

Capital Ratios and Primary Dealers: How the SLR Impacts Treasury Market Intermediation and Balance Sheet Allocation

By

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Abstract

This paper explores the relationship between the supplementary leverage ratio (SLR), primary dealer's balance sheet headroom and intermediation in the Treasury market. Primary dealers are a group of 24 banks who act as a counterparty to the Federal Reserve's monetary policy operations, bid in debt auctions and are responsible for distributing Treasuries to the secondary market. Using regulatory data from Y-9C filings and market making data from FR 2004, this analysis uses a difference in differences identification strategy to quantify the impact of a COVID era SLR policy exemption on dealers' intermediation, balance sheet allocation and trading capacity. Results find that there is a significant reallocation in trading activity between maturity buckets as a result of yield pick up behavior, and that dealers increased their holdings of Treasuries relative to agency mortgage backed securities during the exemption period.

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1. Introduction:

The US Treasury market is not only the largest in the world, with an average volume of $910 billion traded daily, but one of the most important mechanisms for ensuring financial stability (FINRA, 2025). Treasury Bills (< 1 year maturity), notes (between 2 and 10 year maturity) and bonds (10+ year maturity) are sovereign debt securities issued by the US government to fund the deficit. Asset managers and brokers use Treasuries to earn guaranteed returns, as a benchmark price for other assets and to hedge other investments in their portfolio. However, most importantly, Treasuries are used by the Federal Reserve to carry out monetary policy through 24 special financial institutions known as primary dealers. These firms are responsible for buying US debt when it is auctioned by the New York Fed (at monthly events called Treasury auctions) and reselling it on the secondary market, acting as the counterparty to open market trades and participating in various "facilities" that the Fed sets up to ensure stability in this market. Primary dealers are responsible for maintaining liquidity through adequate market making, which is the process of connecting buyers and sellers. During April 2020-March 2021, the exclusion of Treasuries from the calculation of the supplementary leverage ratio (SLR) provides a unique circumstance to analyze the change in dealer Treasury positions and trading activity through looking at both market making and regulatory measures.

On the onset of the COVID-19 pandemic, cracks in the Treasuries market immediately started to show: investors and funds sold large amounts of Treasuries as a guaranteed way to have ultra-liquid cash on hand. As a result, primary dealers, who function as market makers, had a challenging time supplying liquidity as usual. Bid-ask spreads rose, prices plummeted and yields shot up. As an immediate fix, the Fed sold approximately $72 billion per day of Treasuries and other government securities for the two weeks after March 19th, through a

process known as quantitative easing (Millstein and Wessel, 2024). While this supplied much needed liquidity and lowered volatility, more policy was needed to guarantee the stability of primary dealers during this unprecedented time. During the week of April 1st 2020, the Federal Reserve exempted Treasuries from a banking regulation known as the supplementary leverage ratio (SLR), as a way to give them ample balance sheet space. Dealers could essentially hold unlimited Treasuries without it impacting their regulatory standing, which the Fed believed would incentivize them to increase market making during this uncertain time and enhance liquidity.

The exemption period highlights how regulatory policy can impact dealer trading activity through altering balance sheet constraints and allocation. Capital requirements are a regulatory tool used to ensure that banks have adequate capital at hand at all times to fulfill their obligations. On a high level, these are computed by dividing a bank's total assets by its amount of high quality, most liquid capital. The capital ratios a bank is subject to depend on its classification as Category I-IV, based on its total assets. The largest, most systemically important Category I banks are referred to as global systemically important banks (GSIBs) throughout this paper and past literature. To varying degrees, all banks above Category III are subject to two main types of capital ratios, risk based capital (RBC) and non risk based. RBC ratios are calculated by dividing a bank's total risk weighted assets by its common equity tier 1 (CET1) capital or Tier 1 capital, the highest form of liquid capital that encompasses common stock and surpluses (Federal Reserve, 2025). Risk weighted assets are calculated by risk weighting each asset according to its risk weight, which is determined by the Fed. Treasuries have a risk weight of zero, which is central to this analysis. Non RBC ratios do not distinguish between an asset's risk, so are designed as a regulatory back stop to ensure banks hold adequate capital to fund their

assets, or leverage. The SLR takes a similar approach, except its denominator is a broader measure of leverage called total leverage exposure (TLE), instead of consolidated assets. TLE includes off balance sheet items such as derivatives contracts, future contracts and repurchase (repo) and reverse repurchase agreements to more broadly encapsulate a bank's systematic involvement.

All 8 GSIBs, and all Category I-III firms are subject to the SLR, and required to maintain a minimum ratio of 3%. However, GSIBs must maintain an SLR no lower than 5%. Six primary dealers are classified as GSIBs and must meet the 5% requirement, many others the 3% requirement, and a handful of others are not subject to capital ratios at all because they are classified as broker dealers and are not regulated by the Fed. Appendix A lists all 24 primary dealers, and the capital ratios they are subject to.

This paper combines both market making and regulatory data to depict how the SLR impacts balance sheet allocation, trading activity and dealer intermediation. The first analysis utilizes aggregate data from the FR 2004 reporting forms to identify changes in trading and inventory during the exemption period. Any firm specific data is confidential, so aggregate positions give an overall estimate of changes in dealer market making activity. Next, more granular analysis explores changes in activity within each Treasury maturity bucket, and uses a difference in differences (DiD) strategy to determine if there is a significant change in aggregate dealer positions of Treasuries relative to agency mortgage backed securities (AMBS) during the exemption. Results find that there is a significant increase in gross positions during the exemption, and a reallocation of trading activity between maturity buckets to promote yield pick up behavior. Dealers also increased their holdings of Treasuries relative to AMBS during this period; this demonstrates that dealers preferred Treasuries because they were exempt from the

SLR and had a lower shadow cost, but also had the capacity to take on more high yielding Treasuries.

The second analysis dives deeper into regulatory measures of firm positions using Y-9C data. Though these measurements are quarterly and reported using GAAP standards as opposed to an economic measure of market making activity, they act as a publicly available proxy into dealers' behavior. Using each firm's SLR and Treasuries held for trading (HFT), a regression analysis describes the association between balance sheet constraint and a bank's trading capacity. Results support the idea that Treasuries are preferred to higher yielding assets both during and outside of the exemption period because there is a significant positive relationship between SLR and a banks' intermediation capacity.

Together, these analyses take a nuanced look at how banks allocate their balance sheet space and how that changes as they move closer to regulatory limits. Additionally, discrepancies between market making and regulatory measures of trading activity highlights the importance of window dressing activity during quarter-end and year-end, and sets the stage for further analysis. Results also give further insight into the policy implications of significant changes in Treasuries inventory during the exemption period, and connect that to yield pick up behavior and how an asset's risk level impacts its balance sheet shadow cost.

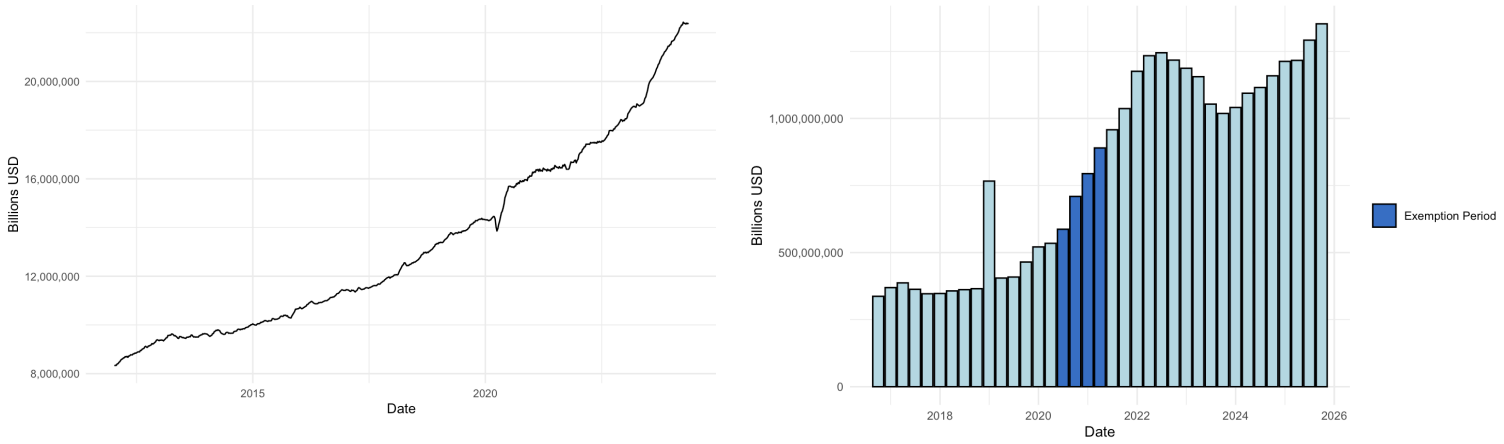
2. Problem Statement:

The purpose of this research is to unpack and quantify the impact that the SLR policy change had on bank balance sheets, synthesizing analyses on both market making data, regulatory data and macroeconomic factors. The intent behind bank capital requirements is to preserve financial stability and ensure that institutions are still able to meet their obligations,

even during times of stress. However, as much as dealers have a responsibility to meet regulatory requirements, Treasury market intermediation is a core focus of a primary dealer. Dealers have a responsibility to make markets, participate in auctions and the NY Fed's repo operations, which are all essential to upholding dealers' role as a counterparty in monetary policy.

Though RBC requirements treat Treasuries as risk free, their inclusion in TLE still penalizes banks for holding Treasury positions. Theoretically, this could constrain their market participation in a rare event, leading to an inability to connect buyers and sellers during market dysfunction. When Treasuries were removed from TLE during the onset of the pandemic, it was intended to reduce strains in the Treasury market. Bid-ask spreads were at a high, so was volatility, and the Fed viewed this policy change as a way to incentivize dealers to hold more Treasuries (Bräuning and Stein, 2024). While the market normalized in the weeks after the intervention, Figure 1 shows that Y-9C inventory, which is a regulatory measure of trading, did not have a visibly larger increase than in years after the exemption. It was expected that there would be a direct, visible increase in dealers' inventory during the quarters while the exemption was in place, however, positions increased continuously alongside Treasury issuance. This means that the significant changes reflected in market making data do not show up on the Y-9C.

Figure 1: Treasuries Outstanding and Total US Treasuries HFT



(a) Treasuries Outstanding (b) Total Treasuries HFT

Figure 1: Panel (a) shows total Treasuries outstanding over time. Treasuries outstanding is the total value of all issued US Treasuries that have not matured. Panel (b) shows total Treasuries held for trading (HFT) by primary dealers using Y-9C data. Treasuries HFT are classified on the balance sheet as assets that are used as inventory for trading and are reported using current market price data.

Source: Federal Reserve BOG FR Y-9C (a) and FR 2004A, FR 2004C, and Treasury Direct (b)

Looking at market making and regulatory data in tandem gives greater insight into the mechanisms by which regulatory constraints connect to trading activity, and can help explain discrepancies between past analyses. Window dressing is the phenomenon where banks reduce assets at month-end and year-end to appear more favorable to regulators and in better standing, and may explain why Treasuries HFT does not significantly change during the exemption period, even while gross positions significantly increase. This phenomenon is well documented, and is essential in explaining how banks' balance sheet allocation strategy is not homogeneous over the course of a year (Garcia, Lewrick, & Sečnik, 2021).

Market making data is useful in analyzing how dealers changed their market making and inventory during the exemption, showing how balance sheet constraints impact a dealer's ability to intermediate. However, Y-9C regulatory data demonstrates how dealers' longer term balance sheet holdings and composition responded to the exemption, and whether more SLR constrained banks changed their balance sheet holdings. This complements existing literature that uses confidential microdata to analyze individual dealer level holdings, and supports the idea that shadow cost directly affects how a bank intermediates.

This analysis also controls for and discusses Treasury and AMBS issuance and other COVID era monetary policy efforts, to more thoroughly understand a bank's motives for holding certain assets. Combined with window dressing, these broader macroeconomic conditions give a comprehensive view of the elements of an asset's shadow cost, and how that manifests in changes in yield pickup behavior and balance sheet allocation during the exemption period.

3. Literature Review:

Exploring the relationship between capital ratios and bank activities has been a core focus of financial stability research in the years since 2008. Early work by Gambacorta and Karmakar (2016) simulates the countercyclicality of risk weights and how that impacts a bank's capital ratios. They find that risk weights do not fully encapsulate a bank's systemic risk profile, and that risk insensitive capital ratios are typically binding constraints during economic booms. Rubio and Carrasco-Gallego (2016) also help establish a theoretical framework for leverage ratios by connecting regulatory restrictiveness with monetary policy regimes. Their model finds that higher capital ratios constrain the effect of expansionary shocks and policy on bank lending

and savers, which connects to today's debate that leverage ratios put a limit on banks lending and market making as a means for SLR reform.

More later works on capital ratios and the SLR, in particular, take more of an applied stance through the lens of policy analysis. Due to the difficulty of obtaining confidential regulatory data (VV-1), the most proprietary analysis is Bräuning and Stein (2024) that analyzes primary dealer's gross positions of Treasuries weekly and internal value at risk (VaR) constraints. They find that there is a significant difference in gross positions before and after Treasuries were exempted from TLE. This corresponds with a smaller bid ask spread, and overall dealer turnover, which is a measure of their market making capacity. Due to data confidentiality, it is challenging to recreate this exact analysis, so most other literature in the space focuses on aggregate level data that is publicly available, and regulatory data from the Y-9C. Zhang (2025) explores the relationship between Treasuries Held for Trading (HFT) from the Y-9C, the SLR and the Tier 1 RBC. These results further emphasize how balance sheet constraints, specifically, those that are non risk based, discourage banks from holding lower yielding instruments such as Treasuries. In turn, this can reduce their market making abilities since inventory is lower.

Cochran et. al. (2024) brings monetary policy into play, by exploring the relationship between Treasuries and AMBS outstanding and holdings by banks. They find that there is a positive relationship between securities outstanding and securities held by primary dealers, and that the sensitivity increases during times of quantitative tightening, where the Fed reduces their Treasuries holdings. For AMBS, this relationship is more pronounced, as the researchers find that dealers' positions in this security increase more relative to Treasuries when there is a supply increase. Another vital part of this analysis is the findings that dealers have ample headroom on

their balance sheets, defined as additional TLE they can take on before reaching the minimum SLR. This supports the authors point that primary dealers have ample space to intermediate.

Nelson et. al. (2025) also found that leverage ratios encourage more risk taking activity rather than increased Treasuries market making, and that increased bank reserves lead the SLR to be a binding constraint. For this reason, they propose a solution to the SLR that replaces the ratio with ½ of a firm's GSIB surcharge. The authors argue that this change reduces the binding nature of this constraint, and will incentivize banks to hold more risk free assets rather than use their balance sheets for higher yielding securities.

Overall, prior work on the effectiveness and mechanics of the SLR is in agreement that a reform is needed to make the regulation stronger, in terms of its impact on banks' balance sheet allocation and market making abilities. Authors vary in the reform that they prefer, however, most previous analyses find that balance sheet constraints *can* limit market making activity, and that a change is needed to preserve dealer's intermediation abilities and to better align the ratio with its original intent as a backstop.

4. Methodology:

Data:

This analysis uses two data sources: regulatory balance sheet data from the Y-9C and market making data from the FR 2004. Y-9C data is reported quarterly by bank holding companies since 2016, which are the parent companies that own and manage one or more dealer subsidiaries. 20 primary dealers report on the Y-9C, but the other 4 are not required to fill out balance sheet information because they do not meet size requirements or are not owned by bank holding companies.

The second data source is available through the FR 2004 database on the NY Fed's website, and shows aggregate primary dealer positions weekly in Treasuries, repo, and AMBS. Both datasets are complementary: regulatory data is more useful when exploring balance sheet allocation since it is reported using standardized accounting practices and is firm-level, and the FR 2004 data is best used to examine dealer-wide trends. In past literature, Cochran et. al. (2024) utilizes FR 2004 data, and Bräuning and Stein (2024) uses confidential, dealer-level FR 2004 data.

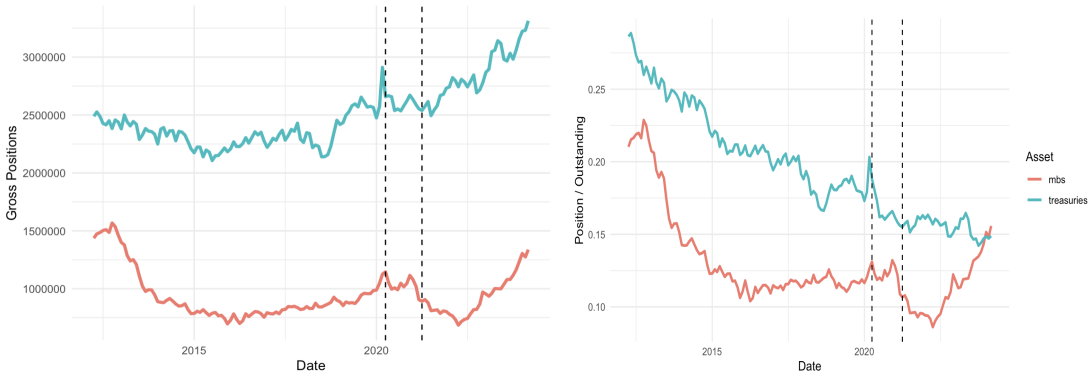
Statistical Methods:

The SLR policy change provides an opportunity to use a difference in differences (DiD) strategy to highlight a causal relationship between changes in intermediation in the Treasury market and the exemption. Treasuries are the treatment group, since they were exempt from TLE, and AMBS are the control group, because they were not subject to the policy change. Dealers are market makers for both securities, use them in repo to finance trades and these are both classified on balance sheets as 0% risk weighted assets.

In order to utilize a DiD strategy, it is necessary to verify the assumption of parallel trends. This requires that the treatment and control groups would have followed the same trend over time if not for the intervention. Figure 2 visualizes gross positions of AMBS and Treasuries over time. While the two time series experienced divergence in the pre-2015 era, this analysis only looks at data after 2015, due to changes in regulatory reporting and instability in the housing market that would confound AMBS positions. Since issuance of Treasuries typically outpaces that of MBS relative to market size, it is essential to take into account the amount outstanding of each asset that dealers must absorb. Parallel trends are even more apparent when

dealer positions are viewed as percent of amount outstanding, since during times of higher issuance, dealers must take on greater inventory. An increase in Treasuries holdings relative to MBS is also more visible when normalized.

Figure 2: Parallel Trends Assumption Visualization



(a) Aggregate Dealer Positions (b) Dealer Positions Relative to Issuance

Notes: Panel (a) shows aggregate dealer holdings of MBS and Treasuries. Since MBS data is reported monthly, Treasuries gross positions are averaged by month to match frequency. Panel (b) shows dealer positions in each asset as a percentage of total issuance. This controls for unequal issuance, which gross positions do not capture.

Source: FR 2004

Another assumption that must hold to use a DiD strategy is that the policy change is not confounded with other events. Bräuning and Stein (2024) finds that other COVID era policy changes such as the Primary Dealer Credit Facility and large scale QE took place weeks before the SLR exemption, which can isolate the impact that this policy had on gross positions.

All other analyses utilize linear regression to demonstrate an association between the SLR exemption and changes in trading behavior, inventory and yield pick up behavior. An additional regression, focused on regulatory Y-9C data and using Zhang (2025) as a guideline,

quantifies the relationship between the SLR, Treasuries HFT and whether that differs for SLR unconstrained vs constrained banks. Results find that banks increase Treasury holdings as a proportion of total assets when they are more balance sheet constrained, which reinforces the idea that an asset's risk profile is an important aspect of shadow cost.

This is a comprehensive analysis of the SLR exemption that is not strictly regulatory or market making focused, and that takes into account issuance and window dressing. Additionally, exploring firm specific market making data is not possible due to confidentiality, but Y-9C data provides a strong proxy for the dealer level data used in Bräuning and Stein (2024). Results are also consistent with Zhang (2025).

5. Theoretical Framework

Based on the framework developed by Bräuning and Stein (2024), there is an extensive relationship between banking regulations, balance sheet activity, trading activity and inventory. Each security on a dealer's books has a shadow cost. A shadow cost is an implicit cost that is not reported on financial statements, but is taken into account when purchasing an asset. For Treasury securities, there are multiple ways to interpret shadow cost, such as the Treasury repo spread (difference between repo return and Treasury return), and cash futures basis (difference between Treasury return and implied financing rate), but for the purpose of this analysis, shadow cost represents the implicit cost of holding an asset on the books.

Generally, easing the leverage ratio lowers the shadow cost of securities, and raising it heightens the shadow cost. Shadow costs have a direct impact on the trades a dealer makes and the inventory it decides to hold. When a client comes to a dealer with a trade, they either accept or deny the position. A high shadow cost would cause the dealer to trade away, where a low

holding cost may incentivize them to add a position to their books. Therefore, if leverage ratios are lowered, such as they were during the pandemic, it is less costly to have a Treasury on the balance sheet. Though balance sheet constraints can be risk sensitive or insensitive, risk insensitive constraints, such as the SLR, give a more comprehensive limit on activities because it includes off balance sheet exposures such as repo financing and gross positions held by primary dealers.

Analyzing changes in turnover and dealer positions during the exemption acts as a proxy for shadow cost. Additionally, yield pick up behavior is a consequence of shadow cost, because a bank will only hold an asset if:

$$\text{Shadow cost} < \text{yield pick up}$$

Changes in inter maturity trading patterns and aggregate positions illustrate where dealers sought yield pickup, and in turn, where shadow cost decreased during the exemption period. Any heterogeneity reveals how the SLR impacts the shadow cost of Treasury securities with different maturities, and whether that impact is changed during the exemption period.

Results

Inventory Turnover and Yield Pickup Behavior

It is useful to start by exploring the overall relationship between turnover and gross positions during the SLR exemption. A simple one variable regression describes the association that the policy exemption had with aggregate dealer holdings, and sets the stage for further granularity on balance sheet allocation and yield pickup behavior. The formal models are:

$$\mathbf{GrossPositions}_{,t} = \beta_0 + \beta_1 \mathbf{SLRExemption}_t + \alpha_t + \epsilon_{,t}$$

$$\mathbf{Turnover}_{,t} = \beta_0 + \beta_1 \mathbf{SLRExemption}_t + \alpha_t + \epsilon_{,t}$$

Utilizing time fixed effects controls for other macro level shocks such as changes in QE, other COVID-19 era policies and changes in issuance patterns from the US Department of Treasury. The variables gross positions and turnover are aggregate measures reported on the FR 2004 reporting forms and are reported on a weekly basis from January 2012- July 2024. Gross positions is the sum of long and short positions at the end of each week, and turnover is the sum of all trades over each week.

Table 1: Association Between SLR and Gross Positions/Turnover

	Gross Positions	Turnover
	(1)	(2)
SLR Exemption	41,131.5**	6,335.60
Standard Error	(12610.6)	(16429)
Time FE	Yes	Yes
N	500	500
R^2	0.1	0.07

Notes: This table reports the difference in mean gross positions and turnover during the exemption period versus before and after. In column (1), gross positions is the dependent variable, and in column (2), net turnover is the dependent variable. Data is recorded as a weekly point in time estimate, with the first observation being 1/4/12 and most recent being 7/31/24. *** p<0.01, ** p<0.05, * p<0.1.

Source: FR 2004

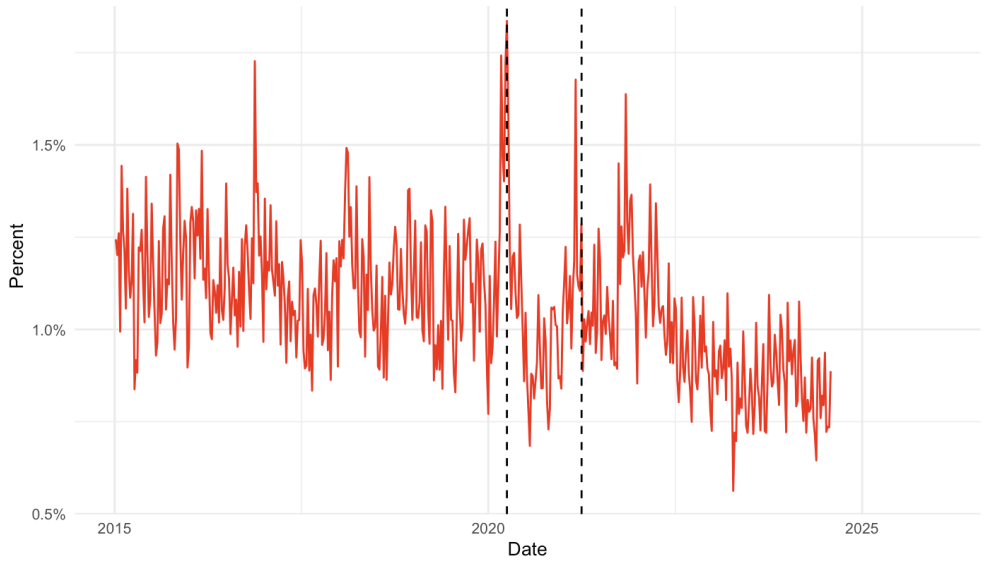
Table 1 demonstrates that a coefficient of 41131.5 represents an average increase in $41.1 billion in total gross positions during the period of SLR exemption, statistically significant at the 1% level ($p < 0.001$). For turnover, a β ($p > 0.1$) of 6335.62 represents an insignificant change in total gross turnover during the exemption period. These findings reveal that balance sheet

constraints primarily impact inventory for dealers- how much space they are willing to allocate towards holding positions- rather than flow of trading and liquidity. Thus, while dealers overall did not change the volume of market making during their exemption, increased balance sheet space allowed for more holdings and longer term positions.

Measuring turnover ratio can better quantify how efficiently dealers are using their balance sheet capacity to intermediate, and whether that changed during the exemption period. Turnover ratio represents how much market making and transaction volume is facilitated by inventory space, and whether indirectly, the SLR exemption impacts the responsiveness of this measure. The turnover ratio for each week is:

Turnover-to-Inventory Ratio = Gross Positions (FR 2004A) / Turnover (FR 2004B)

Figure 3: Turnover Ratio Over Time



Notes: Turnover ratio is shown over time. The x-axis shows dates, and the y-axis shows turnover ratio formatted as a percent. Turnover ratio was visibly lower during the SLR period due to constant transaction volume and greater positions.

Source: FR 2004

As shown by figure 3, a consistently lower turnover ratio during the exemption period corroborates with earlier results: since dealers are mediating the same amount with increased balance sheet space and inventory, market making may not be as correlated with regulatory constraints as inventory. So, even though dealers *had* the capacity to trade higher volumes this period, transactions remained relatively constant. Some reasons for this association may be continued dysfunction in the Treasury market. Past literature shows that dealers' clients kept up demand for Treasuries, however, the frequency of short selling was quite high so dealers were not able to trade away all of the sold securities and had to offload them onto their books (Committee on Capital Markets Regulation, 2021). Ideally, a market maker connects buyers and sellers, but if there were not enough buyers and too many sellers, dealers had no choice but to absorb extra liquidity. This may explain why transaction volume stayed relatively the same during the exemption, while inventory increased. Thus, the exemption period relieved the balance sheet pressure dealers took on when adding inventory to their books. Dealers could hold more inventory while facilitating the same volume of transactions, which may suggest that firms may have had less incentives to optimize their balance sheet usage during the exemption period.

Yield Pick Up Behavior- Treasuries

While there was not a significant impact in overall trading volume during the exemption period, understanding whether there was a reallocation in activity between maturity buckets shows if the policy exemption impacted all maturities equally. Exploring aggregate turnover, broken down by maturity bucket, acts as a proxy for how dealers across the board interpreted yield during the policy change because more granular gross positions data is not available. Though under RBC requirements, all US Treasuries are assigned a 0% risk weight regardless of

duration, firms' internal risk limits (value at risk, VaR) typically distinguish between longer maturity and shorter maturity Treasury securities (Li, Petrasek, and Tian, 2025). It is primarily a measure of volatility as opposed to balance sheet size, and is firm specific. For example, a bill maturing in less than a year carries significantly less risk than an off the run 29 year Treasury bond, since it is capable of greater price fluctuations and there are greater liquidity concerns. Bräuning and Stein (2024) finds that the relationship between VaR and Treasury yields is a multifaceted decision of risk and bindingness: in an environment when a trading desk is close to its VaR limit, decisions must be made whether the marginal balance sheet cost is greater than the benefit associated with extra yield pickup. VaR reflects Treasuries' holding cost, specific to each firm. So while indirect, a relaxed SLR gives dealers more balance sheet space, which then reduces the holding cost of an extra basis point of yield. A visualization of the yield curve during the exemption period is shown in Appendix B. Though the yield curve was flatter at the beginning of the pandemic, it normalized and steepened during the later half of 2020, which shows that the environment needed for traditional yield pick up behavior was present.

VaR constraints themselves are not changed, but the bindingness of a constraint and thus trading and risk taking behavior, has. The formal regression model is:

$$\mathbf{Turnover}_{i,t}=\delta_t+\sum\beta_m(SLR_t\times D_m)+\varepsilon_{i,t}$$

Association Between SLR and Gross Positions,

By Maturity Bucket

	Turnover
SLR × Bills	32,726.5***
	(4788.5)'

SLR × 2Y	-29,867.8***
	(2895.2)
SLR × 2–3Y	-8,567.6**
	(2814.5)
SLR × 3–6Y	-24,050.8***
	(4055.9)
SLR × 6–7Y	-1,626.00
	(2477.6)
SLR × 7–11Y	1,567.30
	(3780.8)
SLR × 11–21Y	23,512.9***
	(2273.3)
Bank FE	No
Time FE	Yes
N	500
R^2	0.668707

Notes: This table reports the difference in net turnover during the SLR exemption and before and after, for each maturity bucket. The reference group is bonds with more than 21 years left to maturity. All maturity buckets are aggregate measures of FR 2004. Data is recorded as a weekly point in time estimate, with the first observation being 1/4/12 and most recent being 7/31/24. *** p<0.01, ** p<0.05, * p<0.1.

Source: FR 2004

Table 2 demonstrates that there is a significant change in turnover ($p < 0.05$) for all maturity buckets besides 6-7 years and 7-11 years. The greatest significance is in the short end ($p < 0.01$), long end ($p < 0.01$), 2 year bucket and 3-6 years. Treasury bills and long end bonds saw the greatest increase in trading activity, whereas activity decreased the most in short end Treasury notes, and the 3-6 year bucket. Trading volumes did not change during the exemption period, as earlier results show, but hints at an economically significant reallocation of trading activities, which gives insight into how balance sheet pressure and economic regimes can impact yield pickup behavior.

In the short end, greater trading activity reflects the economic climate of March 2020: there was a massive selloff in money market funds across the board, so greater trading activity in bills reflects dealers meeting that need. Though bills are duration light and have a lower holding cost than longer maturities, dealers had to compensate for increased selling activity, and the Fed stepped in with other policy measures to stabilize the funding markets. In fact, bills had the largest difference in trading: weekly, 32.7 million more bills were traded during the SLR exemption than before or after. Though there is typically a larger volume of bills trades due to their liquid nature and crucial role in money markets, significance at the 1% level reflects that this increase is economically meaningful. Aggregate net positions (long - short positions) data reflects this point. During the time of the exemption, net positions were more variable and extreme than in stable times. This is both a reflection of pandemic era economic conditions and trading activity.

In the mid range maturity buckets there was a significant decrease in 2 year notes, 3-6 year notes ($p < 0.01$) , and 2-3 year notes ($p < 0.05$). Looking retrospectively at previous financial crises can give insight into why trading activity was reallocated even while two year yields were at zero. Zero yields imply that interest rates are expected to be zero in two years, which is aligned with the belief that economic conditions will necessitate low rates for prolonged periods of time. The only other times two year yields fell to zero was during the dotcom bubble (2002), great financial crisis (2008) and the pandemic. In 2020, yields were zero until mid 2021, which coincides with the release of the vaccine and stabilization of markets. Zero yields and decreased trading activity in two year notes likely means one of two explanations: clients who currently owned two year notes were holding their securities due to price appreciation potential and viewed it as a safe haven. Alternatively, this could reflect an image of persistent Treasury

market dysfunction and irregularities. Multiple weeks of negative net turnover during this period highlights that more investors preferred to sell the 2 year rather than purchase. This shows that in spite of relaxed balance sheet constraints, dealers were likely unable to keep up with a continued selloff, and therefore, were unable to act as a counterparty in such trades. Even while dealers had extra balance sheet headroom during the exemption (as will be discussed on page 23), unwillingness to participate to the fullest extent in the Treasury market shows easing the SLR was not an end all be all to Treasury market dysfunction. Likely, investors were holding 2 year notes so there was less churning- or recycling- happening, which corresponds with lower turnover, while dealers were hesitant to intermediate in continuous shorts. Thus, it is not a question of whether dealers *could* warehouse the large selloff, since they had balance sheet space during the exemption, but whether they wanted to better optimize their space.

Increased trading in long end notes (11-21 years) gives further insight into dealer balance sheet behavior. Weekly trading volume was, on average, $23.5 million greater during the exemption period. Combined with the unique phenomenon of decreased trading in short end notes, negative net positions and zero yields shows that US Treasuries still retained their safe haven status. An insignificant change in total turnover across the board points to a reallocation of balance sheets and preference towards different maturities during the exemption period. If all Treasuries had the same holding cost, then housing a short sale of a two year note should be the same as being long a 20 year. Since this is not the case, it reveals that there must be another mechanism at play that underscores which trades dealers participate in: yield pick up behavior. Yield pickup behavior is the act of holding longer dated, higher yielding securities over shorter dated, lower yielding instruments such as Treasury bills. When Treasuries were removed from the SLR during the exemption period, it gave dealers sufficiently more balance sheet space. Now,

there was more room under trading desk specific regulations due to relaxed constraints. Strategically, dealers likely used their headroom to participate in more yield pick up trades with long end securities that would have been disallowed under tighter VaR requirements. The shadow cost of a Treasury bill vs longer end security is more pronounced under scarcity, however, with more flexibility, dealers could inventory more higher yielding positions without concerns over limits. This is in line with earlier analyses regarding gross positions and turnover. A significant increase in gross positions shows that dealers were able to warehouse more inventory during the SLR exemption, whereas recycling of inventory stayed the same. Since VaR limits are trading desk specific and confidential, this acts as a proxy. Dealers were able to mediate more balance sheet intensive, long end trades and take on additional inventory.

Yield Pick Up Behavior- AMBS vs Treasuries

Additional analyses can demonstrate whether yield pick up behavior was concentrated to Treasuries, or is a more extensive transformation in balance sheet allocation during the SLR exemption. Agency mortgage backed securities (AMBS) are instruments backed by pools of mortgages issued by government agencies, and while also assigned a 0% risk weight on the Y-9C, were not exempt from the SLR. Both Treasuries and AMBS are used as collateral in repo and reverse repo transactions, Fed monetary policy operations and viewed as safe haven assets, though AMBS are primarily used for diversification and are not included in money market portfolios. The similar nature of these assets and SLR exemption for Treasuries creates a natural experiment, where a DiD strategy can be utilized to show if there was a change in trends during the exemption period. The formal equation is:

$$\mathbf{log(position_{a,t})=\beta(MBS_a \times during\_slr_t)+\gamma log(outstanding_{a,t})+\alpha_a+\delta_t+\varepsilon_{a,t}}$$

Changes in Gross Positions: AMBS vs Treasuries

	Log(Gross Positions)
MBS × During SLR	-0.111342***
	(0.021326)
Log(Outstanding)	0.686957***
	(0.111738)
Asset FE	Yes
Time FE	Yes
N	288
R^2	0.96

Notes: This table shows the change in log(gross positions) of MBS relative to Treasuries during the SLR exemption period. Log(gross positions) is the dependent variable, and log(outstanding) is a variable used to control for the impact of changes in issuance of either asset. Data for MBS is recorded monthly, so Treasuries data is averaged out for each month. The first observation is 1/12 and the most recent 7/24. *** p<0.01, ** p<0.05, * p<0.1.

Source: FR 2004

One assumption necessary to utilize a DiD strategy is parallel trends. This appears to be satisfied, besides for some routine deviations, as discussed on page 10. Additionally, this analysis controls for the effect of any other pandemic era policies and changes in issuance patterns. Other policies such as large-scale QE efforts and the primary dealer credit facility (PDCF) had different timelines and included both Treasuries and MBS. Amount outstanding for both assets is added as a control variable.

Table 3 results show that during the SLR exemption, dealer holdings of Treasuries increased approximately 10% relative to AMBS, and carry large scale policy implications. First, a decrease in AMBS relative to Treasuries reveals that dealers preferred Treasuries during this time because they were especially cheaper to warehouse. AMBS and Treasuries are explicitly weighted the same in regulatory measures, but the shadow cost of AMBS tends to be higher

because they are greater to finance through repo. During the exemption, the difference in shadow cost remained, but since Treasuries were essentially free accordingly, dealers would naturally gravitate towards holding more. Even while controlling for increases in issuance, these results demonstrate that dealers used their balance sheet headroom to further intermediation in the Treasury market, rather than purely yield pick up purposes. Yield pick up behavior was seen with higher yielding, longer maturity Treasuries securities, but it seems that the high yield potential of AMBS did not outweigh the tempting nature of zero marginal cost Treasuries.

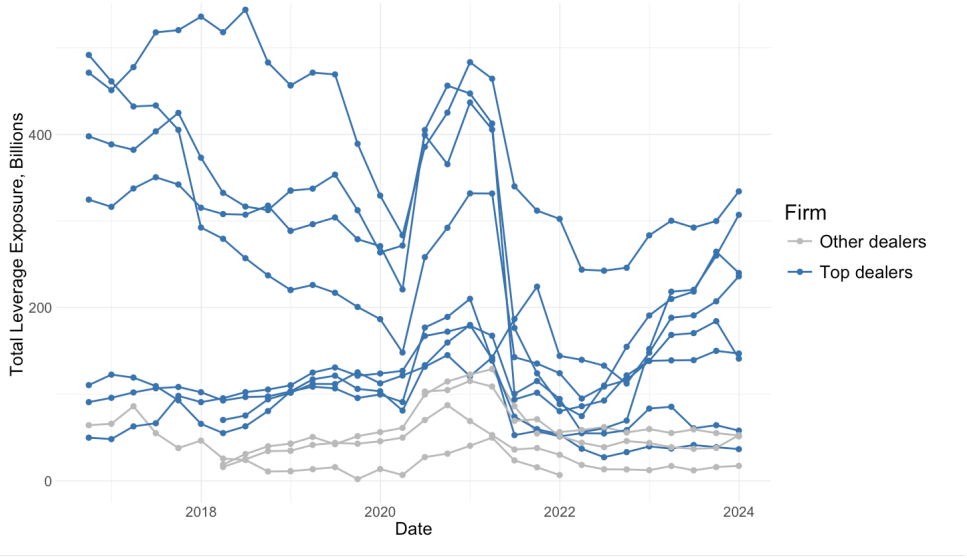
These results verify that dealers utilized their headroom for increased intermediation, and are consistent with earlier results that gross positions of Treasuries were significantly larger during this time. The incentive to purely use headroom for yield pick up, in securities besides Treasuries, was minimized by increasing holdings of Treasuries. Yield pick up was likely a factor in balance sheet allocation within Treasuries of different maturities, but Treasuries remained preferred to more costly securities.

Regulatory Measures

Exploring regulatory measures of market making is useful for multiple reasons. It provides a proxy for Bräuning and Stein (2024) using confidential FR 2004 data, gives insight into how trading inventory flows through at the BHC level, and can provide continuous support for previous analysis on yield pick up behavior. The impact of window dressing will also be discussed in this section. Total headroom is calculated as:

Headroom = (SLR - constraint) * TLE

Figure 4: Graph of Headroom Over Time by Dealer



Notes: This graph shows headroom over time, for each dealer. Dealers that are classified as GSIBs are highlighted in blue, and all other dealers appear as gray. Dealers that are classified as Category IV banks are not subject to the SLR. Dealers that are GSIBs have a minimum SLR of 5%, and all other dealers have a minimum of 3%. The extra 2% buffer is technically classified as the eSLR, however, this analysis views both the SLR and the 2% buffer as the same constraint.

Source: Y-9C, author's calculations

Total headroom is a measure used to show how much balance sheet space individual dealers have at the BHC level. Compared to measuring space in assets, TLE gives a more comprehensive measurement of capacity because it includes off balance sheet exposures. For most large institutions, balance sheet space was decreasing until the policy exemption, then rapidly expanded in Q2 2020. The sharp decrease represents Treasuries' exclusion, and is relatively proportional to the percent of each firm's TLE that comes from Treasuries (and bank reserves, which were also exempted). After the exemption, headroom returned to baseline levels

and continues to stay constant or gradually increase for larger dealers. In Q3 2025, total headroom for the 11 dealers subject to the SLR was approximately $14 billion dollars. Cochran et. al. (2024) finds that as of 2024, dealers collectively had ample space on their balance sheets to absorb Treasuries outstanding, and that alone would not bind the SLR. No dealer has hit their maximum TLE limit yet, and will likely not be over unless there are significant changes in activity or balance sheet size.

Thus, the SLR policy change did not eliminate a binding constraint on intermediation. The SLR *can* become binding in the future if dealers do not limit activities, but it is unlikely that, holding everything constant, Treasuries would be the sole reason for this bindingness. Instead, the SLR exemption likely changed how dealers utilized their increased balance sheet space. Y-9C data is useful in understanding how regulations impact market making at the BHC level, and explains another mechanism by which banking regulations can impact market making.

Using Zhang (2025) as a guide, each firm's Tier1 RBC and SLR are regressed on Treasuries HFT. Treasuries HFT is normalized as a percent of total assets. GSIBs have larger intermediation capacity and a greater balance sheet size than smaller firms, so the raw level of Treasuries HFT is a reflection of bank level heterogeneity rather than a direct relationship. Zhang (2025) finds that Treasuries are a significant component of SLR, and that if the policy exemption did not take place, US GSIBs would, on average, not meet the regulatory minimum SLR of 5%. Building on Zhang (2025), a similar model with minor additions, is used to quantify the association between Treasuries HFT and SLR. It is also useful to incorporate all primary dealers that report data instead of just those subject to the SLR, so a second model uses Tier 1 leverage ratio instead of SLR to understand if there were changes in behavior for non-SLR reporting

dealers during the policy exemption. Banks that do not report an SLR are excluded from the first analysis. The formal regression models are shown below, and results are presented in table 5:

$$\mathbf{TradingRatio_{it}=\beta_1 SLR_{it}+\beta_2 Exempt_t+\beta_3(SLR_{it}\times Exempt_t)+\beta_4 T1RBC_{it}+\beta_5 log(Assets_{it})+\alpha_i+\varepsilon_{it}}$$

$$\mathbf{TradingRatio_{it}=\beta_1 T1_{it}+\beta_2 Exempt_t+\beta_3(SLR_{it}\times Exempt_t)+\beta_4 T1RBC_{it}+\beta_5 log(Assets_{it})+\alpha_i+\varepsilon_{it}}$$

Table 5: Association Between SLR and Intermediation Capacity

	Trading Ratio	Trading Ratio
SLR	-0.030622**	-
	(0.0071)	-
Exempt	-0.014798	-0.118967
	(0.057201)	(0.066123)
T1 Leverage Ratio	-	-0.019909**
	-	(0.003399)
SLRxExempt	0.005931	-
	(0.008201)	-
T1xExempt	-	0.015308
	-	(0.008446)
t1_RBC Ratio	0.013548***	0.011232**
	(0.001843)	(0.001939)
Bank FE	Yes	Yes
Time FE	No	No
N	229	229
R^2	0.74	0.61

Notes:*:* This table shows the association between trading ratio (calculated as Treasuries HFT/ total assets), the SLR or T1 leverage ratio and T1 risk based capital ratio (RBC). Trading ratio is the dependent variable, and is normalized because firms have different levels of trading that are more reflective of size rather than intermediation capacity. SLR/T1 ratio and T1 RBC are the independent variables, and an interaction term is used to denote whether there is a difference in intermediation capacity during the exemption period. Observations are quarterly frequency. *** p<0.01, ** p<0.05, * p<0.1.

Source: Y-9C and author's calculation

These results measure the sensitivity between a bank's intermediation in the Treasury market (as a percentage of total assets) and its SLR and T1 RBC. As opposed to measuring the opposite relationship and regressing Treasuries HFT on SLR, interpreting intermediation capacity as a function of capital ratios follows the framework that dealers reduce trading activity when constraints- and shadow cost- are higher. T1 RBC acts as a control variable for balance sheet size, in addition to normalizing Treasuries HFT. If T1 RBC was omitted, there may be a confound between banks with greater trading volume and a lower SLR, so this inclusion ensures that any relationship between SLR and Treasuries HFT is due to changes in regulatory mechanisms, not simply a large balance sheet. Trading ratio instead of raw Treasuries HFT was used because it ignores differing magnitudes between banks. Larger dealers intermediate more in the Treasury market because they have larger balance sheets- even Treasury auctions assign securities based off of a dealer's market share- so normalizing this value ensures results are due to changes in intermediation not size.

As shown in table 5, a negative coefficient for SLR implies that as SLR decreases and becomes closer to the regulatory minimum, trading ratio increases and banks tend to trade more Treasuries relative to total assets. That relationship also holds for the T1 ratio. This means that intermediation actually increases when banks are under more balance sheet pressure, which gives further insight into risk taking behavior and how banks allocate assets. Even though leverage ratios are risk insensitive, a bank closer to its RBC limit is more likely to be close to leverage ratio limit due to sheer balance sheet size (Gambacorta and Karmakar, 2016) For this reason, the shadow cost of holding an asset incorporates its risk weight. So, even if a Treasury and higher yielding of the same amount of asset increase TLE equally, the higher yielding asset is more expensive to hold on the balance sheet. This may partially explain why banks intermediate more

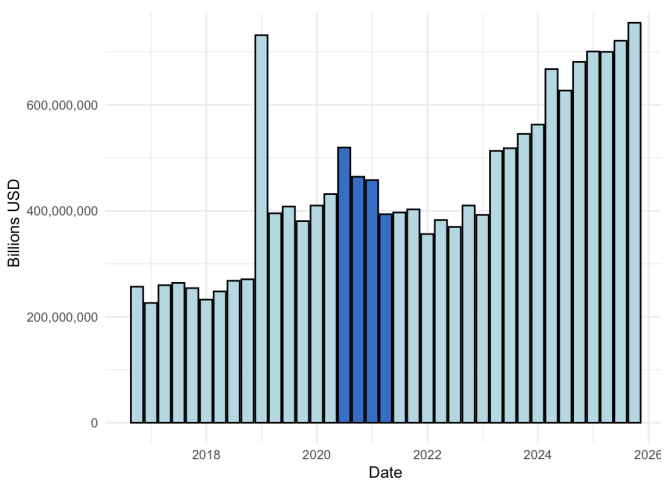
in the Treasury market even when their SLR is more binding, and is consistent with earlier results that they increased holdings of Treasuries during the exemption period relative to MBS. Thus, an assets shadow cost primarily incorporates risk, so Treasuries are naturally preferred over riskier assets regardless of balance sheet limits.

An insignificant change in trading ratio during the exemption period reveals that, on average, dealers intermediation did not change during the exemption period. Even though they had more balance sheet capacity, there was not an increase in the proportion of balance sheet space that was used to hold Treasury securities. However, this is inconsistent with earlier results that found there is a significant increase in gross positions- a market making measure of inventory- during the exemption period. Combined with a lower turnover ratio, these data points show that discrepancies between Y-9C HFT and gross positions are likely due to accounting or the classification of Treasuries. Figure 5 shows that there has been a large increase in total Treasuries held by dealers since 2020, whereas Treasuries HFT has not grown as much. Much of this growth is due to increased issuance of securities, however, taking market making data into account reveals that Y-9C classification is one possible reason for a discrepancy in results.

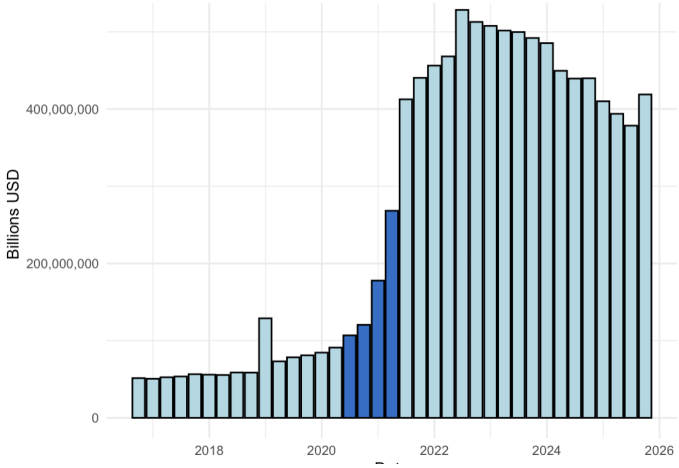
Figure 5 visualizes the breakdown between the Y-9C books of Treasuries, and the exemption period is highlighted in dark blue. Firms use discretion when assigning a security to each book, and that decision is based on liquidity needs at the BHC, market conditions and business factors. Securities that are classified as available for sale (AFS) are neither intended to be held to maturity nor traded and are used for liquidity purposes, and those classified as held to maturity (HTM) are kept on the books until maturity. In a volatile market, it is in the best interest of a BHC to classify a security as AFS since there is uncertainty about future conditions and

whether that security may be sold for a profit, however, HTM is the safest option- especially in a high interest rate environment- because any price losses are reported at maturity.

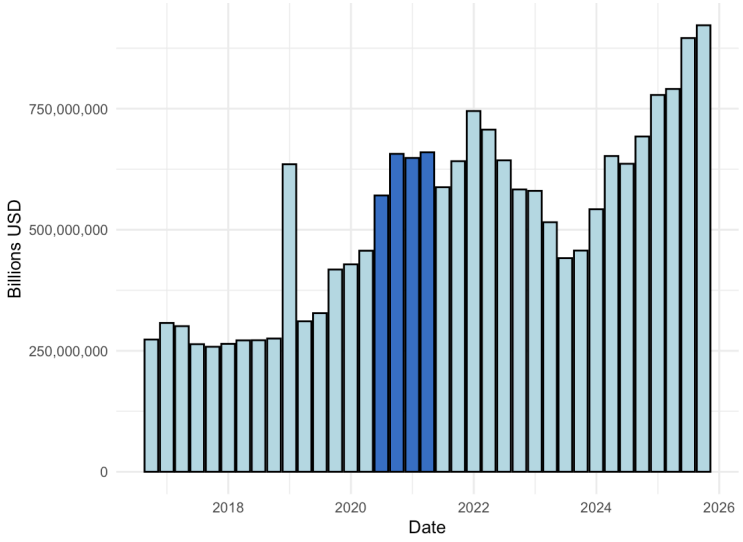
Figure 5: Graph of Total Treasuries Held By Dealers



(a) Total Treasuries Held by Dealers



(b) Treasuries HTM



(c) Treasuries AFS

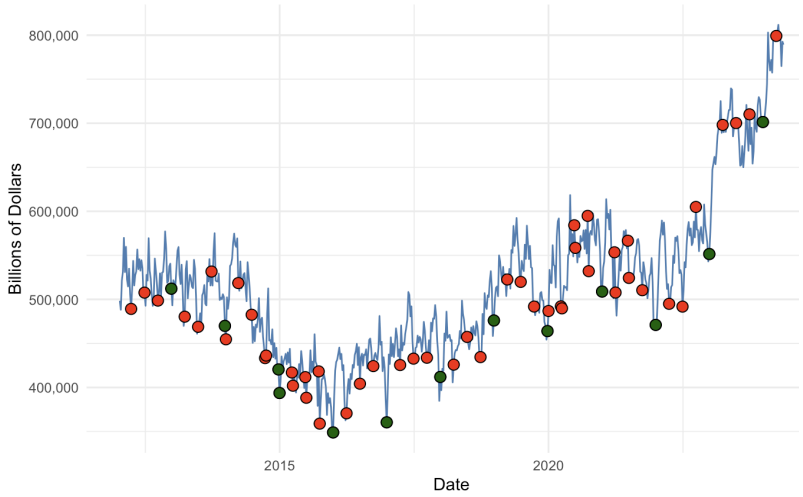
Notes: Panel (a) shows total Treasuries held by dealers, from the Y-9C. Panel (b) shows Treasuries HTM, and panel (c) shows Treasuries AFS. All data is reported quarterly, from 6/2016 - 9/2025.

Source: Y-9C and FR 2004 data

Compared to before the exemption, there was a substantial increase in Treasuries AFS and HTM. Increase in AFS was likely due to the need for flexibility during uncertain market conditions and for liquidity, and HTM, likely due to a need for safe investments and concerns about price fluctuations and losses. As mentioned on page 7, this change was not reflected in Treasuries HFT, which gives further insight into banks behaviors and risk tolerance during this time. As much as banks were incentivized to increase market making, and gross positions data shows that was the case, they could have been more inclined to increase holdings of other types of Treasuries that had lower risk. Classifying a security as HFT during a period of high volatility and fluctuating client demand is riskier than holding it to maturity, or classifying it as AFS where there is more flexibility. Thus, while the exemption reduced the shadow cost of Treasuries for dealers and made them more cheap to hold, there was a change in preferred uses for Treasuries based on the risk profile of potential uses.

Additionally, the reduced frequency of Y-9C data allows for the potential reshuffling and reduction of assets before a filing date. Whereas market making data is taken as a weekly, point in time estimate, Y-9C and other regulatory reports are snapshots of an end of quarter balance sheet and does not show how activity fluctuates. Figure 6 visualizes this occurrence.

Figure 6: Gross Positions Over Time With Month End and Year End Markers



Notes: Figure 6 shows gross positions from FR 2004, and flags both quarter end data points (red) and year end (green). These points also coincide with Y-9C reporting dates. Year end points are typically at troughs, which shows that there is an underlying cause or pattern in trading that differentiates these dates from other estimates. This furthers the view that Treasuries HFT from the Y-9C is not a comprehensive measure of market making and may be a skewed measure.

Source: FR 2004

Therefore, even though Treasury HFT data shows there is not a significant change in inventory during the exemption, gross positions data is more comprehensive; quarterly balance sheet items should be considered when understanding the mechanism that impacts dealers intermediation, but not viewed as an impartial measure of true inventory holdings. Some reasons for window dressing may be that internal VaR limits are assessed at quarter and year-end, so trading desks feel pressured to reduce positions, or a rebalancing in clients' portfolios causes excessive trading demand and inventory declines as a result. Window dressing has been a heavily

debated topic in the regulatory policy space, however, its existence is more visible when looking at gross positions data as opposed to Y-9C data. Reconciling these two measures alludes to the fact that actual dealer inventories, particularly Treasuries HFT, may be higher at quarter's end than actually shown on the Y-9C.

Policy Discussion and Limitations

Permanently removing Treasuries from the SLR has been a hot button issue in banking regulation since the ratio's inception in 2016, and has been supported by a variety of policy analysts and think tanks. Liang and Zhu (2025) finds that the SLR is a binding constraint for a majority of GSIBs, even though this requirement was meant to be a backstop to RBC ratios. These results only further the idea that the SLR limits dealers' intermediation capacity, as shown by a significant increase in Treasuries relative to higher yielding AMBS, and a preference for higher yielding Treasuries during the exemption period. As a result, Liang and Zhu (2025) recommends removing Treasuries that are held in trading accounts from the SLR, since they are already subject to firm level VaR limits, which ensures dealers are still incentivized to manage risk. One concern about permanently exempting Treasuries from the SLR is that RBC ratios do not fully capture interest rate risk, so one possible remedy is changing risk weights to be more sensitive to interest rate risk that comes with longer dated Treasuries.

While there is no credit risk that comes with Treasuries, because they are backed by the full faith and power of the US government to collect tax revenue, there is the risk that interest rates could rise, and current marked-to-market Treasuries lose value. Both Treasuries HFT and AFS are marked-to-market. These losses would immediately be reported on a firm's balance sheet. Treasuries HTM are not marked-to-market, so losses on these securities can be concealed

until maturity, where losses are reported. The reporting conventions for Treasury HTM is a partial reason for the collapse of Silicon Valley Bank (SVB) in 2022: when interest rates started to rise in 2022, the value of their large holdings of long dated Treasuries and MBS declined, but were not reported on earnings reports (Tarullo, 2025). SVB serves as an example for why caution must be exercised when recalibrating the SLR.

Further research on the topic could explore if there is a benefit to exempting Treasuries HFT from the SLR, or in addition, Treasuries AFS and HTM, and the unique risks that come with each possibility. Additionally, building off of Bräuning and Stein (2024), a DiD using FR 2004 firm level data for MBS and gross positions could verify the causality of earlier results. Either way, these findings do highlight that dealers must balance meeting regulatory requirements with their responsibility of Treasury market intermediation, and the SLR limits their capacity to carry out the latter. As Treasury issuance continues to grow, as shown by Figure 1, dealers will likely increase their intermediation in the Treasury market through greater auction sizes and increased client demand (Cochran et. al., 2024). Collectively, dealers have enough headroom to absorb future debt issuances if they increase the proportion of balance sheet space used to warehouse Treasury securities, but there is no guarantee this will not limit other firm activities or responsibilities. In future years, it will only become more crucial to find an amendment to the SLR that both measures firm level risk, and does not constrain primary dealers. The exemption highlights that the SLR may be a large factor in the way dealers make trading decisions and allocate Treasuries on their balance sheet, and the optimal regulatory solution is likely one that accounts for the individual risks of all Treasury books, and allows dealers to comfortably absorb supply increases without needing to substantially change firm behavior or balance sheet allocation.

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Appendix:

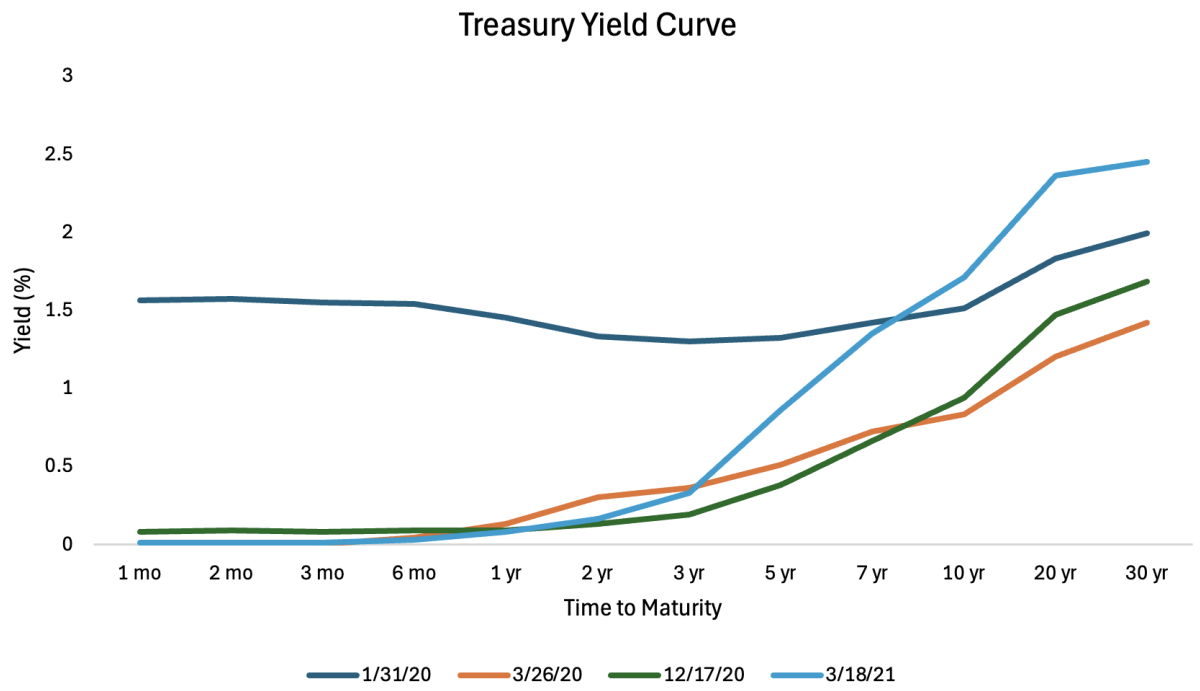
Appendix A: Primary Dealer Information

Dealer Name	GSIB	Reports Y-9C	Subject to SLR
ASL Capital Markets Inc.			
Bank of Montreal, Chicago Branch		X	X
Bank of Nova Scotia, New York Agency		X	
BNP Paribas Securities Corp.		X	X
Barclays Capital Inc.		X	X
BofA Securities, Inc.	X	X	X
Cantor Fitzgerald & Co.			
Citigroup Global Markets Inc.	X	X	X
Daiwa Capital Markets America Inc.			
Deutsche Bank Securities Inc.		X	X
Goldman Sachs & Co. LLC	X	X	X
HSBC Securities (USA) Inc.		X	X
Jefferies LLC			
J.P. Morgan Securities LLC	X	X	X
Mizuho Securities USA LLC		X	X
Morgan Stanley & Co. LLC	X	X	X
MUFG Securities Americas Inc.		X	
NatWest Markets Securities Inc.		X	
Nomura Securities International, Inc.		X	
RBC Capital Markets, LLC		X	X
Santander US Capital Markets LLC		X	X
SMBC Nikko Securities America, Inc.		X	
Societe Generale, New York Branch		X	X
TD Securities (USA) LLC		X	X
UBS Securities LLC.		X	X
Wells Fargo Securities, LLC	X	X	X

Notes: Appendix A lists all 24 primary dealers, whether they report Y-9C data and if they are subject to the SLR. All firms that report Y-9C data are subject to capital requirements but only 16 are required to fulfill SLR requirements.

Source: NY Fed, Y-9C

Appendix B: Yield Curve Visualization



Notes: Appendix B visualizes the yield curve at different points in time during the exemption period and two months before. Though the yield curve was inverted in early 2020, it normalized over the course of the year, and became steeper during the end of the exemption period. This demonstrates that the conditions necessary for yield pick up behavior were present: longer dated securities had higher yields and as a result, were more balance sheet intensive during the exemption period.

Source: U.S. Department of Treasury