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Central bank preparedness for market-functioning asset purchases as a consideration for long-run balance sheet composition[1]

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Abstract

This paper proposes an approach to enhance the Federal Reserve's readiness to undertake market-functioning asset purchases during Treasury market disruptions. It notes that by tilting the SOMA Treasury portfolio toward bills rather than maintaining a maturity structure proportionate to that of outstanding Treasury debt—often viewed as the most neutral portfolio—the Fed can create a larger volume of reinvestments each month that can serve as a "war chest" for undertaking market-functioning asset purchases. This structure of the SOMA Treasury portfolio enables market-functioning asset purchases to be made without expanding the balance sheet or increasing reserves. This avoids the need for close monitoring of reserves when asset purchases are eventually unwound, while also allowing for a clearer differentiation between asset purchases undertaken to support market functioning and asset purchases undertaken to ease financial conditions. Under reasonable assumptions, bills portfolio shares ranging up to around 40 percent—that is, twice that of the 20 percent proportionate portfolio—could be desirable. We also consider approaches for restoring the SOMA Treasury portfolio and, thereby war chest, back to its pre-stress composition. We find that, if the full monthly war chest is depleted to undertake market functioning purchases, restoring it to its pre-stress composition by allowing purchased coupon securities to mature and reinvesting these proceeds into bills, would take 2½ to 5½ years. These lengthy timeframes would limit for many years the Federal Reserve's ability to respond to Treasury market disruptions without expanding its balance sheet.

1. Introduction

The severe impairment of U.S. Treasury markets at the onset of the Covid pandemic initiated an extensive public-sector program to study and, where appropriate, advance reforms to strengthen Treasury market resilience.[2] For the most part, these reforms involve improvements to the structure of Treasury markets to reduce, *ex ante*, the risk of episodes of dysfunction

[1] The views expressed are those of the authors and do not necessarily reflect the views of anyone else affiliated with the Federal Reserve System. We thank Jim Clouse for comments and many conversations and e-mail exchanges; Sriya Anbil, David Bowman, Erin Ferris, Michael Kiley, Elizabeth Klee, Andreas Lehnert, and Trevor Reeve for comments.

[2] See various reports (2021, 2022, 2023, and 2024) by the Inter-Agency Working Group (IAWG) for Treasury Market Surveillance for discussions on these reforms and updates on their progress.

occurring. While not disputing the benefits of such reforms, it remains a possibility that *ex ante* reforms alone cannot eliminate the potential for market dysfunction. Given the importance of the Treasury market to the broader financial system, *ex post* options must also be available for the official sector to address severe market disruptions. In line with this view, a couple of recent papers—notably, Kashyap, Stein, Wallen, and Younger (2025), and Duffie and Keane (2023)—have put forward thoughtful approaches for addressing Treasury market impairment after disruptions occur.[3] These proposals involve the official sector—either the Federal Reserve or the U.S. Treasury (UST)—undertaking market functioning purchases of Treasury coupon securities, akin to the purchases that the FOMC embarked on in spring 2020.

Our paper follows a similar line of thinking. Specifically, we examine whether the FOMC could enhance its readiness to undertake market functioning purchases of Treasury securities by choosing in advance a specific longer-run maturity composition of its SOMA Treasury portfolio. The portfolio structure we explore tilts Treasury securities holdings toward bills and away from the so-called proportionate portfolio—that is, the portfolio that has the same maturity composition as that of outstanding Treasury debt—which is often viewed as the benchmark maturity composition. The motivation for this tilting is that it implies a greater churn of securities and a larger volume of reinvestments each month that can serve as a "war chest" for undertaking market-functioning asset purchases. Importantly, these purchases could be made without expanding the size of the Fed's balance sheet and without increasing the quantity of reserves. This approach could help differentiate purchases for market functioning support from purchases intended to ease financial conditions. It would also avoid the need for close monitoring of reserves when asset purchases are eventually unwound and when reserves are being returned to an ample level.

Past FOMC discussions of different long-run balance-sheet portfolios have not considered how different maturity compositions of the SOMA Treasury holdings might better position the Fed to undertake market-functioning asset purchases. At its November 2016 meeting, the FOMC discussed its ability to use asset purchases as a tool to address market dysfunction, but did not explore specific details about the optimal maturity composition of the SOMA Treasury portfolio.[4] At its April/May 2019 meeting, when the FOMC did discuss different maturity compositions of the Treasury portfolio, it focused on how these compositions might aid the FOMC in fostering more accommodative financial conditions than could be achieved solely by reducing policy rates, given the constraint of the effective lower bound (ELB).[5] This

[3] Kashyap (2024) also discusses central bank readiness for asset purchases, but focuses on the governance structures that could facilitate such purchase decisions.

[4] See the November 2016 FOMC minutes (page 2 and 3), the November 2016 FOMC transcripts (pages 6 to 70), and the September 2016 staff memo on financial stability considerations for the Fed's balance sheet and the October 2016 staff summary memo on a range of considerations for the Fed's balance sheet.

[5] See the April/May 2019 FOMC minutes (pages 2 to 4) for a summary of this discussion, the April/May 2019 FOMC transcripts (pages 6 to 63) for the full discussion, and the April 2019 background staff memo.

focus reflected the fact that, at the time, the primary challenge facing monetary policy was the availability of policy space, given the constraint of the ELB.[6] Additionally, these discussions occurred before the Treasury market disruptions that emerged during the early stages of the Covid-19 pandemic.

The academic literature has not yet examined how the long-run maturity composition of the Fed's Treasury portfolio affects its readiness for market-functioning asset purchases. Greenwood, Hanson, and Stein (2016) explored how a central bank can use its balance sheet to safely satisfy demand for very short-maturity, money-like assets (liabilities for the central bank). The central bank meeting this demand would be preferable to having private-sector intermediaries meet it by creating risky, short-term money-like assets through liquidity and maturity transformation, key threats to financial stability. It would also be preferable to having the Treasury meet this demand and face "auction risk" (that the central bank does not).[7] Greenwood et al. suggest that the central bank hold a shorter maturity SOMA portfolio, since such a portfolio minimizes the central bank's influence over debt management, while still providing safe. short-maturity, money-like assets. Vissing-Jorgensen (2025) also examines the issue of SOMA maturity composition and favors a tilt toward bills. In her study, the context is that of the central bank choosing its securities composition to manage the volatility of its Treasury general account (TGA) liabilities and the associated risk of increases in the TGA pushing reserves below their ample level, while simultaneously seeking the smallest size of its balance sheet. De Vere, Ramaswamy, and Schulhofer-Wohl's (2025) explore SOMA maturity composition from an assets-liabilities management perspective, calculating the net income and mark-to-market volatility properties of several different longer-run assets and liabilities combinations. They stress that their analysis focuses on just one of many relevant policy considerations for the long-run asset composition of the Fed's balance sheet, a point applicable to our analysis, as well as that of Greenwood et al. and Vissing-Jorgensen.

Our paper proceeds as follows:

- We start by discussing the proportionate Treasury portfolio; that is, where the SOMA Treasury portfolio's maturity composition matches that of outstanding Treasury debt. This portfolio serves as a benchmark for evaluating alternative portfolios. The proportionate portfolio represents a reasonable approximation to the portfolio that has the most neutral (that is, least distortionary) effects on Treasury markets. That said, this

[6] Recall that—very close to this time, in June 2019—Chair Powell, in opening remarks, said that "… the proximity of interest rates to the ELB has become the preeminent monetary policy challenge of our time …"

[7] As Greenwood et al. explain, "auction risk" is the risk that, as debt maturity becomes more skewed toward bills, the Treasury has to conduct larger and more frequent bill auctions, which increases the possibility of the Treasury not receiving enough bids to auction the desired quantity of bills at any reasonable price. Such a failure can be remedied by finding more participants and re-running the auction, but the failure can be politically damaging and can hurt investor confidence, thereby raising the Treasury's future borrowing costs.

portfolio has not been derived through formal "optimization" and may not be *the most neutral* option. The degree of neutrality of the proportionate portfolio, and how it compares to other potential portfolios—including our proposed approach—is unclear. Given this, we argue that tilting the SOMA Treasury portfolio towards bills and away from strict proportionality may not necessarily make it less neutral or imply significant costs.

- We next explore the potential benefits of tilting the SOMA Treasury portfolio toward bills. In particular, we focus on how this tilt could better prepare the FOMC to undertake Treasury security purchases to restore market functioning in the event of stress, without expanding its balance sheet. Here, we also quantify the extent of the tilt that would provide a sufficiently large volume of reinvestments each month. This would enable policymakers to respond to a sizable—but not necessarily Covid-sized—Treasury market dislocations.
- We then review whether tilting the portfolio toward bills might have any adverse—and thereby countervailing—implications for financial stability.
- Additionally, we investigate whether, in the event of dysfunction in Treasury coupon markets, redirecting payments of maturing bills to coupon securities and sizably reducing the Desk's Treasury-bill reinvestments could itself create stress in money markets.
- We then address a key issue that emerges after a Treasury-market stress event, when the FOMC's war chest of maturing bills has been used for market-functioning purchases, primarily of Treasury coupon securities. We examine strategies to restore the SOMA Treasury portfolio back to its pre-stress composition, thereby replenishing the war chest for future market stresses. We discuss two main options available to policymakers: 1) allowing purchased coupon securities to mature and reinvesting the proceeds into bills, or 2) actively selling securities that were purchased more heavily during stress and reinvesting into bills. In evaluating these options, we focus on how quickly the war chest needs to be rebuilt in order to be prepared for another significant market shock potentially also requiring market-functioning purchases.
- Finally, we compare our bills-tilted Treasury portfolio approach to other recent proposals for addressing, *ex post*, market dysfunction, specifically Kashyap, et al.'s (2025) basis trade proposal and Duffie and Keane's (2023) fiscal buyback proposal.

2. The proportionate Treasury portfolio and potential costs of tilting toward bills

In policy discussions in recent years, a Treasury portfolio with a maturity composition roughly the same as that of all Treasury debt has tended to be presented as the benchmark candidate for the long-run SOMA Treasury portfolio, and, as such, the one against which other

alternatives are compared.[8] "Market neutrality" considerations are one reason for regarding this portfolio—often called the proportionate portfolio—in this way.

A proportionate SOMA Treasury portfolio implies that the SOMA holds the same share of the market for each maturity of Treasury securities. This means that, for any total volume of SOMA Treasury holdings, the portfolio minimizes the likelihood of SOMA holdings becoming a dominant share of the market for any security maturity and reduces the likelihood of SOMA Treasury holdings creating market functioning strains.[9] Additionally, the proportionate portfolio can be viewed as minimizing pricing distortions across the yield curve.

Note, however, that it is not clear whether, for any maturity of Treasury securities, the risks of market functioning strains—that is, impeded market-participant matching and/or impeded price discovery—are a function of the share of Treasury securities held *in the SOMA portfolio* or the share held *by price-inelastic investors,* where the latter most notably includes insurance companies (ICs), pension funds (PFs), and foreign official investors. If it is the share held by *price-inelastic investors* that matters, a proportionate SOMA Treasury portfolio will not necessarily minimize the possibility of asset purchases straining market functioning. For example, ICs and PFs typically hold more longer-term Treasury securities, while foreign official investors typically hold more short- to medium-term Treasury securities.[10]

Moreover, it is unlikely that the risk of market functioning strains emerging is a linear function of either the share of SOMA holdings or price-inelastic investors' holdings. A reasonable possibility is that the risk is non-linear and increases gradually before rapidly increasing after some threshold.

For a given size of the SOMA Treasury portfolio, therefore, there is likely some range of maturity mixes around the proportionate portfolio for which the risk of market functioning strains arising is essentially the same. This range may be quite broad, given that the SOMA

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[8] See, for example, the January 2025 FOMC minutes (page 6). As noted, staff at the meeting briefed policymakers on alternative strategies for purchases of Treasury securities after the conclusion of balance sheet runoff. All strategies involved moving the maturity composition of Treasury holdings in the SOMA portfolio into closer alignment with that of the outstanding stock of Treasury securities.

[9] A key mechanism through which market strains arise is from private investors (or price-sensitive) investors holding small shares of securities. This situation can raise search costs—so leading to diminished trading volumes—as well as reduce market participation—so leading to thinner markets. That said, central banks purchases—since they imply a large, solvent, committed, and persistent buyer—increase trade volumes and can strengthen market functioning. (See, the October 2019 BIS MC report "Large central bank balance sheets and market functioning," page 16.)

[10] It is possible that the UST's Debt Management Office is already taking into account differences in the share of price-inelastic investors in the markets for different maturity Treasury securities when it determines its composition of Treasuries to issue. If this were the case, this might argue for a proportionate portfolio.

portfolio has been holding a disproportional share of longer-term securities for a long time, without any market functioning issues having arisen.

Differences in the mix of price-inelastic versus price-sensitive investors for each maturity of Treasury securities can also imply differential and distortionary effects on term premiums across the yield curve from a proportionate portfolio. That said, *any* purchases of Treasury securities with duration risk can be viewed as distortionary given that such purchases affect term premiums. Indeed, in the early 1950s, just after the Treasury-Fed Accord, Chair Martin and the Fed Board advocated for the Fed to limit its operations to buying and selling bills. In particular, they considered that the Fed should only influence the short-end of the government securities market, allowing market forces to determine coupon yields and the term structure (see Hetzel and Leach, 2001).

The proportionate portfolio has also been motivated by "Fed balance sheet financial risk" considerations, with this consideration aiming to minimize potential distractions from periods of negative net income. The Fed's liability structure consists of zero duration reserves and ON RRP, alongside long duration currency. To match this duration profile and mitigate the risk of negative net income periods, the Treasury portfolio should ideally blend short- and long-term securities. This rationale has led to the proportionate Treasury portfolio being viewed as an approximation for the duration matching one.[11] However, it is important to note that this approach relies on qualitative characteristics rather than precise assets and liabilities duration calculations, offering only a rough approximation of the optimal portfolio structure. A notable exception is a recent paper by De Vere, Ramaswamy, and Schulhofer-Wohl's (2025), which employs simulation techniques to examine net income volatility and mark-to-market volatility of several different asset portfolio strategies. Notably, they find a barbell portfolio to be the most likely optimal strategy, with an "across-the-curve" portfolio representing more of a compromise strategy.

It is likely, and consistent with the findings of De Vere et al., that the Treasury SOMA portfolio that provides the best match to minimize financial risk is discernibly different from the proportionate portfolio. As such, there is probably some range of Treasury portfolio mixes that

[11] See Dallas Fed President Logan's February 25, 2025 speech "Efficient and effective central bank balance sheets," which notes this rationale among others. Fed Board Governor Waller's March 1, 2024 speech "Thoughts on Quantitative Tightening" and July 10, 2025 speech "Demystifying the Federal Reserve's Balance Sheet," as well as Cleveland Fed President Hammack's April 23, 2025 speech "The Federal Reserve's Balance Sheet: Some Major League Questions" also list asset-liabilities matching as a consideration for long-run Treasury portfolio maturity composition. Bank of Canada Deputy Governor Toni Gravelle's January 16, 2025 speech "The end of quantitative tightening and what comes next," also gives strong emphasis to this motivation.

match the duration of Fed liabilities just as well as the proportionate portfolio.[12] This suggests that some divergence from the proportionate Treasury portfolio may not be that costly and rigid adherence to the proportionate portfolio may not be necessary.

3. Tilting toward bills: boosting the war chest for market functioning purchases

3.1. Rationale for a war chest

Diverging from the proportionate Treasury portfolio to instead have a bills-tilted portfolio provides portfolio liquidity that can aid the FOMC in responding to Treasury market stresses without having to expand its balance sheet.[13] The intuition is straightforward: a "bills-tilted" long-run composition of the SOMA Treasury portfolio would imply a greater churn of securities in this portfolio and a larger volume of reinvestments each month. While these greater reinvestments each month may imply greater operational risks, they also provide a war chest for the FOMC to undertake market-functioning asset purchases, while not altering the total size of the Fed balance sheet nor the total amount of reserves in the system.

A historical episode that occurred in the early days of the Covid pandemic highlights a potential benefit of a bills-tilted Treasury portfolio. Shortly before the FOMC announced on March 15, 2020 that it would start large secondary market purchases of Treasury securities, the Desk announced on March 12, 2020 that, to support smooth functioning of the Treasuries market, it would conduct its March 13 to April 13 $60 billion monthly reserve management purchases—begun in October 2019 and until then directed only to bills—by purchasing securities across a range of sectors (bills, coupons, TIPS, and FRNs) and maturities.

Ultimately, on March 13, the Desk—pursuant to instructions from Chair Powell, in consultation with the FOMC—made $37 billion of Treasury securities purchases across the curve in one day, by bringing forward about half of its $60 billion monthly reserve management purchases.[14] That is, the Desk deployed the FOMC's monthly quota of open market operations on a day when the Treasury market was facing disruptions associated with the coronavirus

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[12] While there are clearly more quantitative ways to assess what different maturity mixes of Treasury securities imply for Fed balance sheet financial risk and how close the proportionate portfolio is to minimizing this risk relative to other portfolios, it is worth noting that "currency in circulation" —typically assumed to be a permanent liability against which longer-term assets would be held—currently accounts for only 35 percent of Fed balance sheet liabilities.

[13] As noted in section 1, a bills-tilted portfolio can also aid the FOMC's use of its balance sheet—specifically, through a maturity extension program—to provide monetary policy accommodation. Since this issue was studied and discussed by the FOMC in April/May 2019, we do not consider it further.

[14] As stated in the "FOMC Authorizations and Continuing Directives for Open Market Operations" document (specifically, section 4B) the Chair, in fostering the Committee's objectives during any period between meetings of the Committee, is authorized by the Committee to instruct the Desk to act on behalf of the Committee to undertake transactions with respect to eligible securities in order to appropriately address temporary disruptions of an operational or highly unusual nature in U.S. dollar funding markets.

outbreak. While these actions turned out to be not enough to stem the large one-sided flow in the Treasury market due to the "dash-for-cash" generated by an unprecedented pandemic, they undoubtedly helped and bought the Committee some time.

The size of such a war chest would depend on how much of the SOMA portfolio is expected to mature in any given month, as this would represent what is available to be reinvested. If market conditions are stressed on any given day or days, with selling pressures building in specific or broader Treasury markets, the Desk—pursuant to instructions from the Chair—can flexibly determine which Treasury security types or maturities, and in what volumes, to purchase using its available war chest.

As noted, a war chest would allow the central bank to respond to market functioning issues while leaving the total size of the Fed balance sheet and the total amount of reserves in the system unchanged.[15] To be sure, in an ample reserves regime, self-sterilization to prevent an expansion of the balance sheet is not a necessity as it is in the scarce reserves regime—where maintaining rate control is crucial. During the scarce reserve period, the FOMC maintained about one-third of its SOMA Treasury portfolio as bills to facilitate draining reserves through bill runoff in the event of a rise in discount window lending. In an ample reserves regime, avoiding an expansion of the balance sheet is a choice, motivated by either political economy considerations, a wish to avoid market functioning supporting purchases being misinterpreted as financial conditions easing purchases (which is particularly salient when market stress occurs while policy is removing accommodation or becoming more restrictive), or a desire to avoid future balance sheet normalization associated with technical policy decisions and communications unrelated to the stance of policy.

When market functioning is restored, purchases would return to the securities mix that would restore the bills-tilted Treasury portfolio. This could involve offsetting some of the purchases made during the period of stress. For instance, if securities of particular longer-term maturities were more heavily purchased during the market stress, then after the stress has passed, securities rolling off with the same longer maturities could be replaced with bills (purchased in the secondary market) that were more lightly purchased during stress. We

[15] While we emphasize the central bank undertaking market-functioning asset purchases without expanding its balance sheet and volume of reserves, there are times when these developments would be beneficial. The onset of the Covid pandemic is one example. While the Treasury market was certainly impaired, with asset purchases needed to restore market functioning, demand for cash—a lot of it in the form of reserves—was also very high, which the increased reserves associated with the Covid market-functioning asset purchases helped meet. The Fed's Treasury purchases following the 1929 stock market crash are another example as these were undertaken with the goal to increasing reserves in the system (see, Anbil, Carlson, Hanes, and Wheelock, 2020, page 9). As such, the FOMC having a longer-run portfolio that enables it to undertake market functioning purchases of Treasury securities without increasing its balance sheet, does not imply that this action is necessarily the preferable one. Rather it gives the FOMC the option of taking this approach.

further discuss the issue of restoring the SOMA portfolio to its previous composition after a period of stress and asset purchases in section 6.

An important reason for a central bank to build a war-chest against possible market stress episodes is that it is the only market player that can reliably provide liquidity or balance sheet capacity during market stress.[16] Market intermediaries cannot be relied upon to step in to "catch the falling knife." Mutual funds (MFs) are subject to investor flows, which can be fickle. Hedge funds (HFs) tend to shut down their strategies when volatility spikes.[17] Primary dealers, who are expected to take the other side of trades against clients, may step in during mild market fluctuations, but are unlikely to absorb a large amount of inventory during more severe market stress. Importantly, dealers are subject to regulatory constraints (such as the SLR) and internal risk (VaR) limits. While in normal times—and even with anticipated Treasury market growth—these constraints and limits may not be binding, they hinder dealers' ability to deploy capital flexibly and quickly during volatile markets.[18]

By increasing the "flow" portion of its balance sheet, the central bank can serve as a better public backstop to prevent systemic liquidity risk from destabilizing core financial markets and undermining monetary and financial stability.

3.2. Sizing the war chest based on the volume of maturing Treasury bills

A key practical question is how much to tilt the Treasury portfolio toward bills, relative to the proportionate portfolio. To gauge this, we use, for simplicity, SOMA securities holdings at the end of balance sheet runoff, which primary dealers expect to be about $6.1 trillion (in 2026:Q1).[19] While it is generally typical to assume that this amount grows about 4 percent per year in line with nominal GDP, we ignore this growth for our calculations.[20] The Treasury Borrowing Advisory Committee (TBAC) recommends that the Treasury strive to maintain the share of Treasury bills to total Treasury securities outstanding at 20 percent.[21] Therefore, if SOMA holdings match the longer-run maturity distribution of outstanding Treasuries as recommended by TBAC, roughly $1.23 trillion of the portfolio would be in bills.

The volume of bills needing to be reinvested in any month would depend on the maturities in which these bills were held. Bill issuance patterns over the last few years suggest

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[16] In addition to being the lender of last resort, central banks likely have to play the role of market maker of last resort in the face of large market dislocation. See also "Stabilising financial markets: lending and market making as a last resort" by the Advisory Scientific Committee to the European Systemic Risk Board, 2023.

[17] See, Falato, Goldstein, and, Hortacsu (2021) as well as, Kruttli, Monin, Petrasek, and Watugala (2025)

[18] See, Cochran, Petrasek, Saravay, Tian, and Wu, (2024) and Li, Petrasek, and Tian, (2025).

[19] This is according to the NY Fed's June 2025 Survey of Market Expectations (question 3c, page 9); specifically, $6.125 trillion. SOMA securities holdings as of July 23, 2025 were at around $6.346 trillion.

[20] The size of the Treasury market is likely going to grow commensurately, so not taking into account of future growth in SOMA holding is likely not going to affect the generality of the results.

[21] See the TBAC's 2024:Q3 presentation deck (page 67), which discusses this 20 percent average share.

the following shares of different bills outstanding: 6 percent for 4-week bills, 8 percent for 6-week bills, 11 percent for 8-week bills, 18 percent for 13-week bills, 16 percent for 17-week bills, 31 percent for 26-week bills, and 10 percent for 52-week bills. This implies roughly $385 billion (= $1.23 trillion*0.314) of a war chest in any month with a proportionate holding of bills in the SOMA.[22] Every additional percentage point of the SOMA Treasury portfolio tilted to bills would increase the amount in the war chest by $19.2 billion per month.

To put this in perspective, we compare the war chest calculated above with potential volumes of needed purchases. One point of comparison is the Fed's Treasury purchases made in March 2020, although they were extreme, having been brought on by an unprecedented global pandemic. As noted in the Desk's annual report on Open Market Operations during 2020 (page 18), in March 2020, the Desk purchased about $850 billion in Treasuries (excluding reserve management purchases). A similar number ($840 billion) is reported in table 2 (page 25) of Vissing-Jorgensen (2021) as the total amount of Treasuries sold by private sector investors in Q1 of 2020. These amounts are about 4½ percent of outstanding marketable Treasury securities ($18.5 trillion) at the time (2020:Q1). If 4½ percent of current (2024:Q4) outstanding marketable Treasury securities ($26.0 trillion) were to be sold now, it would amount to about $1.2 trillion. For the monthly war chest to fully offset these purchases made in two weeks, about 3 times the amount of bills in the proportionate SOMA portfolio would be needed. This means that rather than the SOMA portfolio allocating 20 percent of its volume to bills—in line with a portfolio proportional to steady state Treasury outstandings—it would need to allocate approximately 60 percent of its volume to bills.

The degree to which the SOMA portfolio should be tilted beyond the proportionate portfolio and toward bills depends on two factors: (1) policymakers' perceptions of where in the upper tail of private sector Treasury security sales/Fed purchases they view the sales/purchases that occurred in March 2020 to have been, and (2) policymakers' preferences as to what fraction of the distribution of potential stressed Treasury security selling outcomes they want the war chest to be able to cover.

Table 1 shows calculations for what the tilt in the SOMA portfolio composition would need to be under various assumptions of policymakers' perceptions and preferences, assuming that policymakers view the distribution of potential stress Treasury security selling to be a generalized Pareto distribution. Figure A.1 provides a visual representation of the distributions underlying Table. These calculations, which are for illustrative purposes only, show two key points. First, looking down the last four rows in each column, policymakers that prefer to cover a larger range of the distributions of stressed Treasury securities sales would want a larger war chest. Second, looking across the last three columns from right to left,

[22] The factor of 0.314 is equal to 0.06*4/4+0.08*4/6+0.11*4/8+0.18*4/13+0.16*4/17+0.31*4/26+0.10*4/52. Bill shares by maturity are calculated from recent auctions in the "Bill Auctions – Data from October 2009-present" spreadsheet available on the U.S. Treasury's "Investor Class Auction Allotments" website.

policymakers that view the Fed's Treasury securities purchases of March 2020 as less far out in the right tail of sales would also want a larger war chest.

Table 1: Illustration of different Treasury bills tilts needed for the war chest given various combinations of policymaker perception and preference assumptions

	Policymaker perception as to what percentile (i.e., how far out in the right tail) March 2020 private-sector Treasury sales/Fed purchases were		
	99. 0th percentile	***99.5th percentile***	***99.9th percentile***
	Parameters of generalized Pareto distribution		
	μ=0, σ=100, & ξ=0.37	*μ=0, σ=100, ξ =0.28*	*μ=0, σ=100, ξ =0.15*
	Percentile of Treasury sales that the proportionate portfolio war chest would cover		
	91.6th percentile	93.3rd percentile	95.7th percentile
	Required bills tilt/bills share depending on the percentile of Treasury sales the policymaker wants the war chest to cover (points plotted in figure 1, panel (c))		
90.0th pctl.	● No extra tilt → 20% share	● No extra tilt → 20% share	● No extra tilt → 20% share
92.5th pctl.	● 2 p.p. extra tilt → 22 % share	● No extra tilt → 20% share	● No extra tilt → 20% share
95.0th pctl.	● 8 p.p. extra tilt → 28% share	● 4 p.p. extra tilt → 24% share	● No extra tilt → 20% share
97.5th pctl.	● 20 p.p. extra tilt → 40% share	● 13 p.p. extra tilt → 33% share	● 5 p.p. extra tilt → 25% share

Source: Authors' calculations based on bill shares reported in the "Bill Auctions – Data from October 2009-present" spreadsheet available on the U.S. Treasury's "Investor Class Auction Allotments" website.

The SOMA portfolio tilts reported in Table 1 and plotted in Figure A.1 assume a location parameter, μ, of zero, and a scale parameter, σ, of 100. We chose μ=0 because it implies a modal value of zero for market-functioning asset purchases, which seems appropriate given that such purchases are not typical. We set the scale parameter to ensure that—together with the shape parameter, ξ—it places the quantity of Treasury securities purchases undertaken by the Fed in March 2020 at either the 99.0th, 99.5th, or 99.9th percentile of the probability distribution.

It is important to note that many combinations of σ and ξ that could place the quantity of private sector Treasuries sales/Fed purchases in March 2020 at these percentiles, each implying different tilts of the SOMA portfolio toward bills. Table A.1 in the appendix explores this further. The middle panel replicates Table 1 with σ set to 100. Additional versions show results with σ=75 and σ =125. Higher values of σ require lower values of ξ to place the Fed's March 2020 Treasury sales/purchases quantity at the specified percentiles. Higher σ and lower ξ imply larger necessary tilts of the SOMA portfolio toward Treasuries bills to equip the war chest for policymakers' desired coverage of potential stressed Treasury security selling outcomes. These additional tilts are not trivial. A σ of 125 instead of 75 can imply a 5 or 6 percentage point greater tilt in the SOMA portfolio toward bills.

It is worth noting that Table A.1 only considers different parameterizations of a generalized Pareto distribution, which we chose for its common use in modeling loss severity

and its tractability. Other distributions commonly used for modeling loss severity—such as, gamma, Weibull, log-logistic, and other generalized beta distributions—would imply different Treasury bill tilts for the SOMA portfolio when parameterized to match various policymaker assumptions. Therefore, the Treasury bill tilts reported in Table 1 and A.1 should be viewed as illustrative rather than suggestive of a particular share.

3.3. Relying on soon-to-be maturing Treasury bills as an alternative

Our discussions and calculations so far have assumed that the volume of Treasury bills maturing and being reinvested each month is the only way for the FOMC to make market functioning purchases of Treasury securities without expanding the size of the balance sheet. Table 2 explores an alternative option: selling Treasury bills that are not maturing in the current month but will mature very soon, thus adding some eleventh-hour armory to the war chest.

Table 2: Illustration of comparable resources available through different means for undertaking market-functioning asset purchases

Funds available to make market-functioning asset purchases from ...		
Current month's maturing bills only	***Current month's maturing bills plus sales of the next month's maturing bills***	***Current month's maturing bills plus sales of the next two months' maturing bills***
$385 billion	$668 billion	$850 billion
Equivalent bills tilt of the Treasury SOMA portfolio relative to the proportionate portfolio[23]		
No extra tilt needed (20% T-bill share)	≈ 15 p.p. extra tilt (35% T-bill share)	≈ 24 p.p. extra tilt (44% T-bill share)

Source: See source information provided for Table 1.

Based on our earlier approximation of outstanding bill maturities, if the FOMC were to sell Treasury bills maturing in the next month, it would add $283 billion to the war chest. This would boost the total funds in the war chest to $668 billion (second column), equivalent to a 35 percent bills share. Selling Treasury bills maturing in two months' time would add a further $182 billion, bringing the total to $850 billion (last column).[24] This would be equivalent to a war chest with a 44 percent bills share. These additional sales would significantly enhance the FOMC's ability to make market functioning purchases without expanding the balance sheet.

[23] For the war chest to cover $668 billion, the bills portfolio share would need to be 35% (= 20%+((668-385)/20%)). To cover $850 billion, the bills portfolio share would need to be 44% (= 20% + ((1075-385)/20%)). Note that Table 2's tilt calculations do not depend on any assumptions about policymakers' perceptions and preferences, so do not depend on a distribution of Treasury sales.

[24] The increased war chest numbers cited are calculated as follows : $283 billion (= $1.23 trillion*0.230), where 0.230 is equal to 0.08*2/6+0.11*4/8+0.18*4/13+0.16*4/17+0.31*4/26+0.10*4/52, and $182 billion (= $1.23 trillion*0.148), where 0.148 is equal to 0.18*4/13+0.16*4/17+0.31*4/26+0.10*4/52.

The results of Table 2 suggest that an alternative to a bills-tilted portfolio might be the proportionate portfolio that allows for bill sales if large volumes of market-functioning asset purchases are needed. However, it is important to note that selling securities outright—rather than allowing them to roll off at maturity—has been rare for the FOMC, with the main example being the Maturity Extension Program (MEP) in 2011 and 2012.[25]

Furthermore, there is no guarantee that the Fed could sell this volume of Treasury bills. In practice, Treasury bills are generally held to maturity, with considerably less secondary market trading volume. Indeed, when the FOMC undertook the MEP—and sold Treasury securities with a remaining maturity of 3 years or less—it sold only nominal coupon and TIPS securities, not bills. As a result, the market may not be prepared to absorb $285 billion or $465 billion of *sales* in a month. That said, it is *possible* that such sales may be feasible during periods of Treasury coupon market dysfunction. In these situations, demand for cash and bills is typically high, which could potentially facilitate larger bill sales. However, this remains a theoretical possibility that would require careful consideration and testing before reviewing. In summary, while the option of bill sales represents possible alternative to a permanently bills-tilted portfolio, it comes with its own set of challenges and uncertainties.

4. Potential financial stability risks of a bills-tilted portfolio

Thus far we have examined how a bills-tilted portfolio might aid the FOMC in undertaking asset purchases to reduce market stress and restore financial stability. We have also compared this benefit against potential costs associated with pricing distortions, and increased Fed balance sheet financial risks. In this section, we explore whether a bills-tilted SOMA Treasury portfolio can lead to a build-up of vulnerabilities in the financial system, potentially offsetting any financial stability benefits arising from providing a war chest for crisis management.[26]

It's important to note that throughout this section we assume that the U.S. Treasury's (UST's) Debt Management Office makes no changes in its debt issuance patterns in response to the FOMC's decisions regarding how proportional or how tilted toward bills it specifies its SOMA portfolio. Clearly, the Debt Management Office can alter its issuance patterns and completely offset how tilting the SOMA portfolio toward bills would affect the proportions of different maturity Treasury securities being held by private investors. In such a case, the financial stability implications of tilting the Treasury portfolio toward bills that we discuss below would not materialize.

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[25] See the NY Fed's Domestic Open Market Operations during 2012 (page 5). Even in the scarce-reserves regime, reserves were typically drained by matched-sale purchases rather than outright sales.

[26] This section draws on two memos from the FOMC's 2016 discussions on long-run monetary policy implementation; specifically, the September 2016 staff memo on financial stability considerations for the Fed's balance sheet and the October 2016 staff summary memo on a range of considerations for the Fed's balance sheet.

A bills-tilted SOMA portfolio raises the question of what alternative assets investors will hold. From a financial stability perspective, a key question is whether fewer available Treasury bills might lead to an increase in unstable private money-like assets, from which market participants tend to pull away rapidly during stress when doubts about their safety and liquidity emerge. This mechanism can substantially amplify market instability during stress, as was the case in the Global Financial Crisis (GFC) and early in the Covid pandemic.

Post-GFC MMF reforms have led to a substantial reduction in prime MMF assets under management (AUM) and a corresponding increase in government MMFs. This shift has likely reduced the risk that increased SOMA Treasury bill holdings would lead to increased demand for the most unstable forms of private money-like assets from MMFs. Government MMFs, which would be the main type of investor looking for alternatives to Treasury bills, can only hold government or agency debt, or government or agency debt backed repo. While prime MMFs do hold Treasury bills and would also need to find alternative investments, which could include unstable private money-like assets, the prime MMF sector is now small and unlikely to generate a significant demand for these unstable assets.

However, investment vehicles with similar risks to prime MMFs (e.g., dollar-denominated offshore prime MMFs, short-term investment funds, private liquidity funds, ultrashort bond funds, and local government investment pools) likely also hold Treasury bills and would also need to find alternative investments. These investment vehicles, which are already larger in aggregate than prime MMFs, could augment the demand for unstable private money-like assets beyond that from prime MMFs.

For government MMFs (as well as prime MMFs and prime-MMF-substitute vehicles) looking for alternative investments to Treasury bills, one option would be government debt-backed reverse repo. At the same time, a bills-tilted SOMA portfolio, would, relative to the proportionate portfolio, imply more Treasury coupon securities being held by private investors. If these investors were leveraged, this would create the need for more repo financing. As a result, one adverse financial stability consequence of a more bills-tilted SOMA Treasury portfolio, could be a greater quantity of government debt-backed repo and thus runnable liabilities in the financial system. Furthermore, if these leveraged investors were hedge funds active in the cash-futures basis trade, even greater adverse financial stability effects would result. The basis trade is highly leveraged and exposed to changes in futures margin requirements (and resulting margin calls) and to funding shocks in bilateral repo markets (such as, rising bilateral repo rates, higher haircut requirements, and shrinking funding supply).[27] An expansion in the basis trade would increase vulnerabilities in the financial system and,

[27] The likelihood of the cash-futures basis trade increasing would depend on the supply of Treasury securities more generally, since a large supply depresses the price of Treasury securities relative to that of Treasury futures, and makes the basis trade more attractive

paradoxically, could contribute to the type of market stress episode for which the bills-tilted portfolio aims to build up a war chest to address.

If low-leverage investors (such as insurance companies, pension funds and mutual funds) absorb the additional Treasury coupon securities that private investors would need to hold under a bills-tilted SOMA portfolio, MMFs searching for alternatives to Treasury bills would likely turn to the Fed's overnight reverse repurchase agreement (ON RRP) facility rather than to private sector reverse repo. This could result in a larger volume of ON RRP liabilities for the Fed, potentially expanding the Fed's balance sheet. Alternatively, since ON RRP represents a deployable stock of funding, it could allow the ample reserves threshold to be maintained at a lower level. This offsetting effect would then result in only minor changes to the overall size of the Fed's balance sheet.

In considering a bill-tilted portfolio leading to more Treasury coupon securities being held by private investors, it is worth noting one potential favorable financial stability implication from this outcome. Long-term Treasury securities have generally been believed to provide investors with a valuable hedge against negative demand shocks, as the value of these securities rises when such shocks induce economic downturns.[28] This traditional property of long-term Treasury securities can serve as an important mitigant to the effects of a negative demand shock on the financial system.

A bills-tilted SOMA portfolio could also impact financial system vulnerabilities by steepening the yield curve. This might enhance the returns from maturity transformation, potentially increasing such activities in the system. However, the magnitude of this effect is uncertain. The most relevant historical experience is the FOMC's 2011 and 2012 Maturity Extension Program (MEP), which aimed to *flatten* the slope of the yield curve by selling Treasury securities with a remaining maturity of 3 years or less and using the proceeds to buy Treasury securities with a remaining maturity of 6 to 30 years over the course of 15 months. These sales and purchases totaled $670 billion at the time (about $750 billion in early 2020 dollars) or about $45 billion per month at the time (about $50 billion in early 2020 dollars). While empirical studies find this program to have had perceptible effects on the slope of the yield curve, these effects were not necessarily large enough to meaningfully alter the amount of maturity transformation in the financial system.[29] Moreover, there is some question as to whether a steeper yield curve increases or decreases maturity transformation. On one hand, a steeper yield curve can—as just discussed—imply higher returns to maturity transformation

[28] See Gorton, et al. (2012) and Krishnamurthy and Vissing-Jorgensen (2012) for this point and discussion in the October 2016 staff summary memo on a range of considerations for the Fed's balance sheet.

[29] As discussed in the October 2016 staff summary memo on a range of considerations for the Fed's balance sheet, Cahill et al. (2013) undertake event study analysis of the 2011-12 MEP and find that pushed up yields on Treasury securities with 3 to 4 years in duration by about 10 bps and pushed down yields on Treasury securities at the 10- to 15-year horizon by 20 bps.

and encourage more of it. On the other, if maturity transformation is a central way through which financial institutions generate revenue and institutions have the incentive to reach for yield, a steeper yield curve can imply less maturity transformation.[30]

A potential drawback of any policy that mitigates extreme market outcomes is the risk of moral hazard. Market participants, particularly hedge funds, might be inclined to assume greater risks *ex ante*, anticipating that the Federal Reserve will intervene by absorbing Treasury securities into its balance sheet. However, as suggested by Haddad, Moreira, and Muir (2024), expectations of central bank intervention may already be factored into market behavior, given the historical precedents set during previous crises, including the March 2020 episode.[31] Therefore, the introduction of a war chest for future asset purchases may not substantially alter current market expectations. This suggests that while the moral hazard concern is valid, its incremental impact may be limited given existing market perceptions of potential Federal Reserve interventions.

5. Money market considerations of shifting bill reinvestments towards coupon purchases

Beyond financial vulnerability concerns, we should consider potential market disruptions that could result from an abrupt, significant reduction in Desk Treasury-bill reinvestments, as funds from maturing bills are redirected to coupon securities that are experiencing market stress. In this scenario, bills that the Desk does not purchase would need to be absorbed by private investors.

Typically, the Treasury uses increased bill issuance as a buffer when overall Treasury issuance needs to rise, such as during expansionary fiscal policies. This approach helps keep coupon issuance stable and predictable. Similarly, if SOMA bill reinvestments sharply decrease, leading to more bills in the market, the inherent flexibility of bills should help absorb the shock.

Given that Treasury bills are a substitute for other short-term money market investments, they can draw funds that might otherwise go to repo markets and potentially put upward pressure on repo and other money market rates. However, this upward pressure might be lessened during periods of Treasury coupon market stress. In these periods, investors often prefer cash and show increased demand for bills.

Nevertheless, the possibility remains that money market rates could tighten substantially, challenging rate control, and requiring an increase in reserves and expansion of the balance sheet—precisely the outcomes that the bills-tilted SOMA portfolio and its associated war chest were designed to avoid.

[30] See Goldberg et al. (2020) for this observation.

[31] See Garbade and Keane (2020) for a historical narrative of these interventions.

6. Rebuilding the war chest after market-functioning asset purchases

If the FOMC were to need to use all or a significant portion of its war chest of maturing Treasury bills to undertake market-functioning Treasury coupon purchases, it would face a sizable reduction in its Treasury bill holdings and, consequently, a sizable reduction in its volume of reinvestments each month—effectively reducing its monthly war chest. This reduction would mean that for some period after a Treasury stress event and market-functioning Treasury purchases the FOMC's war chest would be left under-provisioned, unable to cover as much of the distribution of future stressed Treasury selling as the Committee desired.

Once the market stress has passed, the FOMC could rebuild its war chest back to desired levels either passively or actively. Restoring the war chest passively would involve purchasing bills—undertaken on the secondary market—using the proceeds of coupon securities that are maturing and have similar maturities to those purchased more heavily during the market stress. This approach would build back up the low share of bills in the SOMA Treasury portfolio, while running down the greater-than-desired share of coupon securities in the portfolio. Restoring the war chest more actively would not only involve investing into bills the proceeds of coupon securities that are maturing, as just described, but also selling coupon securities that were either part of or the same maturity as the market functioning purchases.

The decision to take a passive (without sales) versus active (with sales) approach to rebuilding the war chest depends on a range of factors, with a central one being how long it would take to restore it in the absence of any sales. Figures 1 and 2 provide the results from calculations undertaken to gauge how long a passive restoration of the war chest could take under various assumptions. Generally, these calculations suggest that passive restoration of the war chest would take a couple of years, at a minimum.

The length of time for restoration depends on several factors, including (1) the size of the initial war chest and associated long-run composition of the SOMA portfolio before the market-functioning Treasury purchases, which determine what policymakers would want to return the war chest and composition of the SOMA portfolio to; (2) the extent to which the war chest was depleted during the Treasury market stress and thus needs to be rebuilt; and, (3) the mix of Treasury coupon securities that were purchased during the stress episode when the war chest was utilized. The discussion that follows considers the first two of these factors. We do not consider variants of the last factor and instead assume throughout that market-functioning asset purchases are made across the curve and in proportion to the outstanding stock of Treasury coupon securities (and their current maturities). This assumption could be adjusted to consider asset purchases that are more targeted at the market where stresses are. Indeed, Hauser (2022) argues that targeted purchases are important for distinguishing market functioning supporting asset purchases from those intending to ease financial conditions.

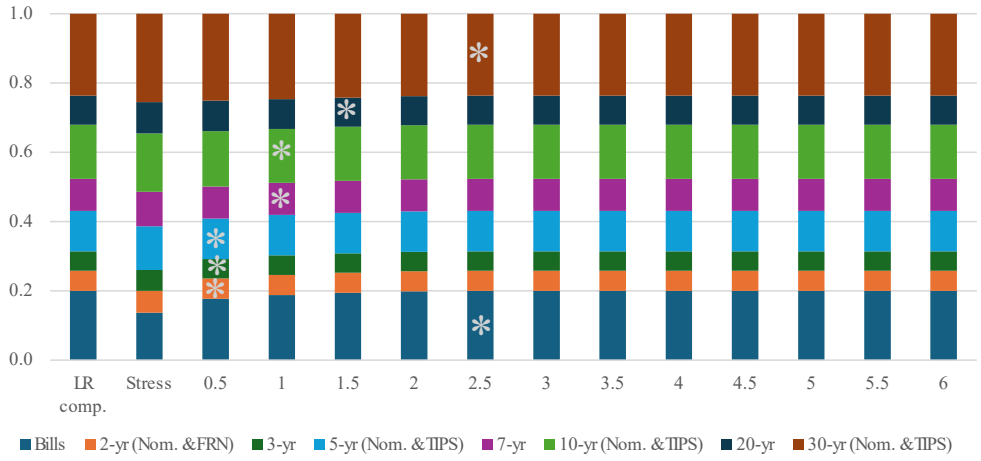
Panel (a) of Figure 1 presents results based on the assumption that policymakers' desired SOMA long-run Treasury portfolio composition is that of the proportional portfolio. The first column of the chart—labeled "L.R. comp."—shows the composition of Treasury securities in this portfolio. As illustrated, in this proportionate portfolio, bills account for 20 percent of securities, while coupon securities account for the remaining 80 percent. Within this 80 percent, different types and maturities of notes and bonds are assumed to be held in the same proportion as the outstanding stock of coupon securities and, within each coupon category, the different remaining maturities of notes or bonds are assumed to be held in the same proportion as in the outstanding stock.[32] The panel also assumes that Treasury market stress leads the central bank to fully deplete its war chest. This depletion implies that the share of bills in the SOMA Treasury portfolio drops from 20 percent to 13.7 percent, while the share of coupon securities increases from 80 percent to 86.3 percent. Panel (b) shows the transition paths of each type of Treasury security; specifically, the SOMA's holdings of bills decrease 32 percent, while its holdings of each type of coupon security increases 8 percent. In our simulations we assume that coupon securities that mature are reinvested into bills, albeit only up to the point that the SOMA's holdings of each type of coupon do not drop to below its initial or longer-run level. This is relevant mainly for 2-, 3-, and 5-year coupon securities.[33]

As evident from panels (a) and (b) of Figure 1, when policymakers' desired war chest for market-functioning purchases is that implied by a proportionate portfolio and is equal to the bills that mature in the current month, a Treasury market stress that results in all of the war chest being deployed means that it takes two-and-a-half years for the SOMA portfolio to be passively restored to its original/longer-run desired securities composition. Note, however, that even though, after two-and-a-half years, the share of each type of security in the portfolio is back at its long run share, the average time to maturity of the portfolio is not. That being said, it is at this time only a few months lower—e.g., 5 years 7 months versus 6 years.

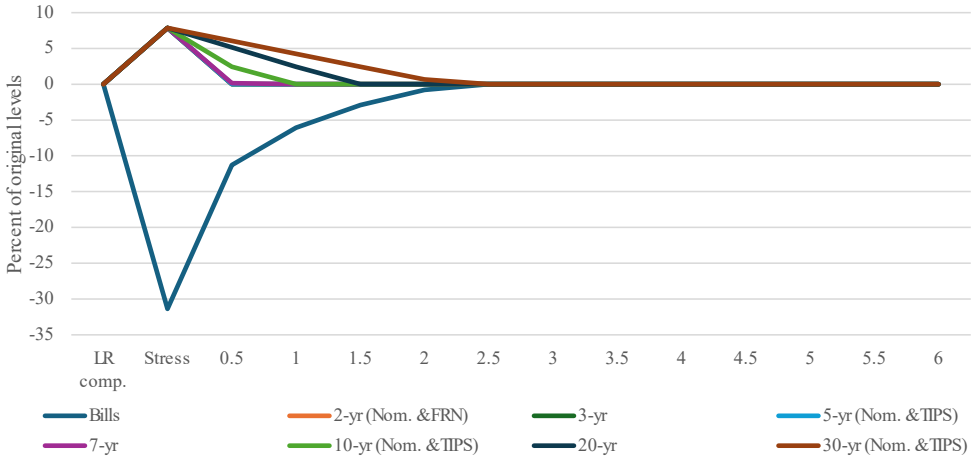
[32] Long-run note and bond shares by maturity are calculated from the "Coupon Auctions – Data from October 2009-present" spreadsheet available on the U.S. Treasury's "Investor Class Auction Allotments" website.
[33] The SOMA's holdings of bills could be restored more quickly—in just over six months—by allowing *all* 2-, 3-, and 5-year coupons that mature to be re-invested into bills. But this would place the SOMA's holdings of these securities below that of their initial and longer-run level, and they would later need to be re-built.

Figure 1: Evolution of shares and levels of Treasury securities, assuming a proportional Treasury portfolio, with bills share = 20 percent (time period = half a year)

Panel (a): Shares of securities following market-functioning asset purchases



Panel (b): Levels of securities following market-functioning asset purchases

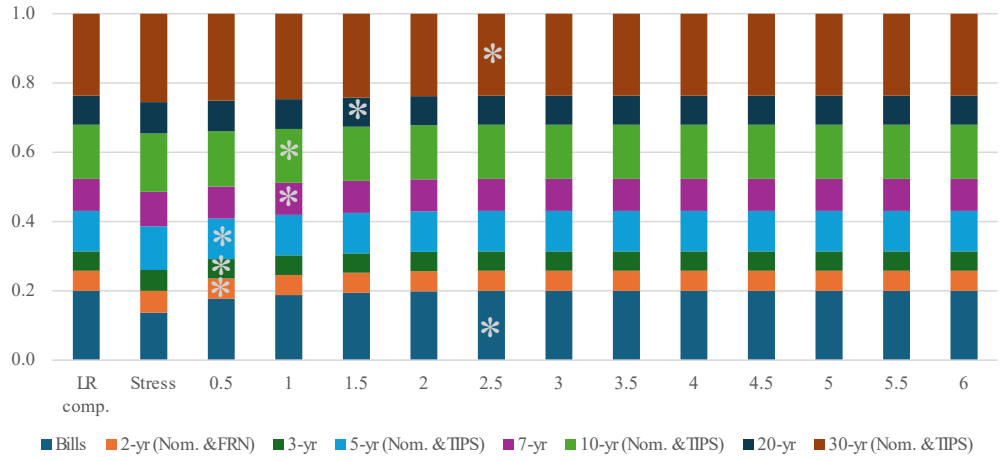


Note: The stars in panel (a) denote the period when the type of security returns to its longer-run share.
Source: Authors' calculations based on bill shares reported in the "Coupon Auctions – Data from October 2009-present" spreadsheet available on the U.S. Treasury's "Investor Class Auction Allotments" website.

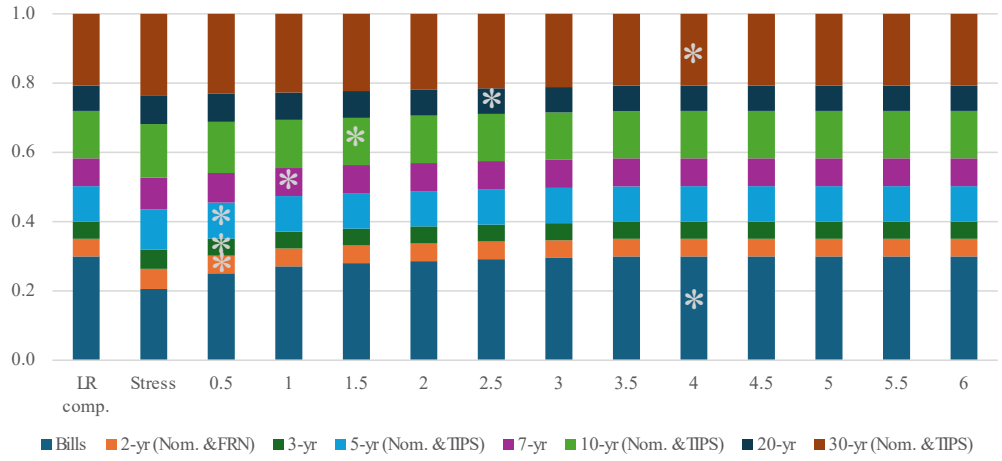
Panel (a) of Figure 2 replicates that of Figure 1, while the remaining panels show corresponding results for different sized war chests—specifically, war chests implied by tilting the SOMA's holdings of bills to be greater than what would be implied by a proportionate portfolio. As in Figure 1, the war chests in each example are fully depleted in the Treasury market stress. As can be seen from panels (b) and (c), SOMA portfolios that consist of 30 or 40 percent of bills would take four and five-and-a-half years, respectively, to be passively restored to their original/longer-run desired securities composition.

Figure 2: Evolution of shares of Treasury securities following market-functioning asset purchases (time period = half a year)

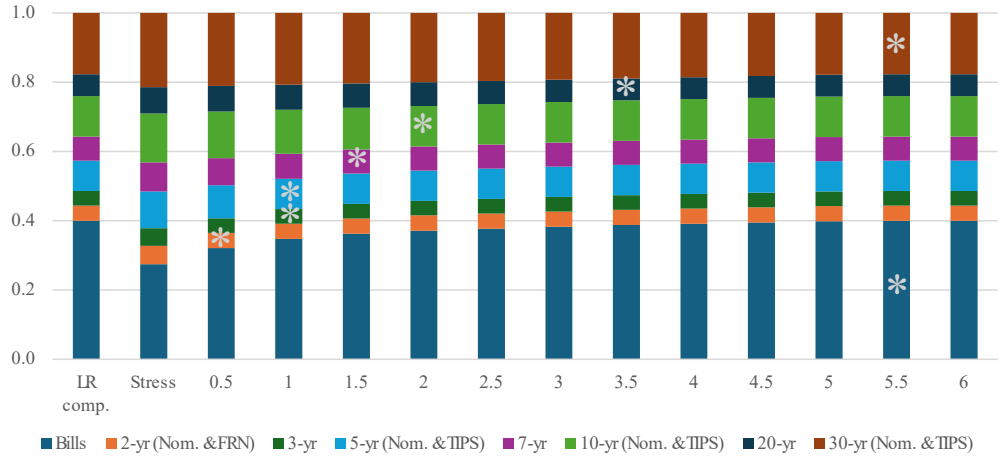
Panel (a): Assuming a proportionate Treasury portfolio, with T-bill share = 20 percent



Panel (b): Assuming a Treasury portfolio, with T-bill share = 30 percent



Panel (c): Assuming a Treasury portfolio, with T-bill share = 40 percent



Note: The stars in each panel denote the period when the type of security returns to its longer-run share.
Source: See source information provided for Figure 1.

Given that Treasury bills are typically held to maturity, with notably less secondary market trading relative to coupon securities, a question arises of whether the market is able to meet the magnitude of Treasury bill purchases implied by the bill rebuilds. Table 3 reports the magnitudes of bill roll-offs (the "war chest depletion" column) and purchases (all subsequent columns implied by the evolutions of Treasury securities considered in Figure 2 and shows that the largest half-year of purchases in each case are on the order of $246 billion to $287 billion. Considering that the FOMC's reserve management bill purchases undertaken in late 2019 and early 2020 (following the September 2019 episode of repo market volatility) were $60 billion per month or $360 billion over the course of six months, the half-year purchases shown in Table 3 appear likely to be able to be met by the market.

Table 3: T-bill roll-offs (implied by war chest depletions) and purchases (implied by rebuilds) in the evolutions of Treasury securities considered in Figures 1 and 2

T-bill share	*War chest depletion*	*0.5 year*	*1.0 year*	*1.5 years*	*2.0 years*	*2.5 years*	*3.0 years*
20 percent	-$385 bill.	$246 bill.	$64 bill.	$39 bill.	$26 bill.	$10 bill.	$0 bill.
30 percent	-$577 bill.	$278 bill.	$124 bill.	$54 bill.	$37 bill.	$33 bill.	$24 bill.
40 percent	-$769 bill.	$287 bill.	$163 bill.	$92 bill.	$54 bill.	$34 bill.	$34 bill.

Source: See source information provided for Figure 1.

The Treasury bill changes reported in Table 3 have corresponding, oppositely signed changes in Treasury coupon securities; that is, changes implied by maturing coupon securities rolling off the balance sheet and not being re-invested. The pace at which this roll-off occurs also does not appear outsized. For comparison, in the most recent balance sheet normalization episode, the monthly run-off rate Treasury securities was, at its largest, capped to $60 billion. These caps imply $360 billion over a half year, which is larger than the run-off implied by the simulations. However, specific months could have larger run-off volumes.

Regarding the question of how quickly it would be preferable for the war chest to be fully restored to its original/ longer-run desired composition, we note that it depends on how frequent episodes of dysfunction in Treasury markets potentially requiring asset purchases are likely to occur. Garbade and Keane's (2020) review of instances of large SOMA purchases being undertaken to support Treasury market functioning, provides one gauge of how frequent episodes of dysfunction requiring purchases might occur. Specifically, in addition to March 2020,they note a few earlier episodes of large SOMA purchases being made to support Treasury market functioning: (1) September 1939 at the start of World War II, (2) July 1958 due to a poorly received Treasury financing, in turn associated with the unwinding of the "rights carry trade" (see Kahn and Nguyen, 2022), and (3) May 1970, also in connection with another poorly received Treasury financing, albeit in this case as a result of developments in the Vietnam War. These events suggest infrequent episodes of large SOMA purchases needing to be made—that is, four over the past 80 years or at most one every 20 years. On its own, this

might suggest that restoring the war chest passively by purchasing bills in the secondary market using the proceeds of maturing coupon securities may be soon enough.

An alternative approach to considering how quickly it would be better for the war chest to be fully restored is to consider how frequently episodes of sudden and notable deteriorations in Treasury market depth occur. Aronovich, Dobrev, and Meldrum's (2021) document several instances since the GFC in which Treasury market depth has dropped notably and suddenly, including during the GFC in 2008, the equity flash crash in 2010, the Eurozone debt crisis in 2011, the taper tantrum in 2013, the Treasury flash rally in 2014, the Brexit referendum in 2016, Volmageddon in 2018, global growth fears in 2019, Covid in 2020, and the flash event of February 2021. Additional instances have occurred since their study, including events associated with Russia's invasion of Ukraine in 2022, the regional bank failures of 2023, and early April's market volatility in 2025. It's important to note that only one of these 13 events over the last 17 years has been associated with Treasury securities purchases needing to be made, and episodes of low market depth are not the situation that we would envision the war chest being used for. However, it is very difficult to predict, or even explain *ex post*, why some episodes of low market depth (when market makers reduce the amount of quotes posted to the order book) result in periods of extreme market illiquidity, while others do not progress further (see the Federal Reserve's May 2022 FSR, page 11). These episodes of low market depth—that may or may not turn into extreme illiquidity—suggest more frequent instances of SOMA purchases potentially needing to be made—13 over the past 17 years or close to one at least every 18 months. This frequency might indicate that restoring the war chest more actively would be beneficial. This would involve not only purchasing bills in the secondary market with the proceeds of maturing coupon securities, but also selling coupon securities that were either part of or the same maturity as the market functioning purchases.

As noted earlier, the length of time that it takes to restore the war chest is not the only consideration as to whether to take a passive (without sales) versus active (with sales) approach. Another important consideration is distinguishing market functioning supporting asset purchases from financial conditions easing purchases. The former type of purchase would more likely benefit from timely, subsequent reversals of previous purchases once the market stress has subsided, to avoid effects on term premia. For the latter type of purchase passive runoff and no sales once economic conditions have sufficiently improved are more likely to be satisfactory. Hauser (2022), for example, stresses that a timely and orderly unwind of the assets accumulated as part of financial-stability-oriented asset purchase program is crucial in solidifying the separation between market functioning supporting and financial conditions easing asset purchases. We will revisit this issue in the next (and final) section, where we consider two other asset-purchase based proposals for addressing Treasury-market stress episodes, both of which stress the importance of distinguishing the purpose of asset purchases, Finally, note that promptly reversing market functioning supporting asset purchases, also helps to align the timeframe of the intervention with the timeframe of the

stress. This closer alignment is often thought to reduce negative side effects—such as, changes to the market ecosystem and asset scarcity—that may result from asset purchase programs (see, the October 2019 BIS MC report "Large central bank balance sheets and market functioning," pages 16 to 17).

7. Other proposals for addressing Treasury-market stress episodes

We now consider how the bills-tilted Treasury portfolio approach to address dislocations in Treasury markets compares to some recent academic papers. These papers also see a need for the official sector to be prepared for asset purchases during Treasury market dysfunction, but propose different methods for executing these purchases.

Kashyap, Stein, Wallen, and Younger (2025) argue that the Federal Reserve could more effectively address market dysfunction through more "surgical" asset purchases. They propose that during market stress, the Fed should engage in a form of cash-futures basis trade, simultaneously acquiring Treasury cash securities and shorting Treasury futures. The authors argue that taking a hedged Treasury securities position has several advantages over simply purchasing cash securities. One is that a hedged Treasury position would not affect the term premium, clearly distinguishing purchases intended to support market functioning from those aimed at easing financial conditions. Another is that hedged Treasury purchases would avoid losses from interest rate movements, unlike the losses experienced by the Fed since late 2022 from its unhedged holdings. Finally, the authors contend that hedged purchases provide a clear exit strategy for the policy intervention.

Our bills-tilted Treasury portfolio approach aligns with the core motivation of Kashyap et al.'s proposal: the central bank should serve as the buyer of last resort to alleviate extreme constraints faced by market intermediaries. However, the approaches differ in what remains unchanged when the Fed undertakes market-functioning asset purchases. In Kashyap et al.'s proposal, the term premium remains unchanged, while the size of the balance sheet and, therefore quantity of reserves, increases. In our approach, the term premium decreases (which may be welcome when prices are depressed for liquidity reasons), while the size of the balance sheet and quantity of reserves remains constant. Which situation is preferable is a matter of opinion. Kashyap et al. view an unchanged term premium as more desirable, arguing it clearly distinguishes purchases for market functioning support from those aimed at easing financial conditions Our approach, with its unchanged balance sheet size and reserve quantity, may be desirable for reducing political economy concerns and avoiding the need for close reserve monitoring during unwinding and being returned to ample level. Importantly, if our bills-tilted Treasury portfolio approach includes timely subsequent sales once stress subsides—as were discussed in the previous section—it would also avoid long-term effects on term premia. This similarity to Kashyap et al.'s proposal would allow for clear distinction between market functioning support and financial conditions easing purchases.

Duffie and Keane (2023) explore official-sector purchases of government securities aimed at restoring market functionality and, similar to Kashyap et al., emphasize the importance of distinguishing asset purchases undertaken to restore market functioning and those intended to ease financial conditions. They argue that assets acquired through market-functioning programs should be explicitly earmarked for liquidation once market functionality is adequately restored. Furthermore, they suggest that in situations where the launch and unwinding of market functioning purchases by central banks create challenging trade-offs with monetary policy objectives, fiscal authorities might be better positioned to execute these market functioning purchases. This could be done through buybacks of coupon securities funded either by new debt issuances—likely in the form of bills—or by using the fiscal authority's cash balances held at the central bank or some combination of these sources.[34] Duffie and Keane (2023) argue that fiscal authorities can gradually exit their market-functioning buybacks by adjusting their issuances to realign with their target Weighted Average Maturity (WAM) over time.

Our bill-tilted Treasury portfolio approach shares similarities with the "fiscal buyback" proposal, albeit through the Fed purchasing rather than the UST buying-back securities. Conceptually, our approach is analogous to the UST issuing a larger share of bills and leveraging their natural turnover to prepare for potential large-scale "buybacks." The bills-tilted portfolio takes the UST's Treasury issuance decisions as given and adjusts the SOMA holdings towards bills to achieve similar flexibility for future large-scale purchases in case of market dysfunction.

As noted by Duffie and Keane, having market-functioning purchases conducted by the fiscal authority offers important benefits by affording greater protection to central bank independence and averting questions of fiscal or financial dominance that might be raised by the alternative of central-bank purchases. Operational capacity, however, may be a reason for the Fed to undertake purchases rather than the UST buying back securities. The Fed has previously undertaken sizable volumes of asset purchases in short periods of time—for example, when it purchased about $850 billion of Treasury securities over the last two weeks of March 2020. In contrast, UST buybacks have been much more modest. Since mid-August 2025, the UST's liquidity buyback program has conducted weekly buybacks with the maximum volume of $38 billion for the quarter. This was an increase from $30 billion, in place since July

[34] Such purchases would be like those of the UST's buyback program—launched in May of 2024—which has involved modest amounts of buybacks to support market liquidity, rather than being intended to be used to mitigate episodes of acute market stress. The two types of buyback operations conducted are cash management buybacks and liquidity support buybacks. Cash management buybacks involve short-dated coupon securities (4-week to 2-year maturity sector only), are expected to be variable, and only undertaken during periods of high tax inflows with the Treasury's motivation being to reduce the volatility in its cash balance and bill issuance. Liquidity support buybacks are intended to bolster market liquidity by establishing a regular and predictable opportunity for market participants to sell off-the-run Treasury securities.

2024, with the program ramping up to this level from $15 billion per quarter starting May 2024, to ensure that any "settlement process limitations" were addressed. In its July 2025 Quarterly Refunding Statement, the UST conveyed that it intends to continue to evaluate ways to enhance its buyback program.[35]

8. Conclusion and key takeaways

Our paper examines whether the FOMC may be better prepared to undertake market functioning supporting Treasury securities purchases by choosing in advance a particular longer-run maturity composition of its SOMA Treasury portfolio. We explore a portfolio that tilts securities holding toward Treasury bills and away from a proportionate portfolio—the portfolio that is often thought of as the benchmark maturity composition portfolio. This tilting is motivated by the resulting greater churn of securities and larger volume of reinvestments each month that can serve as a "war chest" for undertaking market-functioning asset purchases. Importantly, these purchases could be made without expanding the size of the Fed's balance sheet, potentially helping to distinguish purchases for market functioning supporting reasons from purchases for financial conditions easing reasons. Furthermore, these purchases can be made without increasing the quantity of reserves, avoiding the need for close monitoring of reserves when asset purchases are unwound and when reserves are being returned to an ample level.

Our calculations consider the degree to which the SOMA portfolio might be tilted beyond the proportionate portfolio and toward bills to generate a large enough volume of reinvestments each month to serve as a war chest for market-functioning asset purchases. These calculations depend on assumptions relating to policymakers' perceptions of the distribution of potential stressed Treasury securities sales and their preferences regarding what fraction of this distribution the war chest should be able to cover. As expected, these calculations find that policymakers preferring to cover a larger range of the distributions of stressed Treasury sales would want a relatively larger war chest and that policymakers viewing the Fed's most recent Treasury securities purchases of March 2020 as less far out in the right tail of sales would also want a relatively larger war chest. In some cases, the tilt of the portfolio toward bills is sizable—around 40 percent bills, double the share implied by the proportionate portfolio. Given the difficulty in gauging likely distributions of stressed Treasury securities sales and needed purchases, we view these calculated percentages as primarily illustrative.

We also examine the return of the SOMA Treasury portfolio, after a market stress, back to its pre-stress composition, thereby restoring the monthly war chest. Our calculations estimate how long this might take if the monthly war chest is fully depleted to purchase coupon securities during the stress episode and then restored passively—through purchasing

[35] For these buyback amounts, see the UST's web-site for the press releases for the May 2024, July 2024, and July 2025 Quarterly Refunding Statements.

bills in the secondary market using the proceeds of maturing coupon securities that have similar maturities to those purchased more heavily during the market stress. We find that if the pre-stress/longer-run desired composition of the SOMA Treasury portfolio was that of the proportionate scenario, it would take about two-and-a-half years for the SOMA portfolio to be restored via a passive approach. If the desired composition of the SOMA portfolio were tilted more toward bills—at 30 or 40 percent of the portfolio—it would take four or five-and-a-half years. Although instances of large SOMA purchases being undertaken to support Treasury market functioning are rare, the multiple years required to return the SOMA Treasury portfolio back to its pre-stress composition suggest that consideration of asset sales may be appropriate following purchases undertaken for market functioning supporting reasons.

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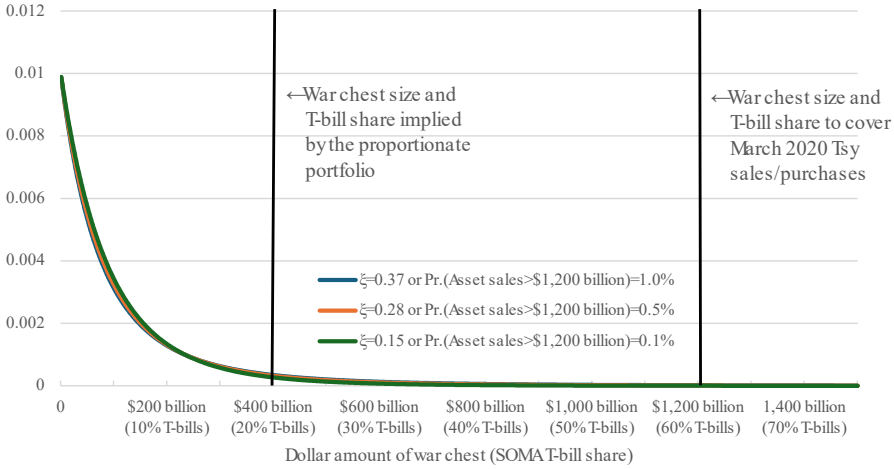
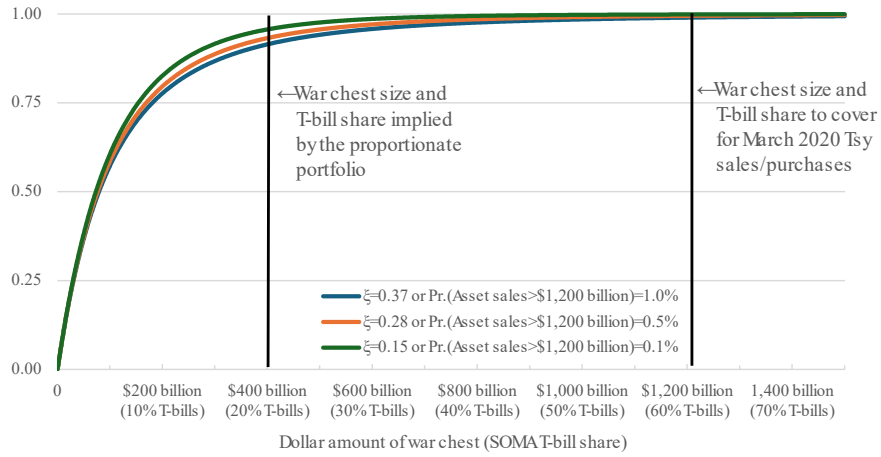
Appendix

Figure A.1: Generalized Pareto distributions for μ=0, σ=100, and different values of ξ

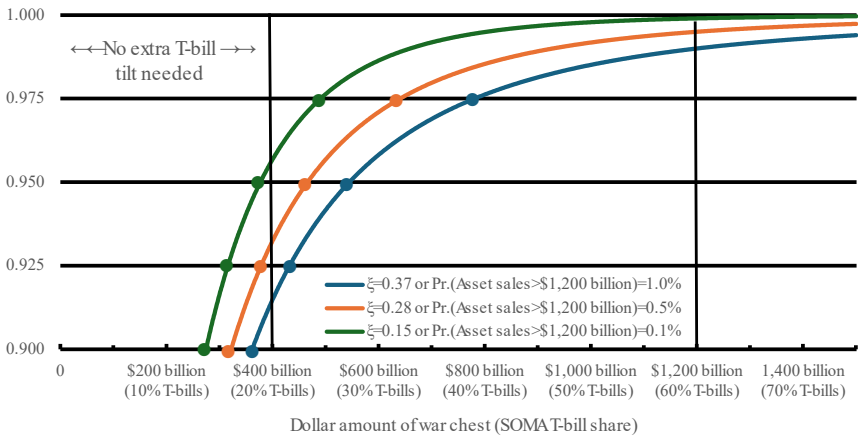
Panel (a): Probability density functions (PDFs) of the Pareto distributions in Table 1



Panel (b): Cumulative distribution functions (CDFs) of the Pareto distributions in Table 1



Panel (c): CDFs of the Pareto distributions in Table 1 over the upper 10th percentile



Notes: Each cell in Table 1 describing the T-bill tilt/share required for the war chest is represented by a dot in panel (c).
Sources: See source information provided for Table 1.

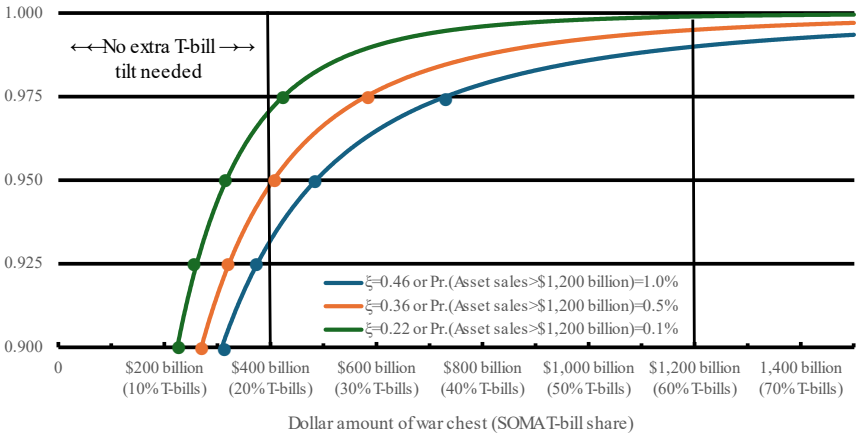
Table A.1: Illustration of different bills tilts needed for the war chest given various combinations of policymaker perception and preference assumptions

	Policymaker perception as to what percentile (i.e., how far out in the right tail) March 2020 private-sector Treasury sales/Fed purchases were		
	99. 0th percentile	***99.5th percentile***	***99.9th percentile***
	Parameters of generalized Pareto distribution		
	μ=0, σ=75, & ξ=0.4619	*μ=0, σ=75, & ξ=0.3612*	*μ=0, σ=75, & ξ=0.2167*
	Percentile of Treasury sales that the proportionate portfolio war chest would cover		
	91.6th percentile	93.3rd percentile	95.7th percentile
	Required bills tilt depending on the percentile of Treasury sales the policymaker wants the war chest to cover (points plotted in figure A.2, panel (a))		
90.0th pctl.	● No extra tilt → 20% Share	● No extra tilt → 20% Share	● No extra tilt → 20% Share
92.5th pctl.	● No extra tilt → 20% Share	● No extra tilt → 20% Share	● No extra tilt → 20% Share
95.0th pctl.	● 5 p.p. extra tilt → 25% Share	● 1 p.p. extra tilt → 21% Share	● No extra tilt → 20% Share
97.5th pctl.	● 17 p.p. extra tilt → 37% Share	● 10 p.p. extra tilt → 30% Share	● 2 p.p. extra tilt → 22% Share
	Parameters of generalized Pareto distribution		
	μ=0, σ=100, & ξ=0.37	*μ=0, σ=100, ξ =0.28*	*μ=0, σ=100, ξ =0.15*
	Percentile of Treasury sales that the proportionate portfolio war chest would cover		
	91.6th percentile	93.3rd percentile	95.7th percentile
	Required bills tilt/bills share depending on the percentile of Treasury sales the policymaker wants the war chest to cover (points plotted in figure A.2, panel (b))		
90.0th pctl.	● No extra tilt → 20% share	● No extra tilt → 20% share	● No extra tilt → 20% share
92.5th pctl.	● 2 p.p. extra tilt → 22 % share	● No extra tilt → 20% share	● No extra tilt → 20% share
95.0th pctl.	● 8 p.p. extra tilt → 28% share	● 4 p.p. extra tilt → 24% share	● No extra tilt → 20% share
97.5th pctl.	● 20 p.p. extra tilt → 40% share	● 13 p.p. extra tilt → 33% share	● 5 p.p. extra tilt → 25% share
	Parameters of generalized Pareto distribution		
	μ=0, σ= 125, & ξ=0.2877	*μ=0, σ= 125, & ξ=0.2058*	*μ=0, σ= 125, & ξ=0.0905*
	Percentile of Treasury sales that the proportionate portfolio war chest would cover		
	91.6th percentile	93.3rd percentile	95.7th percentile
	Required bills tilt/bills share depending on the percentile of Treasury sales the policymaker wants the war chest to cover (points plotted in figure A.2, panel (c))		
90.0th pctl.	● 1 p.p. extra tilt → 21% share	● No extra tilt → 20% share	● No extra tilt → 20% share
92.5th pctl.	● 5 p.p. extra tilt → 25% share	● 2 p.p. extra tilt → 22% share	● No extra tilt → 20% share
95.0th pctl.	● 10 p.p. extra tilt → 30% share	● 7 p.p. extra tilt → 27% share	● 2 p.p. extra tilt → 22% share
97.5th pctl.	● 22 p.p. extra tilt → 42% share	● 15 p.p. extra tilt → 35% share	● 8 p.p. extra tilt → 28% share

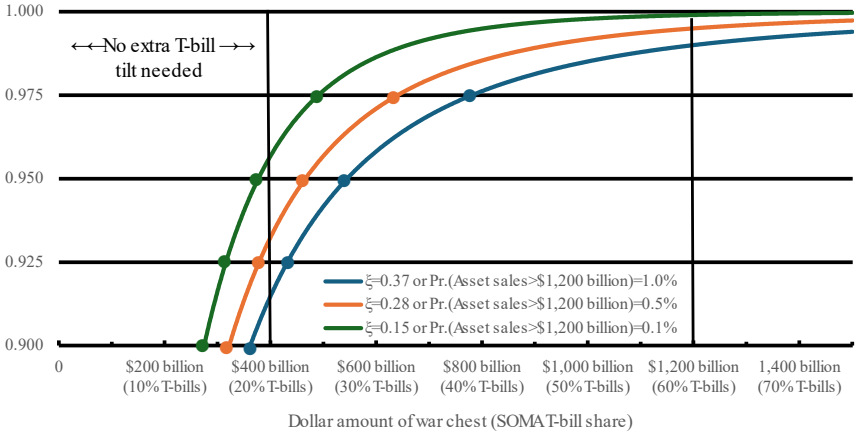
Source: See source information provided for Table 1.

Figure A.2: Generalized Pareto CDFs for μ=0 and different values of σ and ξ

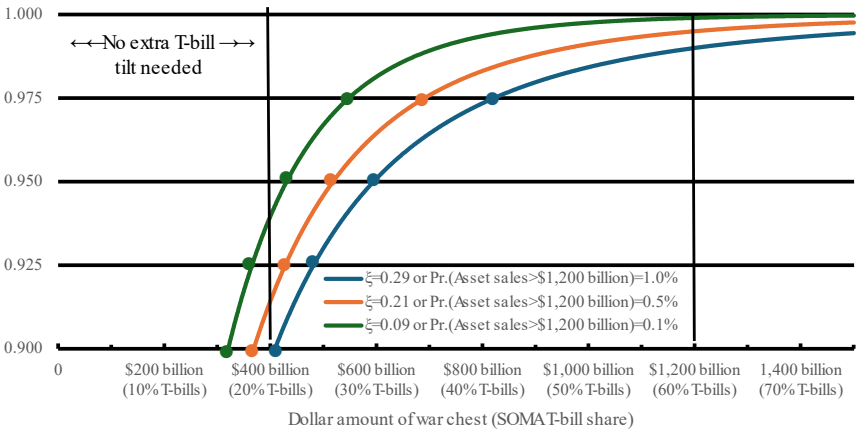
Panel (a): CDF for σ=75 and different values of ξ



Panel (b): CDF for σ=100 and different values of ξ



Panel (c): CDF for σ=125 and different values of ξ



Source: See source information provided for Table 1.