Primer: Fixed Income & Electronic Trading

Analyzing Market Metrics and Fundamentals of Markets

A Look at the Evolution of Electronic Trading

September 2024

SIFMA Insights Primers

The primer series from SIFMA Insights breaks down important technical and regulatory nuances. By fostering an understanding of the marketplace, we set the scene to address complex issues arising in today's markets. The primer series can be found here: www.sifma.org/primers

In addition to this primer, the series includes the following reports: Capital Markets, Global Equity Markets Comparison, Capital Formation and Listings Exchanges, Equities, Options, and Exchange-Traded Funds (ETF).

In this primer: We analyze the fixed income markets. We note the "s" in markets, as there is not one market, but several markets based on multiple subcategories within each main category: US Treasuries, corporates, MBS, agency, munis, and ABS (+money markets and repo). This report begins by identifying the description and purpose of the different markets. We analyze issuance, trading, and outstanding metrics across all the markets. Finally, this report looks at the evolution of electronic trading. We note that while many asset classes trade electronically, the story in the fixed income markets has been one of great evolution since the global financial crisis.

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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

Breaking Out the US Fixed Income Markets

Not One-Size Fits-All

In general, fixed income securities are borrowed capital for the issuer, transferring funding from those that have it to those that need it. These borrowings are used to fund government operations, consumer lending, public projects, or corporate investments, thereby fueling economic growth. In contrast to equities, the buyer of these debt securities does not receive ownership of the issuing entity, instead they become a creditor of the issuer. The debt is repaid at a specified time – repayment of principal – and the return for the investor comes in interest payments – fee charged for lending the money – at a fixed amount on specified time periods, usually semiannually. The diversity of fixed income products both increases the amount of funds available to borrow and spreads credit risk across multiple market participants.

It is important to note we write fixed income markets as plural for a reason. There are several distinct markets that include multiple subcategories within each main category: U.S. Treasuries (UST), mortgage-backed securities (MBS), corporate bonds (corporates), municipal securities (munis), federal agency securities (agency), asset-backed securities (ABS), and money markets (ex: commercial paper). The UST and agency markets are referred to as the rates markets, as valuation and bondholder risk is tied to interest rates. The remaining credit markets involve both interest rate and credit risk, or the probability of the borrower defaulting. There are also repurchase agreements (repos), which aid secondary market liquidity for the cash markets (for example, UST), allowing dealers to act as market makers in a very efficient manner.

These markets may have multiple subcategories. For example, large companies can issue multiple types of bonds (callable, convertible, etc.) that are not fungible, and there are public versus private markets for some fixed income segments. All these subcategories serve different purposes. Fixed income products generally do not trade on exchanges – albeit some products have moved towards greater proportions of electronic execution, i.e. the electronification of markets – and are generally not fungible. This contrasts with U.S. cash equities, where a large corporation could have hundreds of CUSIPs[1] versus only one stock. Therefore, there is no one-size-fits-all way to describe market structure for fixed income securities.

[1] CUSIP = Committee on Uniform Securities Identification Procedures = a number identifying most financial instruments, including: stocks of all registered U.S. and Canadian companies, commercial paper, and U.S. government and municipal bonds.

Regulatory Environment

Since, as noted above, fixed income comprises multiple asset classes, this primer does not have a regulatory evolution section as seen in other primers. However, the markets are regulated, as depicted below. Additionally, the SEC has proposed or finalized several rules that show increasing regulatory focus on these markets, including: mandated Treasury and repo clearing, exchange/platform registration, and more.

	FINRA	SEC	CFTC	FHFA	MSRB	US Treasury
UST	X	X	X			X
Corporates	X	X				
MBS	X	X		X		
Agency	X	X		X		
Munis	X	X			X	
ABS	X	X				

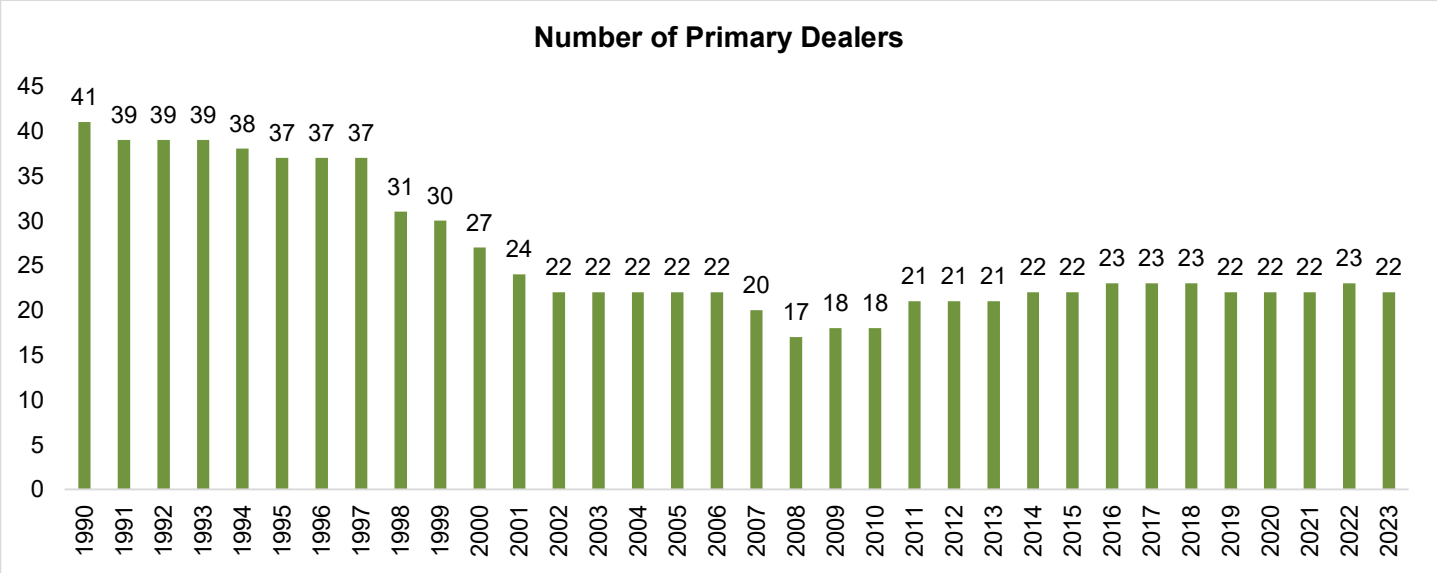
Note: FHFA regulates only agency MBS and debt issuers. MSRB is responsible for writing rules for the municipal bond market, while FINRA is responsible for enforcing those rules. Fixed-income markets and firms involved in those markets may also be subject to regulations from and supervision by banking regulators and various state regulatory agencies.

The Role of Primary Dealers

Another noteworthy factor in fixed income market structure is the use of primary dealers. As trading counterparties to the Federal Reserve Bank of New York (NY Fed), primary dealers play a crucial role in open market operations, which support the implementation of U.S. monetary policy. These firms are required to be active counterparties for the NY Fed's market operations that implement monetary policy and must bid, consistent with their pro rata share of the market, in all Treasury auctions at "reasonably competitive prices." If a primary dealer is active in agency debt or agency MBS, it is also expected to participate in any NY Fed operations in these instruments at a level proportionate with its share in these markets.

Primary dealers are eligible to participate in the NY Fed's securities lending program, which is designed to help dealers make markets in Treasury securities. Primary dealers play another important role by providing the NY Fed insight into market developments and ongoing market trends, which it uses to support the formulation and implementation of monetary policy.

While the number of primary dealers used to be greater than 40, it has since settled in the low 20s. The number troughed in 2008, at 17, as firms exited the markets or otherwise failed to meet the NY Fed's eligibility criteria. The number of primary dealers stood at 22 to end 2023.[2]



Source: New York Fed, SIFMA estimates

[2] 24 as of publishing of this report.

Description & Purpose: U.S. Treasury Securities

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 have a diversity of holders, in both institutional and retail and domestic and foreign. UST include the following securities:

- **Treasury Bills** (T-Bills): Non-interest bearing (zero-coupon) short-term securities with maturities of only a few days or 4, 8, 13, 17, 26, or 52 weeks[3]. They are purchased at a discount to par (face) value and paid out at par value at maturity.

- **Treasury Notes** (T-Notes): These are fixed-principal securities with maturities of 2, 3, 5, 7, and 10 years. Interest is paid semiannually, with the principal paid at maturity.

- **Treasury Bonds** (T-Bonds): These are fixed-principal, long-term securities issued with a maturity of 20 or 30 years. Outstanding T-bonds have remaining maturities of 10 to 30 years. Interest is paid semiannually, with the principal paid at maturity.

- **Treasury Inflation Protected Securities** (TIPS): These are indexed to inflation, as measured by the Consumer Price Index (CPI), acting as a hedge against the negative effects of inflation. They come in 5, 10, and 30 year maturities, and interest is paid semiannually. TIPS are considered a low-risk investment since the par value rises with inflation, while the interest rate remains fixed.

- **Floating Rate Notes** (FRN): These are debt instruments with a 2 to 5 year maturity and a variable interest rate. Its interest rate is tied to a benchmark (U.S. T-Bill rate, Fed Funds rate).

[3] There are also cash management bills (CMB), where maturities range from a few days to three or four months. CMBs are offered when the government has a low cash balance. The money raised through these issues is used by the Treasury to meet any temporary cash shortfalls and provide emergency funding.

Description & Purpose: Corporate Bonds

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 commonly receive ratings from credit ratings agencies that help investors determine creditworthiness, i.e. the probability of repayment of debt according to its terms.

Corporates include the following categories of securities:

- **Publicly Traded**: SEC-registered bonds.
- **144A**: Securities Act Rule 144A creates a mechanism for the sale of bonds that are not registered with the SEC, if certain conditions are met
- **High Yield**: Bonds rated by the credit rating agencies below BBB, indicating a higher risk of default.
- **Investment Grade**: Bonds rated by the credit rating agencies as BBB or higher, indicating a lower risk of default.

The securities may have one or more of the following structural features:

- **Fixed Rate**: These pay the same rate of interest for the entire term, i.e. a guaranteed interest rate throughout maturity.
- **Floating Rate**: These pay a variable interest rate, typically tied to a benchmark rate, such as the U.S. Treasury bill rate, Fed Funds rate, secured overnight financing rate (SOFR), or the prime rate.
- **Callable**: These resemble standard bonds, but the issuer has an option to recall (retire) and prepay the bonds. Otherwise, the bond retires at the originally specified maturity date.
- **Non-Callable**: These cannot be redeemed early by the issuer except with the payment of a penalty.
- **Convertible**: These can be converted into a predetermined amount of the underlying company's equity at certain times during the bond's life, usually at the bondholder’s discretion.

Description & Purpose: Federal Agency Securities

Agency debt is issued by quasi-governmental agencies to fund operations. Unlike UST, these securities are not always fully guaranteed by the U.S. government but are considered to have some degree of an implicit guarantee.

- **Federal Government Agency Bonds**: These are backed by the full faith and credit of the U.S. government and include bonds issued by the Small Business Administration (SBA), etc.

- **Government-Sponsored Enterprise Bonds** (GSE): These are not backed by the same guarantee as federal government agencies and are issued by the Federal National Mortgage Association (Fannie Mae or Fannie), Federal Home Loan Mortgage (Freddie Mac or Freddie), Federal Farm Credit Banks Funding Corporation (Farm Credit) or the Federal Home Loan Bank (FHLB), Federal Agricultural Mortgage Corporation (Farmer Mac). Tennessee Valley Authority (TVA) is unique. A wholly-owned agency of the U.S. government, the TVA is a self-supporting entity whose debt is not guaranteed by the government, but rather is supported strictly by TVA revenues.

Description & Purpose: Municipal Bonds

Munis are debt securities issued by state or local governments or other government agencies and public entities, such as public utilities or school districts. The money raised funds public projects, predominantly infrastructure projects such as: roads, bridges, transit systems, water treatment centers, schools, airports or hospitals. Efficient muni markets enable states and municipalities to borrow at low rates and finance capital expenditures over a longer period commensurate with their useful lives. Munis include the following securities:

- **General Obligation Bond** (GO): These are backed by dedicated property taxes or general funds of the municipality, not by revenue from a specific project.
- **Revenue Bond**: These are backed by revenue from a specific project.
- **Negotiated**: An underwriter sells the bonds to its clients, after determining the bond price by gathering indications of interest during a presale.
- **Competitive**: Bonds are advertised for sale, and any market participant may bid, with the bonds going to the bidder offering the lowest interest cost.
- **Private placement**: A broker-dealer sells the entire muni bond placement to its clients.
- **Refunding**: Retiring or redeeming an outstanding bond issue at maturity by using the proceeds from a new debt issue, typically at a lower interest rate.
- **New Capital**: First issue of a bond, not a refunding.
- **Tax-Exempt Bond:** The interest earned by investors is generally free from federal income tax and often state and local income tax.
- **Taxable Bond:** The interest earned by investors is subject to taxation.

Description & Purpose: Securitized Products

Securitization is the process of designing a new financial instrument by packaging several underlying assets with similar characteristics. This financing technique pools similar types of debt obligations and then structures their cashflows to support the issuance of bonds which are sold to investors.

Mortgage-Backed Securities

A mortgage is a debt instrument collateralized by a specified real estate property(ies). Mortgages may be related to residential or commercial properties. A typical residential mortgage has a term of 15 or 30 years, fully amortizing, and is freely prepayable by the borrower. Commercial mortgages may have varying terms, and typically feature a bullet maturity as opposed to being fully amortizing. A pool of mortgages will serve as collateral for, and the source of repayment of, MBS. MBS include the following securities:

- **Agency MBS**: Issued by Fannie Mae, Freddie Mac, or Ginnie Mae. Can be residential or commercial. Many residential agency MBS are traded in the so-called TBA market, where securities are sold on a forward basis, and provide an important hedging mechanism for mortgage lenders, and allow borrowers to get free or low-cost rate locks when they shop for loans.

- **Non-Agency MBS**: Issued by private entities, such as finance companies or banks. Can be residential or commercial.

- **Passthrough:** The security simply “passes through” payments made by borrowers to security holders (subject to customary fees, such as servicing fees).

- **Collateralized Mortgage Obligation:** Cashflows from a pool of mortgage loans are structured into multiple classes of bonds which may have varying terms, and levels of prepayment, credit, or other risks.

- **Residential MBS** (RMBS): A bond collateralized by residential mortgages on 1-4 family homes.

- **Commercial MBS** (CMBS): A bond collateralized by commercial and/or multifamily mortgages.

- **Fixed-Rate Mortgage**: The borrowers on the mortgage that collateralize the MBS pay the same interest rate for the life of their loans, i.e. monthly principal and interest payment never change.

- **Adjustable-Rate Mortgage (ARM)**: The borrowers on the underlying mortgages have variable interest rates that are commonly fixed for an initial term, but then fluctuate with market rates or relative to an index. Monthly payments may change.

Asset-Backed Securities

Similar to MBS, ABS are securities collateralized by a pool of assets such as auto loans, student loans, credit card debt (cards), equipment, home equity loans, aircraft leases, other loans and leases, royalties, or account receivables. Pooling these assets creates a more liquid investment vehicle, with a valuation based on the cash flows of the underlying assets and the structure of the transaction.

Description & Purpose: Money Markets

The money markets involve highly liquid, short maturity (typically overnight to less than one year) financial instruments, which are used by issuers and investors to borrow and lend in the short term. Common money market instruments include:

- **Commercial Paper** (CP): A short-term, unsecured debt instrument issued by a corporation, typically to finance short-term liabilities (accounts receivables, inventories, etc.). Maturities are usually under 270 days. CP is most often issued at a discount from face value and reflects prevailing market interest rates.

- **Certificate of Deposit** (CD): A savings certificate with a fixed maturity date and interest rate, which restricts access to the funds until the maturity date. CDs are generally issued by commercial banks, in essentially any denomination, and are insured by the FDIC up to $250,000 per individual.

- **Bankers Acceptances**: A promised future payment, or time draft, guaranteed by and drawn on a deposit at the bank. The amount, date and holder of the draft are specified at issuance, at which time the draft becomes a liability of the bank. The holder of the draft can sell the bankers acceptance for cash to a buyer who is willing to wait until the maturity date for the funds in the deposit.

Transactions in the money market are wholesale, taking place only between institutional investors (no individual, or retail, investors) and for large denominations. Participants in these markets include corporations, banks, and mutual funds. Retail investors access money markets through smaller investment amounts in money market funds (MMF), a type of mutual fund required by the SEC to invest in low-risk securities. There are several types of MMFs, including ones investing primarily in government securities, tax-exempt municipal securities, or corporate debt (called prime funds). MMFs are not insured, yet are considered relatively safe and stable investment vehicles, given the low-risk nature of the underlying financial assets. MMFs seek to maintain a stable net asset value (NAV), the price at which investors can redeem their shares, at $1.00 per share. While rare, NAV may fall below $1.00 per share causing investor losses.

Description & Purpose: Repurchase Agreement

Defining Repo Markets

A repurchase agreement (repo) is a financial transaction in which one party sells an asset to another party with a promise to repurchase the asset at a pre-specified later date (a reverse repo is the same transaction seen from the perspective of the security buyer). Repos can be overnight (duration one day) or term (duration up to one year, albeit some are up to two years and the majority are three months or less). The repo market enables market participants to provide collateralized loans to one another, and financial institutions predominantly use repos to manage short-term fluctuations in cash holdings, rather than general balance sheet funding.

In general, repos aid secondary market liquidity for the cash markets (for example, U.S. Treasuries), by allowing dealers to act as market makers in a very efficient manner. Market makers stand ready to buy and sell securities, providing liquidity to markets. These firms must take the other side of trades when there are short-term buy and sell imbalances in customer orders. Healthy repo markets provide them the necessary cash and access to securities to perform these actions and keep secondary cash markets running effectively. The ability to finance and efficiently source securities contributes to lower interest rates paid by the issuers, most notably the U.S. Treasury, which lowers debt servicing costs borne by taxpayers.

The repo markets allow investors to manage excess cash balances safely and efficiently. Dealers also benefit from significantly reduced funding costs, the capacity to finance long positions in securities and the ability to borrow securities to cover short positions to satisfy client needs. Long holders of securities can also gain incremental returns by engaging in repo transactions with cash investors for securities they own but have no immediate need to sell.

Types of Repo Markets

While a broad array of assets may be financed in the repo market, the most commonly used instruments include UST, federal agency securities, high quality MBS, corporate bonds and money market instruments.

The repo market can be split into two main segments:

- **Bilateral Repo** – The bilateral repo market has investors and collateral providers directly exchange money and securities, absent a clearing bank. Bilateral repo transactions can either allow for general collateral or impose restrictions on eligible securities for collateral. Bilateral repo is preferred when market participants want to interact directly with each other or if specific collateral is requested.

- **Tri-Party Repo** – The tri-party repo market is named as such given the role played by clearing banks in facilitating settlement. Clearing banks act as an intermediary, handling the administrative details between the two parties in the repo transaction. Tri-party repo is used to finance general collateral, with investors accepting any security within a broad class of securities. According to the Federal Reserve Bank of New York (New York Fed), market participants view tri-party repo as more cost efficient.

There is also the **general collateral finance (GCF) repo** market, which is offered by the Fixed Income Clearing Corporation (FICC), a central clearing counterparty. GCF repo is predominantly used by securities dealers, who negotiate the trade on an anonymous basis and then submit it to FICC. FICC then interposes itself as the legal counterparty to both sides of the repo transaction.

Repo Market Participants

Securities dealers are at the heart of the repo market, operating in all repo market segments. The diagram on the following page shows the interaction of market participants in both repo market segments described above. Additional participants in the repo market include:

- **Financial institutions** – Primary dealers (see appendix for a list), banks, insurance companies, mutual funds, pension funds, hedge funds
- **Governments** – The New York Fed (used in its implementation of monetary policy), other central banks, municipalities
- **Corporations**

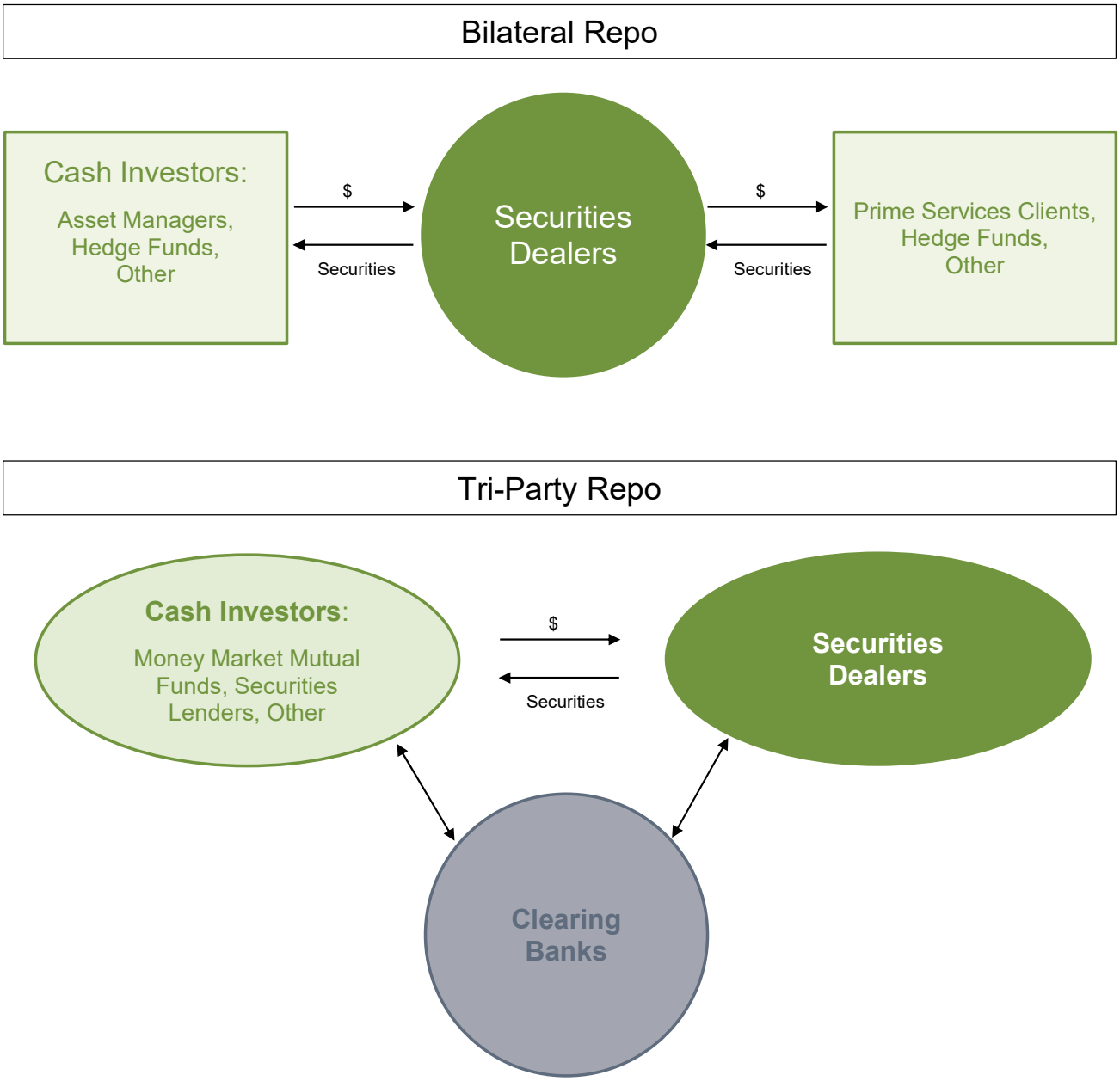
These entities all benefit from the security, operational efficiency and low funding costs available in the repo market. Repos offer cash providers collateralization (with additional margin requirements in most cases) marked-to-market daily to ensure continuing protection. The operational efficiencies developed through tri-party repo and the largely centralized settlement mechanism for repos further minimize risks. Standardized documentation, broadly accepted by market participants, provides further certainty for market participants.

Repo Regulation

Prior to the financial crisis, some financial institutions used repos to fund leveraged position taking in securities. As asset prices declined during the crisis, repo lenders increased the amount of collateral required, limiting the level of repo activity for some investors holding leveraged portfolios. This created a funding shortfall and forced investors to decrease leverage by selling assets, leading to even lower asset valuations. This fed back into additional asset sales, and the circle went round and round. Repos backed by government securities also faced stress. Flight to safety tendencies drove increased demand for these standalone assets, leading to shortages of available collateral in the repo market.

In light of this, the New York Fed works continuously with market participants – most notably with the Treasury Market Practices Group – to monitor repo infrastructure and recommend reforms as necessary, to ensure these markets remain stable sources of funding during periods of market stress. The New York Fed also provides data for market participants on the repo markets. While comprehensive data for all segments of repo markets are not available, data is provided for certain segments of and specific firms operating in this market.

Repo Operations



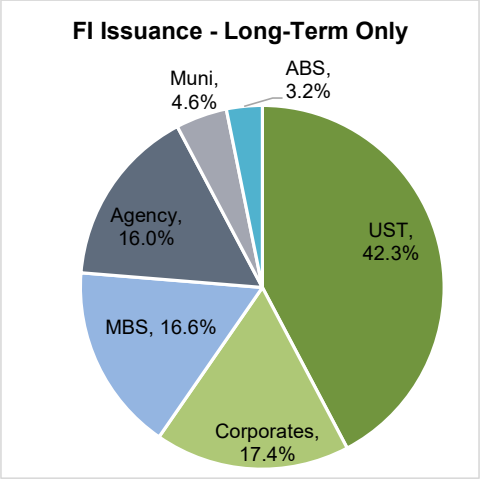
Sources: Federal Reserve Bank of New York, SIFMA estimates

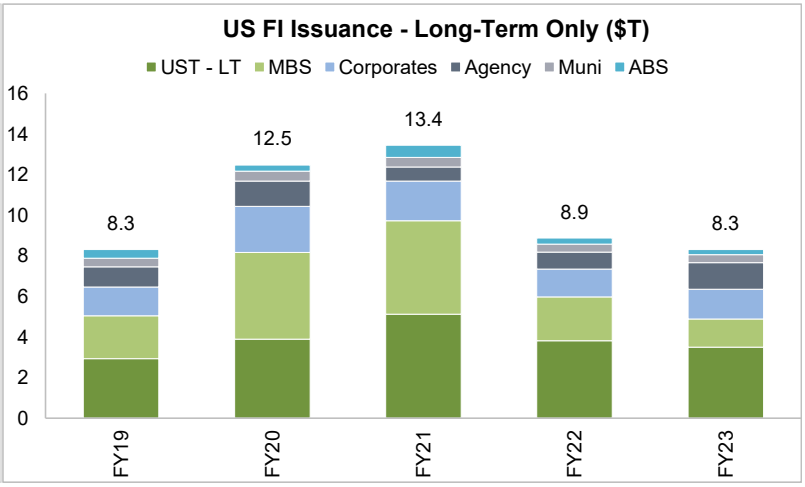
Market Metrics

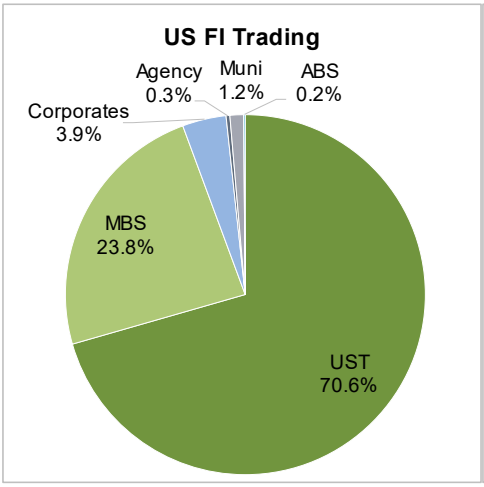
All data in this section is as of FY23, unless otherwise noted.

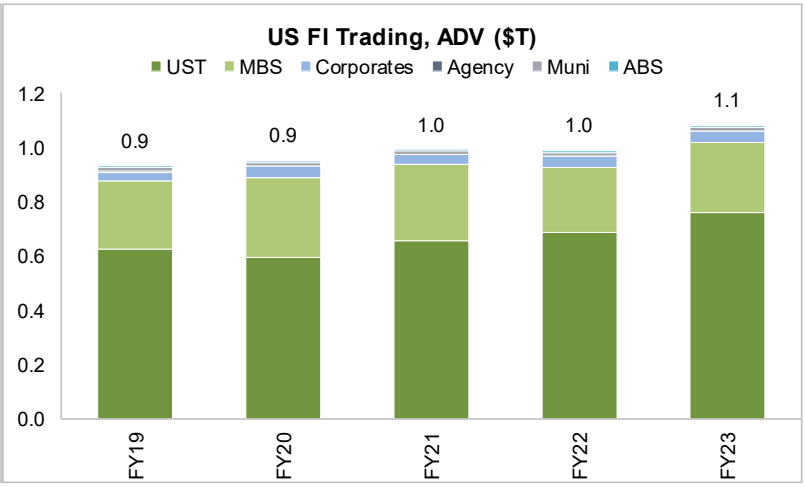
Total US Fixed Income

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



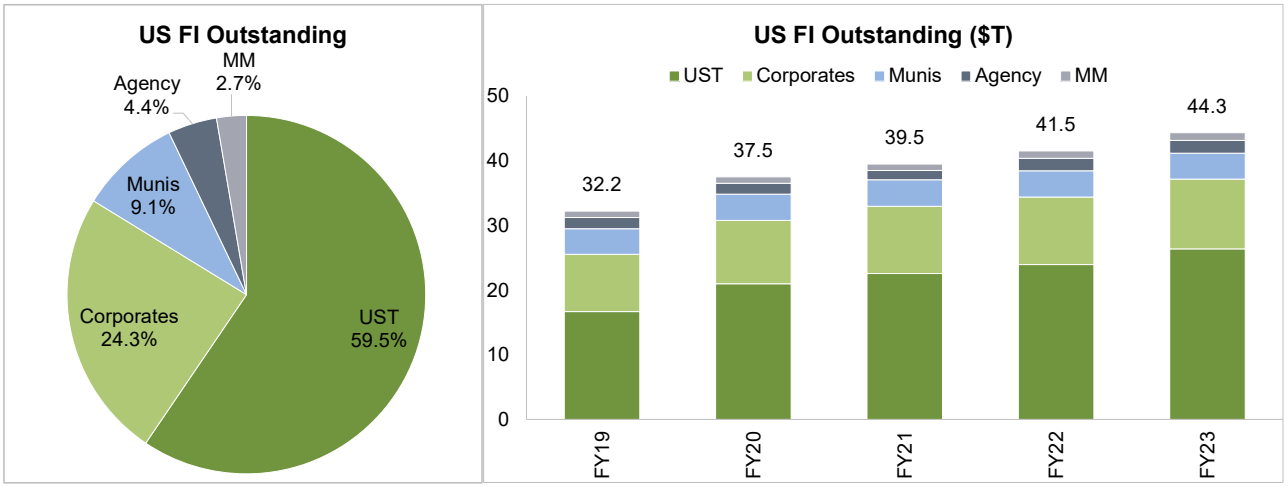






Source: Bloomberg, The Federal Reserve, Federal Reserve Bank of New York, FINRA, Municipal Securities Rulemaking Board, Refinitiv, US Agencies, US Treasury, SIFMA estimates
Note: UST = U.S. Treasury securities, MBS = mortgage-backed securities, Corporates = corporate bonds, Agency = federal agency securities,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

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

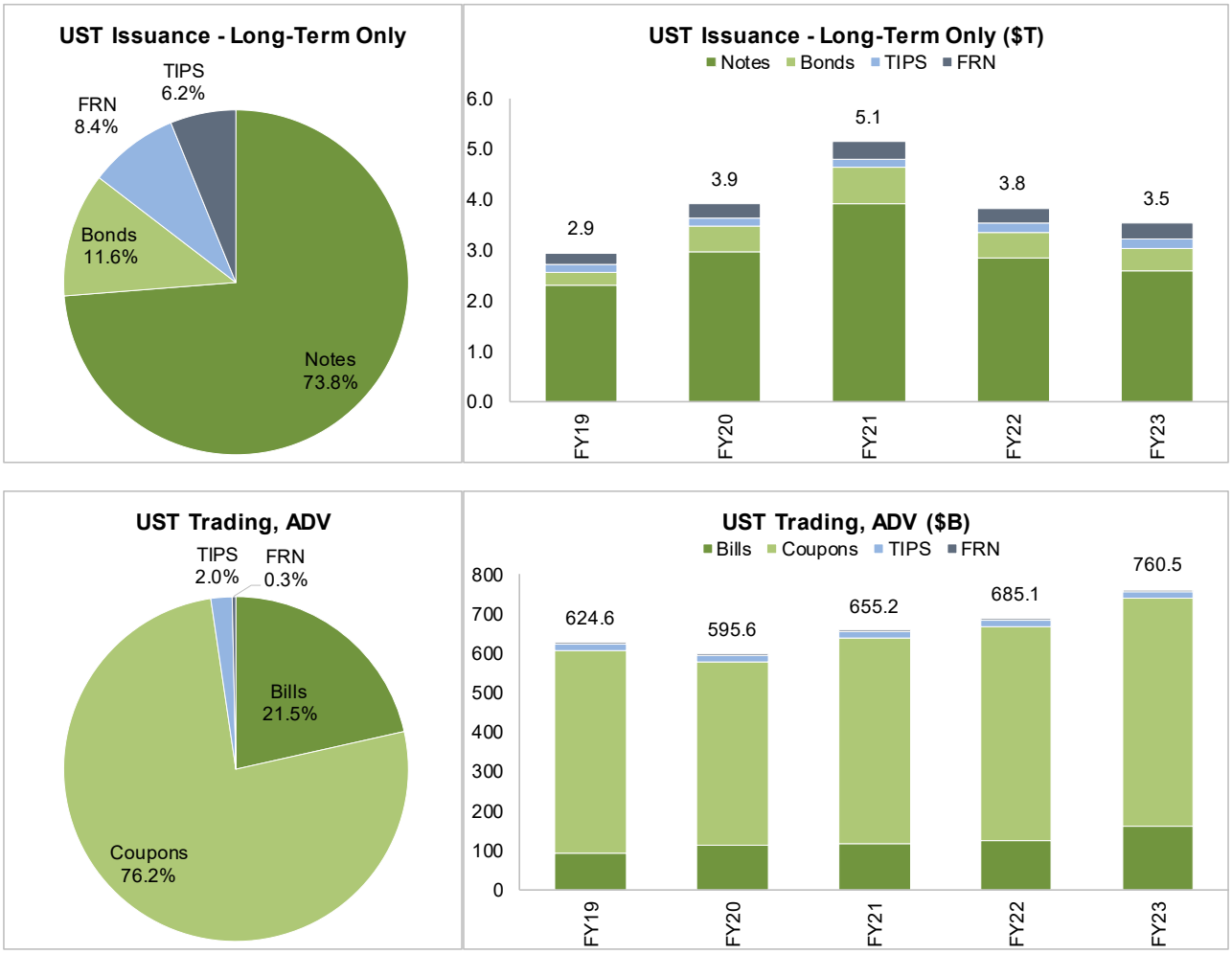


Source: Bloomberg, The Federal Reserve, Federal Reserve Bank of New York, FINRA, Municipal Securities Rulemaking Board, Refinitiv, US Agencies, US Treasury, SIFMA estimates

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.

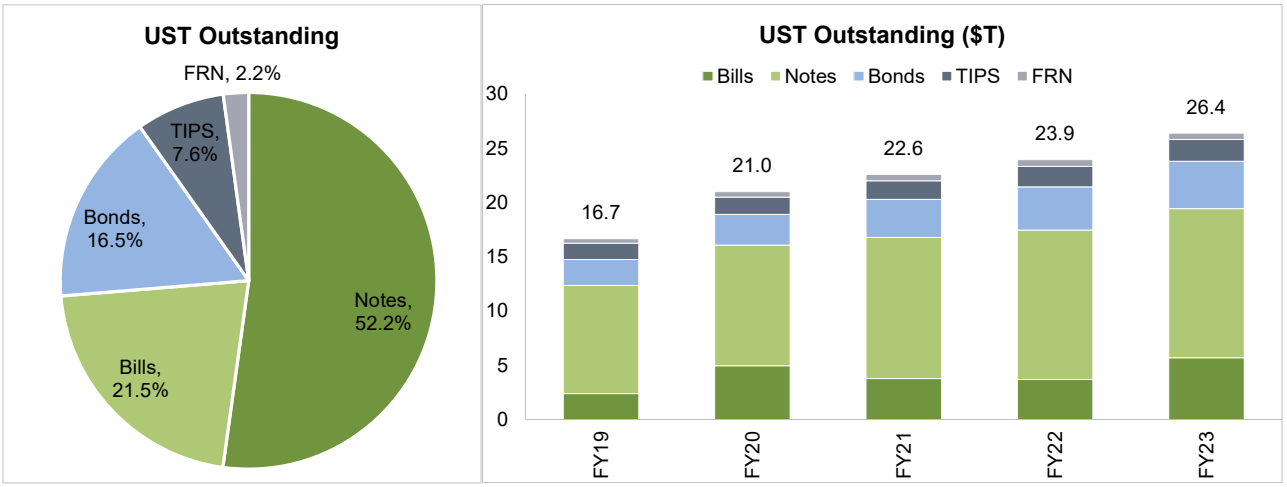
US Treasuries

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



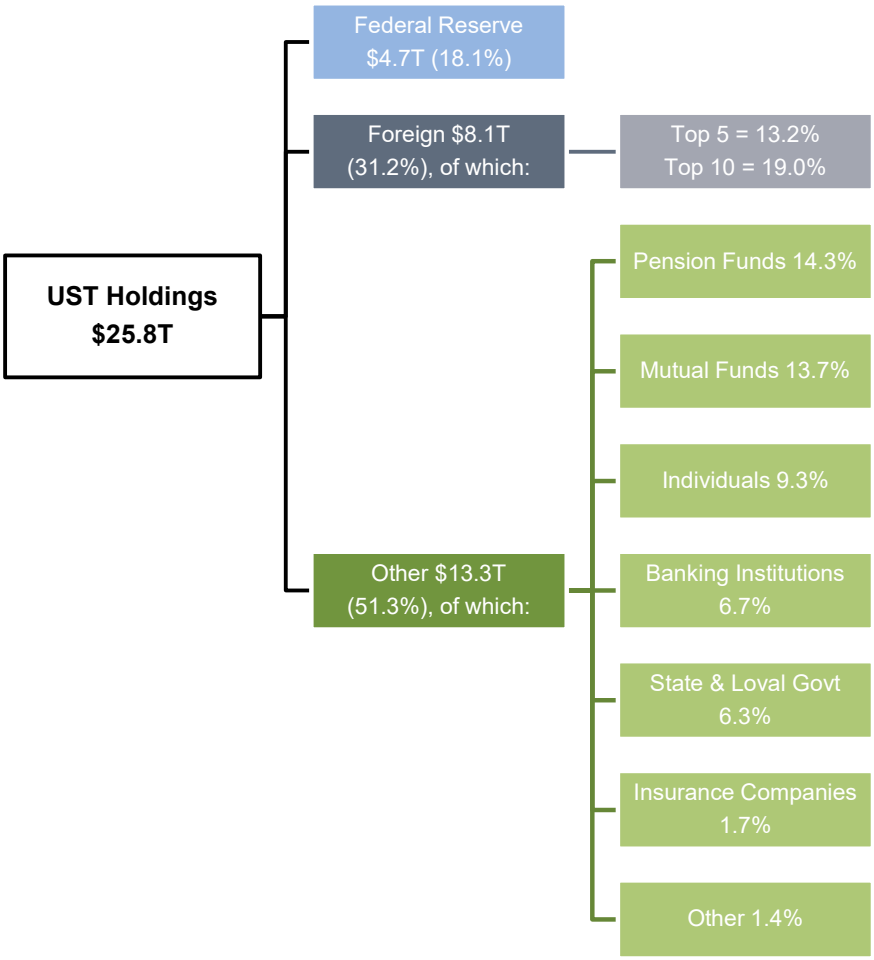
Source: FINRA, NY Fed, US Treasury, SIFMA estimates
Note: FRN = floating rate note, TIPS = Treasury inflation-protected securities

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



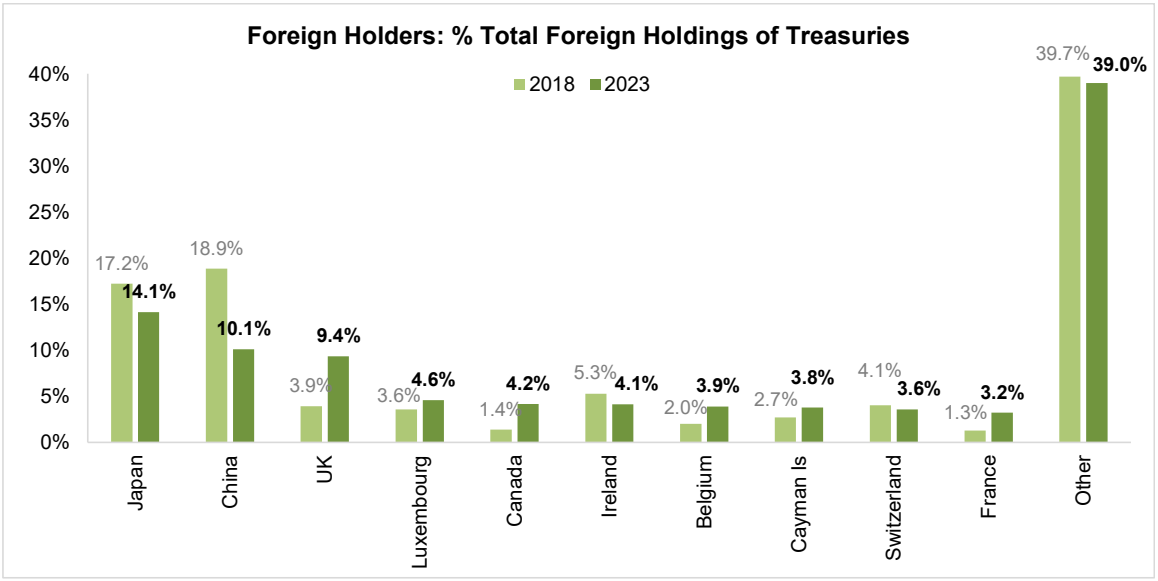
Source: FINRA, NY Fed, US Treasury, SIFMA estimates
Note: FRN = floating rate note, TIPS = Treasury inflation-protected securities

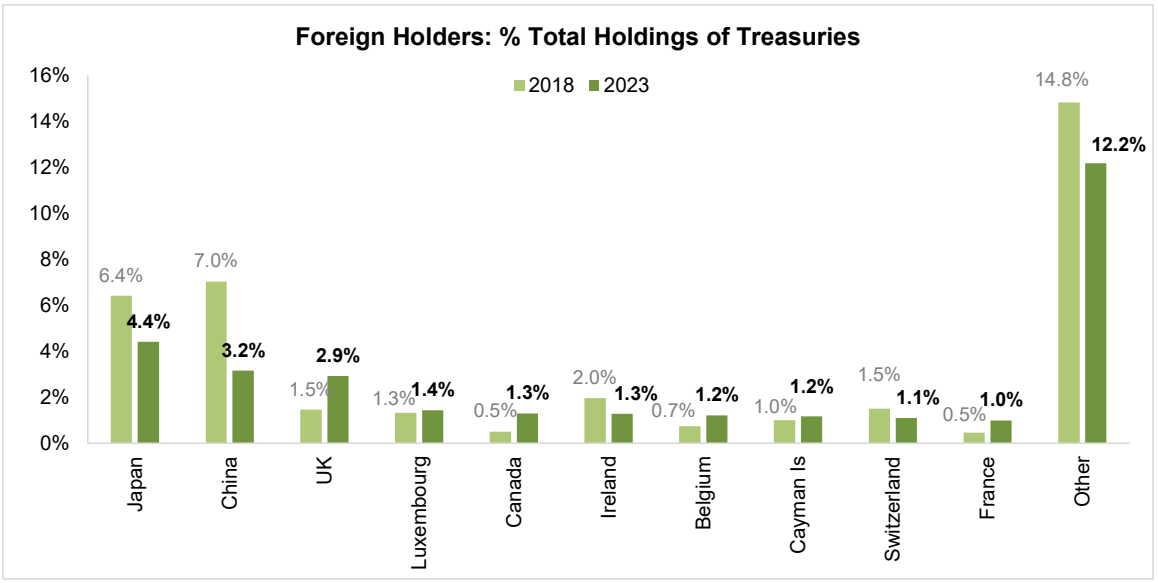
Treasury Holders



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.

Foreign Holders

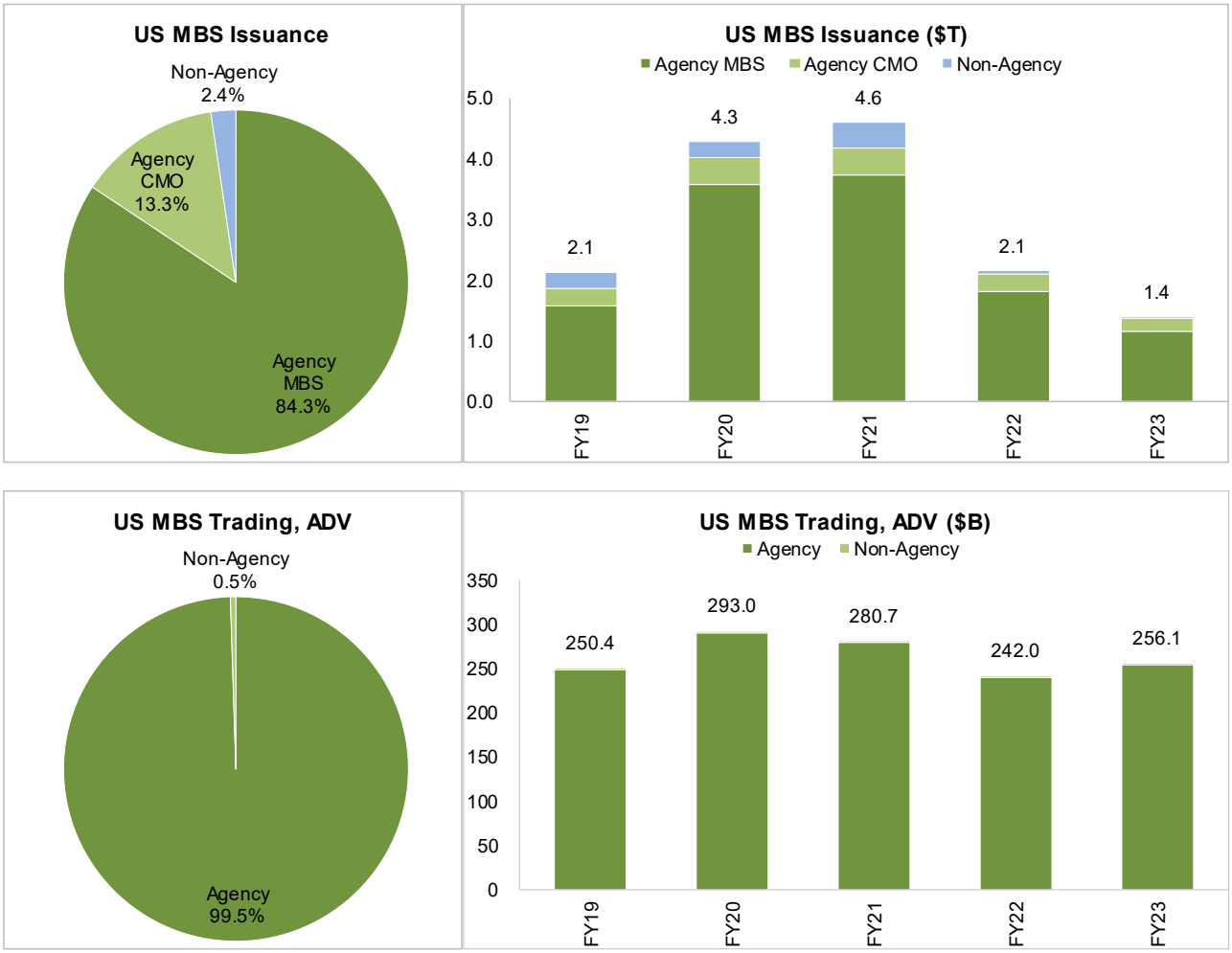




Source: U.S. Treasury, SIFMA estimates (as of December 2023)

Mortgage-Backed Securities

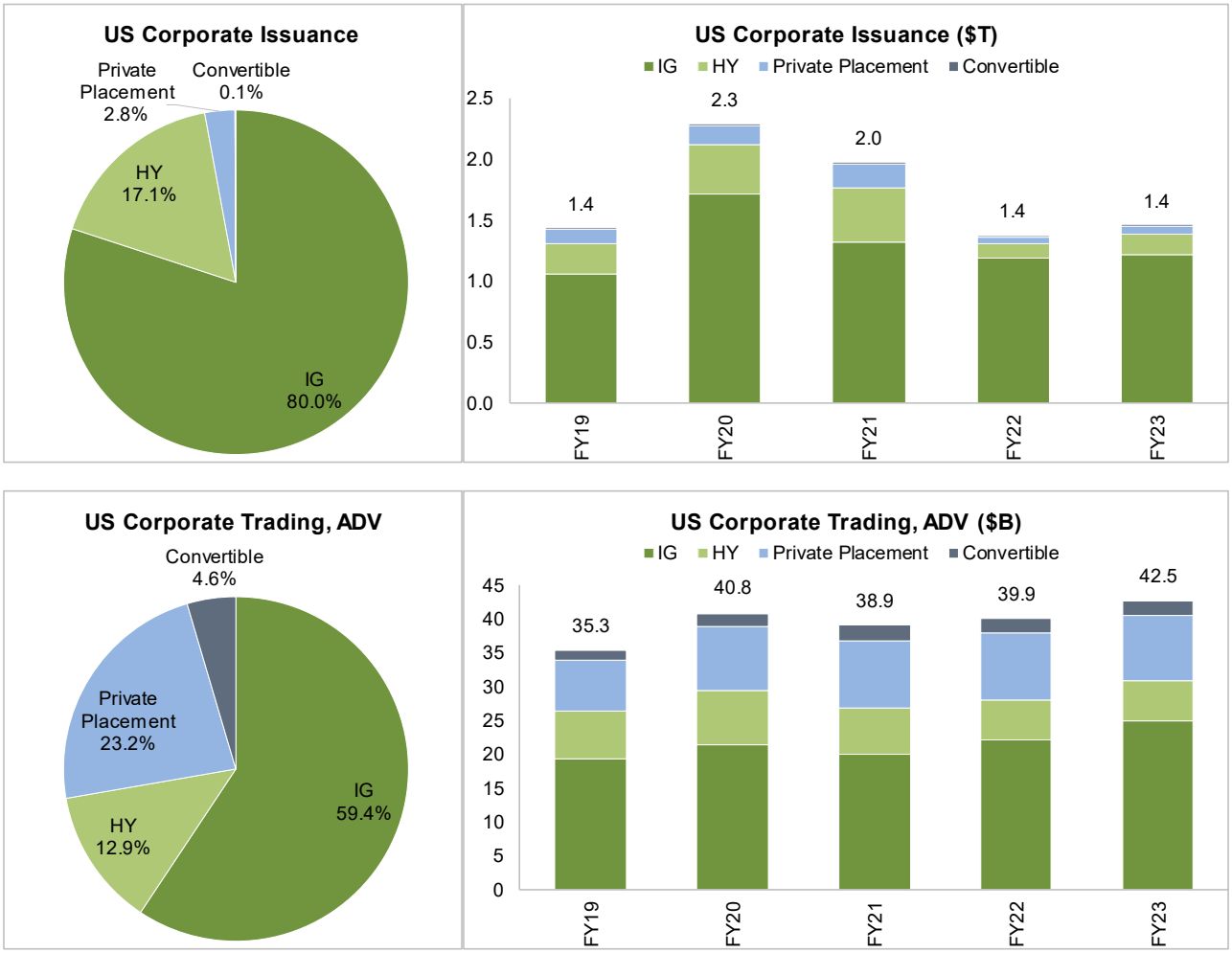
- Issuance: $1.4T; -35.4% Y/Y
- ADV: $256.1B; +4.2 % Y/Y



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

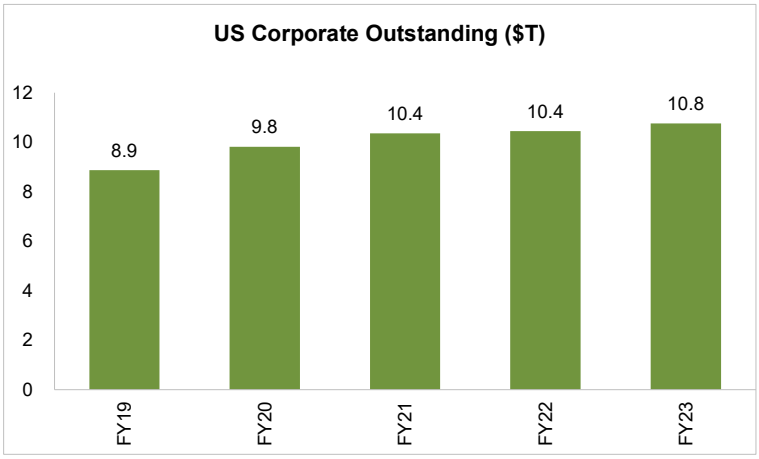
Corporate Bonds

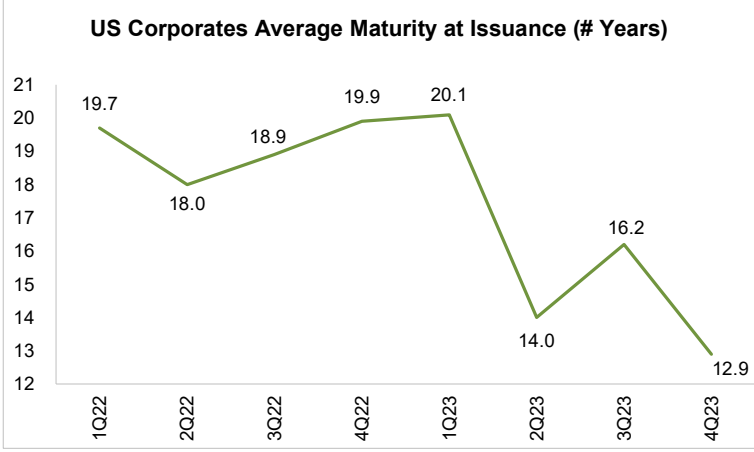
- Issuance: $1.4T; +5.4% Y/Y
- ADV: $42.5B; +6.6% Y/Y

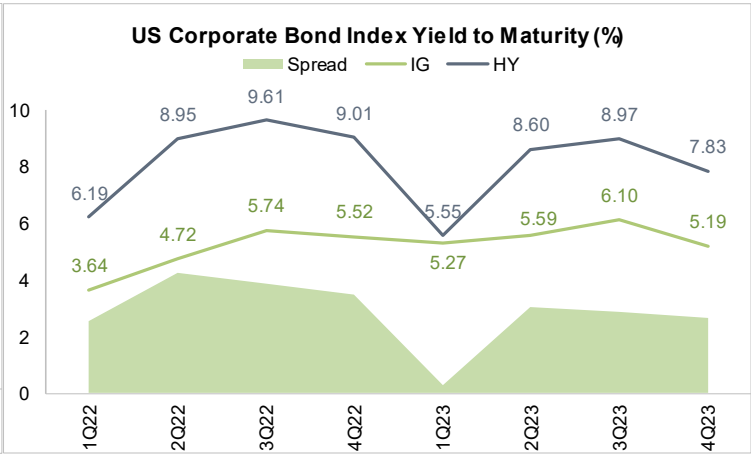


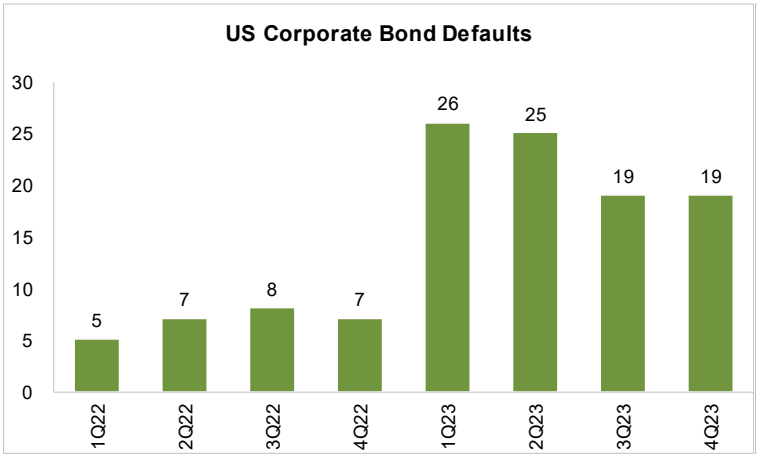
Source: Refinitiv, FINRA, The Federal Reserve, SIFMA estimates
Note: IG = investment grade, HY = high yield

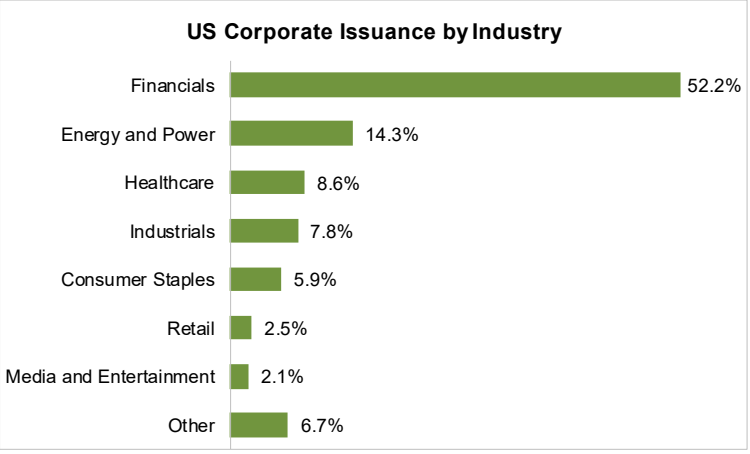
- Outstanding: $10.8T, +3.0% Y/Y







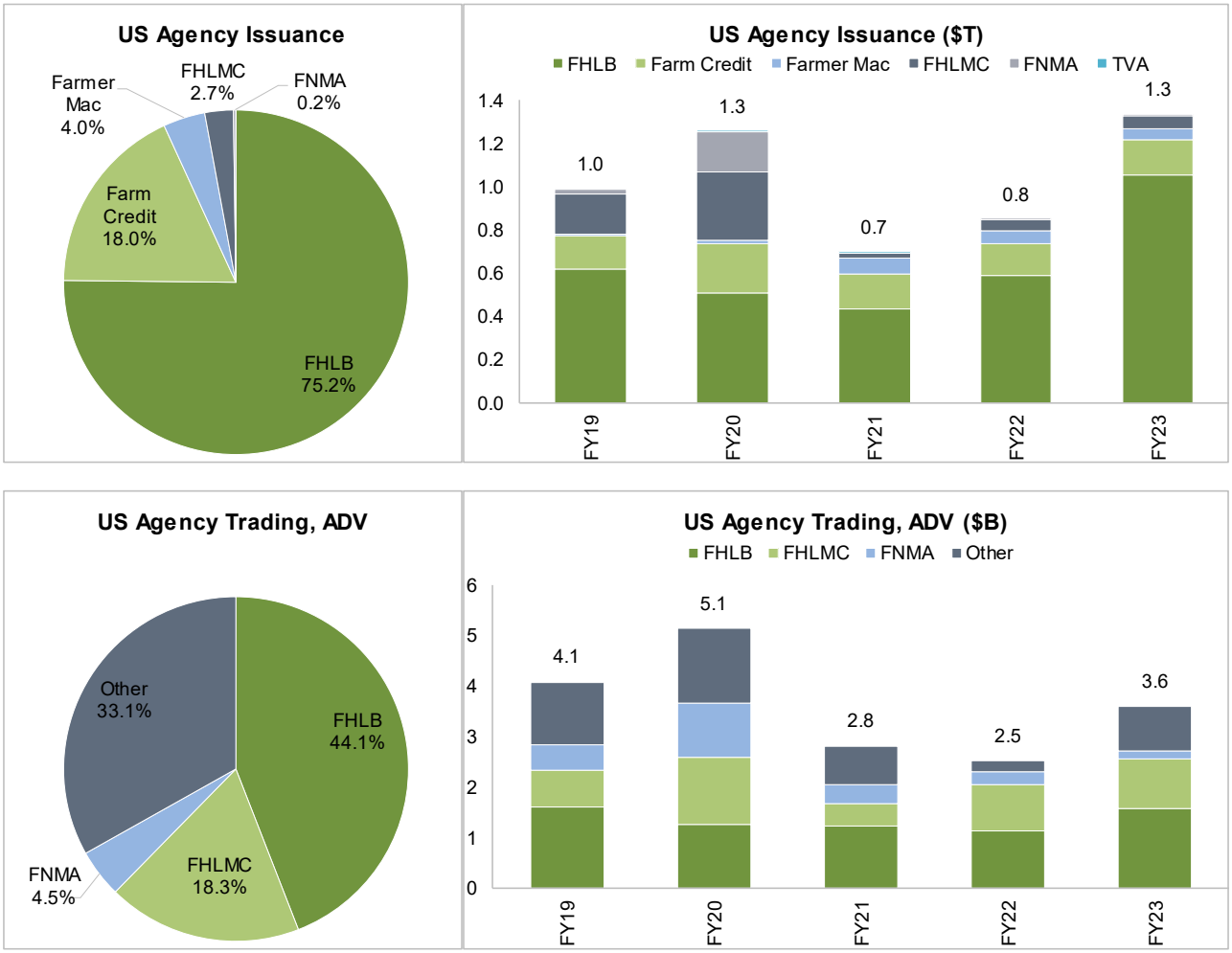




Source: The Federal Reserve, SIFMA estimates

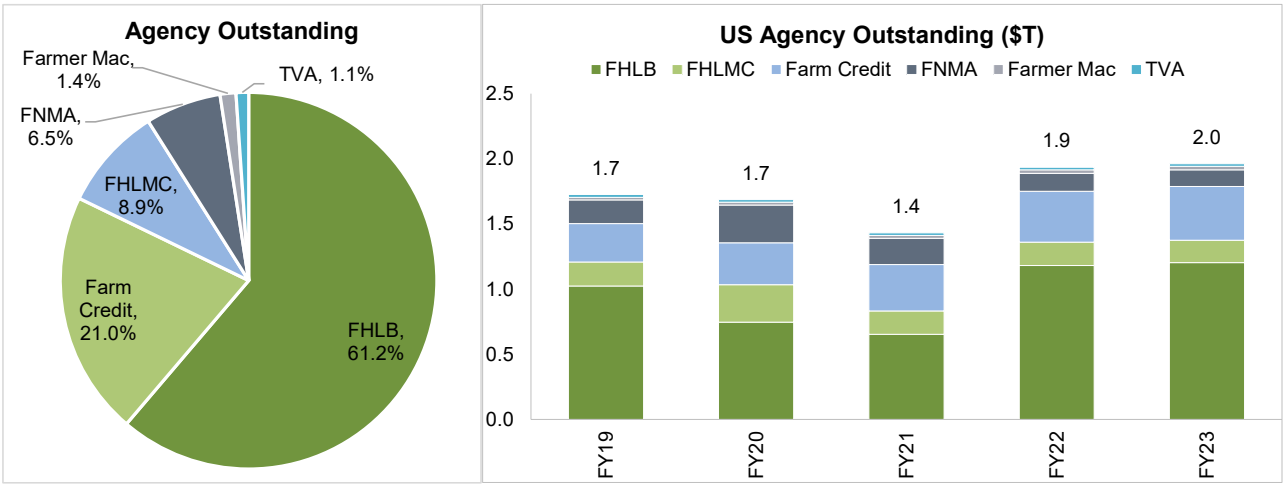
Federal Agency Securities

- 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

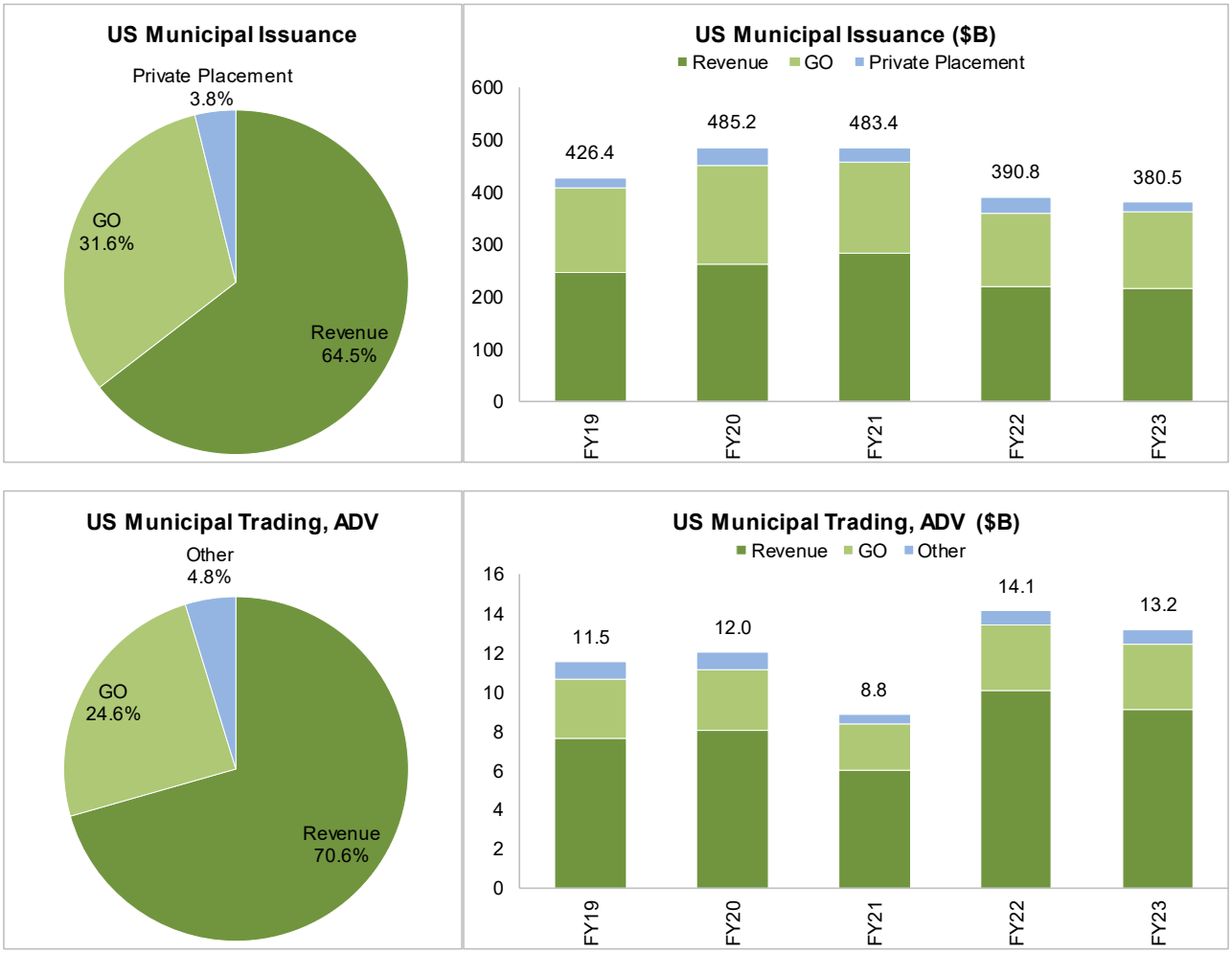
- Outstanding: $2.0T; +1.4% Y/Y



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

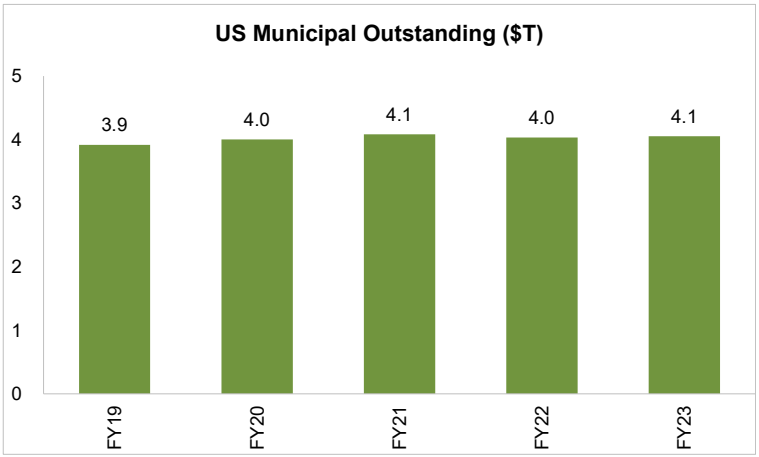
Municipal Bonds

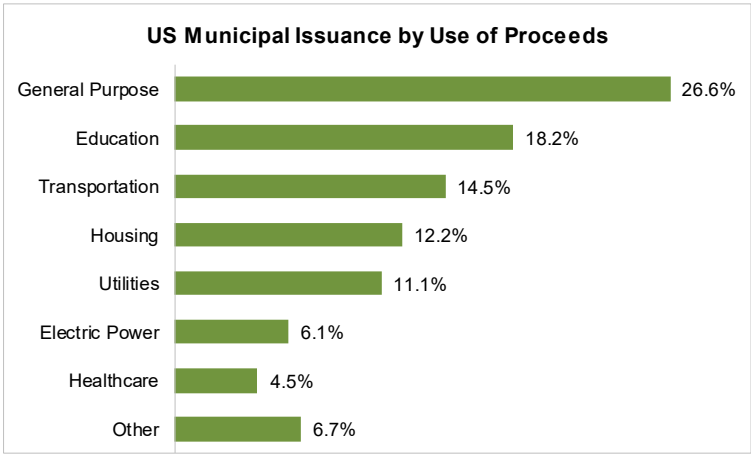
- Issuance: $380.5B; -2.6 Y/Y
- ADV: $13.2B; -5.7% Y/Y

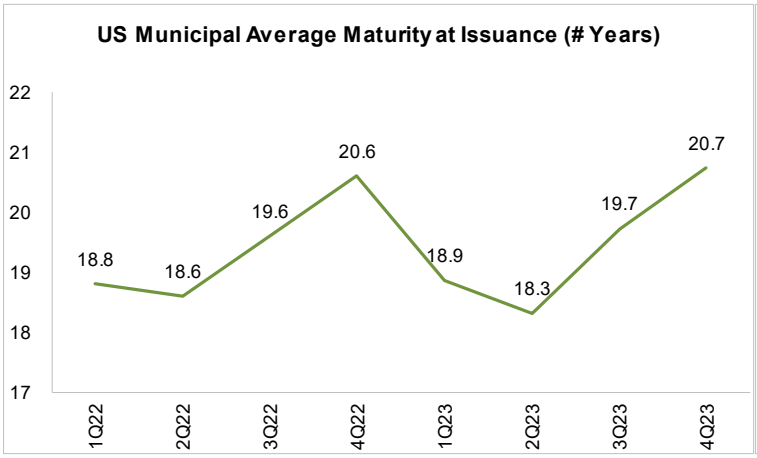


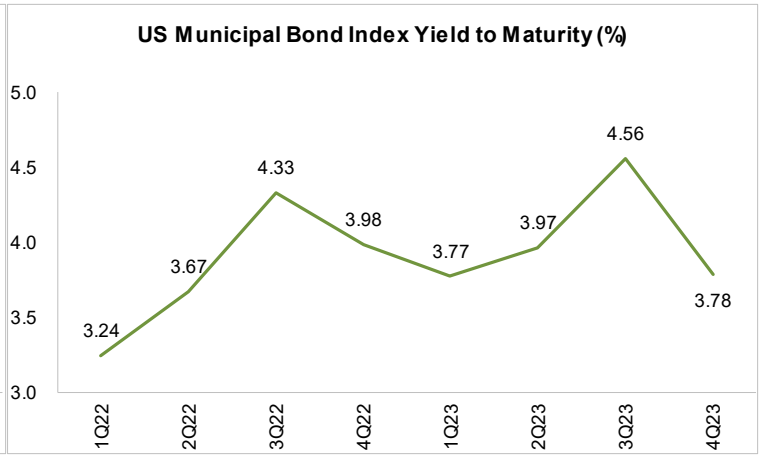
Source: Municipal Securities Rulemaking Board, SIFMA estimates
Note: GO = general obligation

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





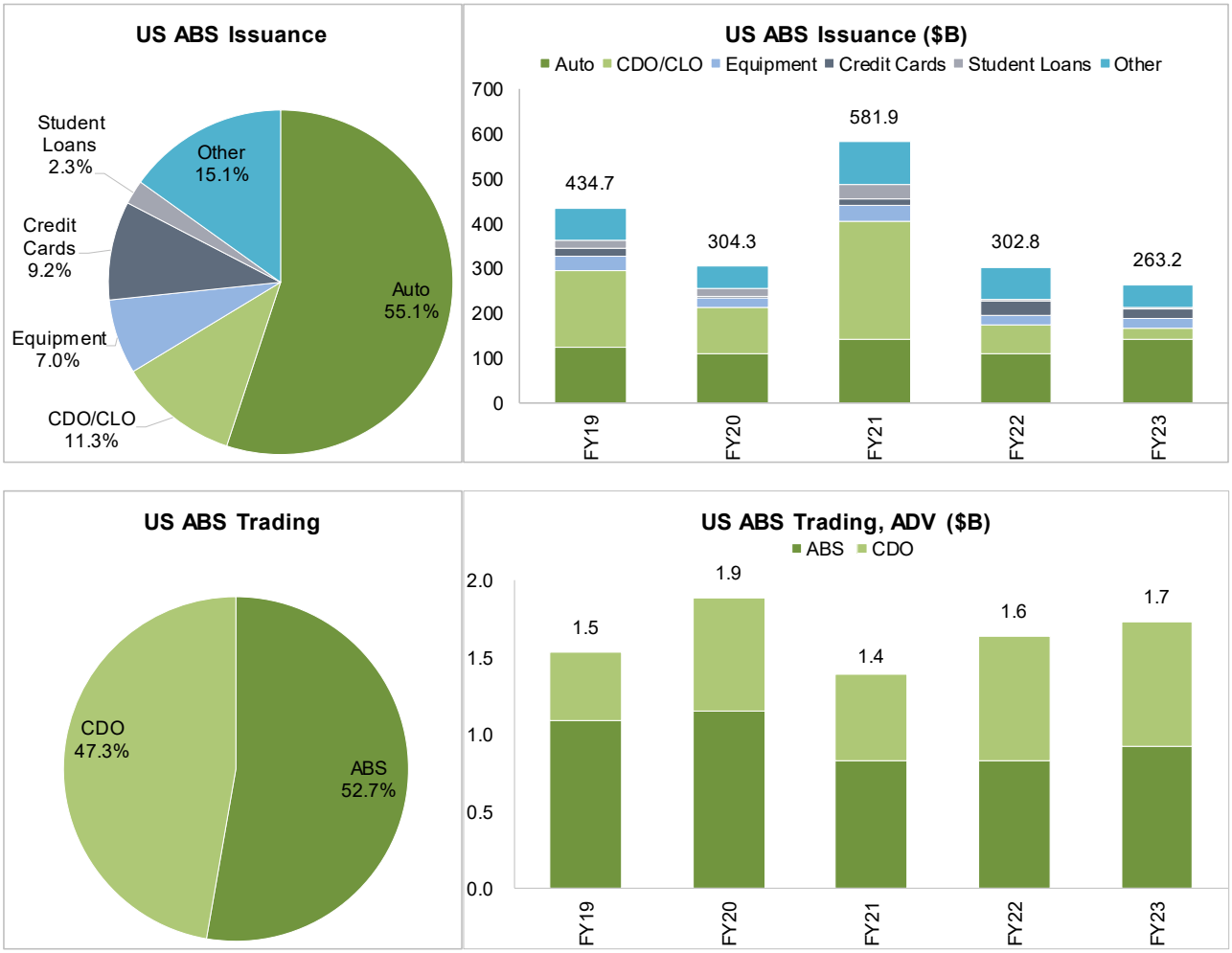




Source: ICE Data Indices, Refinitiv, Municipal Securities Rulemaking Board, SIFMA estimates

Asset-Backed Securities

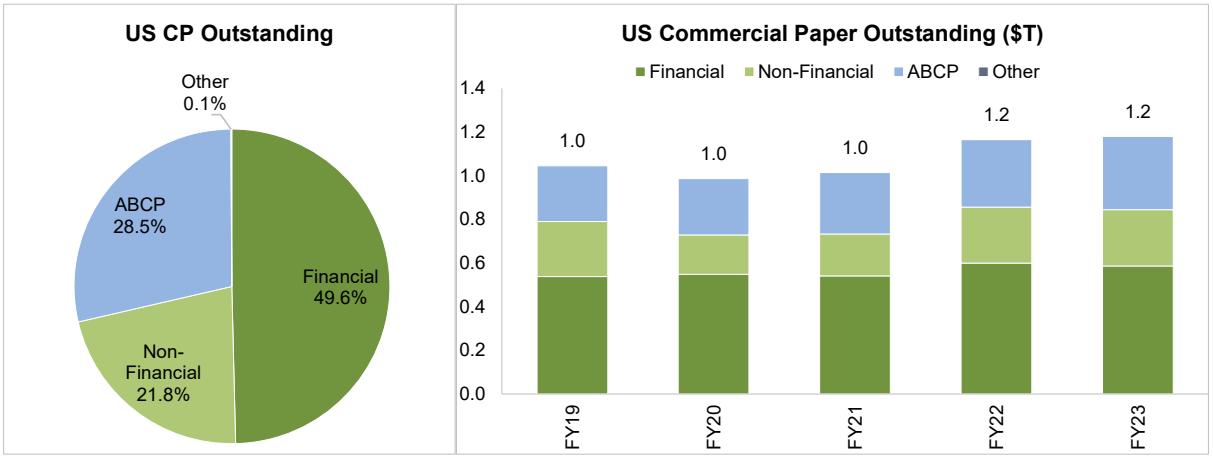
- Issuance: $263.2B; -13.1% Y/Y
- ADV: $1.7B; +5.9% Y/Y



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

Money Markets

- Commercial Paper Outstanding: $1.2T, +1.0% Q/Q, +1.4% Y/Y



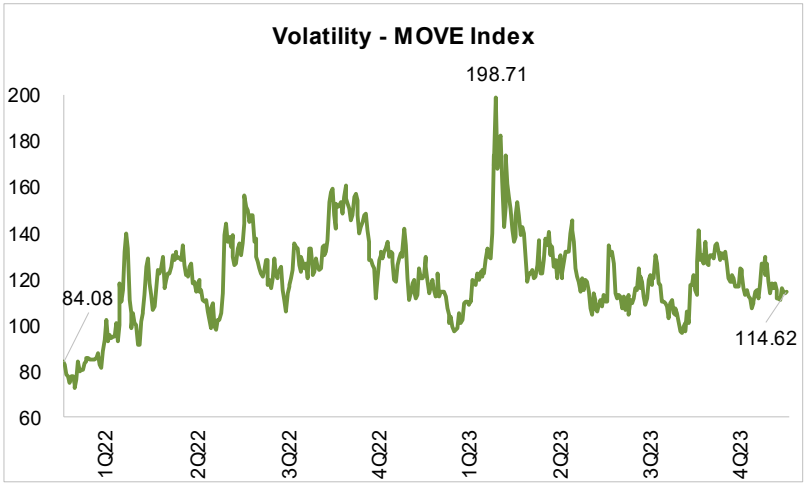
Source: The Federal Reserve Bank of New York, SIFMA estimates

Note: ABCP = asset-backed commercial paper

Rates Review

Volatility (MOVE Index)

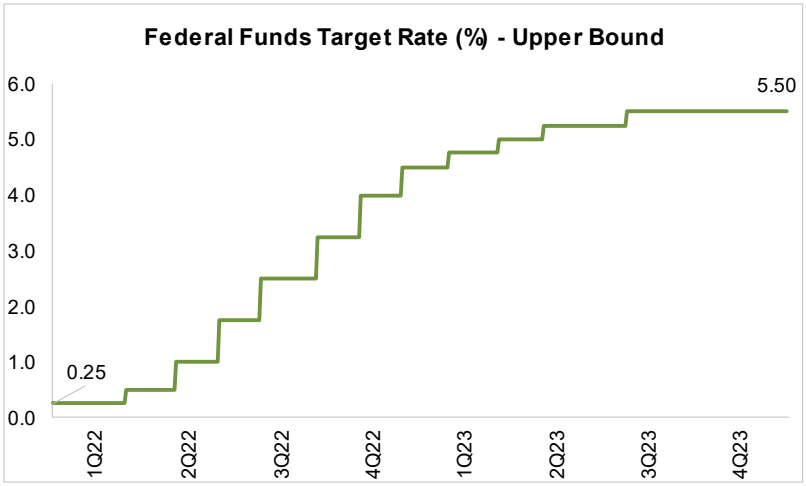
- End: 114.62
- Peak: 198.71 on 3/15/23



Source: Bloomberg, SIFMA estimates

Federal Funds Rate (Fed Funds)

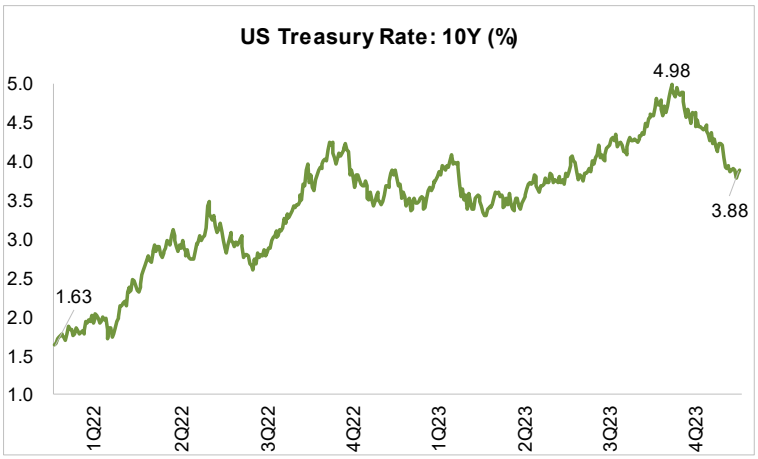
- End: 5.25% (Lower Bound) - 5.50% (Upper Bound, shown in the chart)

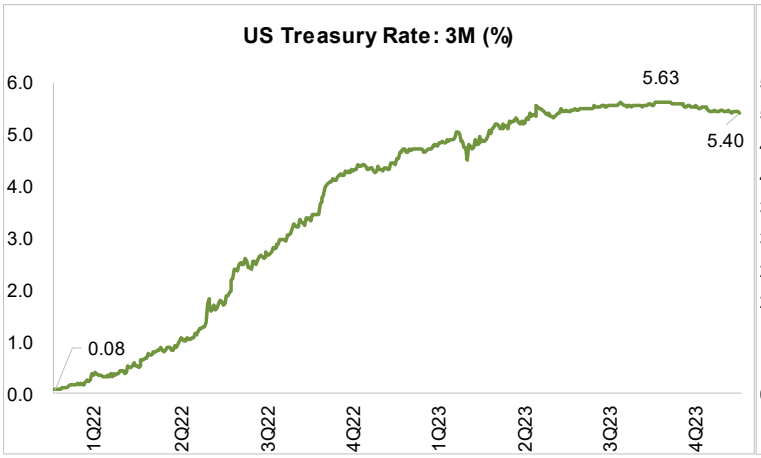


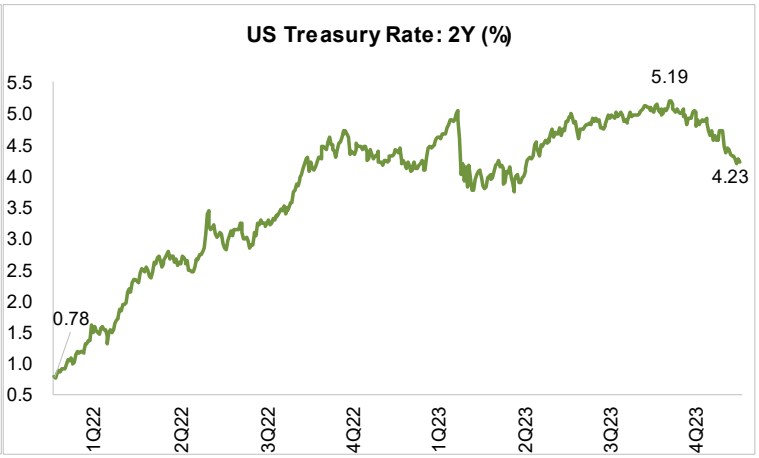
Source: Bloomberg, SIFMA estimates

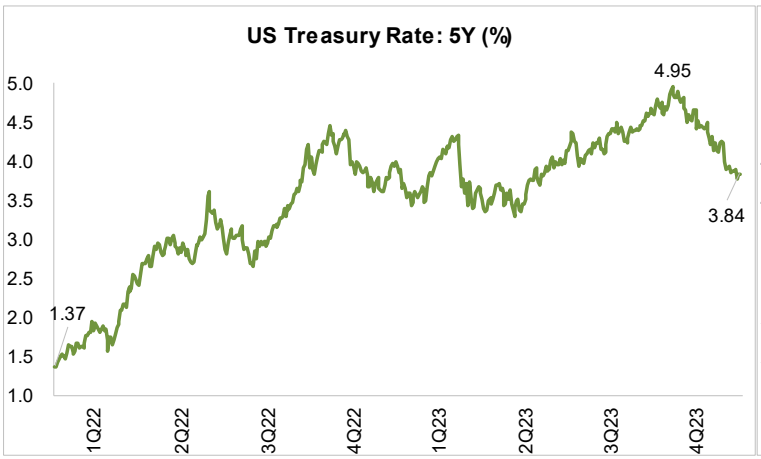
UST by Tenor

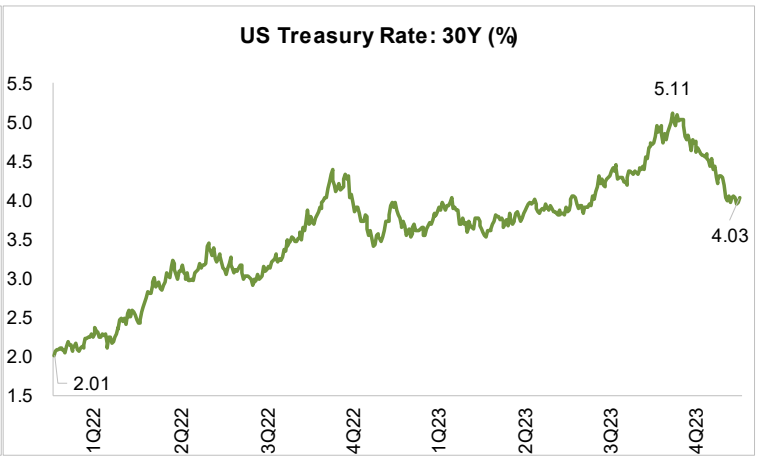
- 10 Year Benchmark
  - End: 3.88%
  - Peak: 4.98% on 10/19/23



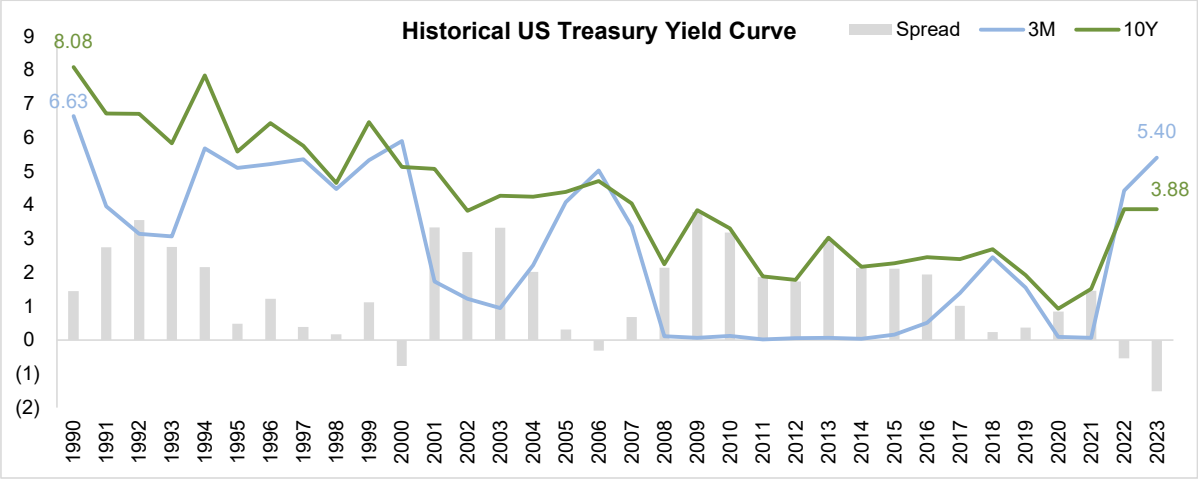


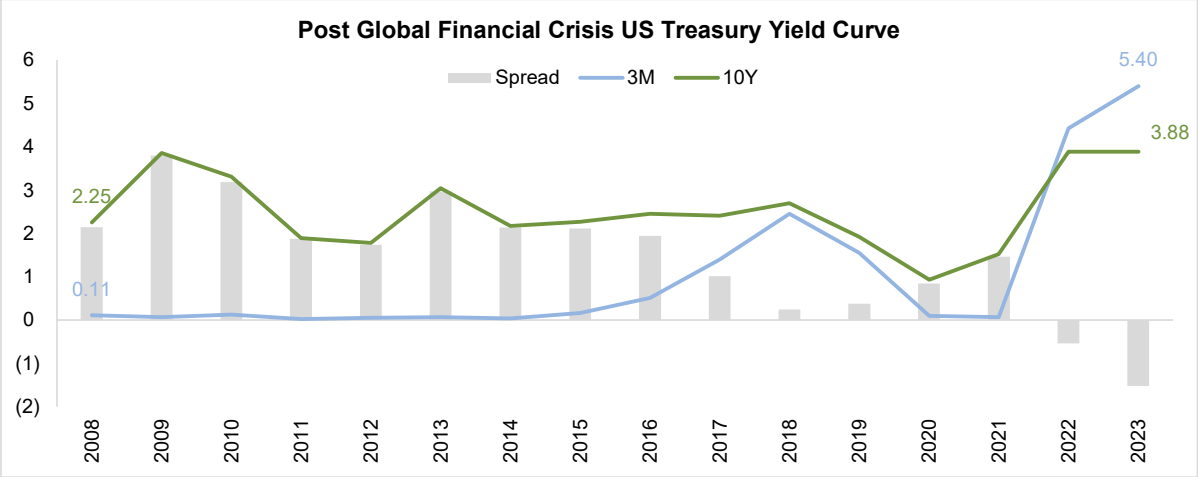






Historical View of Treasury Rates

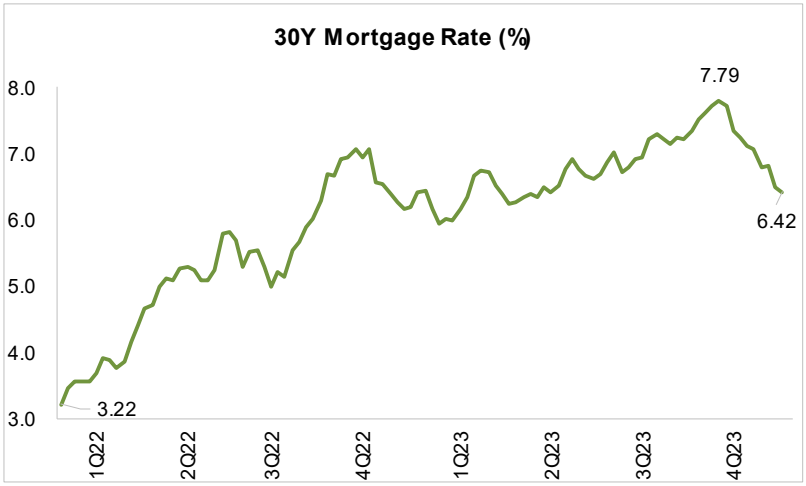




Source: U.S. Department of the Treasury, SIFMA estimates

30-Year Mortgage Rate

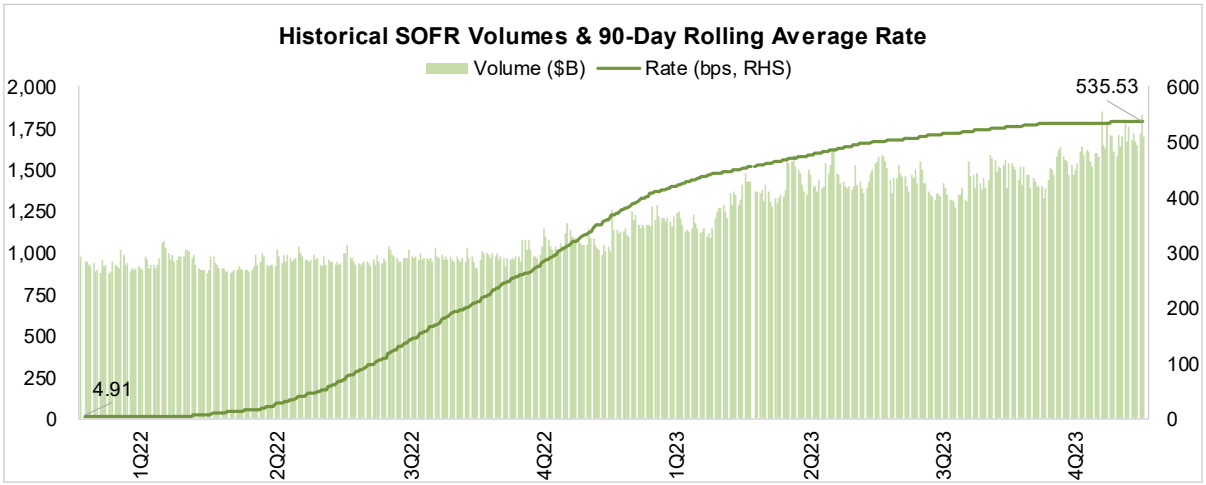
- End: 6.42%
- Peak: 7.79% week of 10/26/23



Source: Bloomberg, SIFMA estimates

Secured Overnight Financing Rate (SOFR)

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



Source: Federal Reserve Bank of New York, SIFMA estimates

The Evolution of Electronic Trading

Why Market Structure Matters

The Importance of Market Liquidity

Market liquidity is the ability to efficiently buy or sell securities, as measured by speed and ease of execution, without causing a substantial change in the price. It impacts everything from the bid-ask spread – the difference between the highest price that a buyer is willing to pay for an asset and the lowest price that a seller is willing to accept, an important variable in calculating the total cost of a trade – to the ability to execute a trade.

Markets need robust trading volumes to remain liquid. In a less liquid market, there are not as many buyers and sellers and large transactions may lead to large price movements, thereby increasing volatility. Security prices represent the estimated value based on fundamental analysis, which may include both an assessment of the issuer's quality and the depth of the market for the particular security. In liquid markets, when market participants see prices move outside of their expected price range, they step in to buy/sell the security, which adjusts the price back to fair value accordingly. In illiquid markets, low demand leads to fewer transactions, hindering traders' ability to execute quickly and to understand costs efficiently. Fewer market participants mean traders are not there to step in and adjust prices, or at least not as quickly as in liquid markets. Therefore, prices can experience wide swings.

This can further limit demand for the securities, keeping volumes depressed. Lower volumes lead to increased time to execute a trade and wider bid-ask spreads, which increases costs to trade. Additionally, lower liquidity increases risk. The lack of liquidity is known as liquidity risk, and investors – and issuers in the primary market – will have to pay a premium to cover this risk, as traders cannot quickly open and close their positions. Spreads are often a measure of market liquidity.

Liquid Markets	Illiquid Markets
High demand for a security	Low demand for a security
Easier to trade larger sizes	Harder to trade larger sizes
Many buyers and sellers	Fewer buyers and sellers
Frequent trading	Infrequent trading (trading by appointment)
Narrower bid-ask spreads	Wider bid-ask spreads
Security easily converted to cash	Security not easily converted to cash

The Cost of a Trade

Market liquidity impacts the costs to trade and therefore affects returns to investors. Higher spreads lead to higher transaction costs which decrease investors' returns. Lower liquidity can also increase the cost of capital raising for corporations and governments. Market structure matters as it can drive liquidity and trade costs. Market participants, therefore, continually strive to create the most efficient markets. This includes adapting new technologies to achieve operational efficiencies, searching for new ways to transact and, generally, sculpting market structure to maximize efficiencies and reduce controllable risks.

In many fixed income markets for example, asset price is calculated as:

Price = f (time value of money + credit risk premium + interest rate premium + liquidity premium + other)

- Time value of money = base return for giving up the use of these funds
- Credit risk premium = the risk of not getting repaid in full
- Interest rate premium = the potential decline in asset value if interest rates rise
- Liquidity premium = the degree of difficulty in buying or selling an asset
- Other = FX premium, etc.

The higher the rate, the lower the price of a bond (inverse correlation between price and rate). This will increase the cost of a bond issuance.

Generally, across many markets, the total cost of a trade can be split into explicit and implicit costs:

Trade Cost = f (explicit costs + implicit costs)

Explicit and implicit costs may include:

Type	Description
Explicit	Broker or dealer commissions: Fees to cover trade execution expenses; may provide a reasonable profit for executing the trade; may add a premium for the risk that the dealer may lose money executing the transaction (only if acting as a principal); covers the costs to hold the inventory of securities to make markets (supply of securities and capital required to be held against these securities); cover costs of staff and technology; etc.
	Transaction costs/market access fees: Fees paid for accessing liquidity are added to trade costs; rebates received for adding liquidity are subtracted from trade costs
	Clearing and settlement costs
	Broker or dealer commissions: Fees to cover trade execution expenses; may provide a reasonable profit for executing the trade; may add a premium for the risk that the dealer may lose money executing the transaction (only if acting as a principal); covers the costs to hold the inventory of securities to make markets (supply of securities and capital required to be held against these securities); cover costs of staff and technology; etc.
	Regulatory fees, taxes
Implicit	Bid-ask spreads
	Opportunity cost: The loss of potential gain for investors on other alternatives when one alternative is chosen; for example, the time it takes to fill an order, the percent of an order filled, etc.
	Price impact of a trade: Trade price deviates from current market price as a result of the trade, for example:
	-- Losses can occur from market prices moving when executing large volumes; block trades are often performed off exchange to lessen this price impact
	-- In some markets, including in the U.S., brokers are required to seek best execution for clients (best ex includes an assessment of an opportunity to get a better price than what is currently quoted, the speed of execution, the likelihood that the trade will be executed, percent of fulfillment at current prices, etc.). In the time it can take to meet this requirement, markets may move, and the broker must then execute at a less profitable price or not execute the clients' order.
	Information leakage: Occurs when other market participants learn a market participant plans to execute a large block; they get ahead of that trade and move prices. Blocks are typically split in smaller amounts and electronically executed (depending upon market) over time to avoid a significant price impact; however, this makes the trade vulnerable to others anticipating its occurrence and trading ahead of it. Anonymity is key.

Putting It All Together

Putting together these pieces – achieving high levels of market liquidity and minimizing trading costs – shows that market structure matters, as it drives liquidity and trade costs.

We note that all markets or products are not created equal. For example, a financial institution may have only one stock, but it could have around 1,500 CUSIPs[4] for its corporate bonds. Likewise, stocks are generally fungible in trading, settlement and clearing, yet this is generally not the case in fixed income (albeit some common factors often exist). Fixed income products generally do not trade on exchanges and are typically not fungible.

Products may trade on an exchange/trading venue or over-the-counter (OTC). On an exchange, transactions are completed through a centralized source, where one intermediary connects buyers and sellers and guarantees trades/delivery. Products by necessity are standardized, and the systems are highly regulated. There are typically many participants, leading to generally higher liquidity.

In OTC markets, trades are done in a decentralized manner; there are multiple participants competing to link buyers to sellers. Trades may be executed bilaterally on the phone, through chat applications, or on single-dealer or multilateral trading platforms that link buyers and sellers electronically. Products that are not fungible or have lower liquidity are more likely to trade OTC. Most fixed-income products fall into this category.

As market participants across different markets search for smart order routing paths to achieve the best trade for their client while minimizing market impact, they look to new technologies to address market fragmentation – which can decrease liquidity – and identify greater liquidity. This is one of the main drivers of the electronification of markets.

We note that in the journey from bilateral to multi-lateral trading, some products might never trade on an exchange.

[4] CUSIP = Committee on Uniform Securities Identification Procedures; a nine character alphanumeric code identifying a security to facilitate clearing and settlement of trades

Trading Methods

Types of trading by venue can include:

Exchange Listed	Over-the-Counter (OTC): Bilateral	Over-the-Counter (OTC): Other
•Traded on registered securities exchange or alternative trading system •More agency based •Frequent, continuous trading •Homogeneous products •High number of market participants •Open and closing auctions/cross, no direct negotiations; unidentified buyers/sellers enter competitive bids/offers at the same time	•Off-exchange trading between counterparties •More principal based •Infrequent, less continuous trading •Less homogenous product, more CUSIPs - ex: large issuer may have 100 bond CUSIPs vs.1 stock •No auction; bilateral trading between two known parties Dealer-to-Dealer (D2D): dealers trade amongst each other Dealer-to-Client (D2C): dealers trade with institutional clients	•Not all OTC is bilateral •Some trading may be done on electronic trading platforms

Note: Characterizing trading as frequent or infrequent are generalizations; different products within each group may trade more or less frequently than others. OTC – Bilateral: CUSIP = Committee on Uniform Security Identification Procedures' nine-digit, alphanumeric security identifier.

In addition to the types of trading by venue, financial intermediaries can act in one of two roles:

- **Agent**, where there is no capital at risk.
- **Principal**, where a firm's capital is typically at risk, unless it is a riskless principal transaction (when a broker-dealer simultaneously buys and sells a security in separate but offsetting transactions to execute a customer's trade without taking on market risk).

What Is Electronic Trading?

Answering an Unanswerable Question

Q: If the number 2 pencil is the most popular, why is it still number 2? A: Unknown.

Q: Before they invented drawing boards, what did they go back to? A: Unknown.

Q: If you try to fail and succeed, which have you done? A: Unknown.

Q: What is the definition of electronic trading? A: That's complicated, and it's not a single answer…

Defining the Undefinable

Electronic trading is not one thing. The term covers a variety of systems and activities across the trade lifecycle: execution (trading); clearing; and settlement. We focus on the execution side in this report. On the execution side, it can mean transferring ownership of a security by matching two counterparties through an electronic platform. This is not just about the platform, as trades can be negotiated by voice yet settled electronically.

The amount of electronic trading done in a product or market can be attributed to the type of marketplace. In general, markets can be defined as centralized or decentralized:

- **Centralized**: Most futures exchanges (and some other markets) use a central limit order book (CLOB) trading method – or matching engines in the equities world – an automated system which uses an algorithm to match customer orders on a price time priority basis (no negotiation). The highest bid and lowest ask orders establish the best market in a security, and low cost execution is achieved by crossing the bid/ask spread. Market depth is transparent, displaying bid/ask order sizes and prices. CLOBs/matching engines establish markets which are centralized, order driven (prices follow orders), transparent, real-time and anonymous. Interactions are multilateral and can be dealer-to-dealer (D2D), dealer-to-client (D2C), or client to client (C2C), albeit access is typically limited to dealers or members. Markets with CLOBs/matching engines have dealers or market makers quoting two-way prices, but market makers are not necessarily required in these already liquid markets. Ex: futures exchanges.

- **Decentralized:** OTC market interactions are bilateral, quote driven (orders follow prices), and segmented by D2D or D2C, and prices can be negotiated, particularly for large orders. Dealers quote on an indicative basis – estimate of current market price provided by the dealer to the investor, dealer is not obligated to honor it – or firm basis – price is guaranteed by the dealer – bids/asks up to a set trade size, and prices are finalized when a quote is hit by the other counterparty. Ex: fixed income, derivatives.

Whether traditional or electronic, markets address several key features:

Feature	Description	Centralized (Exchange, CLOB)	Decentralized (OTC)
Access	Trading with each other or through intermediaries; D2D, D2C, or C2C	No segmentation	Segmentation
Anonymity	Are counterparty identities disclosed	Anonymous	Not anonymous
Continuity	Continuous or periodic (orders are batched and cleared at set intervals)	Continuous or periodic	Generally continuous
Dealers	Is execution dependent on dealers or market makers, i.e. liquidity is too low without their involvement	Not necessary but do exist	Necessary
Interaction	Bilateral allows price negotiation; multilateral pools interactions on a single trading platform	Multilateral	Bilateral
Pricing	Price discovery can be determined in or out of the system; prices can be order or quote driven; prices stem from quotes competing in a central location or fragmented price formation	Centralized, order-driven	Fragmented, quote-driven
Protocols	Types of orders allowed (limit, stop, market, off market), trading rules (tick size, trading halts, open/close hours)	Standardized	Not standardized
Transparency	Amount and extent information is disseminated; full = timely pre (bids, asks, depth) and post (last price, volume) trade details disseminated to all participants	High	Limited

Source: Bank for International Settlements

With electronic trading – while still about connecting buyers and sellers or dealers and their clients – technology automates part or all of the processes in the trade life cycle in order to generate efficiencies. These efficiencies seek to lower costs, increase speed of execution, enhance risk management, or generally improve the market for trading a specific product.

- **Integration** – Electronic trading enables straight-through-processing (STP), integrating the processes in the trade lifecycle. Systems can display pre-trade data (bid/ask quotes, depth of book), match buyers/sellers, execute the trade, clear/settle the trade, handle risk management, and report post-trade data (price, volume). This eliminates the need to utilize multiple systems for different processes and creates efficiencies for both the front and the back offices, as well as for clients.

- **Location** – Electronic trading is location neutral, allowing continuous multilateral interaction among participants; participants need only to connect to the system from any location, particularly enabling cross-border transactions.

- **Scale** – Electronic trading can increase the number of transactions handled by increasing the capacity of the system, enabling economies of scale to lower operational costs.

Drivers of Electronic Trading

Drivers behind the greater adoption of electronic trading all relate to the search for efficiencies. This can come in the form of cost savings, increased speed of execution, or sourcing liquidity. Or, in some fixed income markets, prudential regulatory requirements forced dealers to hold less inventory of securities and exit some businesses. This negatively impacted liquidity, driving market participants to search for alternative solutions (trading venues). Additionally, European regulatory requirements to prove best execution across multiple markets led firms to build new systems to provide pre- and post-trade reporting.

Companies are always searching for cost savings, particularly in financial services where post-crisis regulations have driven up costs (increased capital requirements). Additionally, as financial services is a relationship driven business, it is difficult for firms to walk away from costly businesses for fear of alienating clients. Therefore, moves to lower-touch electronic trading in some markets allow firms to continue serving clients at a lower cost base.

Again, not all markets or products are created equal. The scalability of electronic trading platforms depends upon the capacity of the technology and the characteristics of the market/product. Economies of scale are more readily achieved for standardized products which are traded frequently or markets with a large, diverse set of participants. Therefore, the benefits of different electronic trading platforms and activities will vary, and some products might never trade on an exchange.

Benefits of Electronic Trading

We break out benefits of electronic trading into the following buckets:

- **Cost Savings** – Advances in technologies or utilization of technology (at sufficient scale) to automate processes frequently results in cost reductions. Electronic trading can increase speed of execution and lower both transaction and search costs. By increasing transparency via better (faster and more accurate) dissemination of prices to a greater number of market participants – thereby limiting inherent information asymmetries – search costs come down. Price competition provides opportunities for price improvement and therefore can lower transaction costs. Additionally, the pooling of liquidity on electronic trading platforms reduces fragmentation and the costs associated with it, such as lowering spreads. As technological innovations advance, the fixed costs for building new trading systems decrease (albeit there are still costs to market participants to adopting new systems).

- **Operational Efficiencies** – Technological advances increase computational speed and therefore allow for the processing of large amounts of data simultaneously. This integrates processes across the trade lifecycle by enabling integration. Integration links execution, trade confirmation, clearing and settlement (as well as risk management), which lowers order processing costs and minimizes the risk of reporting errors. Electronic platforms enable direct market access to increase speed to markets. Electronic trading also automates the collection of pre- and post-trade information (prices, volumes), increasing the amount and speed of available information. This reduces the costs of searching for the best price. Further, electronic systems can help firms better monitor client trading behavior. Monitoring flow, and how it moves on news, enables firms to then internalize flow efficiently across trading desks, putting resources in the right areas to serve clients.

- **Price Formation** – Electronic trading systems, whether quote or order driven, can help improve price discovery, as they can be more transparent than traditional OTC markets. Additionally, prices produced in these systems may be used as proxies for less liquid or fragmented markets. For example, the continuously updated prices of highly liquid bond futures and on the run government bonds can be used in pricing engines to develop quotes for less liquid fixed income securities.

- **Transparency and Anonymity** – Electronic trading can increase pre- (best bids/asks; depth of book; firm or indicative quote type; etc.) and post- (price, volume, execution time, etc.) trade transparency. Technology can bundle information sources, explicitly drawing links across markets and products. Pooling information across platforms can also illuminate depth of market for participants. Further, electronic systems can have access to all trade-related information, which can provide insights into clients' search and trading activities and dealers' reactions (price quality, speed, hits/misses, etc.). That said, electronic platforms are not created equal, instead they are built for specific strategic reasons. In some platforms, anonymity is key and client-specific trade information is not shared, while in others trading identities are fully disclosed. As markets become more multilateral, it should become easier to unwind positions anonymously. Where these systems evolve into CLOBs/matching engine systems, trading can become completely anonymous.

- **Market Access** – Electronic trading enables the transition to multilateral trading from bilateral, which increases access to end users and can allow users to interact directly with each other, altering the balance of power between dealers and clients but not necessarily eliminating the dealer role altogether. Electronic trading also allows non-intermediaries to directly access markets. Direct electronic access can come in the form of intermediated or non-intermediated. Intermediated direct access has clients accessing a market either via their dealers' infrastructure (automated order routing) or without utilizing the intermediary's systems (sponsored access). Either way, the intermediary retains responsibility for the order. Non-intermediated direct access (not allowed in all markets or jurisdictions) enables clients to connect directly to the market without an intermediary.

- **Compliance** – Electronic trading platforms can automate processes for risk management activities and regulatory reporting requirements across the trade lifecycle (ex: real time or near real time reporting opportunities). Electronification enables efficient development of electronic audit trails and can also improve processes for overall data management.

Concerns around Electronic Trading

Not every market participant views electronic trading as only a positive for markets. Several areas of concern have been expressed around the increased adoption of technology. For one, some market participants express concern that the continued adoption of various types of electronic trading changes market sentiment, with some participants discouraged from participating because they cannot match the technological advancements of some automated trading strategies. Additionally, regulators express concerns that today's more technology driven markets can contribute to the transmission of shocks across trading venues, whether trading the same products or across different markets. As we continue to put decades of electronic trading under our belts, regulators can continue to get more comfortable with its benefits and their approaches to monitoring these markets.

2010 Flash Crash

What happened? On May 6, 2010, the prices of many US equity-based products experienced an "extraordinarily rapid decline and recovery". Major equity indices and futures markets dropped 5-6% (already down 4% from the prior day) in only a few minutes, and then rebounded almost as fast. Many stocks and ETFs suffered price declines of 5%, 10%, 15%, or more (for some stocks) and reversed all within a short time, recovering most if not all the losses. 20,000+ trades on 300 securities executed at prices >60% off of their prices moments prior to trade. Major equities indices and futures recovered to close down 3% from the prior day.

Regulatory Assessment: A joint report was issued from the SEC and CFTC. Regulators were surprised by the interconnection between cash equities and futures markets. They noted that today's markets of fully automated trading strategies and systems process a large volume of quotes, orders, and trades each second. They also acknowledged that high trading volume is not necessarily a true indicator of market liquidity, particularly in markets with significant volatility. Essentially, the report acknowledged that market monitoring must continue to evolve with evolving markets.

While electronification can lower barriers to entry and allow for more competition – which can lead to lower transaction costs – it can also lead to market fragmentation. There is a balance between concentrated and fragmented markets. Concentrated markets can provide greater depth of book and higher probability of order execution at the terms stated by the client. Yet, it can lead to monopolistic behavior in terms of pricing and limit innovation. On the other side, fragmented markets can be more competitive and geared toward innovation to win business. However, this can lead to lower probability of order execution and increased total trade costs, as brokers may search multiple trading venues to find the best price for their order (based on the order and their client's objectives).

The U.S. equities markets are an example of fragmentation, with 16 exchanges predominantly under three main parent groups, over 30 equity alternative trading systems (ATS) and over 200 OTC venues. Conversely, some market participants believe there are too few trading venues in some fixed income markets, such as U.S. Treasuries. Again, markets need a balance.

Types & Subsets of Electronic Trading

As discussed above, defining electronic trading is not black and white. There is no single definition that would enable labeling one type of firm or trading strategy as simply electronic trading. Further, trading activities vary across markets, typically dependent upon the level of liquidity and trading/post trade infrastructure. Over the years, firms of all types – including traditional market participants like broker dealers trading for clients, market makers, and asset managers, not just proprietary trading firms or hedge funds – have adopted technologies to enable better trading execution. Markets and market participants are intermingled in today's environment – trading is a complicated and dynamic ecosystem, with competitive forces and structural and regulatory changes continually shaping the environment – and technology enabling electronic trading is now part of market DNA.

Therefore, one cannot label one strategy or firm as good or bad. (And it is left to the regulators to determine whether a trader or trade is labeled bad, as manipulative trading activities like front running or spoofing are illegal.) Further, strategies may not be solo, with a firm switching between strategies over time.

In explaining the world of electronic trading in this report, we draw from the Bank for International Settlements' (BIS; global standard setters[5]) guidance in this area, coupled with practical experience from market participants. As shown in the visual on the following page, electronic trading can be segmented in the following manner:

- **Electronic Trading (ET)** –Electronic trading has many different subgroups, including:
    - **Automated Trading (AT)** – One main segment is automated trading.
    - **Market Making (MM)** – Within automated trading lies a trading strategy subgroup labeled market making, which can also be thought of as liquidity providing.
    - **High-Frequency Trading (HFT)** – A small subgroup of market making is the high frequency trading strategy.

[5] BIS = established in 1930, owned by 60 central banks; represents countries from around the world that together account for about 95% of world GDP.

We note that our visual differs from BIS in one important area – we identify the differences between MM and proprietary HFT. In some overviews of the market, MM and HFT have been lumped together and generically all labeled HFT; and the firms have been given this label as a type of firm, even though it is more of a trading strategy than an entity. While some firms lumped into this category received negative press over the years, it is important to note that this label has combined different functionalities, facilitating markets and proprietary trading. And not all firms or activities performing either function can be blanketly labeled as bad. The diversity of market participants is a key factor that contributes to the depth and liquidity of U.S. capital markets.

Further, this strategy is used by firms which have become significant providers of liquidity in today's capital markets. Perhaps instead of generically labelling all these firms HFTs, it is time to rename them to technology enabled market makers or electronic liquidity providers.

Source: Source: Bank for International Settlements, SIFMA estimates

The Automated Trading Subset of Electronic Trading

Before diving deeper into automated trading, it is important to note that the financial services industry is focused on serving their clients' needs. This is no different in electronic trading – the strategy or approach a firm uses to accomplish the provision of liquidity is responsive to a client's request. Execution is driven by the customer base, and firms strive – and are often required by regulations – to provide the best execution for their clients, which can vary by the end goal of an order. Different types of investors, and therefore orders, may have different objectives (speed, size, price, etc.).

Electronic trading has enabled and increased the usage of automated trading to improve efficiencies in trade execution. Automated trading employs complex statistical and econometric models on advanced technology and communication platforms to make order and trade decisions electronically and independently. These quantitative trading strategies interpret market signals and automatically implement trading strategies accordingly, with trades sometimes lasting only seconds or milliseconds. In short, electronic trading enables market makers to execute high volumes with narrow spreads and to provide an opportunity for price improvement, on behalf of clients.

Again, looking to BIS guidance, automated trading can be split into algorithmic (algo) trading and market making, of which high-frequency trading is one smaller subset. None of these are single strategies, rather sets of technological activities and tools employed in a variety of strategies, each with different objectives and market impacts.

- **Algo** – Algorithmic trading strategies execute orders using automated pre-programmed trading instructions (time, price, volume, venue, etc.) to send small slices of an order into the market over time. Algo trading is used for a sell side firm's own trading, and these firms also offer their algos to clients to execute their trades. Algos are used on the buyside not only to minimize price impact on single trades but also with rebalancing large portfolios. Algo terminology dates back longer than HFT, which came into use in the early 2000s.

- **MM/HFT** – MM/HFT strategies submit orders and execute trades at very high speeds (microseconds), attempting to profit from very small changes in asset prices with small but frequently executed trades. Firms using this strategy maintain tight intraday inventories, i.e. they end the day flat. This strategy is about speed, or minimal latency. Minimal latency is important as providing liquidity can involve holding a risky inventory position; this risk is minimized by moving inventory or adjusting posted quotes to incorporate new information quickly. This can result in a high volume of messages to trading platforms, a large number of smaller sized trades which are held for short time periods (seconds or less), a high order to trade ratio, and a high count of canceled orders. The strategy enables market makers to continuously provide two-sided quotes in the market, i.e. provide liquidity to facilitate trading.

- There are other automated trading strategies where speed is less critical, such as auto quoting by market makers.

Automated trading strategies perform best in markets with CLOBs/matching engines, which have solid market infrastructures (trading, communications, etc.) and demonstrate high liquidity even before automated trading is added. Conversely, automated trading strategies are limited in some OTC markets utilizing request for quote (RFQ), as there is often not a continuous market. Many of these strategies attempt to capitalize on short-term patterns from price and order flow information in asset prices or markets. Rapid execution is therefore key to capturing these short-lived trends.

Continuing to utilize BIS guidance, we break automated trading strategies into:

- **Market Making** – This strategy involves continuously posting orders on both sides of the trade, thereby providing liquidity to the market. Algos generate indicative or live screen quotes or reply to requests for quote, i.e. auto quoting. The objective is to profit from the bid-ask spread while maintaining minimal securities inventory. Of note, some firms register with exchanges and trading venues as official market makers. Yet, some trading firms instead act as informal liquidity providers and do not register as a market maker. These firms have become significant liquidity providers and contributors to price formation in many markets.

- **Execution** – Algos split a large trade into smaller trades and execute over time and across venues. The objective is to minimize the price impact of a transaction, attempting to build or exit a position at low cost. The strategy is used by broker-dealers and investors (asset managers).

- **Arbitrage** – This strategy attempts to capitalize on price discrepancies by purchasing a security in one market and simultaneously selling this asset in another market at a higher price. Examples include trading the same instrument: on an exchange and on an ATS or multilateral trading facility (MTF); in an index and a basket of the underlying securities; or related instruments, i.e. a security and associated derivative. While often considered risk-free profit for a trader, arbitrage trading also ensures prices do not deviate substantially from fair value for long periods of time. For example, arbitrage traders look at historical deviations from trend (prices, correlations) and, assuming mean reversion, seek to eliminate inconsistencies between prices. Pair arbitrage trading involves attempting to capitalize on price discrepancies between two closely related companies (Coca Cola vs. Pepsi, Lowes vs. Home Depot, Exxon vs. Chevron). These strategies adjust price discrepancies in markets to historical fundamental levels.

- **Directional** – The strategy to buy or sell is based on the investor's view of the future direction of an asset price or the market. It involves carrying unhedged positions to trade across small but lasting intraday price changes. This can include trading around a stock mispricing which can occur around an event, such as corporate announcements (earnings, investor day), macroeconomic news, industry reports, etc. It can also include attempting to detect upcoming undisclosed liquidity changes caused by large institutional buying/selling (anticipation of upcoming block trades).

- **Relative Value** – This strategy trades securities in relation to each other. For example, an investor can simultaneously buy a stock and sell a stock index future at a spread.

Types of Electronic Trading Platforms & Activities

As discussed above, the generic term electronic trading covers a variety of systems and activities across the trade lifecycle. It cannot be defined by a single definition for a firm or strategy. For example, different types of electronic trading platforms can perform just the order transmission piece or up to full trade execution. Or different types of electronic activities can automate one piece or all aspects of the trade lifecycle.

Some common types of electronic trading platforms and activities include (among others[6]):

- Systems handling quotation of prices or dissemination of trade requests
- Systems to disseminate pre- and post-trade information
- Clearing and settlement systems
- Reporting mechanisms
- Electronic order routing platforms
- Alternative Trading Systems (ATS)
- Electronic Communications Networks (ECNs)
- Dark Pools
- Dealer platforms (single or multiple dealer platforms)
- Exchanges
- Electronic trading platforms (ETPs)

[6] Source: Bank for International Settlements

Types of Electronic Trading Platform (ETP) Protocols

ETPs all attempt to match buyers with sellers. Yet, they may use a variety of different trading protocols to align with the types of clients they are serving. Some common types of ETP trading protocols – which may differ in anonymity (quote receiver/requester identified), how many and what type of participants are involved, the type of quote (buy, sell; executable or indicative), etc. – include (among others[7]):

- **Dealer-to-Dealer (D2D)** – System allows only dealers to negotiate and trade with other dealers.
- **Dealer-to-Client (D2C)** – System allows dealers to negotiate and trade with clients.
- **All-to-All (A2A)** – System allows members, dealers, or clients to negotiate and trade with any other member.
- **Real Time Matching Session** – Orders matched throughout the trading session.
- **End of Session Matching** – Orders matched at the end of the trading session.
- **Central Limit Order Book (CLOB**; or matching engines in equities) – System uses an algo to match customer orders on a price time priority basis (no negotiation); the highest bid and lowest ask orders establish the best market in a security, and low cost execution is achieved by crossing the bid/ask spread.
- **Lit Order Book** – The order book is made public for all members, allowing all traders to see the amount of liquidity posted on the bid and offer side of the book.
- **Hidden Order Book** – The order book is not fully made public for members, some pre-trade transparency (price, market depth) is deliberately hidden to entice liquidity suppliers to offer greater quantities for trade.
- **Click to Trade (CTT)** – Systems allow immediate trading at aggregated prices streamed by a dealer(s).
- **Request for Quote (RFQ)** – Platform members query dealers to request prices on an order at a set size.
- **Request for Spread** – System enables members to trade on a spread rather than a cash price, uses RFQ protocol.
- **Request for Stream** – Market makers provide continuous streams of firm quotes with available size; clients can click to trade.
- **Auto Quoting** – Algos respond automatically to RFQs based on defined parameters (maturity, sector, security type, currency, etc.).
- **Internal Crossings** – System matches opposite trading interests of users based on internal pricing models or electronically determined mid prices.

[7] Source: Bank for International Settlements

The Electronification of Markets

As described above, securities can trade on an exchange (or trading venue) or OTC. There are various differences among these types of trading environments, all of which generally lead to varying levels of liquidity in the market. Some of the main differences between exchange and OTC trading include:

(We note that in the journey from bilateral to multi-lateral trading, some products might never trade on an exchange.)

Exchange*	OTC
•Centralized, 1 main intermediary	•Decentralized, multiple intermediaries
•Standardization	•No/less standardization
•Highly regulated	•Not as regulated (but the dealers acting as intermediaries are regulated)
•Many market participants	•Fewer market participants
•Order driven	•Quote driven
•Highly liquid	•Less liquid

Source: Source: Bank for International Settlements
Note: *Traded on an exchange or registered trading venue.

As technological advances and market structure evolved over time, markets and products began the electronification journey from bilateral to multilateral trading, predominantly in search of liquidity.

Source: Bank for International Settlements

- **Voice** – Voice execution is OTC trading where dealers acted as intermediaries to match buyers/sellers in a quote driven marketplace; it was performed predominantly over the telephone (now instant messaging, email).

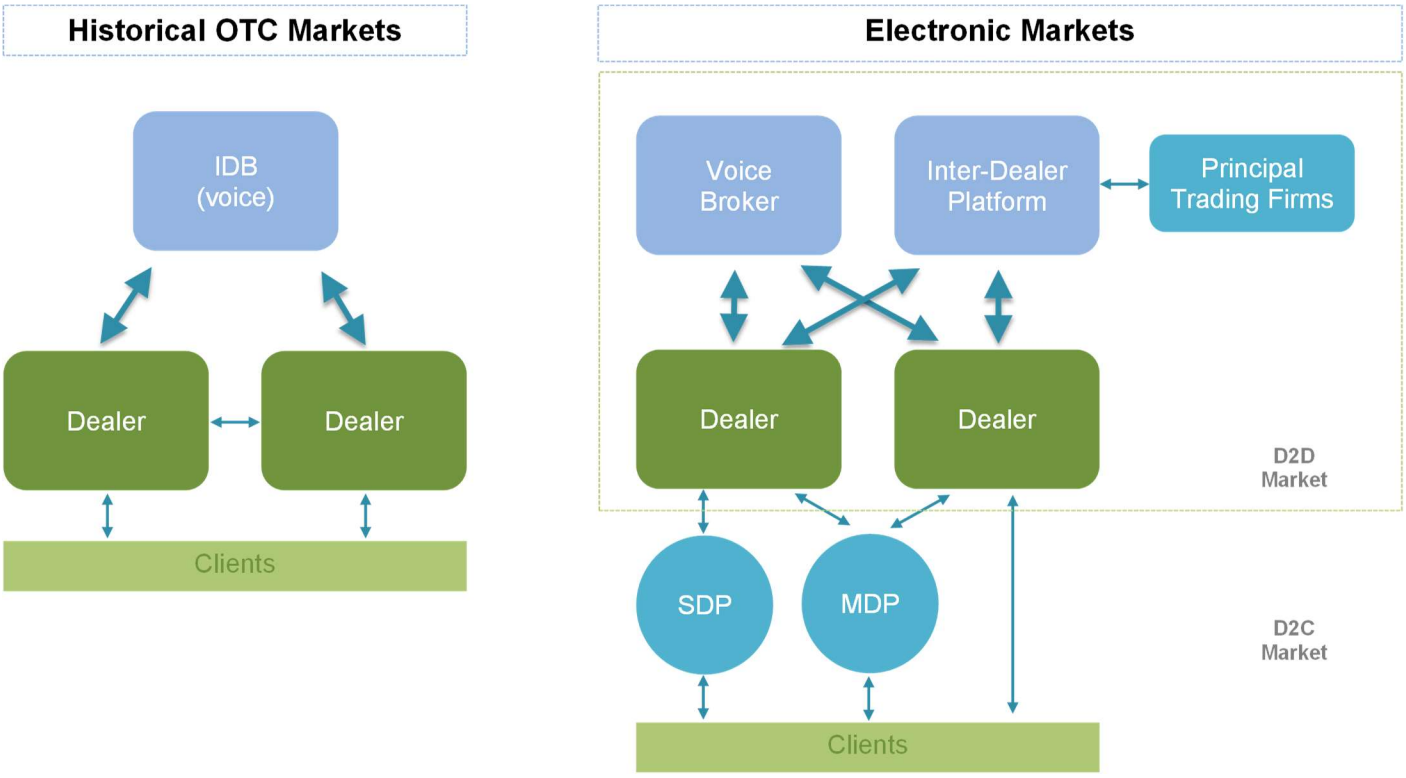
- **Electronic D2D** – In the late 1990s, electronic communication networks (ECN) emerged and took their place in more liquid markets, like equities, FX, and government securities. ECNs are electronic systems acting as intermediaries to disseminate orders on a wide basis; orders can be executed in whole or part. This was a move to order driven markets, as ECNs often used CLOB/matching engine trading protocols. ECNs also offered integration to increase efficiencies in the trading process.

- **Electronic D2C** – Electronic D2C also began to grow in the late 1990s. D2C markets typically use RFQ trading protocols and are offered in two methods:

    - **Single-dealer platforms (SDPs)** – SDPs, or trading systems offered by a dealer to its clients, are electronic versions of bilateral OTC markets.

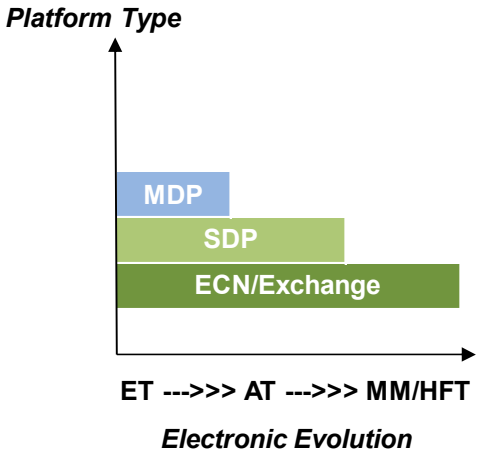
    - **Multi-dealer platforms (MDPs)** – MDPs enable clients to request quotes from multiple dealers simultaneously, thereby reducing search costs. MDPs also increase efficiencies in operations and compliance requirements by automating record keeping, helping with audit trails for regulators.

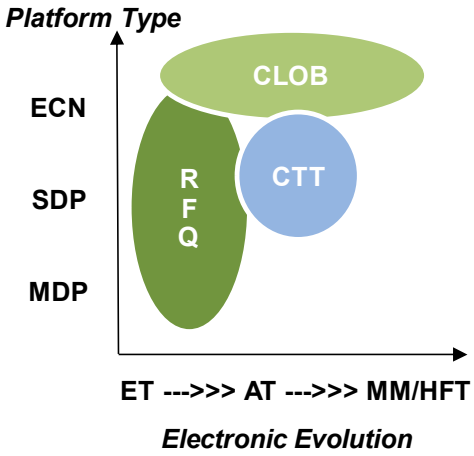
- **Automated Trading** – Electronic trading platforms enable markets/products to adopt automated trading. As described above, in automated trading, order and trade decisions are made electronically and autonomously. Even traditional market participants have invested in automated trading platforms/strategies over the years.



Source: Bank for International Settlements, SIFMA estimates
Note: Visual is representative of a fixed income trading platform. IDB = inter-dealer broker = financial intermediary facilitating transactions between investment banks, broker-dealers, and other large financial institutions (formerly called voice brokers); SDP = single-dealer platform; MDP = multi-dealer platform; D2D = dealer-to-dealer, dealers trade amongst each other; D2C = dealer-to-client, dealers trade with institutional clients.

Putting this all together, one can see the different types of platforms and trading protocols as they move across the electronic evolution scale:





Source: Bank for International Settlements

The Shifting Financial Institution Infrastructure

Broker Dealers Adapt to Changing Market Environment and Clients' Needs

Financial institutions such as broker-dealers act as financial intermediaries, providing advice and connecting clients needing capital with those providing capital. Broker-dealers work on behalf of clients to understand clients' needs and connect them with the right products to fit their objectives. Roles include, among others: executing trades, making markets, managing risk, providing investment advice, and publishing investment recommendations.

The role of the broker-dealer and, in particular, the markets and securities division has evolved significantly since the global financial crisis. This has been driven not just by regulations – which have pressured cost structures for both sell and buy side firms – but also given financial technology innovations and shifting investor profiles. Broker-dealers have (and continue) to innovate to serve changing clients' needs.

This shift in business structure has enabled the growth of electronic trading.

From Sales & Trading to Markets & Securities

Historically, firms segmented groups and employees by:

- **Department** – Research; sales, trading, and prime brokerage
- **Function** – Research, sales trader, and trader
- **Product** – Cash equities, derivatives, credit, rates, commodities, securitized products

One aspect that has not changed is firms are there to serve their clients' needs. Today, the divisions are setup to serve clients in one of two ways:

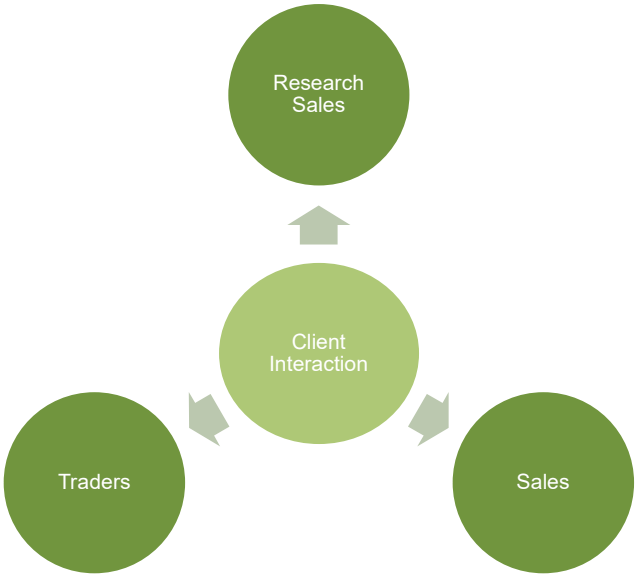
- **High Touch** – Interacting heavily with clients to provide tailored investment solutions
- **Low Touch** – Electronic trading for clients, emphasizing the provision of low cost, highly efficient execution

Broker dealers now provide electronic trading across asset classes, and employees might trade multiple products rather than focusing on one/two product specialties. Electronification frees up employees to spend more time maintaining and expanding client relationships.

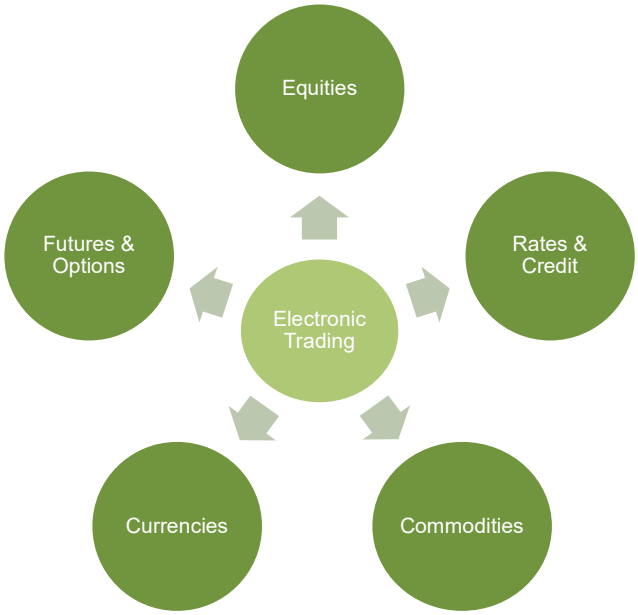
Firms now compete on electronic trading platforms. There has been a strong momentum to provide global electronic trading capabilities that are integrated and cross asset: equities, fixed income, futures, and FX. These platforms offer clients numerous e-trading solutions and innovations to provide deep liquidity pools and increased transparency, as well as often overlaying data science capabilities for trade analytics.

Today's Markets & Securities Division

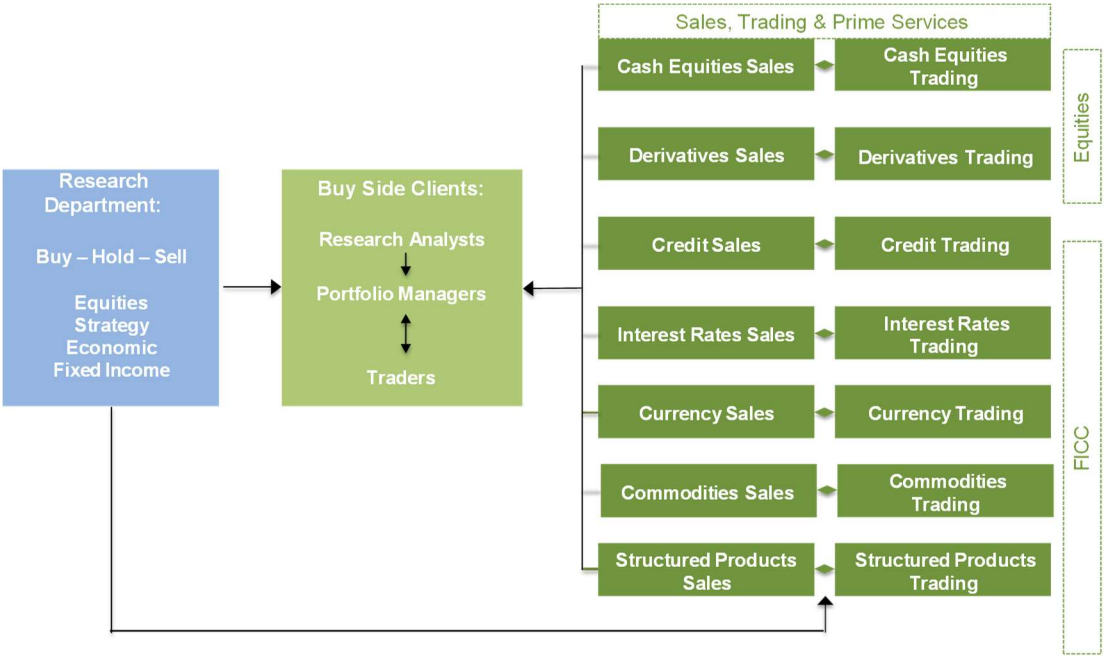
Focus: Tailored Investment Solutions



Focus: Low Cost, High Efficiency Execution



Formerly the Sales & Trading Division



Note: Firms may use different terminology, group businesses differently, or offer different or additional services (may not be an all-inclusive list).

It's All About Access to Information

Access to information is key in the trading world. An important part of the journey to electronification of trading is the capability for market participants to communicate with each other quickly, efficiently, and across borders. As such, throughout the decades market participants continued to develop new ways to communicate fast and efficiently.

Decades ago, it was about location – futures markets had pits, while equities had specialist posts. Designated stocks, products, or markets were traded in these locations. People knew where to go to get the most updated prices and execute trades efficiently. Market participants also developed electronic systems for reliable messaging (trade confirmation, settlement, etc.) and payments (interbank, with central banks, etc.). These were designed to gain operational efficiencies and decrease costs to trade. Eventually, market participants designed electronic communications systems.

All of this established the building blocks – along with technological innovations – to creating electronic markets. Below we review a few pertinent communications and messaging methods and systems.

Specialist Traders/Designated Market Makers

The specialist system for trading stocks on the NYSE was in place for almost 150 years; NYSE had specialists operating on the floor since 1872. A specialist was a member of a stock exchange acting as a market maker[8] to facilitate trading of stock. They traded 5-10 stocks at a time, with one specialist per stock standing ready to step in and buy/sell as needed to ensure a fair and orderly market. A specialist stood on a particular spot on the floor of the exchange (his trading post), and floor traders acting on behalf of clients would come to the post for price discovery and to execute orders. (This is an open outcry auction system, just under a different name.)

Due to electronification of equities markets, the number of specialists declined significantly. In the mid-1980s, there were around 420 floor brokers selling around 250 million stocks each day. Today, the NYSE floor is almost vacant during intraday trading, with the majority of equity trading executed electronically. In fact, the specialist system is gone, with NYSE now using the Designated Market Maker (DMM) model, which still requires the maintaining of fair and orderly markets for assigned securities. Today, DMMs operate manually and electronically to facilitate price discovery during market opens, closes, and periods of trading imbalances or instability.

The Transformation from the Mid-1980s to the Modern Era

Source: (left) Quartz; (right) William & Mary

[8] Market makers stand ready to buy and sell stocks on a continuous basis, making two sided quotes in the market at all times

Open Outcry Pits

In open outcry trading, verbal and hand signals convey trading information (volume, price, intentions, acceptance) in the trading pits, or a set area on the trading floor designated to trade a certain product or market. To the untrained eye, it looked like a mosh pit. For those of us who love the movie Trading Places, we remember the mayhem that ensued in the frozen concentrated orange juice futures pit once the real orange crop report was broadcast. In reality, open outcry was an organized auction process where participants had a chance to compete for orders. Once traders agreed on terms, they settled a contract for that trade. The format enabled price discovery and other efficiencies (for that time).

It was used in futures and listed options markets for many years. While some commodity and option exchanges continued to use open outcry, they simultaneously offered electronic alternatives until the time they fully closed the pits. The London Metal Exchange is the largest exchange still using open outcry.

The Closing of CME's Trading Pits

Source: (left) MarketWatch; (right) Crain's

Messaging Systems

SWIFT Messaging System

The Society for Worldwide Interbank Financial Telecommunication (SWIFT) is a member owned cooperative founded in 1973 to create a global financial common language and messaging service. It was developed to validate and route messages in a standardized manner for financial institutions across the globe.

It went live in 1977, replacing the Telex technology then used by firms to communicate cross-border transfers, with 518 institutions in 22 countries connected to its services. It processed 10 million messages within its first 12 months of operations. In 1983, it connected central banks for the first time, officially establishing itself as the common link between all parties in financial services. By 1989, it served 2,814 customers in 79 countries, with 296 million messages processed in 1989. Technology advancements (UNIX interface systems, straight-through processing capabilities) in the 1990s enable it to serve 6,797 customers in 189 countries, with over 1 billion messages in 1999. Today SWIFT is used by 11,000+ institutions in 200+ countries, having processed 8.4+ billion messages.

SWIFT remains a primary channel for institutions – banks, broker-dealers, custodians, investment managers, central banks, market infrastructures and corporations – to ensure a secure and cost effective way to transmit standardized messages relating to: payments (interbank transactions, corporate services, cash management, compliance), securities (trade confirmations, clearing, settlement) and FX/Treasury.

SWIFT's services address operational challenges and increase efficiencies for financial institutions, including: automating manual and time consuming processes; back office processes; communications; etc.

FIX Messaging System

The Financial Information eXchange (FIX) protocol is an electronic communications protocol established in 1992. It enables electronic communication of global, real time securities transactions and market information, replacing phone communications between broker-dealers and institutional clients. Its objectives are to provide standardization, operational efficiencies, transparency and cost reductions to market participants.

The FIX protocol language is comprised of a series of messaging specifications used in trade communications, originally used in equities markets for pre trade and trade communications. It expanded into post trade transactions, supporting straight-through processing, and it gained acceptance in fixed income, FX, and listed derivative markets.

The FIX messaging standard is owned, developed, and maintained by the FIX Trading Community. Its membership includes 270+ financial institutions across the globe (35% EMEA, 29% Americas, 26% Asia Pacific and Japan, 10% other). These firms work to ensure the standard continues to meet emerging trading requirements and to promote its increased adoption.

Electronic Trading Metrics

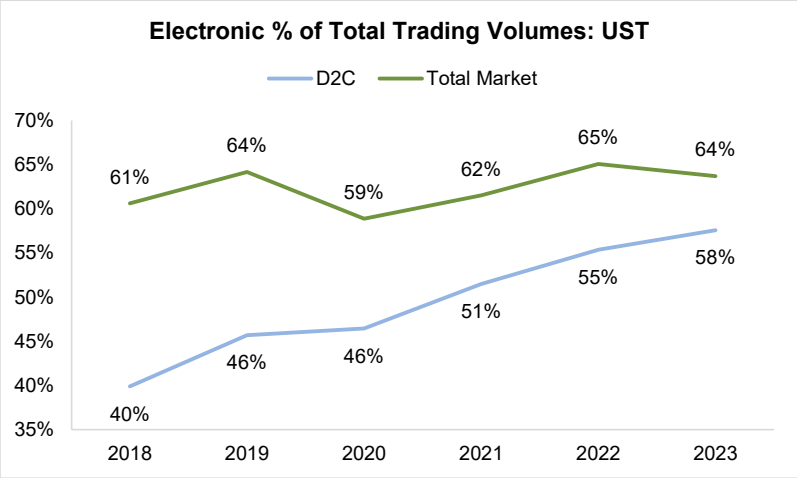
We have seen a transformation in fixed income markets since the global financial crisis, historically bilateral and performed by dealers. Post-crisis regulatory constraints on balance sheets, such as the Volcker Rule, resulted in many dealers dramatically reducing inventory and market making capabilities, as they exited businesses with high capital charges.

This was to the detriment of some fixed income activities. In other words, it decreased liquidity. To continue servicing clients' needs, markets had to be innovative and leverage product innovation and technology. This enabled the development and adoption of electronic market makers – and the growth in ETFs and other passive investments as well – albeit gradual and varying by type of security. We again note that in this journey from bilateral to multi-lateral trading, some products might never trade on an exchange.

On the following pages, we analyze where select markets are in their electronic journey.

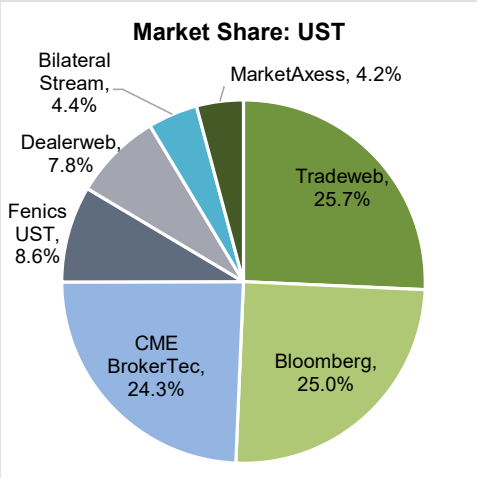
US Treasuries

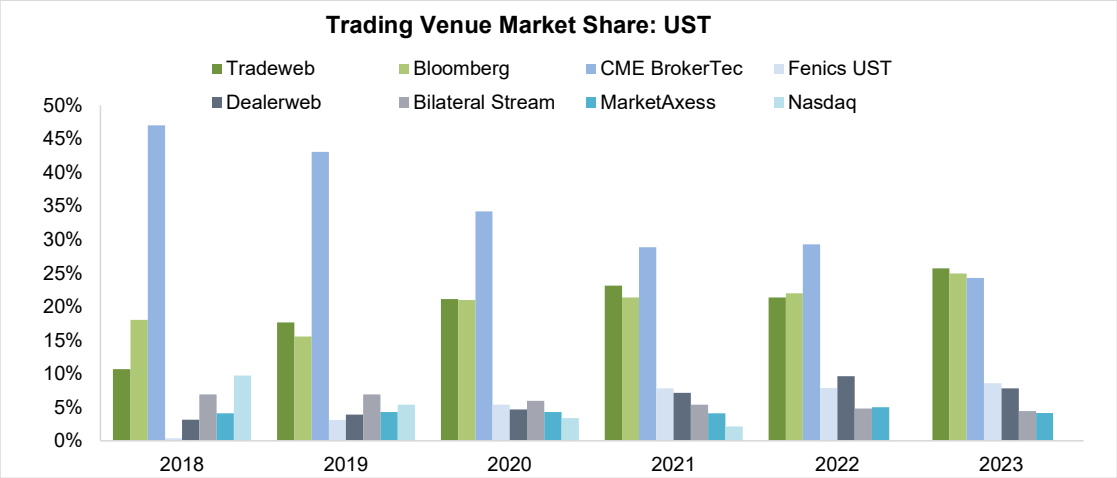
U.S. Treasuries (UST) electronic trading as a percent of total trading volumes finished 2023 at 64%, +3 pps from 2018 but -1 pps from the 2022 peak. On the dealer to client (D2C) side, electronic volumes were 58% of the total, +18 pps since 2018.



Source: Coalition Greenwich
Note: D2C = dealer to client

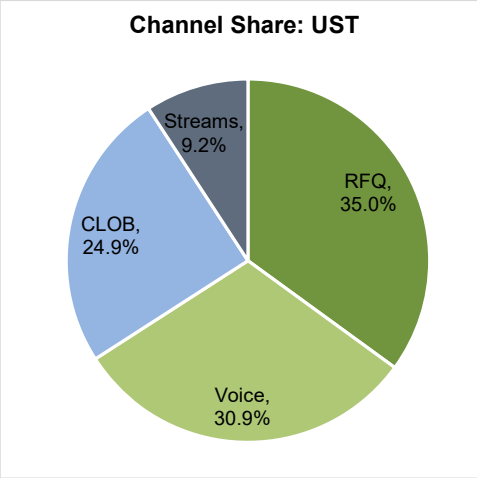
In 2023, it was a tight race at the top for electronic trading venues in UST, with Tradeweb (#1), Bloomberg (#2), and CME BrokerTec (#3) all roughly around 25%.

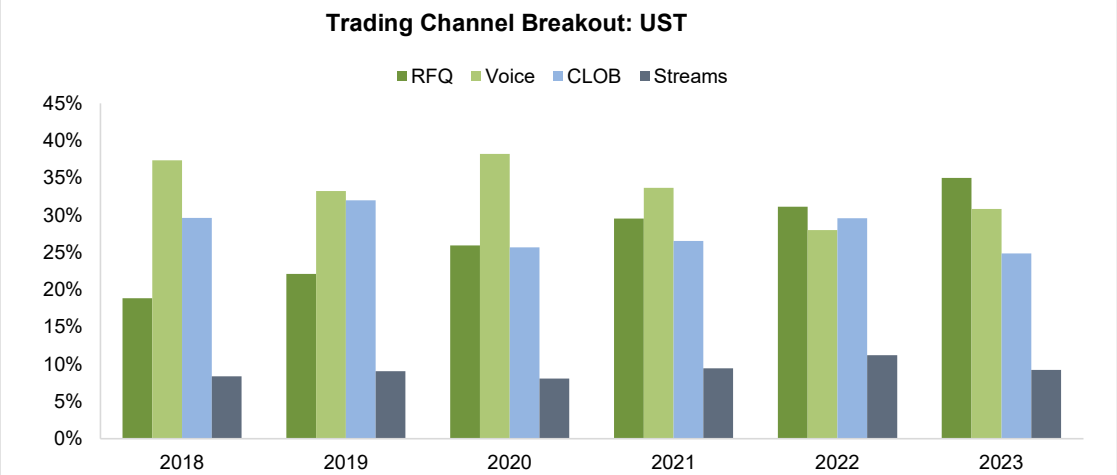




Source: Coalition Greenwich

As to channel by which UST were traded, request for quotes (RFQ) was on top in 2023 at 35.0%, followed by voice at 30.9%

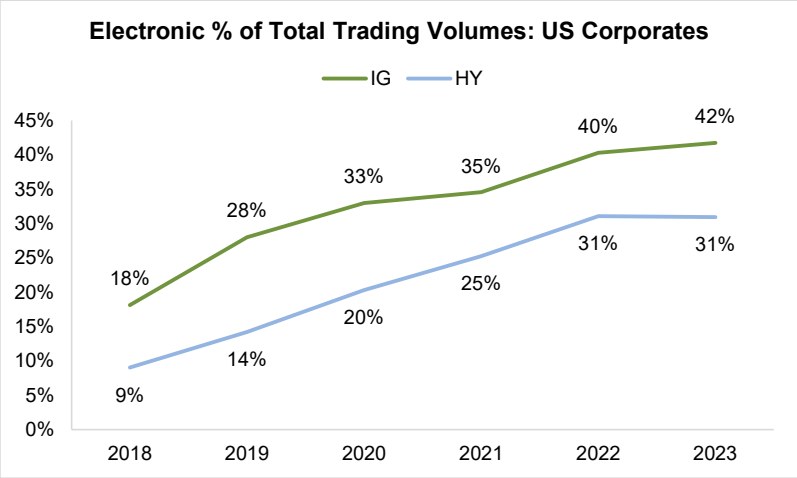




Source: Coalition Greenwich
Note: RFQ = request for quote, CLOB = central limit order book

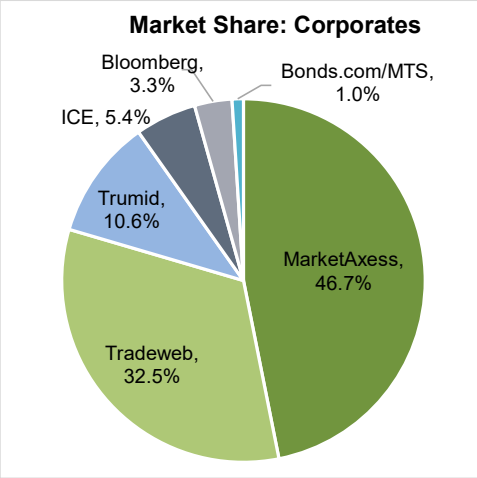
US Corporate Bonds

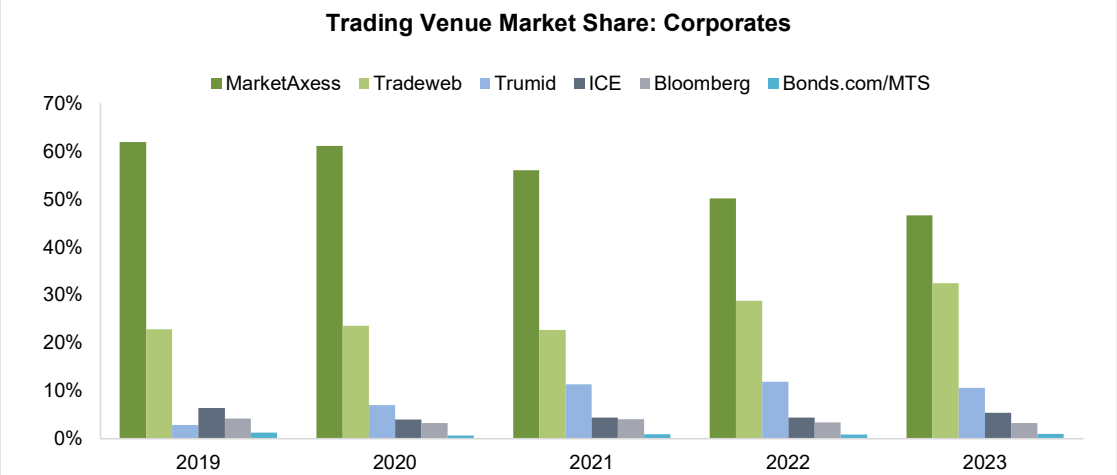
In the U.S. corporate bond market, investment grade (IG) electronic trading as a percent of total trading volumes finished 2023 at 42%, +24 pps from 2018. On the high yield (HY) side, electronic volumes were 31% of the total, +22 pps since 2018.



Source: Coalition Greenwich
Note: IG = investment grade, HY = high yield

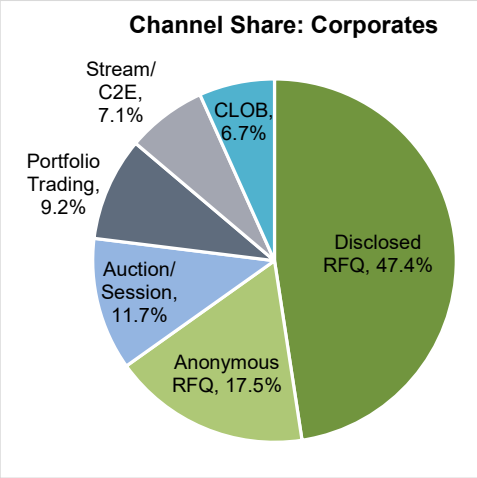
In corporate bond electronic trading, MarketAxess held the top market share in 2023 at 46.7%, followed by Tradeweb at 32.5%.

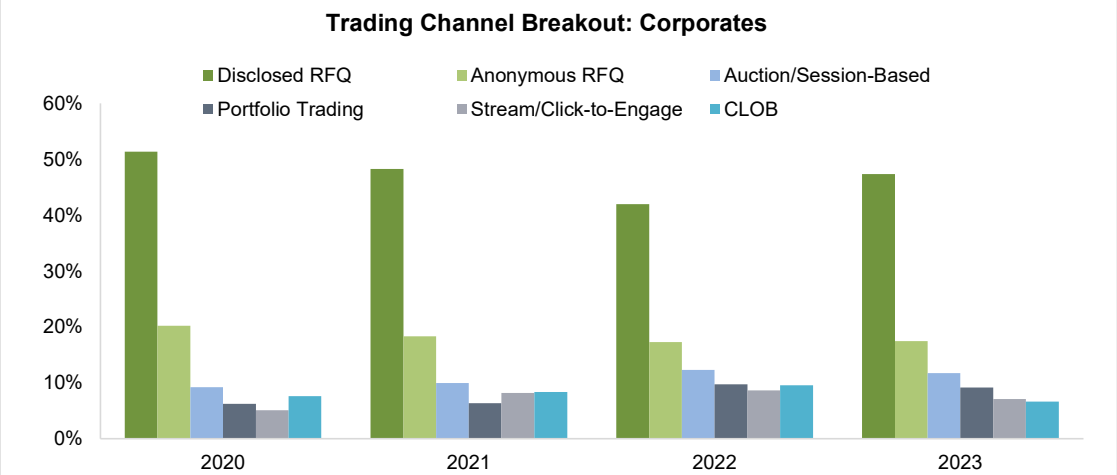




Source: Coalition Greenwich

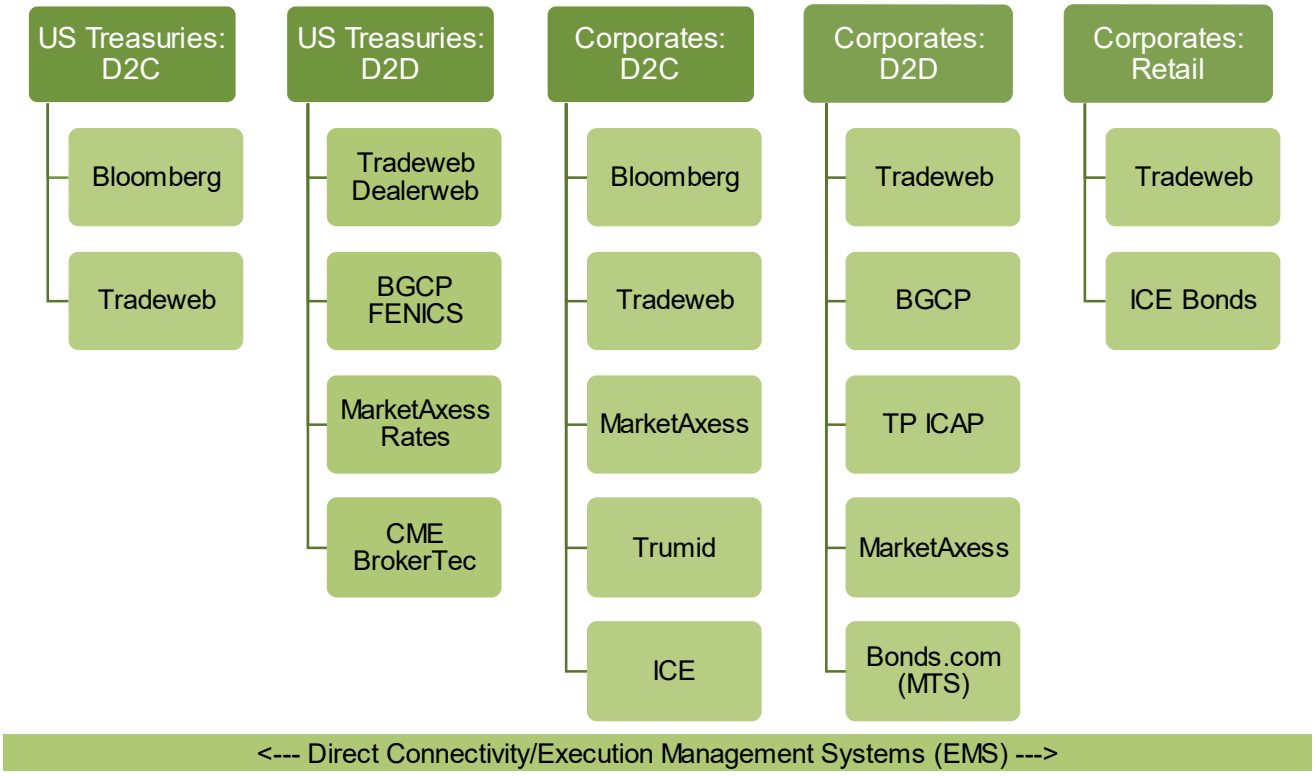
As to channel by which corporates were traded, RFQ dominated in 2023 at 64.9%, 47.4% disclosed and 17.5% anonymous.





Source: Coalition Greenwich

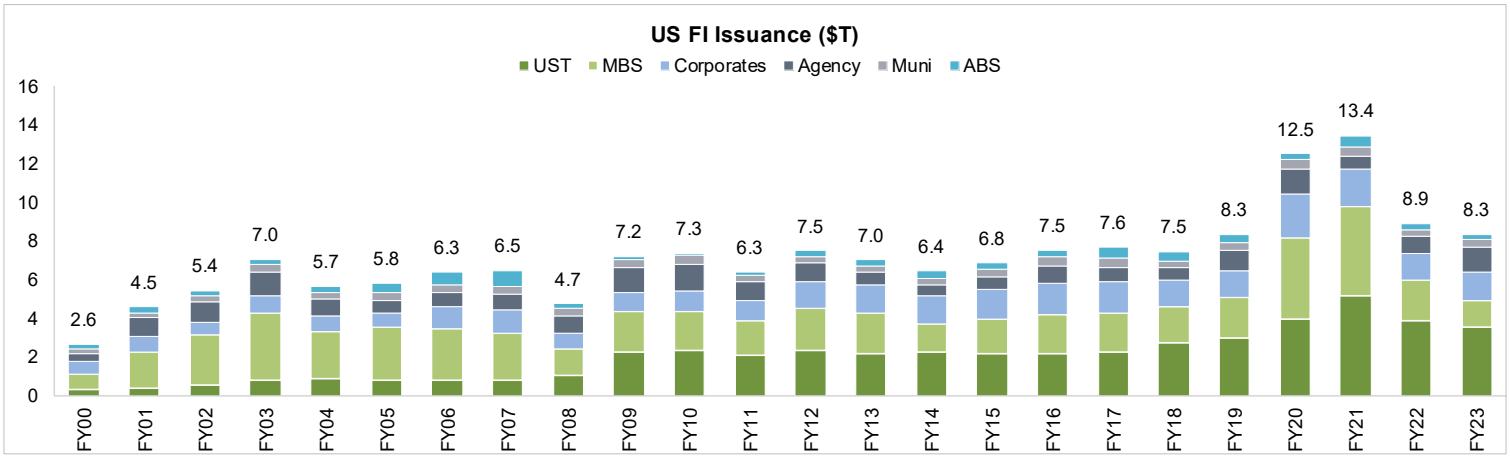
Electronic Trading Platforms

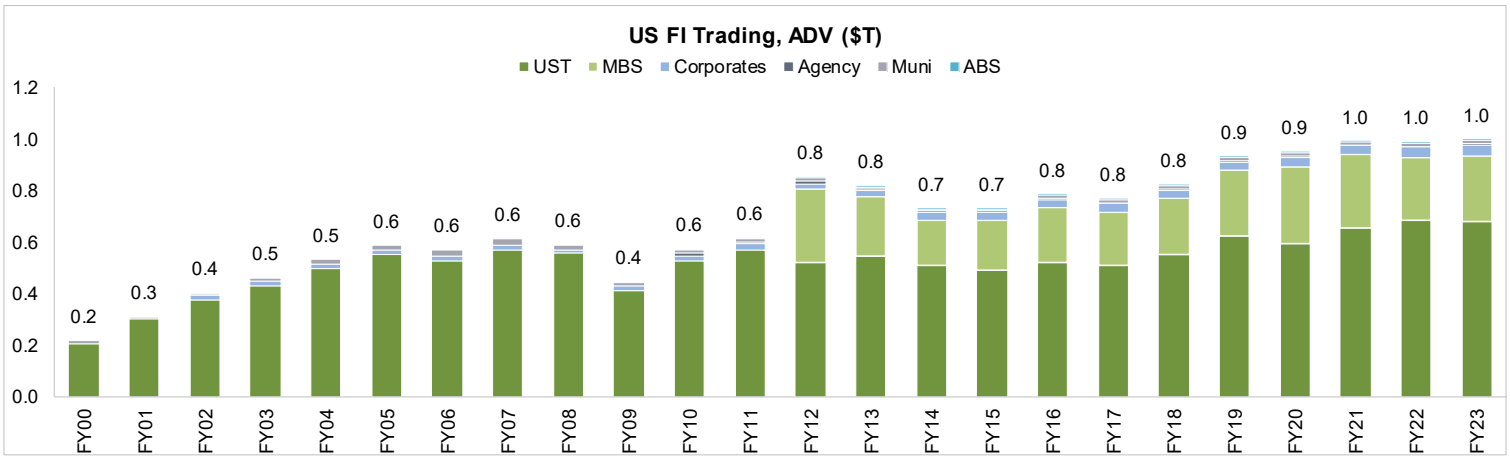


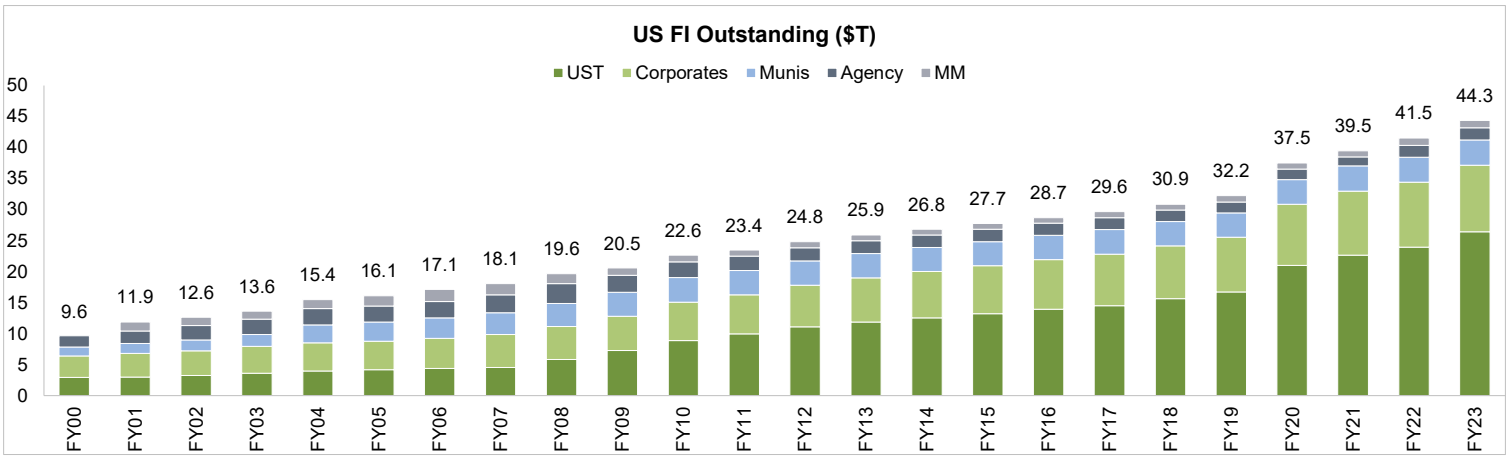
Note: Different firms may use different terminology or segment platforms differently, and this list may not be all inclusive. D2D = dealer-to-dealer, D2C = dealer-to-client. While we have separated D2D and D2C, lines are blurring with all-to-all trading (buy-side and sell-side liquidity) continuing to grow. MarketAxess Rates includes LiquidityEdge acquisition. ICE Bonds includes BondPoint, TMC Bonds acquisitions. Tradeweb includes eSpeed. Retail can be referred to as retail/click-to-trade; there is some institutional activity on these platforms albeit minimal. Voice trading remains an option across all asset classes. Broker dealers may also trade with clients on proprietary electronic platforms (single-dealer platforms).

Appendix: Historical Trends

Total Fixed Income Securities



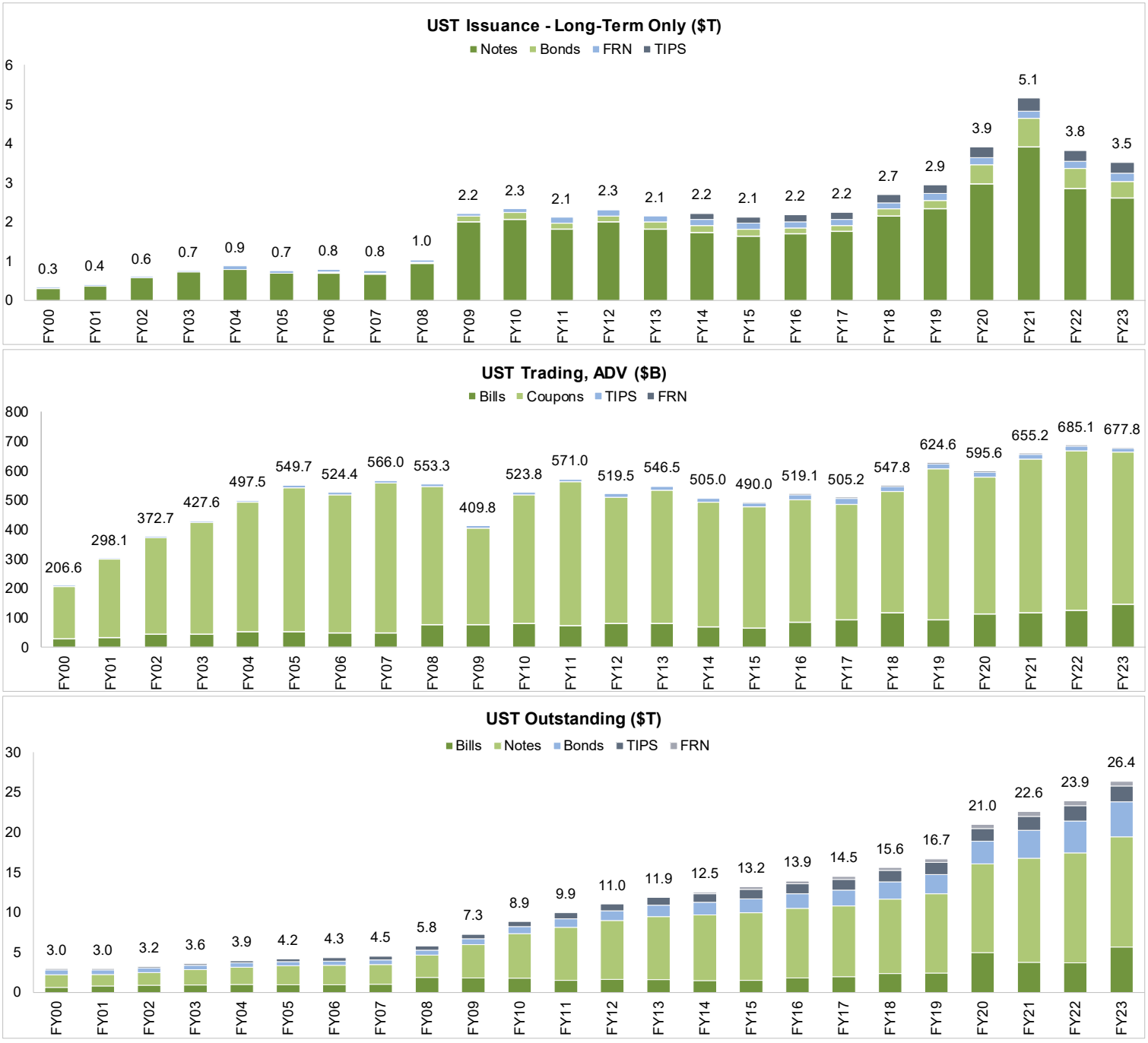




Source: Bloomberg, Federal Reserve, Federal Reserve Bank of New York, FINRA, Municipal Securities Rulemaking Board, Refinitiv, US Agencies, US Treasury, SIFMA estimates

Note: Issuance = Long-term securities only, UST = U.S. Treasury securities, MBS = mortgage-backed securities, Corporates = corporate bonds, Agency = federal agency securities, Munis = municipal bonds, ABS = asset-backed securities

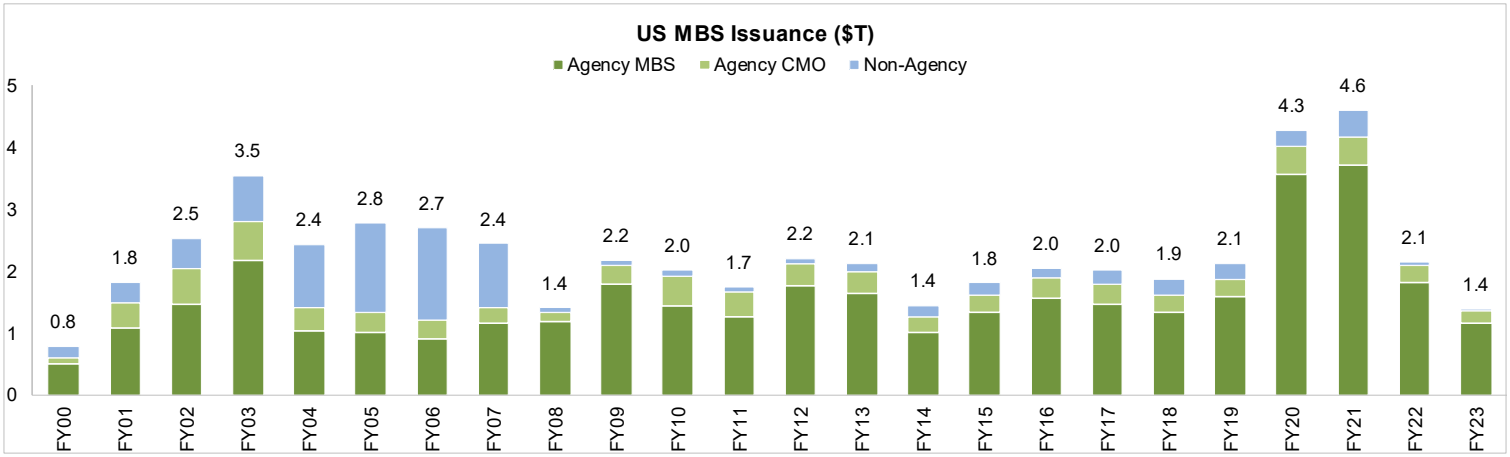
US Treasury Securities

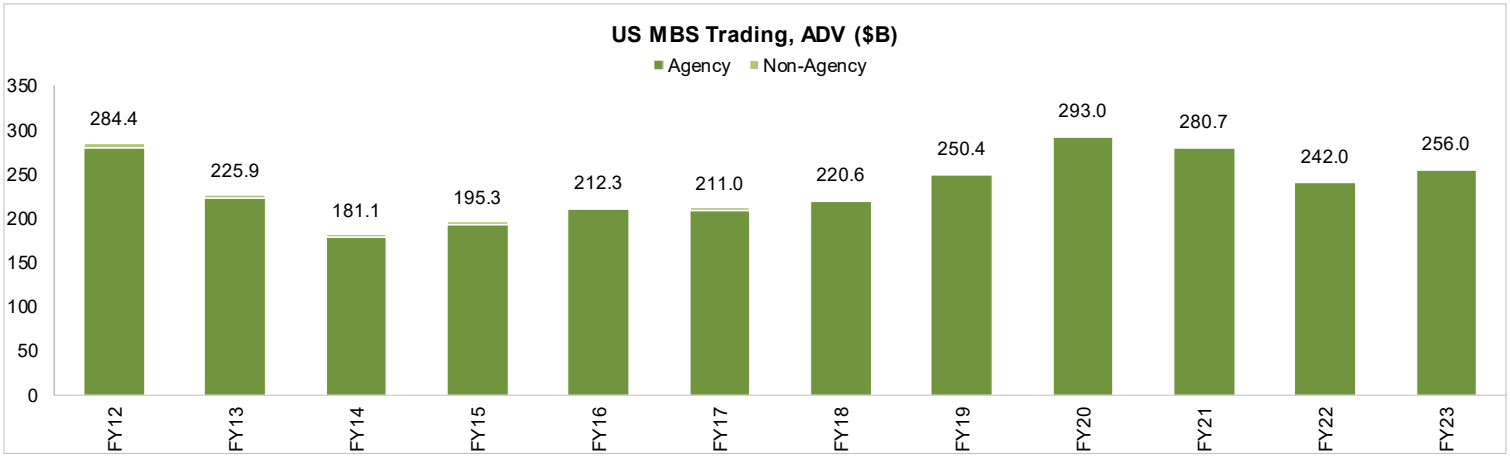


Source: FINRA, NY Fed, US Treasury, SIFMA estimates

Note: FRN = floating rate note, TIPS = Treasury inflation-protected securities, UST Trading data pre-FY19 sourced from NY Fed (primary dealer reporting), data for FY19 and on sourced from FINRA

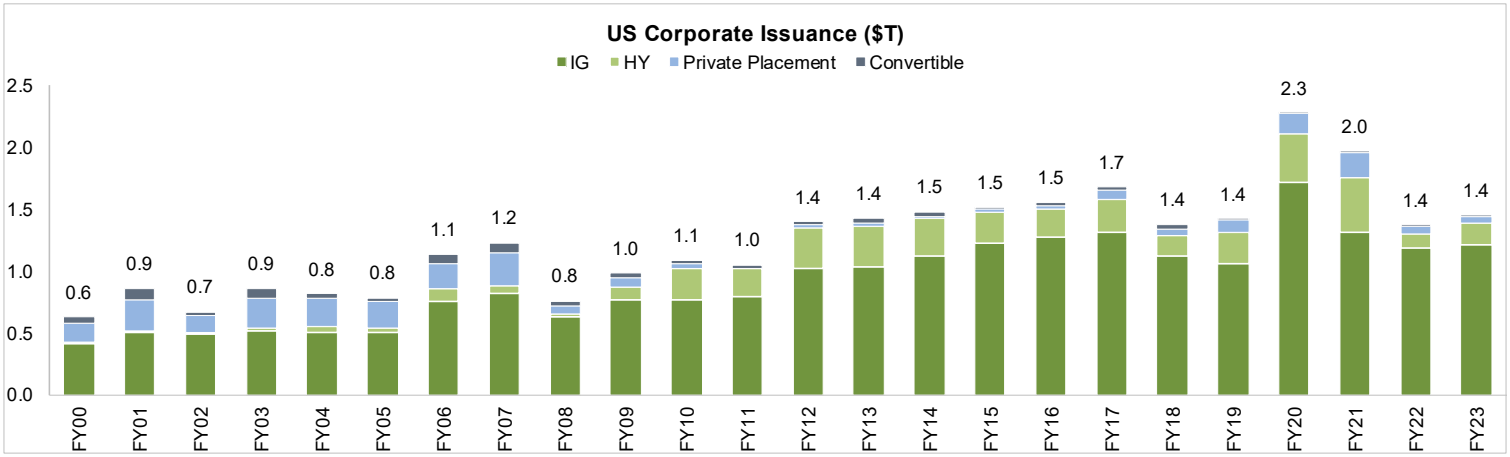
Mortgage-Backed Securities

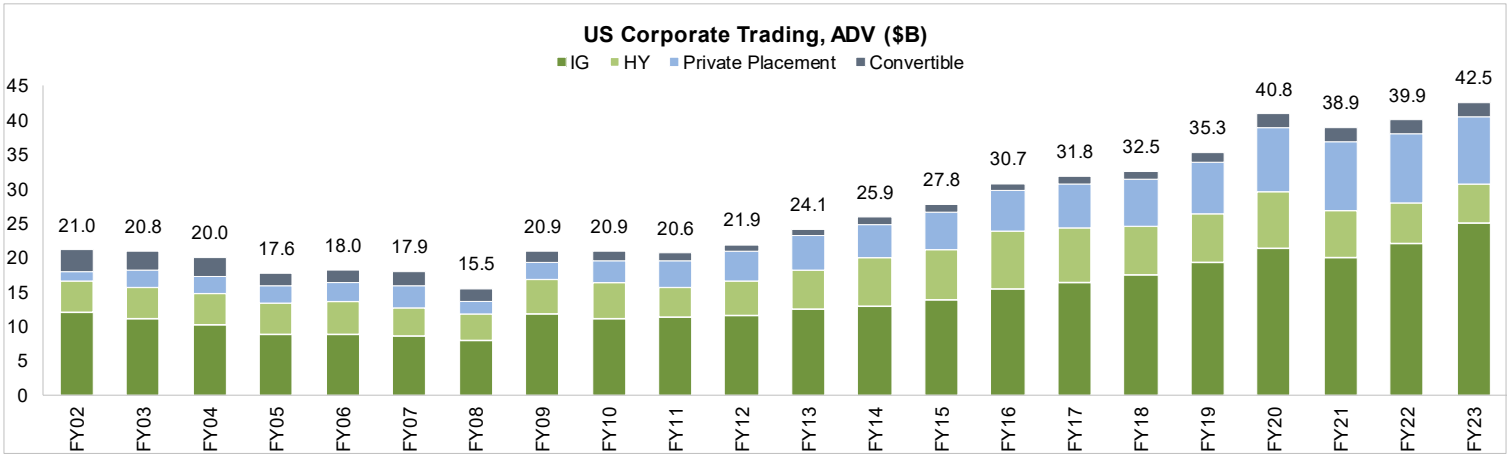


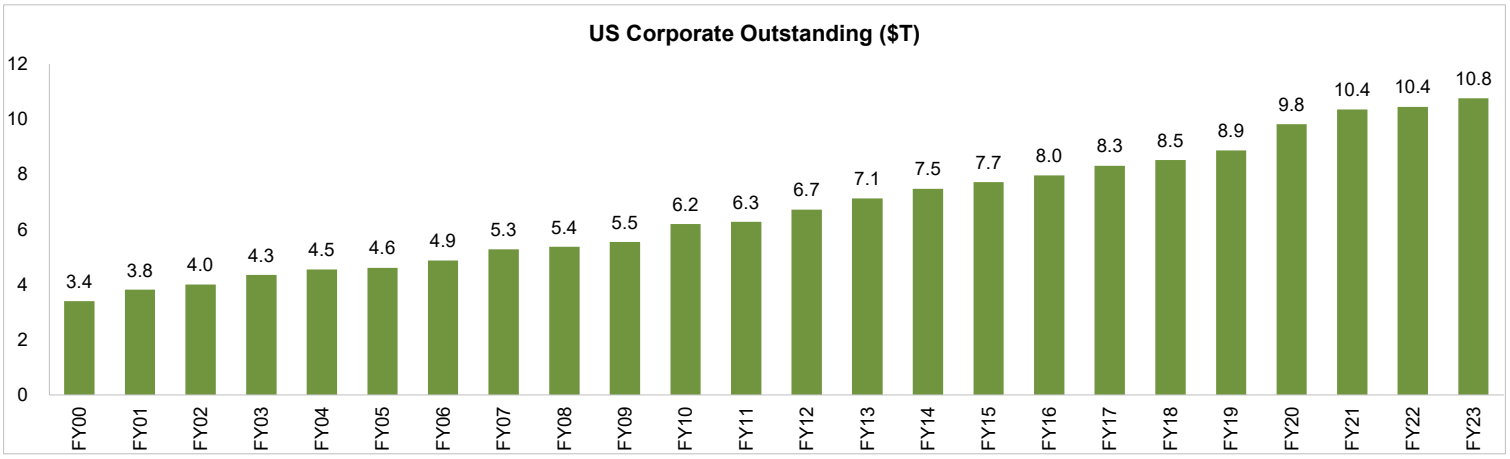


Source: Bloomberg, FINRA, Refinitiv, SIFMA estimates
Note: CMO = collateralized mortgage obligation

Corporate Bonds

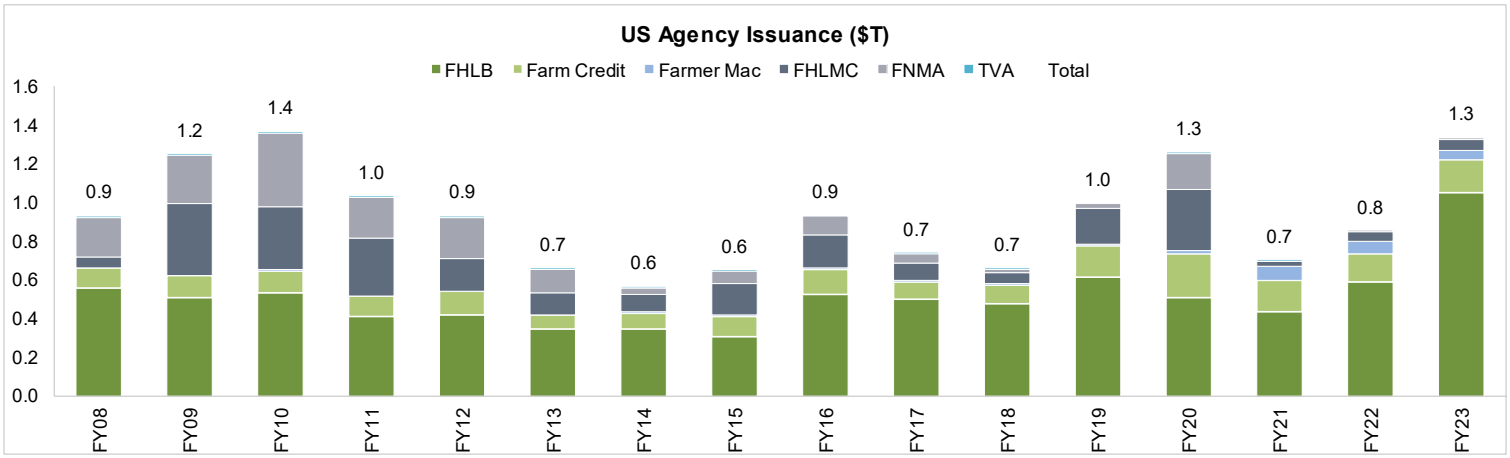


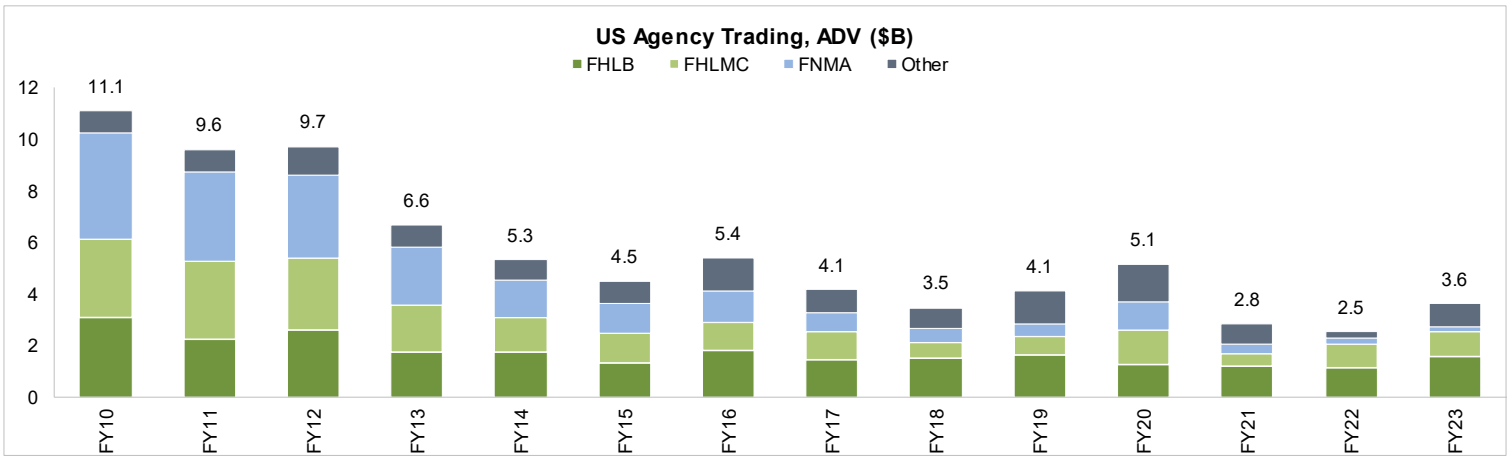


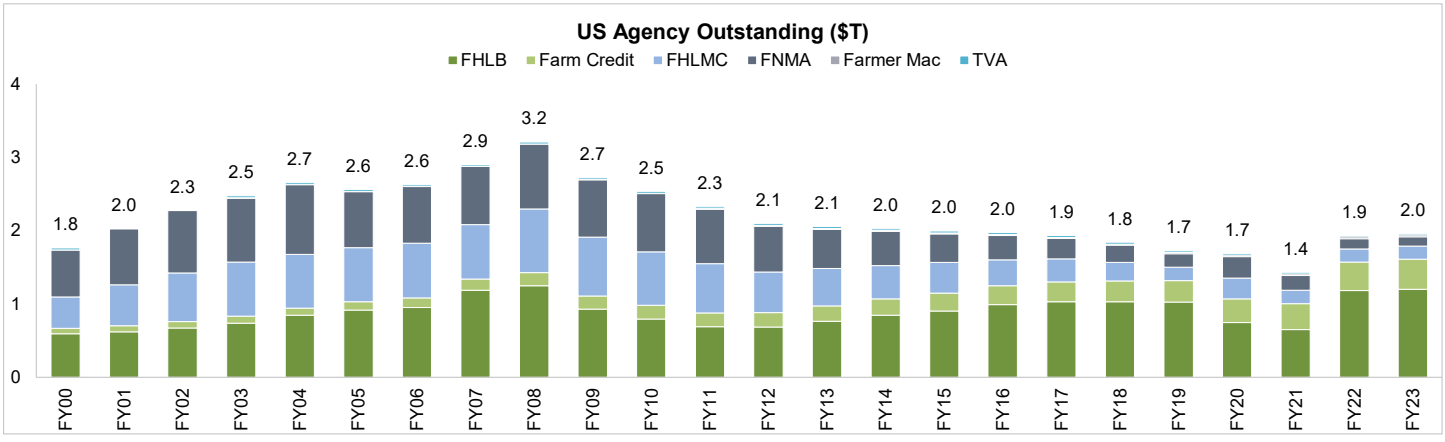


Source: Refinitiv, FINRA, Federal Reserve, SIFMA estimates
Note: IG = investment grade, HY = high yield

Federal Agency Securities

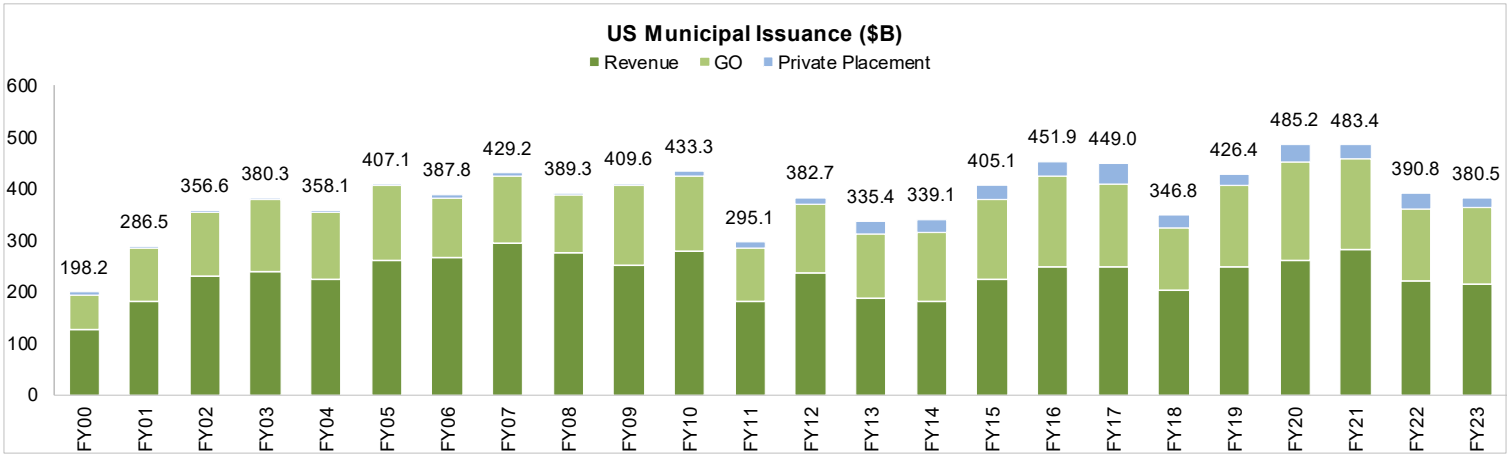


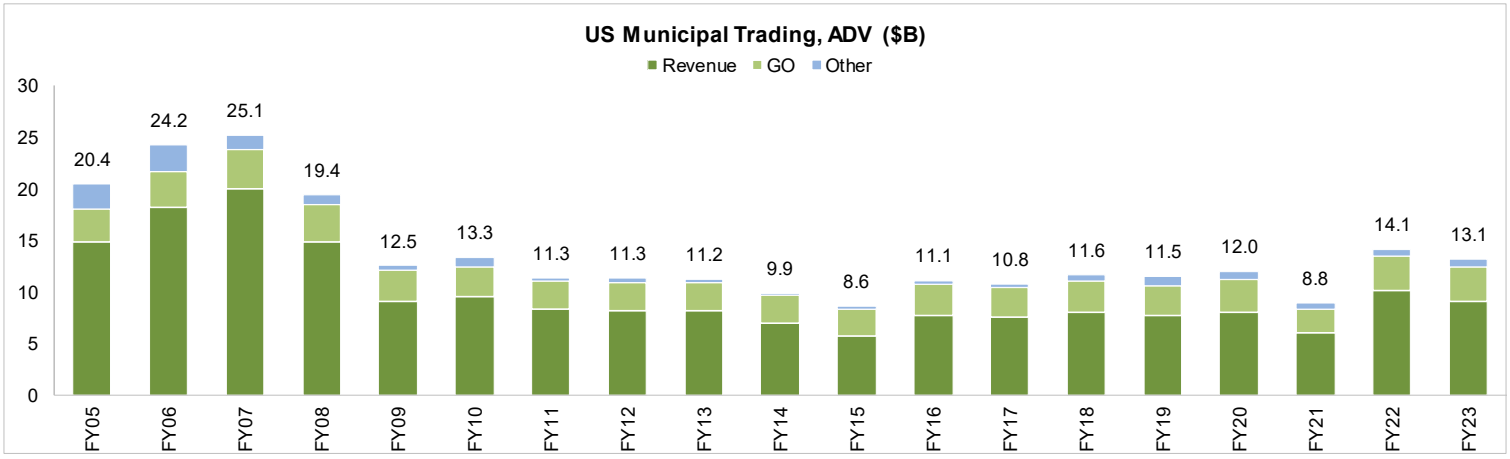


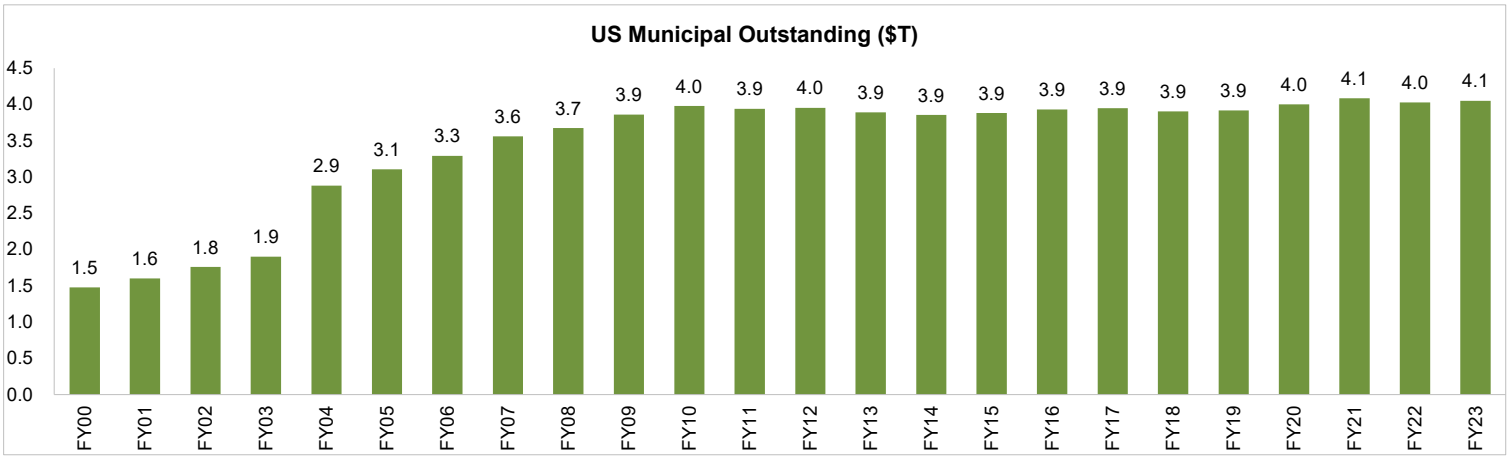


Source: FINRA, US Agencies, SIFMA estimates
Note: FHLB = The Federal Home Loan Banks, FHLMC = The Federal Home Loan Mortgage Corporation (Freddie Mac), FNMA = The Federal National Mortgage Association (Fannie Mae), TVA = The Tennessee Valley Authority

Municipal Bonds

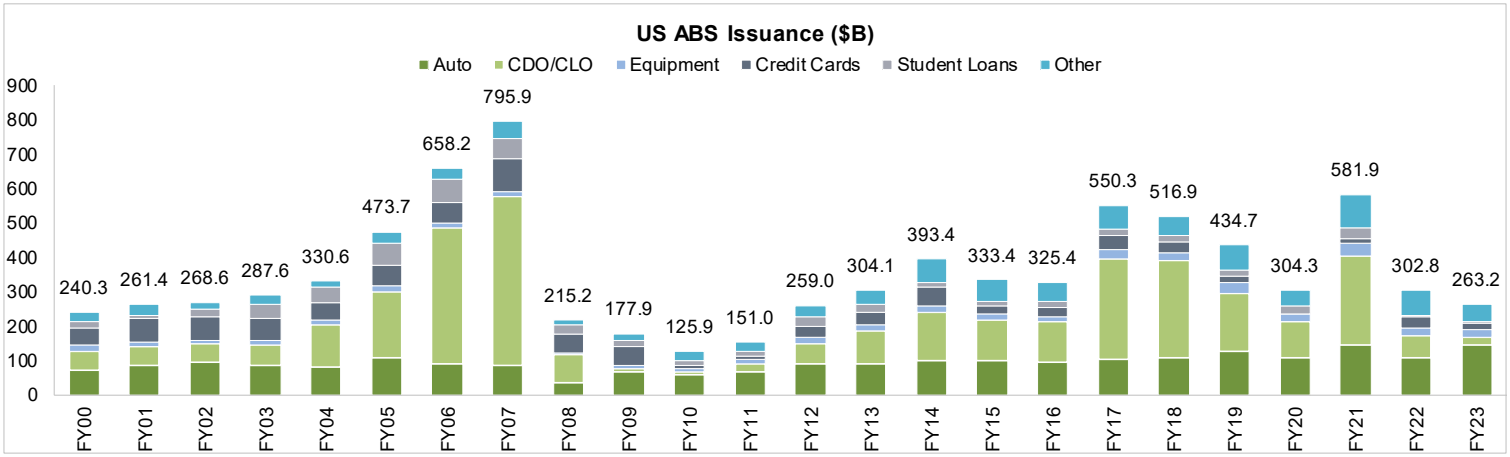


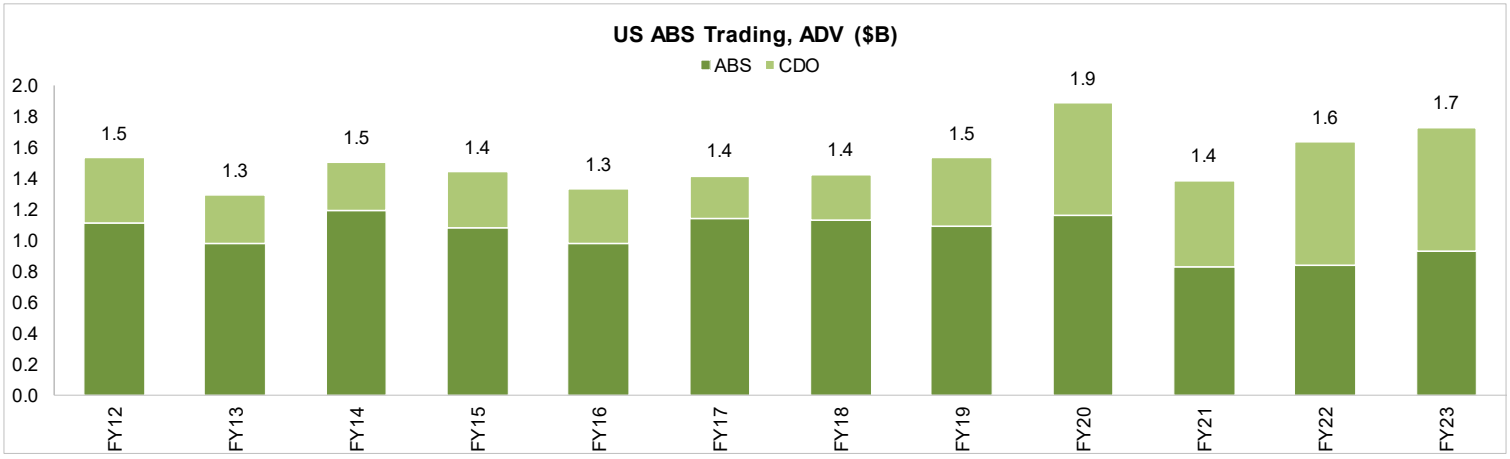




Source: Municipal Securities Rulemaking Board, Refinitiv, Federal Reserve, SIFMA estimates
Note: GO = general obligation

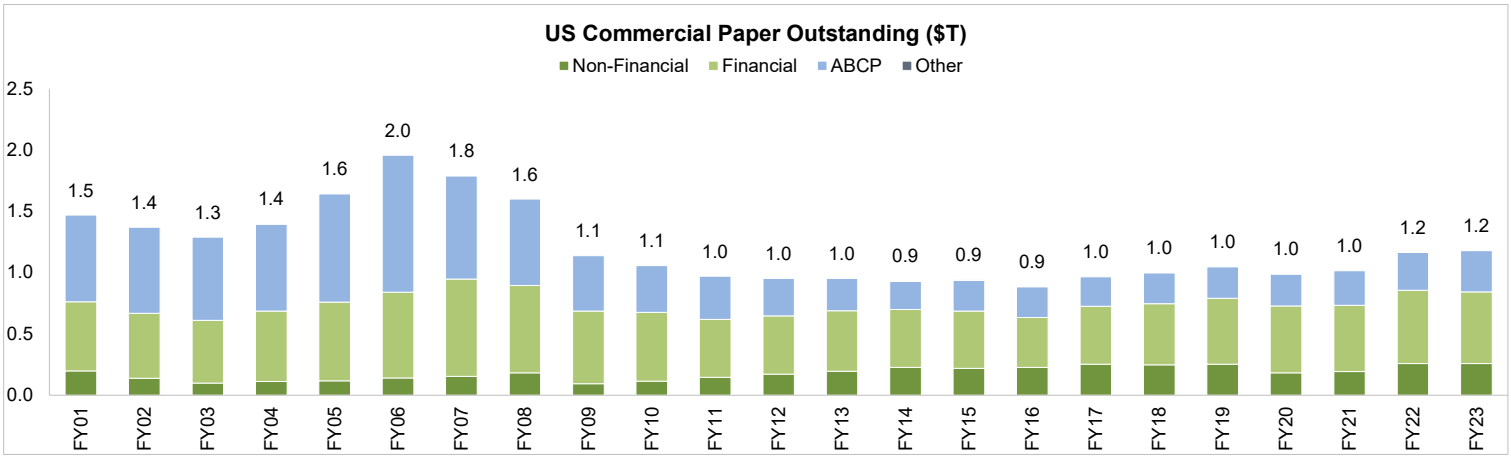
Asset-Backed Securities





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

Money Markets



Source: The Federal Reserve, SIFMA estimates
Note: ABCP = asset-backed commercial paper

Appendix: Current Primary Dealer List

The following is the list of primary dealers, as per the Federal Reserve Bank of New York: (as of 2023)

- ASL Capital Markets Inc.
- Bank of Montreal, Chicago Branch
- Bank of Nova Scotia, New York Agency
- BNP Paribas Securities Corp.
- Barclays Capital Inc.
- BofA Securities, Inc.
- Cantor Fitzgerald & Co.
- Citigroup Global Markets Inc.
- Daiwa Capital Markets America Inc.
- Deutsche Bank Securities Inc.
- Goldman Sachs & Co. LLC
- HSBC Securities (USA) Inc.
- Jefferies LLC
- J.P. Morgan Securities LLC
- Mizuho Securities USA LLC
- Morgan Stanley & Co. LLC
- NatWest Markets Securities Inc.
- Nomura Securities International, Inc.
- RBC Capital Markets, LLC
- Santander US Capital Markets LLC
- Societe Generale, New York Branch
- TD Securities (USA) LLC
- UBS Securities LLC.
- Wells Fargo Securities, LLC

Appendix: Credit Ratings Scale

Moody's		S&P		Fitch		Rating Description	
Long-Term	Short-Term	Long-Term	Short-Term	Long-Term	Short-Term		
Aaa	P-1	AAA	A-1+	AAA	A-1+	Prime	Investment Grade Bonds
Aa1		AA+		AA+		High Grade	
Aa2		AA		AA			
Aa3		AA-		AA-			
A1		A+	A-1	A+	A-1	Upper Medium Grade	
A2		A		A			
A3	P-2	A-	A-2	A-	A-2		
Baa1		BBB+		BBB+		Lower Medium Grade	
Baa2	P-3	BBB	A-3	BBB	A-3		
Baa3		BBB-		BBB-			
Ba1	Not Prime	BB+	B	BB+	B	Speculative	High-Yield Bonds
Ba2		BB		BB			
Ba3		BB-		BB-			
B1		B+		B+		Highly Speculative	
B2		B		B			
B3		B-		B-			
Caa1		CCC+	C	CCC	C	Substantial Risks	
Caa2		CCC				Extremely Speculative	
Caa3		CCC-				Default Imminent (low probability of recovery)	
Ca		CC					
		C					
C		D	/	DDD	/	In Default	
/				DD			
				D			

Appendix: Capital Markets Terms to Know

Statistics	
Y/Y	Year over Year
Q/Q	Quarter over Quarter
M/M	Month over Month
W/W	Week over Week
D/D	Day over day
YTD	Year to Date
QTD	Quarter to Date
MTD	Month to Date
WTD	Week to Date
BPS	Basis Points
PPS	Percentage Points
CAGR	Compound Annual Growth Rate
RHS	Right hand side (for charts)

Other	
AUM	Assets Under Management
DCM	Debt Capital Markets
ECM	Equity Capital Markets

Regulators	
North America	
FINRA	Financial Industry Regulatory Authority (United States)
SEC	Securities and Exchange Commission (United States)
CSC	Canadian Securities Administrators
European Union	
ESMA	European Securities and Markets Authority
AMF	Autorité des marchés financiers (France)
BaFin	Federal Financial Supervisory Authority (Germany)
FINMA	Swiss Financial Market Supervisory Authority (Switzerland)
United Kingdom	
FCA	Financial Conduct Authority
AsiaPac	
ASIC	Australian Securities and Investments Commission
CSRC	China Securities Regulatory Commission
SFC	Securities and Futures Commission (Hong Kong)
SEBI	Securities and Exchange Board of India
FSA	Financial Services Agency (Japan)
MAS	Monetary Authority of Singapore

Trading	
ADV	Average Daily Trading Volume
Algo	Algorithm (algorithmic trading)
ATS	Alternative Trading System
Best Ex	Best Execution
BPS	Basis Points
CLOB	Central Limit Order Book
D2C	Dealer-to-Client
D2D	Dealer-to-Dealer
ECN	Electronic Communication Network
ETP	Electronic Trading Platforms
HFT	High-Frequency Trading
IDB	Inter-Dealer Broker
IOI	Indication of Interest
MM	Market Maker
OTC	Over-the-Counter
SDP	Single-dealer platform
Bid	An offer made to buy a security
Ask, Offer	The price a seller is willing to accept for a security
Spread	The difference between the bid and ask price prices for a security, an indicator of supply (ask) and demand (bid)
NBBO	National Best Bid and Offer
Locked Market	A market is locked if the bid price equals the ask price
Crossed Market	A bid is entered higher than the offer or an offer is entered lower than the bid
Opening Cross	To determine the opening price of a stock, accumulating all buy and sell interest prior to the market open
Closing Cross	To determine the closing price of a stock, accumulating all buy and sell interest prior the market close

Order Types	
AON	All or none; an order to buy or sell a stock that must be executed in its entirety, or not executed at all
Block	Trades with at least 10,000 shares in the order
Day	Order is good only for that trading day, else cancelled
FOK	Fill or kill; must be filled immediately and in its entirety or not at all
Limit	An order to buy or sell a security at a specific price or better
Market	An order to buy or sell a security immediately; guarantees execution but not the execution price
Stop	(or stop-loss) An order to buy or sell a stock once the price of the stock reaches the specified price, known as the stop price

Post Trade	
DTCC	The Depository Trust and Clearing Corporation
CSD	Central Securities Depository
CCP	Central Counterparty Clearing House
CP	Counterparty
IM	Initial Margin
VM	Variation Margin
MPR	Margin Period at Risk
T	Trade Date
T+1	Settlement Date

Investors	
Institutional	Asset managers, endowments, pension plans, foundations, mutual funds, hedge funds, family offices, insurance companies, banks, etc.; fewer protective regulations as assumed to be more knowledgeable and better able to protect themselves
Individual	Self-directed or advised investing

Equities	
EMS	Equity Market Structure
NMS	National Market System
Reg NMS	Regulation National Market System
SIP	Security Information Processor; aggregates all exchange's best quotes, sent back out to the market in one data stream
PFOF	Payment For Order Flow
Tick Size	Minimum quote increment of a trading instrument
CAT	Consolidated Audit Trail
SRO	Self Regulatory Organization

ETFs/Funds	
AP	Authorized Participant
PCF	Portfolio Composition File
NAV	Net Asset Value
IIV	Intraday Indicative Value
ETF	Exchange-Traded Fund
ETP	Exchange-Traded Product
MF	Mutual Fund
OEF	Open-End Fund
CEF	Closed-End Fund
UIT	Unit Investment Trust

Options	
Call	The right to buy the underlying security, on or before expiration
Put	The right to sell the underlying security, on or before expiration
Holder	The buyer of the contract
Writer	The seller of the contract
American	Option may be exercised on any trading day on or before expiration
European	Option may only be exercised on expiration
Exercise	To put into effect the right specified in a contract
Underlying	The instrument on which the options contract is based; the asset/security being bought or sold upon exercise notification
Expiration	The set date at which the options contract ends, or ceases to exist, or the last day it can be traded
Stock Price	The price at which the underlying stock is trading, fluctuates continuously
Strike Price	The set price at which the options contract is exercised, or acted upon
Premium	The price the option contract trades at, or the purchase price, which fluctuates constantly
Time Decay	The time value portion of an option's premium decreases as time passes; the longer the option's life, the greater the probability the option will move in the money
Intrinsic Value	The in-the-money portion of an option's premium
Time Value	(Extrinsic value) The option premium (price) of the option minus intrinsic value; assigned by external factors (passage of time, volatility, interest rates, dividends, etc.)
In-the-Money	For a call option, when the stock price is greater than the strike price; reversed for put options
At-the Money	Stock price is identical to the strike price; the option has no intrinsic value
Out-of-the-Money	For a call option, when the stock price is less than the strike price; reversed for put options

Equity Capital Formation	
IPO	Initial Public Offering; private company raises capital buy offering its common stock to the public for the first time in the primary markets
SPAC	Special Purpose Acquisition Company; blank check shell corporation designed to take companies public without going through the traditional IPO process
Bought Deal	Underwriter purchases a company's entire IPO issue and resells it to the investing public; underwriter bears the entire risk of selling the stock issue
Best Effort Deal	Underwriter only guarantees the issuer it will make a best effort attempt to sell the shares to investors at the best price possible; issuer can be stuck with unsold shares
Secondary	(Follow-on) Issuance of shares to investors by a public company already listed on an exchange
Direct Listing	(Direct placement, direct public offering) Existing private company shareholders sell their shares directly to the public without underwriters. Often used by startups or smaller companies as a lower cost alternative to a traditional IPO. Risks include, among others, no support for the share sale and no stock price stabilization from the underwriter after the share listing.

Underwriting	
Underwriting	Guarantee payment in case of damage or financial loss and accept the financial risk for liability arising from such guarantee in a financial transaction or deal
Underwriter	Investment bank administering the public issuance of securities; determines the initial offering price of the security, buys them from the issuer and sells them to investors.
Bookrunner	The main underwriter or lead manager in the deal, responsible for tracking interest in purchasing the IPO in order to help determine demand and price (can have a joint bookrunner)
Lead Left Bookrunner	Investment bank chosen by the issuer to lead the deal (identified on the offering document cover as the upper left hand bank listed)
Syndicate	Investment banks underwriting and selling all or part of an IPO
Arranger	The lead bank in the syndicate for a debt issuance deal
Greenshoe	Allows underwriters to sell more shares than originally planned by the company and then buy them back at the original IPO price if the demand for the deal is higher than expected, i.e. an over-allotment option

Documentation	
Pitch	Sales presentation by an investment bank to the issuer, marketing the firm's services and products to win the mandate
Mandate	The issuing company selects the investment banks to underwrite its offering
Engagement Letter	Agreement between issuer & underwriters clarifying: terms, fees, responsibilities, expense reimbursement, confidentiality, indemnity, etc.
Letter of Intent	Investment banks' commitment to the issuer to underwrite the IPO
Underwriting Agreement	Issued after the securities are priced, underwriters become contractually bound to purchase the issue from the issuer at a specific price
Registration Statement	Split into the prospectus and private filings, or information for the SEC to review but not distributed to the public, it provides investors adequate information to perform their own due diligence prior to investing
The Prospectus	Public document issued to all investors listing: financial statements, management backgrounds, insider holdings, ongoing legal issues, IPO information and the ticker to be used once listed
Red Herring Document	An initial prospectus with company details, but not inclusive of the effective date of offering price, filed with the SEC
Tombstone	An announcement that securities are available for sale. (Also a plaque awarded to celebrate the completion of a transaction or deal)

Process	
Roadshow	Investment bankers take issuing companies to meet institutional investors to interest them in buying the security they are bringing to market
Non-Deal Roadshow	Research analysts and sales personnel take public companies to meet institutional investors to interest them in buying a stock or update existing investors on the status of the business and current trends
Pricing	Underwriters and the issuer will determine the offer price, the price the shares will be sold to the public and the number of shares to be sold, based on demand gauged during the road show and market factors
Stabilization	Occurs for a short period of time after the IPO if order imbalances exist, i.e. the buy and sell orders do not match; underwriters will purchase shares at the offering price or below to move the stock price and rectify the imbalance
Quiet Period	(Cooling off period) The SEC mandates a quiet period on research recommendations, lasting 10 days (formerly 25 days) after the IPO

SEC Filings	
Reg S-K	Regulation which prescribes reporting requirements for SEC filings for public companies
Reg S-X	Regulation which lays out the specific form and content of financial reports, specifically the financial statements of public companies
Form S-1	Registration statement for U.S. companies (described above)
Form F-1	Registration statement for foreign issuers of certain securities, for which no other specialized form exists or is authorized
Form 10-Q	Quarterly report on the financial condition and state of the business (discussion of risks, legal proceedings, etc.), mandated by the SEC
Form 10-K	More detailed annual version of the 10Q, mandated by the SEC
Form 8-K	Current report to announce major events shareholders should know about (changes to business & operations, financial statements, etc.), mandated by the SEC
EGC	Emerging Growth Company; qualified companies may choose to follow disclosure requirements that are scaled for newly public

Fixed Income	
CUSIP	Committee on Uniform Securities Identification Procedures; a nine character security identifier
FICC	Fixed Income, Currencies and Commodities
FI	Fixed Income
TRS	Total Return Swap

Rates Markets	
UST	U.S. Treasury Securities
FRN	Floating Rate Note
T-Bill	U.S. Treasury Bill
T-Note	U.S. Treasury Note
T-Bond	U.S. Treasury Bond
TIPS	Treasury Inflation Protected Securities
Repo	Repurchase Agreement; also have reverse repos
Agency	Federal Agency Securities
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

Credit Markets	
Corporates	Corporate Bonds
HY	High Yield Bond
IG	Investment Grade Bond
Munis	Municipal Securities
GO	General Obligation Bond
Revenue	Revenue Bond

Securitized Products	
MBS	Mortgage-Backed Security
CMO	Collateralized Mortgage Obligation
CMBS	Commercial MBS
RMBS	Residential MBS
ABS	Asset-Backed Securities (auto, credit card, home equity, student loans, etc.)
CDO	Collateralized Debt Obligation

Money Markets (MM)	
CP	Commercial Paper
ABCP	Asset-Backed Commercial Paper
MMF	Money Market Funds

SIFMA Insights Research Reports

SIFMA Insights: www.sifma.org/insights

- Ad hoc reports on timely market themes
- Annual Market Structure Compendiums: Equity and Fixed Income
- 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: An Overview of Capital Markets and the Role of Financial Institutions
- Global Equity Market Comparison
- Capital Formation & Listings Exchanges
- Equities
- Options
- ETFs
- Fixed Income & Electronic Trading

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

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