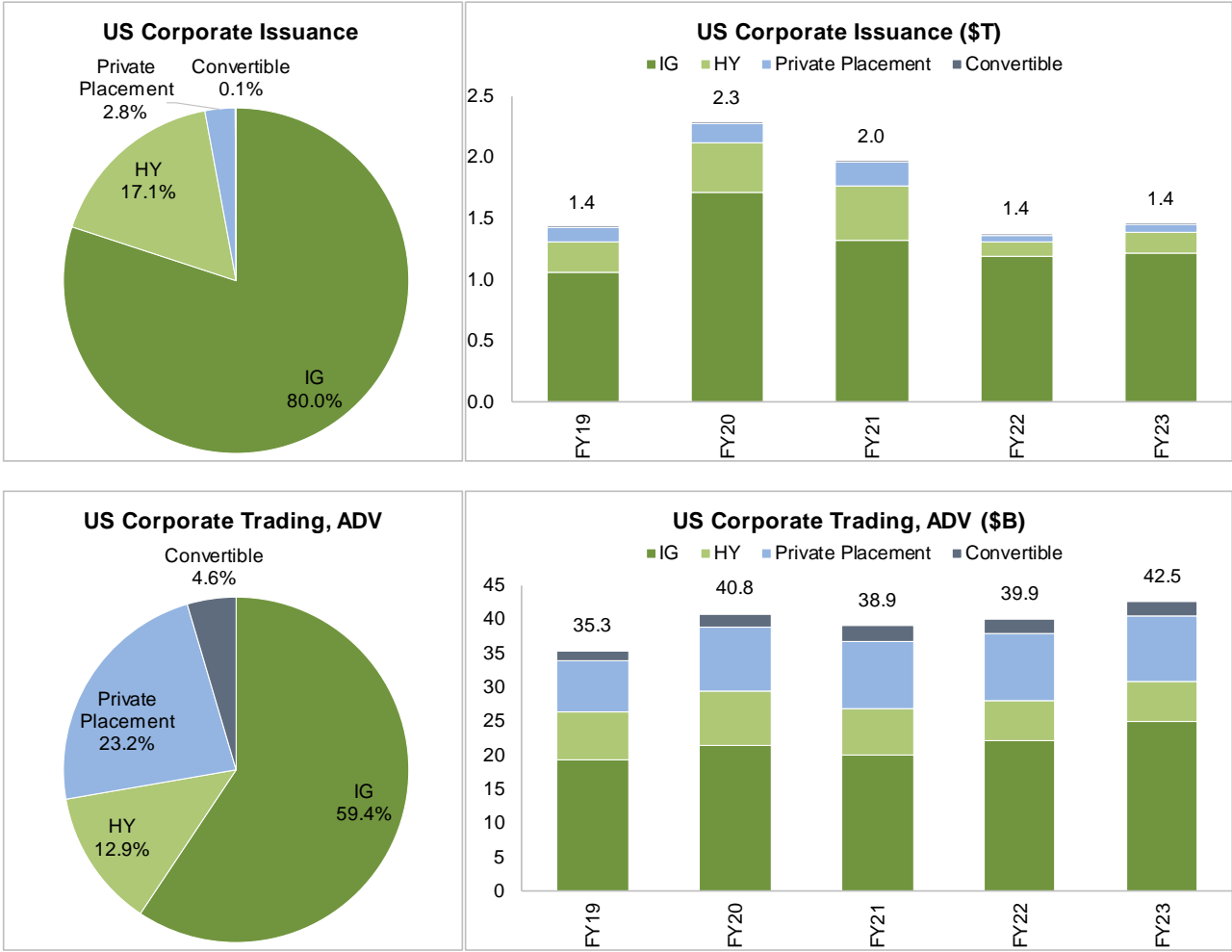
- Issuance: \$1.4T; -35.4% Y/Y
- ADV: \$256.1B; +4.2 % Y/Y



Source: Bloomberg, US Agencies, FINRA, SIFMA estimates
 Note: CMO = collateralized mortgage obligation

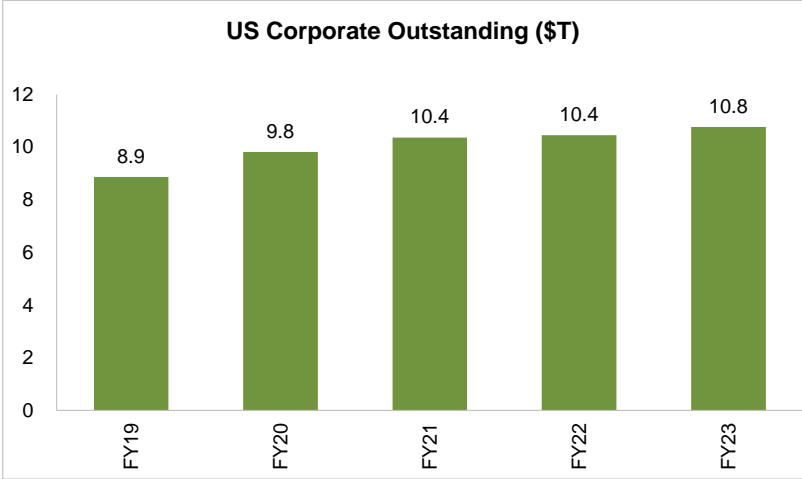
Corporate Bonds (Corporates)

- Issuance: \$1.4T; +5.4% Y/Y
- ADV: \$42.5B; +6.6% Y/Y



Source: Refinitiv, FINRA, The Federal Reserve, SIFMA estimates
 Note: IG = investment grade, HY = high yield

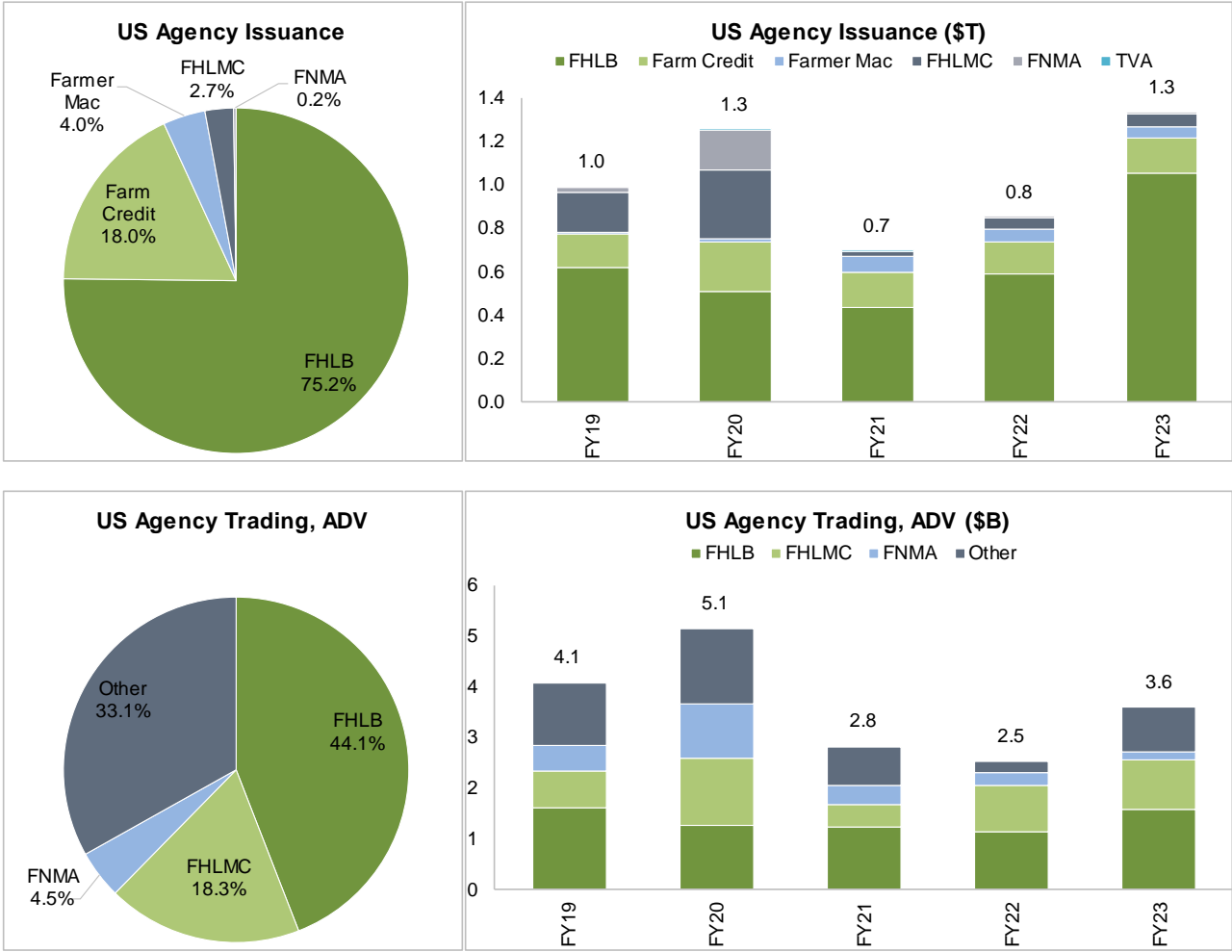
- Outstanding: \$10.8T, +3.0% Y/Y



Source: The Federal Reserve, SIFMA estimates

Federal Agency Securities (Agency)

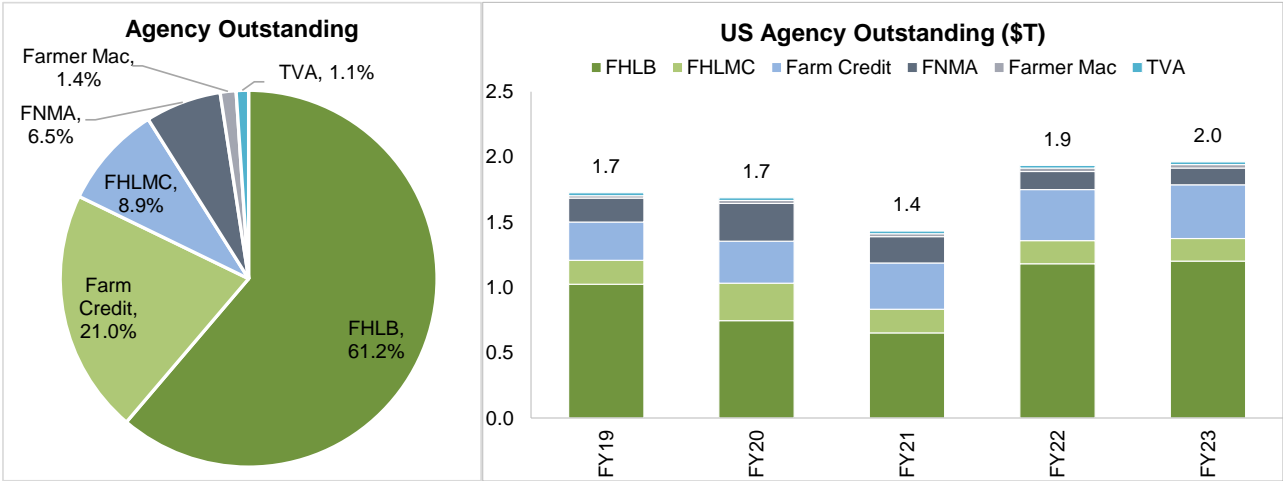
- Issuance: \$1.3T; +57.3% Y/Y
- ADV: \$3.6B; +42.5% Y/Y



Source: FINRA, US Agencies, SIFMA estimates

Note: FHLB = The Federal Home Loan Banks, FHLMC = The Federal Home Loan Mortgage Corporation (Freddie Mac), FNMA = The Federal National Mortgage Association (Fannie Mae), TVA = The Tennessee Valley Authority

- Outstanding: \$2.0T; +1.4% Y/Y

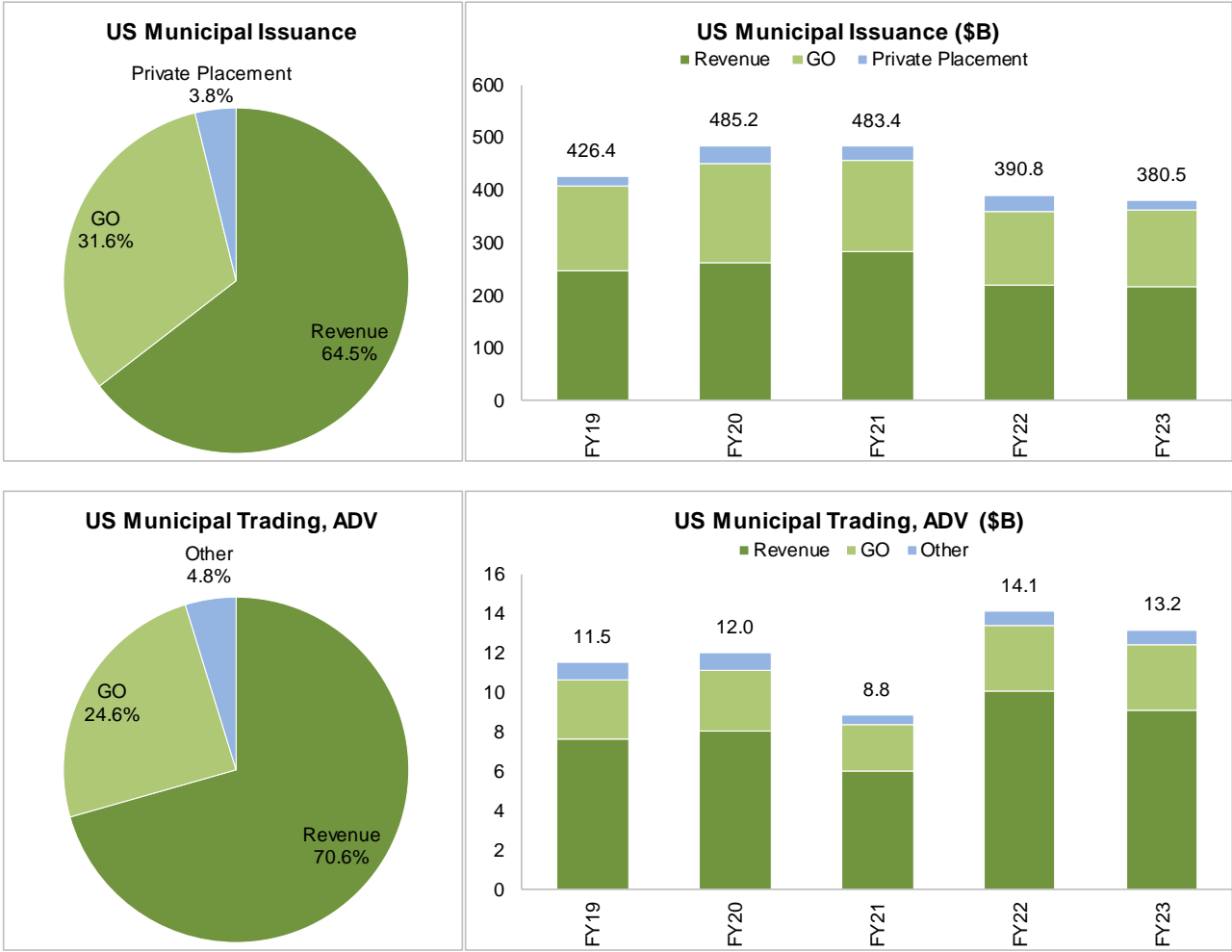


Source: US Agencies, SIFMA estimates

Note: FHLB = The Federal Home Loan Banks, FHLMC = The Federal Home Loan Mortgage Corporation (Freddie Mac), FNMA = The Federal National Mortgage Association (Fannie Mae), TVA = The Tennessee Valley Authority

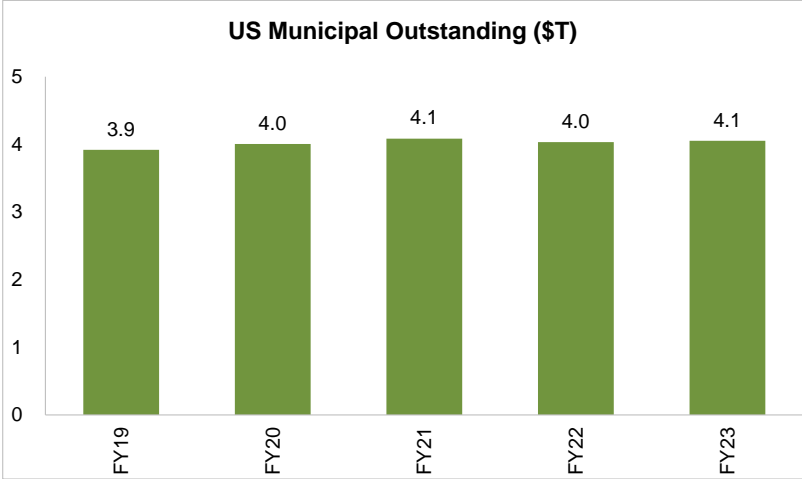
Municipal Bonds (Munis)

- Issuance: \$380.5B; -2.6 Y/Y
- ADV: \$13.2B; -5.7% Y/Y



Source: Municipal Securities Rulemaking Board, SIFMA estimates
 Note: GO = general obligation

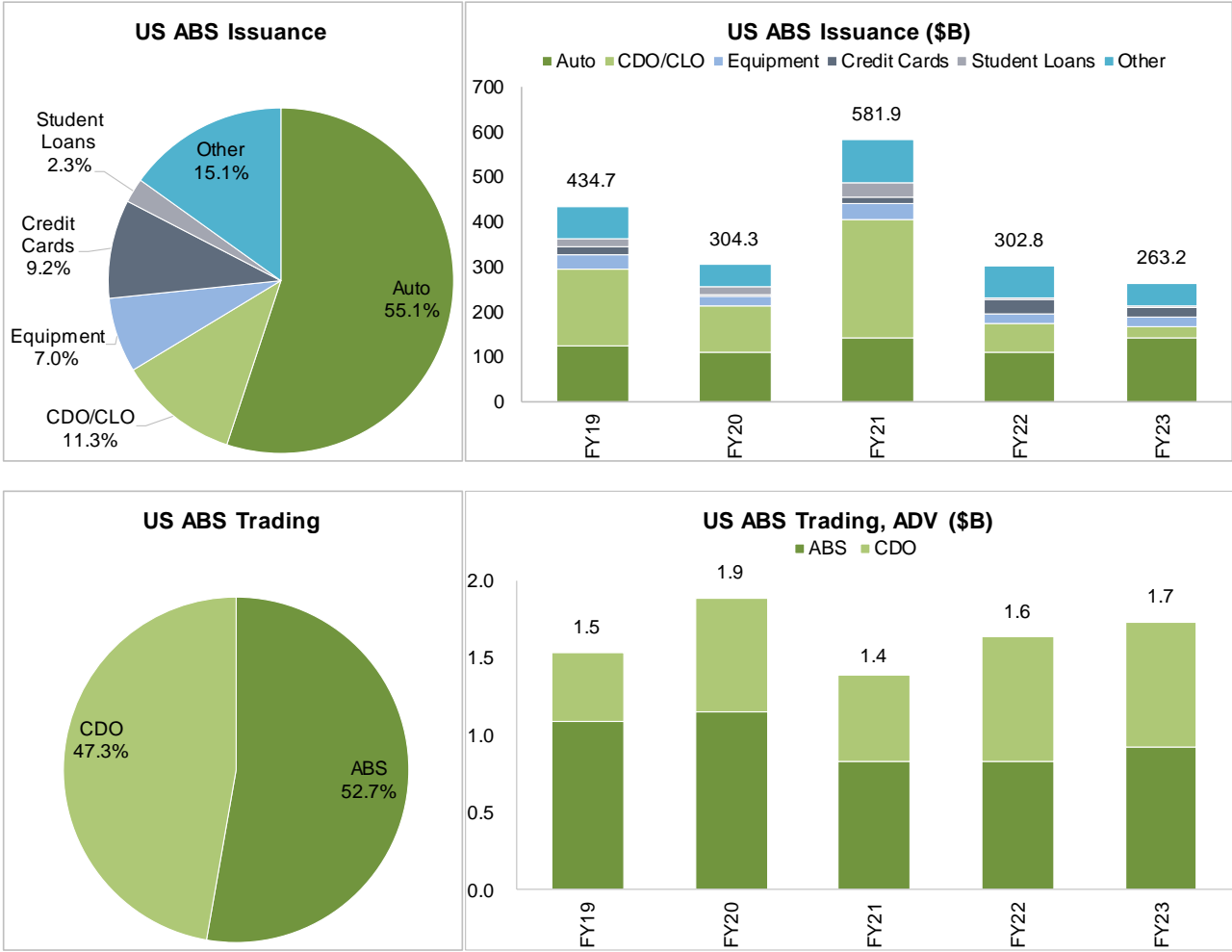
- Outstanding: \$4.1T; +0.5% Y/Y



Source: Municipal Securities Rulemaking Board, SIFMA estimates

Asset-Backed Securities (ABS)

- Issuance: \$263.2B; -13.1% Y/Y
- ADV: \$1.7B; +5.9% Y/Y



Source: Bloomberg, FINRA, Refinitiv, SIFMA estimates
 Note: CDO = collateralized debt obligation, CLO = collateralized loan obligation

Rates Review

Volatility (MOVE Index)

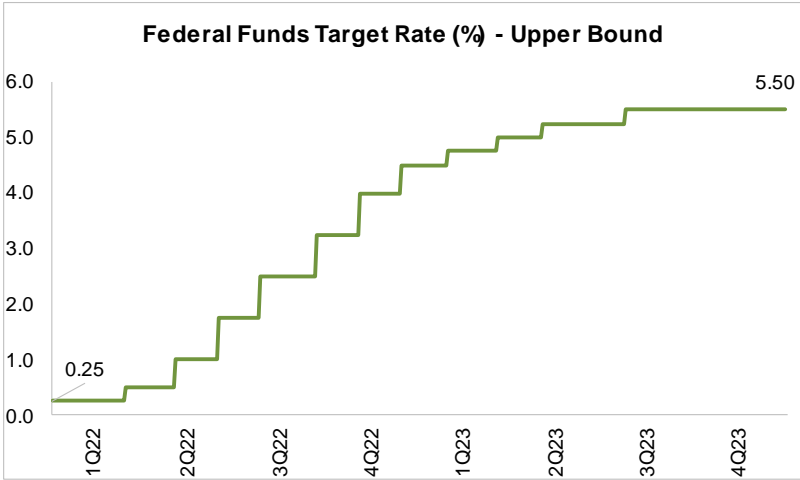
- Year end: 114.62
- Peak: 198.71 on 3/15/23



Source: Bloomberg, SIFMA estimates

Federal Funds Rate (Fed Funds)

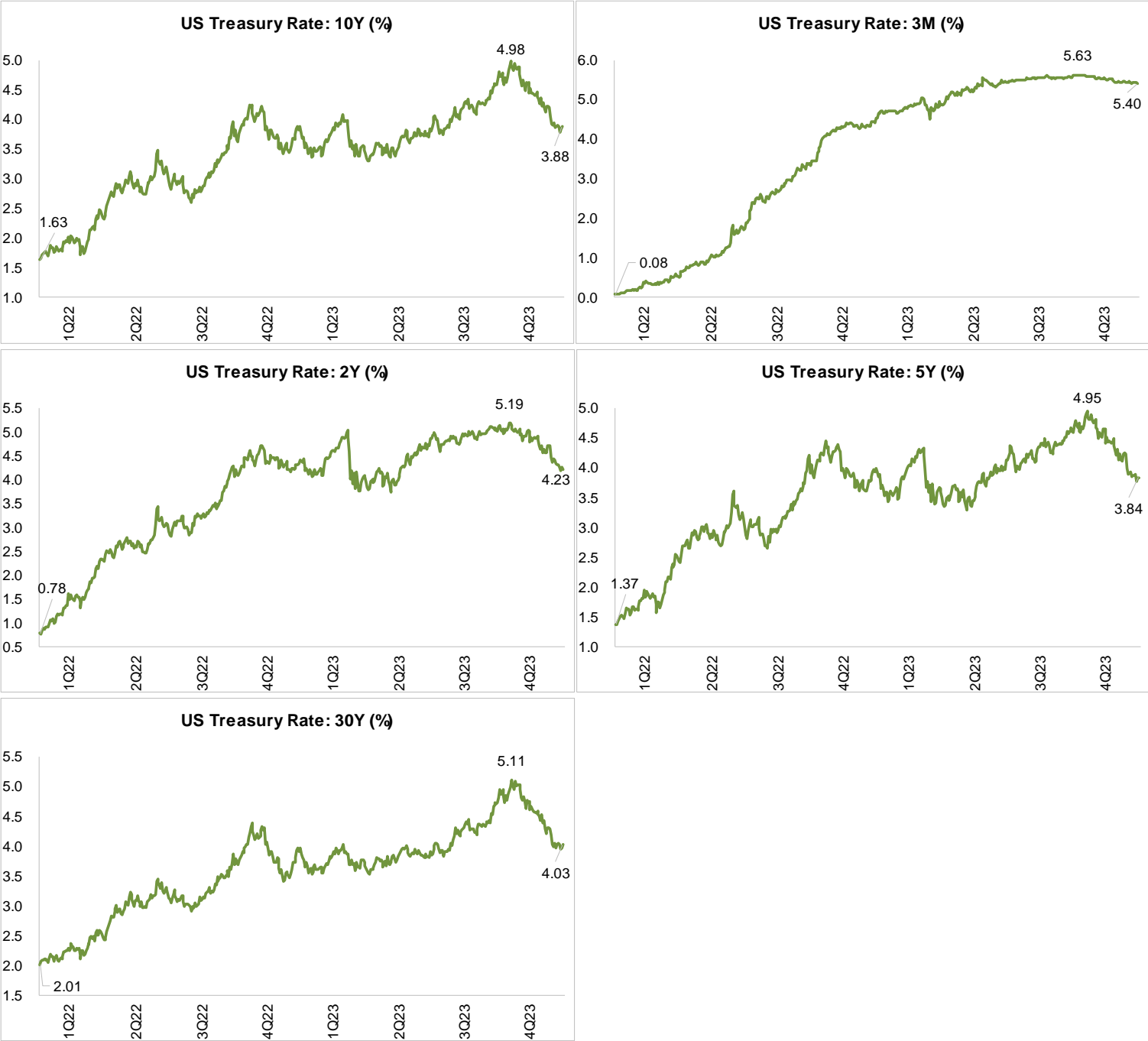
- Current (next FOMC meeting April 30/May 1): 5.25% (Lower Bound) - 5.50% (Upper Bound, shown in the chart)



Source: Bloomberg, SIFMA estimates

UST by Tenor

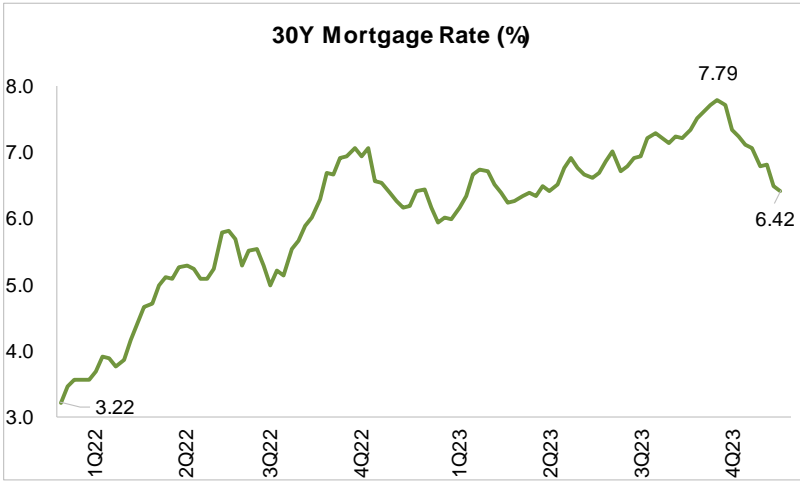
- 10 Year Benchmark
 - Year end: 3.88%
 - Peak: 4.98% on 10/19/23



Source: Bloomberg, SIFMA estimates

30-Year Mortgage Rate

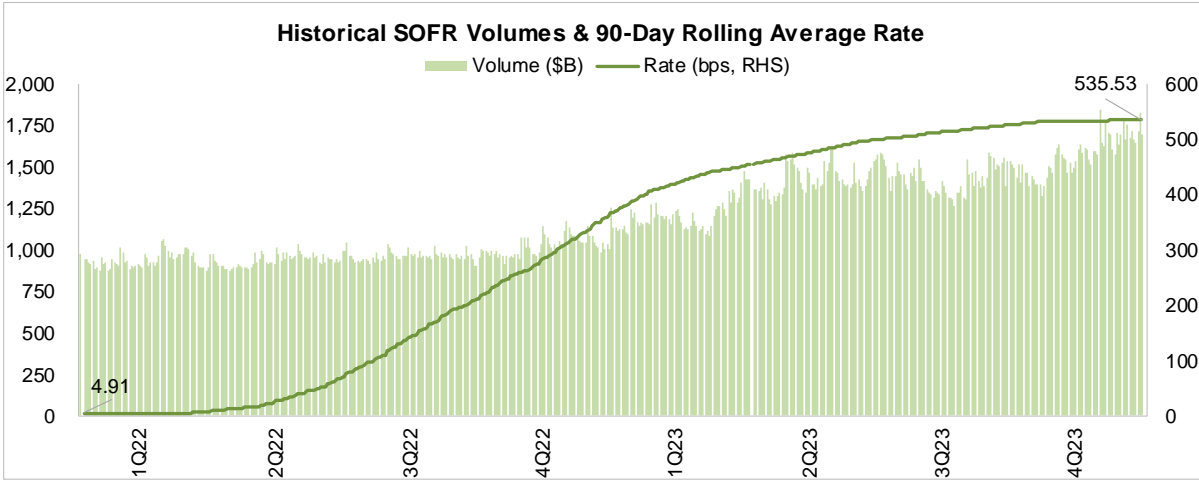
- Year end: 6.42%
- Peak: 7.79% week of 10/26/23



Source: Bloomberg, SIFMA estimates

Secured Overnight Financing Rate (SOFR)

- Year end (90 day rolling average): 535.53 bps
- Year end Fed Volumes: \$1,702.0B



Source: Federal Reserve Bank of New York, SIFMA estimates

Appendix: Definitions & Purpose

In general, fixed income securities are borrowed capital for the issuer to fund government operations, public projects, or corporate investments, thereby fueling economic growth. The diversity of fixed income products both increases the amount of funds available to borrow and spreads credit risk across multiple market participants.

- **U.S. Treasury Securities (UST)** – UST are debt obligations of the federal government used to fund its operations. Since UST are backed by the full faith and credit of the U.S. government, these securities are considered by market participants as the benchmark credit. As such, UST show a diversity of holders, in both institutional type and foreign holders.
- **Mortgage-Backed Securities (MBS)** – Since mortgages – a debt instrument collateralized by a specified real estate property – are less liquid than other investment vehicles, they can be securitized into MBS, whether in pass-throughs or collateralized mortgage obligations (CMOs).
- **Corporate Bonds (Corporates)** – Corporates are debt securities issued by public and private corporations. They are issued to raise money to fund investments or expansion plans. Corporates are considered riskier than UST, and receive ratings by credit ratings agencies to determine creditworthiness, i.e. probability of repayment of debt in a timely manner.
- **Municipal Bonds (Munis)** – Munis are debt securities issued by state/local governments or government agencies and public entities (utilities, school districts) to fund public projects, predominantly infrastructure related. Efficient muni markets enable states and municipalities to borrow at low rates and finance capital expenditures over a longer time period.
- **Federal Agency Securities (Agency)** – Agency securities are issued by quasi-governmental agencies (federal government, government sponsored enterprises) to fund operations. Unlike UST or munis, these securities are not always fully guaranteed by the U.S. or a municipal government. As such, they can hold credit and default risk.
- **Asset-Backed Securities (ABS)** – ABS are financial securities collateralized by a pool of typically illiquid assets such as auto loans, student loans, credit cards, etc. Pooling these assets creates a more liquid investment vehicle, with a valuation based on the cash flows of the underlying and the structure of the transaction.
- **Secured Overnight Financing Rate (SOFR)** – As the world transitioned away from the London Interbank Offered Rate (LIBOR), SOFR was chosen by the U.S. as its chosen alternative reference rate. Publication of the SOFR rate began in April 2018. Trading and clearing of SOFR based swaps and futures began in May 2018.

Appendix: Terms to Know

Y/Y	Year-over-Year
Q/Q	Quarter-over-Quarter
YTD	Year-to-Date
BPS	Basis Points
PPS	Percentage Points
CAGR	Compound Annual Growth Rate
CUSIP	Committee on Uniform Securities Identification Procedures

CFTC	Commodity Futures Trading Commission
SEC	Securities and Exchange Commission
Fed	Federal Reserve System
FRB	Federal Reserve Bank
NY Fed	Federal Reserve Bank of New York
ARRC	Alternative Reference Rates Committee

ADV	Average Daily Trading Volume
Algo	Algorithm (algorithmic trading)
AT	Automated Trading
ATS	Alternative Trading System
AUM	Assets Under Management
Best Ex	Best Execution
CLOB	Central Limit Order Book
D2C	Dealer-to-Client
D2D	Dealer-to-Dealer
ECN	Electronic Communications Network
ETP	Electronic Trading Platforms
ETD	Exchange Traded Derivative
FI	Fixed Income
FICC	Fixed Income, Currencies and Commodities
GCF	General Collateral Financing
IDB	Inter-Dealer Broker
IIV	Intraday Indicative Value
IOI	Indication of Interest
MM	Market Maker
OI	Open Interest
OTC	Over-the-Counter
VWAP	Volume Weighted Average Price

IBOR	Interbank Offered Rate
LIBOR	London Inter-bank Offered Rate
RFR	Risk Free Rate
SOFR	Secured Overnight Financing Rate
DV01	Dollar Value of Basis Point
DVP	Delivery-versus-Payment
EFFR	Effective Fed Funds Rate
PAI	Price Alignment Interest
Repo	Repurchase Agreement

UST	U.S. Treasury Securities
MBS	Mortgage-Backed Security
Corporates	Corporate Bonds
Munis	Municipal Securities
Agency	Federal Agency Securities
ABS	Asset-Backed Securities
MM	Money Markets

FRN	Floating Rate Note
FRA	Forward Rate Agreement
T-Bill	U.S. Treasury Bill
T-Note	U.S. Treasury Note
T-Bond	U.S. Treasury Bond
TIPS	Treasury Inflation Protected Securities

ABS	Asset-Backed Security
CMO	Collateralized Mortgage Obligation
MBS	Mortgage-Backed Security
CMBS	Commercial MBS
RMBS	Residential MBS

HY	High Yield Bond
IG	Investment Grade Bond

GO	General Obligation Bond
Revenue	Revenue Bond

CD	Certificate of Deposit
CDO	Collateralized Debt Obligation
CLO	Collateralized Loan Obligation
CP	Commercial Paper
ABCP	Asset-Backed Commercial Paper
MMF	Money Market Mutual Funds

FAMC	Farmer Mac/Federal Agricultural Mortgage Corporation
FCS	Farm Credit System
FHLB	Federal Home Loan Banks
FHLMC	Freddie Mac/Federal Home Loan Mortgage Corporation
FNMA	Fannie Mae/Federal National Mortgage Association
GNMA	Ginnie Mae/Government National Mortgage Association
TVA	Tennessee Valley Authority

IR	Interest Rate
IRS	Interest Rate Swap
OIS	Overnight Index Swap
TRS	Total Return Swap
STIR	Short-Term Interest Rate

Appendix: SIFMA Insights Research Reports

SIFMA Insights: www.sifma.org/insights

- Ad hoc reports on timely market themes
- Market Structure Compendium (annual report)
- COVID Related Market Turmoil Recaps: Equities; Fixed Income and Structured Products

Monthly Market Metrics and Trends: www.sifma.org/insights-market-metrics-and-trends

- Statistics on volatility and equity and listed options volumes
- Highlights an interesting market trend

Market Structure Primers: www.sifma.org/primers

- Capital Markets Primer Part I: Global Markets & Financial Institutions
- Capital Markets Primer Part II: Primary, Secondary & Post-Trade Markets
- Global Equity Markets
- Electronic Trading
- US Capital Formation & Listings Exchanges
- US Equity
- US Multi-Listed Options
- US ETF
- US Fixed Income

Conference Debriefs

- Insights from market participants into top-of-mind topics
- Pre-Conference Survey Comparison, compares survey results across various conferences

Equity Market Structure Analysis

- The ABCs of Equity Market Structure: How US Equity Markets Work and Why
- Analyzing the Meaning Behind the Level of Off-Exchange Trading, Part II
- Analyzing the Meaning Behind the Level of Off-Exchange Trading
- Why Market Structure and Liquidity Matter

Top of Mind with SIFMA Insights

- Podcasts with market participants on key market and economic themes, including reference guides defining terms and providing charts on the topics discussed on the podcast

Appendix: About Coalition Greenwich

Coalition Greenwich, a division of CRISIL, an S&P Global Company, is a leading global provider of strategic benchmarking, analytics and insights to the financial services industry. Coalition Greenwich specializes in providing unique, high-value and actionable information to help its clients improve their business performance. Its suite of analytics and insights encompass all key performance metrics and drivers: market share, revenue performance, client relationship share and quality, operational excellence, return on equity, brand perception, behavioral drivers, and industry evolution.

<https://www.greenwich.com/>

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