The Safe-Debt Laffer Curve

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Abstract

I study how the financial costs of producing safe public debt limit net safe-asset supply, combining a model with new estimates of marginal Treasury absorption cost. I construct a quarterly measure using cash-Treasury and real-duration premia and estimates of how additional supply reprices the outstanding stock. This cost rose from 86 to 223 basis points between 2015Q1 and 2026Q2, with stock repricing accounting for 174 basis points of the 2026Q2 cost. Payments for supporting public debt are income to their recipients, whose saving generates demand for safe assets. As debt expands relative to financial capacity, the payments generated by further issuance can induce more demand than the new debt supplies, producing a safe-debt Laffer curve. In an illustrative household calculation, the estimated increase in absorption costs over this period reduces the marginal net contribution of issuance from 66 to 11 cents per dollar.

JEL Codes: E43, E44, E52, E62, H63, G12, G23.

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1 Introduction

Safe public debt can alleviate safe-asset shortages and support aggregate demand (Caballero and Farhi, 2018). Producing safe debt, however, requires more than a creditworthy issuer. Financial institutions provide the human capital, funding, and balance-sheet capacity needed to finance and trade the debt, support its rollover, and bear its price risk. As public debt expands relative to this capacity, institutions require greater compensation for these services. I study how these production requirements limit the ability of public debt issuance to alleviate safe-asset scarcity in the long run, after the outstanding stock has been rolled over at the new financing terms.

I combine new estimates of Treasury absorption costs with a model of household demand for safe assets to assess how much net supply additional public debt creates. The estimates measure the payments generated by issuance, while the model determines how much demand for safe assets arises from the income these payments provide. Although issuance raises gross safe-asset supply dollar for dollar, rising absorption costs can eventually induce more demand than the additional debt supplies. This produces a safe-debt Laffer curve: net safe-asset supply rises with public debt at low debt levels but falls as debt expands sufficiently relative to financial capacity.

The same mechanism limits the expansionary effect of safe public debt. At a given safe rate, additional issuance raises aggregate demand at low debt levels, but this effect weakens as debt expands relative to financial capacity and reverses beyond the Laffer peak. The equilibrium safe rate therefore rises with issuance below the peak and falls above it, offsetting these changes in demand.

Quantifying this mechanism requires estimating the additional annual absorption payments generated by debt issuance. The annual compensation per dollar of debt is the absorption premium. The Treasury's all-in funding rate equals the safe rate earned by households plus this premium. An additional dollar of debt requires compensation for the new claim and raises the compensation paid on the outstanding stock as it is rolled over. I call the resulting increase in steady-state annual payments the marginal absorption cost. Because the higher premium eventually applies to the outstanding stock, this marginal cost can be substantial even when the premium on the new claim is small.

I construct a quarterly measure of marginal Treasury absorption cost by combining cash-Treasury and real-duration premia with estimates of their responses to Treasury supply outside the Federal Reserve. I interpret Treasury–swap spreads as cash financing and warehousing compensation net of convenience, and use estimates of the real term premium for duration compensation. I estimate the cash-supply response from changes in Federal Reserve holdings across maturity buckets, allowing it to vary with financial capacity at Treasury dealers' holding companies. I estimate the duration response from purchase and runoff announcements, using dealer surveys to measure anticipated purchases. Applying these responses to nominal Treasury notes and bonds held outside the Federal

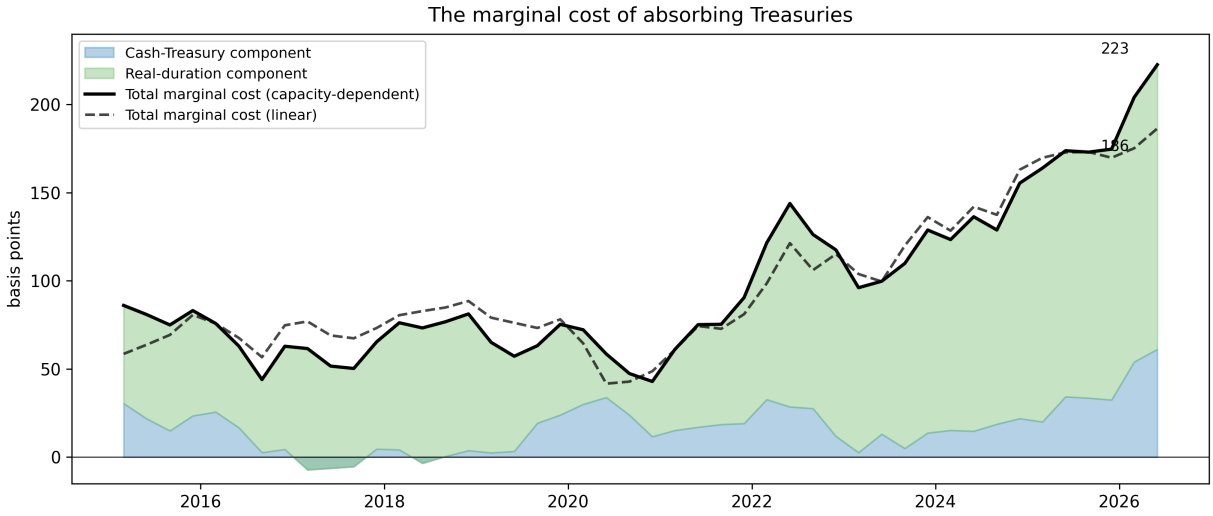


Figure 1: Marginal Treasury absorption cost. The solid line allows the cash-supply response to vary with dealer-parent capacity; the dashed line uses the constant cash-supply response estimated from the sample beginning in 2015. Both series end in 2026Q2. Shading separates the cash-Treasury component, the cash premium plus its stock-repricing term, from the real-duration component, the real term premium plus its stock-repricing term. Entries are annualized basis points. Section 2 describes the construction.

Reserve captures the additional annual payment associated with repricing the outstanding stock through rollover.

I estimate that marginal Treasury absorption cost rose from approximately 86 to 223 basis points between 2015Q1 and 2026Q2, an increase of 137 basis points. In 2026Q2, repricing the outstanding stock accounts for 174 of the 223 basis points. The premium on new debt alone therefore substantially understates the annual payment generated by additional issuance once the stock has rolled over.

Figure 1 presents quarterly estimates under two empirical specifications described in Section 2. The solid line corresponds to the estimates reported above, while the dashed line shows the alternative series. Both show a substantial increase in marginal absorption cost over the period. The blue and green shaded areas decompose the solid line into its cash-Treasury and real-duration components, respectively, each including the premium level and its stock-repricing term. The real-duration component accounts for most of the increase.

To relate these costs to net safe-asset supply, I develop a stationary perpetual-youth endowment economy with financial institutions and two household groups: high-net-worth households and other households. High-net-worth households have a lower marginal propensity to consume out of wealth than other households. Financial institutions commit to rolling over debt without knowing how much capacity other institutions will supply. They require compensation for the risk that rollover needs

exceed available capacity, with larger potential shortfalls requiring more compensation. Longer maturity reduces rollover needs but increases bond-price sensitivity to changes in yields. Institutions reserve additional capital against this price exposure, adding a duration premium. These rollover and price exposures make the compensation required per dollar of debt rise as debt expands relative to financial capacity.

The payments for these services accrue to the high-net-worth household group. Both groups hold safe government debt and consume out of financial wealth and the present value of lifetime income. In the baseline, absorption payments are nontradable lifetime income. At a given safe rate, the capitalization of higher payments raises consumption by less than the additional income. Steady-state consumption must equal total income, including interest receipts, so recipients' desired safe holdings also rise. The lower their propensity to consume out of wealth, the larger the increase in holdings needed to make consumption consistent with the higher income. This strong demand response means that even a small annual payment generated by new debt can substantially offset the safe-asset supply it creates. Appendix SC relaxes the nontradability assumption and shows that the same mechanism operates with tradable claims when compensation for duration risk limits their capitalization.

Net safe-asset supply is the debt stock less the desired holdings induced by absorption income. At low debt, additional issuance supplies more safe assets than its absorption payments generate in demand. As marginal absorption costs rise, each additional dollar of debt generates more income for recipients and a larger demand for safe holdings. The Laffer peak occurs when an additional dollar of debt induces exactly one dollar of desired holdings. Beyond this point, induced demand exceeds additional issuance and net supply declines. The market-clearing safe rate reaches its maximum at the same debt stock as net safe-asset supply. Greater financial capacity raises this maximum by reducing the required absorption payments and the demand they generate.

In an illustrative calculation with an annual marginal propensity to consume out of wealth of 2 percent for high-net-worth recipients, the estimated 2015Q1–2026Q2 increase in marginal absorption cost reduces the marginal net contribution of issuance from approximately 66 to 11 cents per dollar.

The saving out of absorption payments that offsets new safe-asset supply also has an aggregate-demand interpretation (Caballero and Farhi, 2018). With taxes fixed, additional debt raises private wealth and consumption, while its debt service and absorption payments require lower government purchases. Recipients consume part of the additional absorption income, partially offsetting the associated fiscal contraction. At sufficiently high debt, the contraction exceeds the consumption generated by additional wealth and income. A lower safe rate restores goods-market clearing, just as it reduces desired holdings to clear the asset market.

Literature Review. Caballero and Farhi (2018) show how issuing safe public debt can alleviate safe-asset shortages and support economic activity. Caballero, Farhi, and Gourinchas (2008, 2016, 2017, 2021) study how safe-asset scarcity depresses safe rates and contributes to global imbalances and recessions. The mechanism is related to models in which a shortage of stores of value leads to low real rates, high valuations, bubbles, and macroeconomic fragility (Caballero, 2006, 2015). Auclert, Malmberg, Rognlie, and Straub (2025) connect asset supply, U.S. wealth, real rates, and fiscal sustainability. Related work studies Treasury safety and liquidity premia (Krishnamurthy and Vissing-Jorgensen, 2012), the supply and maturity of short safe claims (Greenwood, Hanson, and Stein, 2015; D'Avernas and Vandeweyer, 2024), and reserve-currency supply under limited intermediary capacity (Maggiori, 2017; Farhi and Maggiori, 2018). Itskhoki and Mukhin (2026) examine global asset supply and demand, and Jiang, Krishnamurthy, Lustig, and Richmond (2026) study the macroeconomic consequences of declining reserve-currency demand. Brunnermeier, Merkel, and Sannikov (2024) derive debt-capacity limits from the fiscal value of convenience yields. Here, scarce financial capacity generates payments in excess of safe-rate debt service. Saving out of these payments creates demand for safe assets that can exceed the additional supply.

In convenience-yield models, safety and liquidity services enter preferences or constraints, generating downward-sloping Treasury demand and a convenience yield that falls with supply (Krishnamurthy and Vissing-Jorgensen, 2012). In fiscal applications, dilution of the premium on outstanding debt can produce an interior revenue or debt-capacity peak (Brunnermeier, Merkel, and Sannikov, 2024; Mian, Straub, and Sufi, 2025; Li and Merkel, 2026). The peak studied here concerns debt net of the safe holdings induced by absorption income. Convenience dilution also enters my marginal absorption cost through the decline in the convenience yield on the outstanding stock. Rising balance-sheet costs add a second source of stock repricing.

On the demand side, Barro (1974) provides the Ricardian benchmark, while Blanchard (1985) and Weil (1989) show how finite horizons shape private wealth demand. Straub (2019) uses non-homothetic preferences to explain why permanently richer households save a larger fraction of income. The aggregate-demand interpretation connects to Mian, Straub, and Sufi (2021), who link payments to high savers to lower aggregate demand and interest rates, including when public debt is financed through lower government spending. Their intermediation extension also assigns spread income to savers. In this paper, absorption payments rise with debt relative to financial capacity, and additional issuance raises the payments on outstanding debt as it is rolled over. Mian, Straub, and Sufi (2025) further connect saving behavior, public debt, and low rates. Work on self-financing fiscal expansions (Angeletos, Lian, and Wolf, 2024), feedback among debt, distortions, and productivity (Fornaro and Wolf, 2025), and expansionary fiscal adjustment (Giavazzi and Pagano, 1990; Alesina and Perotti, 1997) studies other channels through which fiscal policy affects aggregate demand.

Caballero (2010) emphasizes the financial system's role in accommodating demand for safe assets. Du, Hébert, and Li (2023) show how dealer balance-sheet and financing costs shape Treasury yields, while He, Nagel, and Song (2022) connect the March 2020 Treasury inconvenience yield to supply pressure on constrained dealer balance sheets. Kashyap, Stein, Wallen, and Younger (2025) study how growing Treasury supply and leveraged intermediation increase market fragility. These costs enter the model's cash-Treasury absorption premium, net of convenience benefits. The payments they require generate demand for safe assets through recipients' saving.

He, Krishnamurthy, and Milbradt (2019) show how investors' rollover decisions, debt size, and demand for safe assets jointly determine sovereign debt safety. In my model, participation determines each institution's exposure to rollover shortfalls and hence the compensation required to commit capacity.

Greenwood, Hanson, and Stein (2015) study the tradeoff between the monetary services of short government debt and the fiscal risk from rolling it over at uncertain future interest rates. Vayanos and Vila (2021) show how maturity-specific demand and risk-averse arbitrageurs determine bond risk premia. For institutions absorbing debt, longer maturity reduces rollover needs but increases exposure to bond-price changes; their required compensation reflects both effects.

The measurement relates to estimates of the effect of debt and fiscal positions on government yields (Laubach, 2009; Gruber and Kamin, 2012; Gamber and Seliski, 2019; World Bank, 2026) and to high-frequency evidence on fiscal news, Treasury supply, term premia, inflation, and convenience yields (Gómez-Cram, Kung, and Lustig, 2024, 2025). I combine supply-response estimates with observed premium levels to measure the marginal absorption cost of additional debt. Recent evidence points to a decline in the convenience of Treasury securities, particularly at medium and long maturities. Jiang, Richmond, and Zhang (2025) connect this decline to the expansion of Treasury supply. Krishnamurthy and Chumbo (2026) find that dollar repo has high convenience, while the global richness of dollar safe assets, particularly Treasuries, has fallen.

Section 2 defines and measures marginal Treasury absorption cost. Section 3 develops household demand and the financial system's absorption schedule. Section 4 derives the safe-debt Laffer curve, studies financial capacity and maturity, and presents the aggregate-demand interpretation. Section 5 combines the measured costs and household response to quantify the net contribution of issuance. The appendices provide detailed proofs, data construction, and supporting results.

2 Measuring U.S. Treasury Absorption Costs

Financing and warehousing Treasury debt require balance-sheet and funding resources, and holders also bear bond-price risk. As issuance expands relative to financial capacity, compensation can rise

on new claims and on outstanding debt as it is rolled over. I measure the resulting marginal annual payment as the sum of cash-Treasury and real-duration components.

2.1 The marginal absorption cost

The net annualized Treasury absorption premium is $s = s^R + s^D$, where s^R is cash-Treasury compensation net of liquidity, collateral, and transaction services, and s^D is compensation for real-duration exposure. In the real model, the Treasury's all-in funding rate is $r + s$, where r is the safe rate. For a stock b of safe government debt, annual absorption payments after rollover at current terms are

$$S = bs. \tag{1}$$

Holding the safe rate, financial capacity, and maturity composition fixed, the marginal absorption cost is

$$S_b = s + bs_b = \left(s^R + bs_b^R\right) + \left(s^D + bs_b^D\right). \tag{2}$$

The premium levels compensate for absorbing the additional claim; the terms bs_b^R and bs_b^D capture the increase in annual payments on the outstanding stock after rollover at the new terms. A low premium on the marginal claim can therefore coexist with a substantial marginal absorption cost when issuance reprices a large stock.

The empirical stock consists of nominal Treasury notes and bonds held outside the Federal Reserve, including foreign official holdings. Premium levels and stock-repricing terms are reported in annualized basis points. The empirical exercise compares 2015Q1, the first quarter for which the capacity measure is available, with 2026Q2.

2.2 The two premium levels

The quarterly cash-Treasury premium, s_t^R, is the Treasury par yield minus the maturity-matched par swap rate. An interest-rate swap provides duration exposure without requiring an investor to finance and warehouse a cash Treasury security. I interpret the spread as compensation for cash-Treasury financing and warehousing, net of convenience relative to the swap benchmark (Du, Hébert, and Li, 2023; Krishnamurthy and Chumbo, 2026). The model represents these absorption services through commitments to roll over debt.

The spreads use a consistent London Interbank Offered Rate (LIBOR) basis, with the Secured Overnight Financing Rate (SOFR) plus the contractual fallback after June 2023. For the premium level, I interpolate quarterly-average spreads at two, five, ten, and thirty years to each security's remaining maturity and weight by quarter-end nominal notes and bonds held outside the Federal Reserve. Appendix A gives the market-series and maturity conventions. The resulting cash-Treasury

premium rises from −18.3 basis points in 2015Q1 to 2.0 basis points in 2026Q2. The negative initial spread means that convenience benefits exceeded financing and warehousing compensation.

I use the D'Amico–Kim–Wei (DKW) real term premium (D'Amico, Kim, and Wei, 2018) to measure compensation for the real-duration risk studied in the model. DKW jointly prices nominal and inflation-indexed Treasuries and separates compensation for real-duration risk from inflation-risk compensation. To construct s_t^D, I linearly interpolate or extrapolate its five- and ten-year estimates to the average remaining maturity of nominal Treasury notes and bonds, weighted by the stock held outside the Federal Reserve. I then average the daily estimates within each quarter. The real-duration premium rises from 7.3 basis points in 2015Q1 to 46.3 basis points in 2026Q2.

Together, the two premia rise by 59.3 basis points (Table 1).

Table 1: Measured Treasury absorption premia

Date	Cash-Treasury s_t^R	Real duration s_t^D	Total s_t
2015Q1	−18.3	7.3	−11.0
2026Q2	2.0	46.3	48.3
2015Q1–2026Q2	20.4	39.0	59.3

Notes: Entries are annualized basis points. Cash-Treasury premia are debt-weighted Treasury par yields minus maturity-matched par swap rates. Real-duration premia are debt-weighted DKW real term premia. Totals and changes are computed before rounding.

2.3 Cash-Treasury repricing

I estimate the cash-spread response to an increase in the stock held outside the Federal Reserve. Following the purchase-allocation evidence in D'Amico and King (2013), identification uses Federal Reserve holdings across two-, three-, five-, seven-, ten-, and thirty-year maturity buckets. At horizon h, measured in months, I estimate by ordinary least squares (OLS)

$$\Delta_h s_{m,t}^R = \phi_m + \psi_t + \beta_h \Delta_h share_{m,t} + \varepsilon_{m,t}. \tag{3}$$

Here m indexes maturity buckets, t the starting month, and Δ_h the change from t to $t+h$. The variable $share_{m,t}$ is the percentage of bucket debt held in the Federal Reserve's System Open Market Account (SOMA). The coefficient β_h is in basis points of spread per percentage-point increase in that share. Maturity effects ϕ_m absorb persistent differences across tenors, and start-month effects ψ_t absorb aggregate news and curve-wide repricing.

Identification comes from relative changes in holdings and spreads across maturity buckets with the same starting month. The supply interpretation requires these relative holdings changes to be

uncorrelated with other maturity-specific spread shocks, conditional on the fixed effects. The sample omits observations with starting months from March through June 2020. With $\beta_h < 0$, transferring debt from the Fed to other holders raises the Treasury–swap spread.

Let $w_{m,t}$ be bucket m's share of notes and bonds held outside the Fed, and $\varpi_{m,t}$ the fraction of bucket debt held in SOMA, equal to $share_{m,t}/100$. Marginal issuance follows the existing maturity distribution. The conversion treats each dollar of issuance as supply-equivalent to a transfer from SOMA at fixed bucket outstanding, giving the cash-Treasury stock-repricing term, the empirical counterpart of bs_b^R:

$$\mathscr{M}_{h,t}^R = -100\,\beta_h \sum_m w_{m,t}(1-\varpi_{m,t}). \tag{4}$$

The factor $\sum_m w_{m,t}(1-\varpi_{m,t})$ weights each maturity bucket's fraction held outside the Fed by its share in the portfolio. It converts the response to a percentage-point change in the SOMA share into the response to a proportional increase in the stock held outside the Fed. The factor is 0.781 in 2015Q1 and 0.840 in 2026Q2. Appendix A derives the conversion.

I measure persistent repricing by averaging the estimates over horizons $h = 12, \ldots, 24$ months and omit h when reporting this average. Adjacent outcome windows overlap, so inference uses Driscoll–Kraay/Newey–West standard errors with 24 monthly lags. In a linear specification beginning in 2015, the average slope is approximately -0.27, implying a 2026Q2 repricing term of 23 basis points. The corresponding estimates are 40 basis points for the sample beginning in 2010 and 32 basis points for the instrumental-variables (IV) specification in Table S2. The linear specifications hold the cash-supply slope fixed; the preferred specification allows it to depend on financial capacity.

2.4 Financial capacity and the capacity-dependent specification

Limited financial capacity can make Treasury spreads more sensitive to additional supply. I measure capacity variation using balance-sheet room and Treasury inventories at Treasury dealers' holding companies. Let k be a common leverage-ratio threshold, $T1_{i,t}$ dealer parent i's Tier 1 capital, $LE_{i,t}$ its leverage exposure, and $UST_{i,t}$ its Treasury inventory. The financial-capacity index $N_t(k)$ is

$$N_t(k) = \sum_i \left(\frac{T1_{i,t}}{k} - LE_{i,t} \right) + \sum_i UST_{i,t}. \tag{5}$$

Adding Treasury inventory to balance-sheet room measures both capacity already devoted to Treasuries and room for additional holdings. The preferred index applies a common 5 percent threshold to every dealer parent with the required data; a second index uses 6 percent. These common thresholds put dealer-parent balance sheets on a comparable scale. Let $\widetilde{N}_t$ denote the chosen index standardized using its estimation-sample mean and standard deviation. Monthly

capacity interpolates the quarterly regulatory measure using dealer-parent market equity while preserving quarterly means. Appendix A describes the data and regulatory conventions.

I allow the supply response to depend on financial capacity:

$$\Delta_h s^R_{m,t} = \phi_m + \psi_t + \beta_h \Delta_h share_{m,t} + \gamma_h \left(\Delta_h share_{m,t} \times \widetilde{N}_t \right) + \varepsilon_{m,t}. \tag{6}$$

At capacity level $\widetilde{N}_t$, the spread response to the SOMA share is $\beta_h + \gamma_h \widetilde{N}_t$. Because a higher SOMA share reduces the stock held outside the Fed, a positive γ_h means that capacity attenuates the spread response to issuance. Under the 5 percent threshold, the averages over $h = 12, \ldots, 24$ are $\beta_h = -0.24$ and $\gamma_h = 0.19$, with Driscoll–Kraay/Newey–West t-statistics for the interaction between 2.4 and 2.9. Under the 6 percent threshold, the interaction is also positive but its t-statistics range from 1.0 to 1.6.

The 2026Q2 index is \$7.527 trillion, or -2.45 estimation-sample standard deviations. Replacing β_h in (4) by $\beta_h + \gamma_h \widetilde{N}_t$ gives the capacity-dependent repricing term. The effective slope is -0.70, giving a cash-Treasury repricing term of 59.1 basis points. In 2015Q1, the capacity index is \$7.772 trillion, or -2.03 estimation-sample standard deviations, giving an effective slope of -0.63 and a repricing term of 48.8 basis points. The number of dealer parents with the required data rises from nine to sixteen across these dates. Among the eight parents present at both endpoints, fixed-rule capacity falls from \$7.632 trillion to \$6.421 trillion. Changes in firm coverage therefore attenuate the decline in measured capacity and, through the estimated interaction, the increase in cash-Treasury repricing costs. Supplemental Appendix SA reports the coefficient paths and IV results.

2.5 Real-duration repricing

I estimate the response of the real-duration premium to supply using twelve Federal Reserve purchase and runoff announcements. For each announcement e, let Δs^D_e denote the two-trading-day change in the DKW real term premium. I estimate

$$\Delta s^D_e = c_D + \beta_D Amount_e + u_e. \tag{7}$$

The variable $Amount_e$ measures the revision in cumulative Federal Reserve Treasury purchases, in billions of dollars. I subtract anticipated purchases, measured from New York Fed dealer surveys where available and the policy in place otherwise, from announced or assigned cumulative amounts. Positive values indicate more Federal Reserve holdings than expected, including slower-than-expected runoff. Monthly paths are cumulated over a common horizon; Appendix A.3 documents the construction and the dollar equivalents used for open-ended announcements. Interpreting the

slope as a supply response assumes that these amounts capture unanticipated purchase news and that other news affecting real term premia is uncorrelated with them.

For the debt-weighted, average-maturity DKW real term premium, the estimate with an intercept is

$$\beta_D \simeq -0.0064$$

basis points per billion dollars. Here b_t^{priv} is the stock of nominal Treasury notes and bonds held outside the Federal Reserve, measured in billions of dollars. Federal Reserve purchases reduce the stock held outside the Fed, so additional issuance has the opposite sign. The implied increase in annual payments on that stock after rollover is the empirical counterpart of bs_b^D:

$$\mathscr{M}_t^D = -\beta_D b_t^{priv}. \tag{8}$$

The dollar specification applies the same per-dollar premium response at both dates. The stock held outside the Fed rises from \$7.525 trillion in 2015Q1 to \$17.954 trillion in 2026Q2. Applying the estimated premium response to this larger stock raises the duration-repricing term from 48.3 to 115.2 basis points.

Using leverage-adjusted, heteroskedasticity-robust (HC3) inference, the 95 percent confidence interval for β_D implies a 2026Q2 duration-repricing term between -203 and 433 basis points (Table 6). Leave-one-event-out estimates imply 85–245 basis points; excluding the two March 2020 announcements gives 683 basis points.

Dividing the assigned purchase amounts by the contemporaneous stock held outside the Fed gives a share-normalized specification. It assigns the same premium response to a given percentage increase in supply. A given dollar amount therefore has a smaller effect in a larger market, giving a stock-repricing term of 99.5 basis points at both dates. With this term, marginal absorption cost rises by approximately 70 basis points between 2015Q1 and 2026Q2, compared with 137 in the dollar specification.

Using the ten-year DKW premium produces a 2026Q2 duration-repricing term of 163 basis points. This alternative emphasizes long-duration price sensitivity.

2.6 Accounting for the increase

Marginal issuance preserves the maturity distribution of notes and bonds held outside the Fed at each date. Combining the measured premium levels and stock-repricing terms gives

$$S_{b,t} = s_t^R + s_t^D + \mathscr{M}_t^R + \mathscr{M}_t^D. \tag{9}$$

Table 2: Marginal Treasury absorption cost

Component	Construction	2015Q1	2026Q2
Cash-Treasury premium, s_t^R	Treasury par yields minus maturity-matched par swap rates, weighted by notes and bonds held outside the Fed.	−18.3	2.0
Real-duration premium, s_t^D	DKW real term premia from nominal and inflation-indexed yields, mapped to the maturity of notes and bonds held outside the Fed.	7.3	46.3
Cash-Treasury repricing, $\mathscr{M}_t^R$	Capacity-dependent response of spreads to Fed-share changes across maturity buckets, converted to a per-dollar supply response and multiplied by the stock held outside the Fed.	48.8	59.1
Real-duration repricing, $\mathscr{M}_t^D$	Two-day DKW premium responses to purchase surprises measured around Fed purchase and runoff announcements estimate the premium increase per billion dollars of additional Treasury supply held outside the Fed. Multiplying by the outstanding stock in billions of dollars gives the stock-repricing term.	48.3	115.2
Marginal cost, $S_{b,t}$	Sum of the four components.	86.1	222.6

Notes: Entries are annualized basis points. The cash-Treasury response uses an OLS interaction between Fed-share changes and dealer-parent financial capacity, measured under a common 5 percent leverage threshold. The duration estimate uses the debt-weighted average-maturity DKW premium. The stock consists of nominal Treasury notes and bonds held outside the Federal Reserve, including foreign official holdings. Table S4 reports the linear estimates. Sums use unrounded components.

Table 2 reports each component's construction and estimates. The preferred specification combines capacity-dependent cash-Treasury repricing estimated by OLS with the average-maturity duration estimate. Marginal absorption cost rises from 86.1 basis points in 2015Q1 to 222.6 in 2026Q2, an increase of approximately 137 basis points.

Higher premium levels contribute 59.3 basis points to the increase in marginal cost. Growth in the stock held outside the Fed raises the duration-repricing term by 66.9 basis points, while lower measured capacity acting through the cash-supply interaction, together with changes in maturity weights, adds 10.3. The linear specification estimated on the sample beginning in 2015 gives a cost increase of 127.9 basis points. Supplemental Appendix SA.2 compares the specifications and decomposes the linear increase.

Table S3 varies the duration term with the capacity-dependent cash-Treasury estimate held fixed. The resulting 2026Q2 marginal absorption costs range from 207 to 271 basis points, with the average-maturity estimate at 223 basis points.

2.7 A local calculation at the 2026 borrowing pace

Further debt accumulation raises marginal absorption cost even with unchanged financial capacity. I illustrate the local magnitude using the Congressional Budget Office's projected fiscal-year 2026 borrowing pace. CBO projects a $1.9 trillion deficit, approximately $70 billion of additional borrowing from other financing activities, and $32.1 trillion of debt held by the public at the end of the fiscal year (Congressional Budget Office, 2026). Relative to that end-of-year stock, net borrowing is approximately 6.1 percent. The illustration applies the same proportional increase to notes and bonds held outside the Fed, holding maturity composition, the Federal Reserve share, and financial capacity fixed.

The conversion from SOMA shares expresses the cash estimate as the spread response to a proportional increase in supply. With the cash regression coefficients, maturity weights, and Federal Reserve shares held fixed, $\mathscr{M}^R = bs_b^R$ therefore remains constant, so $s_b^R = \mathscr{M}^R/b$. The duration coefficient is estimated per dollar, so its conversion holds s_b^D constant. Since $S_b = s^R + s^D + \mathscr{M}^R + \mathscr{M}^D$, the resulting local change is

$$dS_b \simeq \left(\mathscr{M}^R + 2\mathscr{M}^D\right)\frac{db}{b}. \tag{10}$$

The factor of two arises because additional debt increases the duration premium on the new claim by $s_b^D db$ and raises the stock-repricing term bs_b^D by the same amount. In the cash specification, bs_b^R is held fixed under the local conversion, so only the cash premium itself increases.

The 2026Q2 terms, 59.1 and 115.2 basis points, imply approximately 2.9 basis points of additional marginal cost per 1 percent increase in debt, or 18 basis points at the 6.1 percent borrowing ratio. Supplemental Appendix SA gives the beginning-stock and share-normalized comparisons.

3 The Model

I consider a stationary perpetual-youth endowment economy in which financial institutions support safe public debt and households demand it as a store of wealth. Payments for the institutions' absorption services enter recipients' income and therefore their desired safe holdings.

3.1 Environment and government budget

Output is normalized to one; debt, financial wealth, and annual income flows are expressed in these output units. Let N denote effective financial capacity in the model. At a given debt stock, financial capacity, and maturity, the safe rate r adjusts to clear markets. Let S denote annual absorption

payments, as in (1). Section 3.4 derives their dependence on debt, capacity, maturity, and the safe rate.

The government finances debt service and absorption payments through lower purchases. Let $\bar{\tau}$ be a fixed annual tax flow and g government purchases. The government's stationary budget is

$$g = \bar{\tau} - rb - S. \tag{11}$$

3.2 Household consumption and saving

There are two unit-mass household groups: high-net-worth households, indexed by I, and other households, indexed by H. Both receive endowment income and hold safe government debt earning the safe rate r. The absorption premium is paid to institutions, and all income generated by their Treasury absorption services accrues to group I.

Effective horizons are represented by a perpetual-youth structure. Members of group j die with Poisson intensity $\lambda_j > 0$ and are replaced one-for-one by newborns with zero financial wealth. They discount utility at rate $\rho > 0$ and have logarithmic flow utility. I take $\lambda_I < \lambda_H$, so absorption-income recipients have longer effective horizons. Actuarially fair annuity markets operate within each group: the safe-asset holdings of members who die are transferred to the surviving members of the same group.

Let $a_{j,t}$ and $c_{j,t}$ be group j's aggregate safe financial wealth and consumption at time t. Let $y_{j,t}$ be its nontradable income flow and $h_{j,t}$ the capitalized value of that income while a member remains alive. Each member has a nontransferable entitlement that expires at death; newborns receive their own income streams. At a constant safe rate and income flow, $h_j = y_j/(r+\lambda_j)$. Household portfolios consist of safe claims. Appendix B derives this portfolio choice as the limit of a portfolio problem in which households become arbitrarily averse to rollover losses.

Logarithmic preferences imply consumption proportional to financial wealth and capitalized income. The aggregate budget and consumption rule are

$$\dot{a}_{j,t} = r_t a_{j,t} + y_{j,t} - c_{j,t}, \tag{12}$$

$$c_{j,t} = (\rho + \lambda_j)(a_{j,t} + h_{j,t}). \tag{13}$$

Annuity credits to survivors offset the removal of deceased members' assets, so aggregate financial income is ra_j. The annual marginal propensity to consume (MPC) out of financial wealth is $m_j^w \equiv \rho + \lambda_j$. At a given safe rate and current wealth, a permanent increase in nontradable income

raises consumption through its capitalized value h_j. The corresponding MPC is

$$m_j(r) \equiv \frac{\partial c_j}{\partial y_j}\bigg|_{a_j,r} = \frac{\rho+\lambda_j}{r+\lambda_j}. \tag{14}$$

In a stationary allocation, consumption equals total income, $ra_j + y_j$. The consumption rule therefore determines desired financial wealth per unit of permanent income, $\kappa_j(r)$:

$$a_j = \kappa_j(r) y_j, \qquad \kappa_j(r) = \frac{r-\rho}{(r+\lambda_j)(\rho+\lambda_j-r)}. \tag{15}$$

Positive stationary wealth requires $\rho < r < \rho + \lambda_j$. The lower bound gives positive saving from permanent income; the upper bound ensures that excess financial wealth is spent down. Within this interval, $\kappa_j'(r) > 0$: a higher safe return raises saving from income and slows the spending of accumulated wealth, increasing desired stationary holdings.

The household MPC in (14) and the stationary wealth–income ratio are linked by

$$\kappa_j(r)\big(\rho+\lambda_j-r\big) = 1 - m_j(r) = \frac{r-\rho}{r+\lambda_j}. \tag{16}$$

At unchanged financial wealth, consumption absorbs the fraction $m_j(r)$ of an additional unit of permanent income. In steady state, the remaining income must be matched by consumption out of additional safe holdings, net of the interest they earn. Each unit of these holdings raises consumption by $\rho + \lambda_j$ and interest income by r, so their desired stock equals the unconsumed share divided by $\rho + \lambda_j - r$. A low wealth MPC makes this net spending rate small and can generate a large demand for safe assets from a modest income flow.

3.3 Income and market clearing

Let $x_H > 0$ and $x_I > 0$ denote the groups' fixed after-tax endowment incomes. Both groups pay taxes, with

$$x_H + x_I = 1 - \bar{\tau}. \tag{17}$$

Group I receives the Treasury absorption payment as part of its nontradable lifetime income. The two groups' total nontradable incomes are

$$y_H = x_H, \qquad y_I = x_I + S. \tag{18}$$

I consider allocations with positive income flows and nonnegative government purchases.

Government debt is the private sector's net safe financial asset. Asset-market clearing requires

$$b = a_H + a_I = \kappa_H(r)x_H + \kappa_I(r)(x_I + S). \tag{19}$$

Conditional on positive income flows, desired safe wealth is continuous and strictly increasing from zero to infinity over $\big(\rho, \rho + \min\{\lambda_H, \lambda_I\}\big)$. For a given absorption payment, equation (19) therefore determines a unique stationary safe rate for each $b > 0$.

In a stationary allocation, the household and government budgets imply

$$c_H + c_I + g = 1 + r(a_H + a_I - b). \tag{20}$$

With asset-market clearing, goods-market clearing is $c_H + c_I + g = 1$.

The costs of committing balance-sheet capacity are nonpecuniary and do not consume output. The payment S cancels from the resource identity because it is a transfer from the government to private recipients. It changes desired safe holdings by changing recipients' income.

3.4 Treasury absorption payments

Annual absorption payments depend on debt, financial capacity, maturity, and the safe rate. The level of these payments determines recipients' income, while their marginal cost determines the income generated by an additional dollar of debt.

Rollover compensation net of convenience services and compensation for duration exposure are the model counterparts of the cash-Treasury and real-duration premia measured in Section 2.

3.4.1 Rollover and financial capacity

First suppose the full debt stock is rolled over during a unit interval. A unit mass of institutions has combined ordinary rollover capacity N when all participate. Institutions decide whether to participate before knowing how many others will do so. Participating institutions divide the rollover commitments equally and must meet them even when this requires support beyond their ordinary capacity, at a nonpecuniary balance-sheet cost. The premium compensates institutions for this uncertain exposure. Since the shortfall per unit of capacity depends on debt relative to capacity, the gross rollover-support spread is a function of b/N:

$$\pi^R(b, N) = p\left(\frac{b}{N}\right). \tag{21}$$

To derive the schedule, let $q = b/N$ and let $\alpha \in [\underline{\alpha}, 1]$ be the fraction of institutions supplying ordinary capacity, where the fraction $\underline{\alpha} \in (0, 1)$ always participates. The remaining institutions

choose whether to participate in response to the offered compensation and their opportunity costs; I call these institutions elastic. Active capacity is αN, and each participant supports b/α. The rollover shortfall per unit of active capacity is

$$\zeta(q,\alpha) = \frac{[b-\alpha N]_+}{\alpha N} = \left[\frac{q}{\alpha} - 1\right]_+.$$

Here $[u]_+ = \max\{u, 0\}$. Let $\Gamma(\zeta)$ be the annual compensation per dollar required to support this exposure, with $\Gamma(0) = 0$, $\Gamma' > 0$ for positive stress, and $\Gamma'' \geq 0$. It measures the nonpecuniary cost of expanding commitments beyond ordinary capacity. Lower participation raises each active institution's exposure and required compensation.

Each elastic institution observes $z_i = \theta + \eta\varepsilon_i$, where θ is a common additive opportunity-cost shock, $\eta > 0$ scales signal noise, and the independent noises have a continuous distribution F with a positive log-concave density and finite first absolute moment. The prior over θ is flat. A cutoff strategy with participation when $z_i \leq z^*$ gives

$$\alpha(\theta; z^*) = \underline{\alpha} + (1-\underline{\alpha})F\left(\frac{z^*-\theta}{\eta}\right).$$

Conditional on the marginal signal $z_i = z^*$, the probability integral transform makes α uniform on $[\underline{\alpha}, 1]$. The Treasury chooses its spread to procure a fixed interior participation share when $\theta = 0$; this keeps z^*/η fixed as noise vanishes. In the small-noise limit, marginal indifference therefore equates exposure-weighted compensation and support cost:

$$\int_{\underline{\alpha}}^{1} \left[\pi^R - \Gamma\left(\left[\frac{q}{\alpha} - 1\right]_+\right)\right] \frac{d\alpha}{\alpha} = 0.$$

Lemma 1 (Rollover-support pricing)**.** *Under the information and procurement assumptions above, the small-noise limit of the gross rollover-support spread is $\pi^R = p(q)$, where*

$$p(q) = \frac{1}{\log(1/\underline{\alpha})} \int_{\underline{\alpha}}^{1} \Gamma\left(\left[\frac{q}{\alpha} - 1\right]_+\right) \frac{d\alpha}{\alpha}. \tag{22}$$

The premium is an exposure-weighted average of support costs across possible participation shares. Appendix C derives the finite-noise quote and establishes the cutoff equilibrium. The premium is zero for $q \leq \underline{\alpha}$. Above this threshold, a positive set of participation shares requires additional support, so $p' > 0$. Because each state's cost is convex in utilization and the averaging

weights are fixed, $p'' \geq 0$.

$$\pi^R_b = \frac{p'(q)}{N} > 0, \qquad \pi^R_N = -\frac{qp'(q)}{N} < 0,$$
$$\pi^R_{bb} = \frac{p''(q)}{N^2} \geq 0, \qquad \pi^R_{bN} = -\frac{p'(q)+qp''(q)}{N^2} < 0. \tag{23}$$

Capacity lowers both utilization and the change in utilization caused by a unit of debt, accounting for the negative debt-capacity interaction. The supply-capacity interaction in Section 2 measures the latter property.

Cash Treasuries also provide liquidity, collateral, and transaction services relative to maturity-matched swaps. Let $\nu(b) > 0$ denote this convenience value, with $\nu'(b) < 0$ as additional supply reduces scarcity. The annualized net cash-Treasury spread is

$$s^R(b,N) = \pi^R(b,N) - \nu(b). \tag{24}$$

I assign the net cash payment bs^R to group I; the participation mechanism determines the gross compensation component π^R. Additional debt lowers the convenience value and raises balance-sheet utilization, so $s^R_b > 0$. Since ν is independent of N, $s^R_{bN} = \pi^R_{bN} < 0$. The cash-supply coefficient at mean capacity contains both convenience dilution and balance-sheet pressure; its interaction with financial capacity isolates the capacity-dependent part.

In the short-maturity economy, $s = s^R$, the Treasury's all-in funding rate is $r + s^R$, and the absorption payment is $S(b,N) = b\,s^R(b,N)$. Its marginal cost is

$$S_b(b,N) = s^R(b,N) + b\,s^R_b(b,N). \tag{25}$$

Marginal absorption cost combines the spread on the new claim with the increase in payments on the outstanding stock.

Convexity of the absorption payment, which Section 4.2 uses to obtain a unique peak, is a restriction on gross support and convenience together. In this short-maturity economy,

$$S_{bb} = \frac{2p'(q)+qp''(q)}{N} - 2\nu'(b) - b\nu''(b).$$

Increasing, convex support costs make the first term positive in the active region. Convenience dilution contributes $-2\nu' - b\nu''$, whose sign depends on its curvature. The Laffer result applies over debt ranges where the sum is positive.

For the schematic illustration in Figure S5, I use a quadratic support premium that extends the local approximation derived in Appendix C.3:

$$\pi^R(b,N) = \frac{\phi}{2}\left[\frac{b}{N} - \bar{q}\right]_+^2, \qquad \phi > 0, \tag{26}$$

where $\bar{q} > 0$ is the utilization threshold and ϕ scales curvature above it. Balance-sheet stress begins at $\widehat{b}(N) = \bar{q}N$, with a continuous marginal absorption cost at the threshold.

3.4.2 Maturity and rollover needs

Let $\delta > 0$ be the Poisson maturity intensity of each unit of debt. Average maturity is $1/\delta$. Denote by $\mu(\delta)$ the probability that an inherited claim matures during a unit-length interval:

$$\mu(\delta) = 1 - e^{-\delta}. \tag{27}$$

I measure support exposure by $\mu(\delta)b$, the stock of positions outstanding at the start of the interval that mature during it, with each position counted once. This exposure approaches the full debt stock as δ increases.

With finite maturity, the gross rollover-support spread is

$$\pi^R(b,N,\delta) = p\left(\frac{\mu(\delta)b}{N}\right). \tag{28}$$

The active-region properties extend to $\pi^R_b > 0$, $\pi^R_N < 0$, $\pi^R_\delta > 0$, $\pi^R_{bN} < 0$, and $\pi^R_{\delta N} < 0$. Shorter maturity increases rollover pressure, while capacity attenuates its effect on the spread.

I hold the convenience value fixed when varying maturity to isolate the tradeoff between rollover pressure and duration exposure. The net cash-Treasury component continues to subtract the convenience value:

$$s^R(b,N,\delta) = \pi^R(b,N,\delta) - \nu(b). \tag{29}$$

Hence $s^R_b = \pi^R_b - \nu' > 0$ and, when convenience services are independent of N, $s^R_{bN} = \pi^R_{bN} < 0$.

In the participation model, stress begins when $\mu(\delta)b/N = \underline{\alpha}$, so $\widehat{b}(N,\delta) = \underline{\alpha}N/\mu(\delta)$. In the quadratic illustration, the corresponding threshold is $\bar{q}N/\mu(\delta)$.

3.4.3 Duration compensation

Longer maturity increases bond-price sensitivity to changes in yields. For a bond with a fixed coupon and principal repaid at Poisson maturity, with intensity δ and all-in yield $r + s(b,N,\delta;r)$,

price is proportional to

$$\frac{1}{r+s(b,N,\delta;r)+\delta}. \tag{30}$$

The claim's yield duration is $D = 1/(r+s+\delta)$. Let σ_y^2 be the annualized variance of yield innovations; the associated local return variance is $\sigma_y^2 D^2$. Institutions reserve capital against this price risk. With $\chi(N) > 0$ denoting the capital requirement per unit of variance relative to ordinary support, duration exposure requires $\chi(N)\sigma_y^2 D^2$ times the resources committed to rollover support.

Both uses face the same state-dependent cost of committing capacity. The duration requirement therefore multiplies support costs in every participation state by the same factor, and multiplies the gross premium by that factor as well. Define $\vartheta(N) = \chi(N)\sigma_y^2$, with $\chi_N < 0$ capturing the lower capital intensity of price exposure when capacity is abundant. The additional duration premium is

$$s^D(b,N,\delta;r) = \frac{\vartheta(N)}{[r+s(b,N,\delta;r)+\delta]^2}\pi^R(b,N,\delta). \tag{31}$$

The total Treasury absorption premium, $s = s^R + s^D$, satisfies

$$s = -\nu(b) + \pi^R(b,N,\delta)\left[1 + \frac{\vartheta(N)}{(r+s+\delta)^2}\right]. \tag{32}$$

Higher all-in yields shorten duration, so including the total premium in the denominator moderates the amplification of gross rollover pressure. Equation (32) determines the premium conditional on the safe rate. Since $S = bs$, it must be solved together with asset-market clearing (19) to determine equilibrium.

The admissible domain is

$$r+s+\delta > 0. \tag{33}$$

Conditional on r, the pricing equation has a unique solution on this domain when $\pi^R > 0$: its right-hand side decreases from infinity toward a finite limit as s rises, while its left-hand side increases. When $\pi^R = 0$, the solution is $s = -\nu(b)$, provided the duration denominator remains positive.

The pricing fixed point implies

$$\begin{aligned} s_b &= \frac{-\nu' + (1+\vartheta D^2)\pi_b^R}{1+2\vartheta\pi^R D^3} > 0, \\ s_N &= \frac{(1+\vartheta D^2)\pi_N^R + \pi^R D^2 \vartheta_N}{1+2\vartheta\pi^R D^3} \leq 0, \\ s_r &= -\frac{2\vartheta\pi^R D^3}{1+2\vartheta\pi^R D^3} \leq 0. \end{aligned} \tag{34}$$

These partial derivatives hold maturity fixed. The capacity effect is strictly negative in the active support region and zero when gross support compensation is zero. Capacity lowers both rollover compensation and its duration amplification. For maturity, the same calculation yields

$$s_\delta = \frac{(1+\vartheta D^2)\pi^R_\delta - 2\vartheta\pi^R D^3}{1+2\vartheta\pi^R D^3}.$$

The first term in the numerator is the higher compensation required for more debt reaching rollover; the second is the reduction in duration compensation. Thus shorter maturity has an ambiguous effect on the total premium. As δ becomes large, the exposed share approaches one and duration amplification vanishes, recovering the short-maturity benchmark.

The annual absorption payment is therefore

$$S(b,N,\delta;r) = b\,s(b,N,\delta;r). \tag{35}$$

Its marginal cost is $S_b = s + bs_b$, with r, N, and δ fixed. At a fixed debt stock, $S_N = bs_N \leq 0$ because greater capacity lowers the required payment, and $S_r = bs_r \leq 0$ because a higher safe rate shortens duration and reduces duration compensation. The cash-supply interaction $s^R_{bN} < 0$ follows from the rollover block.

4 The Safe-Debt Laffer Curve

4.1 Debt issuance and safe-asset demand

The debt stock supplies b units of safe assets, while absorption income generates $\kappa_I(r)S$ units of desired holdings. With maturity δ fixed, let $r(b,N)$ denote the market-clearing safe rate. Net safe-asset supply is the debt stock less these induced holdings:

$$\mathscr{B}(b,N) \equiv b - \kappa_I(r(b,N))S(b,N,\delta;r(b,N)). \tag{36}$$

In equilibrium, this balance equals desired holdings generated by households' endowment income. The safe-debt Laffer curve is the equilibrium schedule $b \mapsto \mathscr{B}(b,N)$. Below, S and its partial derivatives are evaluated at $(b,N,\delta;r(b,N))$; partial derivatives hold the other arguments fixed.

At a given safe rate, an additional unit of annual absorption income raises group I's desired holdings by $\kappa_I(r)$. A unit of additional debt therefore supplies one unit of safe wealth and induces $\kappa_I(r)S_b$ units of desired holdings. The marginal net contribution is $1-\kappa_I(r)S_b$.

Differentiating asset-market clearing (19) gives

$$r_b = \frac{1 - \kappa_I(r) S_b}{\kappa_H'(r) x_H + \kappa_I'(r)(x_I + S) + \kappa_I(r) S_r}. \tag{37}$$

The numerator is the marginal net contribution of issuance. The denominator is the response of aggregate desired holdings to the safe rate along the absorption-pricing schedule. A higher rate raises desired wealth per unit of income through the two κ_j' terms. It also shortens duration and lowers absorption payments, reducing group I's income and desired holdings through $\kappa_I S_r$.

I consider continuous equilibrium branches on which the direct wealth-demand response dominates this income feedback, so the denominator is positive. In the short-maturity limit, $S_r = 0$ and positivity follows from $\kappa_j' > 0$. When the marginal net contribution is positive, the safe rate rises to induce households to hold the additional supply. When induced demand exceeds issuance, the safe rate falls to reduce desired holdings and restore market clearing. The numerator measures the supply pressure before that adjustment; in the new equilibrium, desired holdings again equal the outstanding debt stock.

Asset-market clearing also gives

$$\mathscr{B}(b,N) = \kappa_H(r(b,N)) x_H + \kappa_I(r(b,N)) x_I. \tag{38}$$

Consequently,

$$\mathscr{B}_b(b,N) = \left[\kappa_H'(r) x_H + \kappa_I'(r) x_I\right] r_b. \tag{39}$$

Because the bracket is positive, net safe-asset supply is a strictly increasing transformation of the safe rate across stationary allocations with the same endowment incomes. The marginal contribution $1 - \kappa_I(r) S_b$ measures additional supply net of induced demand before the rate adjusts; the slope $\mathscr{B}_b$ also incorporates that adjustment. Both change sign at the same debt stock.

The marginal contribution reaches zero when $\kappa_I(r) S_b = 1$. Equivalently, the marginal absorption cost reaches $1/\kappa_I(r)$. Define the absorption-cost margin as this critical cost less the marginal absorption cost:

$$\mathscr{G}(b,N) \equiv \frac{1}{\kappa_I(r(b,N))} - S_b. \tag{40}$$

Both terms are annual rates. Section 2 estimates marginal absorption cost; household consumption and saving determine the critical value. Net safe-asset supply rises with debt when $\mathscr{G} > 0$ and falls when $\mathscr{G} < 0$.

Two groups allow recipients' wealth–income ratio to exceed the aggregate ratio. With a single household type, market clearing would require $b = \kappa(r)(1 - \bar{\tau} + S)$, fixing the critical cost at

$$\frac{1}{\kappa(r)} = \frac{1 - \bar{\tau} + S}{b}.$$

With two groups, aggregate wealth demand determines a weighted combination of κ_H and κ_I, while the response to absorption income depends on κ_I alone. Concentrating that income among high savers allows its marginal wealth-demand effect to exceed the aggregate wealth–income ratio.

4.2 The Laffer peak

Suppose the absorption-cost margin is positive at low debt and becomes negative within the range of feasible allocations, with $S_{bb} > 0$ throughout. This is the partial curvature of absorption payments with respect to debt, holding the safe rate, capacity, and maturity fixed. Net safe-asset supply initially rises with debt and reaches its peak at the stock b^L satisfying

$$\frac{1}{\kappa_I(r(b^L, N))} = S_b = s + b^L s_b, \tag{41}$$

where the absorption premium and its partial derivatives are evaluated at $(b^L, N, \delta; r(b^L, N))$. At the peak, each additional unit of debt generates exactly one unit of desired safe holdings through absorption income.

Proposition 1 (Safe-debt Laffer curve)**.** *Consider a continuous equilibrium branch on which the denominator in (37) is positive, both income flows remain positive, and government purchases are nonnegative. Suppose there is a low debt stock $\underline{b}$ at which $\mathscr{G}(\underline{b}, N) > 0$. If there is a debt stock $\bar{b} > \underline{b}$ such that $S_{bb} > 0$ throughout $[\underline{b}, \bar{b}]$ and*

$$\kappa_I(r(\bar{b}, N)) S_b(\bar{b}, N, \delta; r(\bar{b}, N)) > 1,$$

then there is a unique $b^L(N) \in (\underline{b}, \bar{b})$ satisfying (41). Within this debt range, additional supply exceeds induced demand and net safe-asset supply rises below $b^L(N)$; above it, induced demand exceeds the additional supply and net safe-asset supply falls. The net safe-asset supply schedule has a strict maximum at $b^L(N)$. The market-clearing safe rate reaches its maximum at the same debt stock.

Existence follows from continuity. At every zero of $1 - \kappa_I(r) S_b$, equation (37) gives $r_b = 0$, so the numerator has slope $-\kappa_I(r) S_{bb} < 0$. Hence every crossing is downward. Equation (39) then establishes a unique strict maximum of net safe-asset supply. At a candidate peak, the safe rate and

thus the critical cost are locally unchanged. Convex absorption payments make the next unit of debt more costly to absorb, so the induced demand overtakes the additional supply.

The rate adjustment also changes the distribution of debt. Below the peak, the higher rate raises group H's desired holdings. At the peak, its holdings are unchanged and group I absorbs the marginal claim. Beyond the peak, the lower rate reduces group H's holdings, so group I absorbs the new claim together with part of group H's previous holdings.

Remark 1 (The role of nontradable absorption income)**.** Absorption payments generate demand for safe assets when consumption out of their capitalized value falls short of the payments themselves. In the baseline, the entitlement expires at death, limiting its capitalized value. Supplemental Appendix SC allows recipients to trade a perpetual claim to S. There, owners require compensation for duration exposure, which limits capitalization and preserves the mechanism.

4.3 Financial capacity and maturity

At fixed maturity, more capacity moves the onset of additional rollover support outward because $\widehat{b}(N,\delta) = \underline{\alpha}N/\mu(\delta)$. In the active support region, it lowers both rollover compensation and its duration amplification, giving $S_N < 0$.

At a fixed debt stock, differentiating (19) with respect to capacity gives

$$r_N = -\frac{\kappa_I(r)S_N}{\kappa_H'(r)x_H + \kappa_I'(r)(x_I+S) + \kappa_I(r)S_r}. \tag{42}$$

On the equilibrium branch under consideration, the denominator is positive. Greater financial capacity reduces absorption income and the associated demand for safe holdings, increasing net safe-asset supply at the unchanged debt stock. The safe rate rises to restore market clearing. Using (38) and $\mathscr{B}_b = 0$ at a peak in the active support region gives

$$\frac{d\mathscr{B}(b^L(N),N)}{dN} = \left[\kappa_H'(r)x_H + \kappa_I'(r)x_I\right] r_N(b^L,N) > 0. \tag{43}$$

Capacity therefore raises the maximum net safe-asset supply.

The effect on the debt stock at the peak also depends on the marginal absorption cost. For the cash component, greater capacity lowers the supply sensitivity, $s^R_{bN} < 0$. The empirical interaction measures this property: additional debt raises the cash premium more when capacity is scarce. With duration compensation included, the response of total marginal cost also reflects the endogenous change in bond-price exposure.

Differentiating (41) yields

$$\frac{db^L}{dN} = \frac{-S_{bN} - \left[\dfrac{\kappa_I'(r)}{\kappa_I(r)^2} + S_{br}\right] r_N(b^L, N)}{S_{bb}}. \tag{44}$$

All terms are evaluated at the peak. The first term in the numerator is the direct capacity effect on marginal absorption cost. The higher equilibrium safe rate lowers the critical cost $1/\kappa_I$ and also changes marginal absorption cost through S_{br}. The peak debt stock rises when the combined effect makes the numerator positive. Its direction therefore depends on these responses, while the peak's height rises with capacity.

In the short-maturity schedule, $S_{br} = 0$ and $S_{bN} = \pi_N^R + b\pi_{bN}^R < 0$. Holding the safe rate, and hence the critical cost, fixed isolates the decline in marginal absorption cost. The crossing in Supplemental Figure S5 then moves outward at rate

$$-\frac{S_{bN}}{S_{bb}} > 0.$$

Holding the convenience value fixed, maturity changes both the quantity reaching rollover and its price exposure. A higher maturity intensity δ increases rollover needs but shortens duration. The total-payment response $S_\delta = bs_\delta$, derived from the pricing schedule in Section 3.4, combines these opposing effects. At fixed debt and capacity, market clearing gives

$$\begin{aligned} r_\delta &= -\frac{\kappa_I(r) S_\delta}{\kappa_H'(r) x_H + \kappa_I'(r)(x_I + S) + \kappa_I(r) S_r}, \\ \mathscr{B}_\delta &= \left[\kappa_H'(r) x_H + \kappa_I'(r) x_I\right] r_\delta. \end{aligned} \tag{45}$$

Whichever maturity change reduces absorption payments also reduces induced demand and raises net safe-asset supply. Its direction depends on the balance between rollover needs and duration exposure. Supplemental Appendix SB studies optimal maturity when uncertainty about future rollover conditions adds to the price cost of long debt.

4.4 The aggregate-demand interpretation

With taxes fixed, additional debt is private net wealth, and government purchases adjust to finance its debt service. At a given safe rate, a marginal claim held by group I raises private consumption by $\rho + \lambda_I$, while its debt service reduces government purchases by r. The resulting net wealth effect, $\rho + \lambda_I - r$, is positive within the admissible rate interval. Absorption payments require a further reduction in government purchases, while recipients consume only the fraction $m_I(r)$ of the

additional income. As marginal absorption cost rises, the reduction in government purchases net of recipients' additional consumption can exceed the positive net wealth effect of issuance. A high saved share strengthens this contraction; a low wealth MPC weakens the expansion from additional debt.

At a given safe rate, group H's income and desired holdings do not change with debt. Keeping this group at its desired holdings assigns the additional debt to group I, which also receives the additional absorption income. Holding financial capacity and maturity fixed, the marginal expenditure response is

$$\left.\frac{\partial(c_H + c_I + g)}{\partial b}\right|_{r,N,\delta} = (\rho + \lambda_I - r) - [1 - m_I(r)]S_b = (\rho + \lambda_I - r)\,[1 - \kappa_I(r)S_b]\,. \tag{46}$$

This expenditure response determines the direction of adjustment in the stationary equilibrium safe rate.

Expenditure declines with the safe rate on the positive-response branch considered here, including the effect of duration on absorption income (Appendix B.6). The rate rises to offset positive expenditure pressure and falls to offset negative pressure. Equation (46) has the same sign as the asset-market numerator in (37), so the two interpretations give the same reversal condition. Above the peak, the consumption generated by additional wealth and absorption income falls short of the reduction in government purchases required to finance debt service and absorption payments.

Finite horizons permit a stationary safe rate above the common discount rate. In the infinite-horizon limit with a common discount rate, a stationary interior allocation has $r = \rho$: consumption generated by an additional claim equals its debt service, and recipients consume the full permanent income increment.

5 Back-of-the-Envelope Calculations

To translate the estimated absorption costs into the net contribution of issuance, I combine them with recipients' desired safe holdings per dollar of permanent annual income.

5.1 Household saving and desired safe holdings

I assume an annual marginal propensity to consume out of wealth of 2 percent for the high-net-worth households receiving absorption income. Two estimates in Di Maggio, Kermani, and Majlesi (2020) help motivate this choice. Using Swedish administrative data, they estimate an annual consumption response of 2.1 cents per dollar of factor-related stock-market gains among households in the top

5 percent of financial wealth (Table XIII). For households with heads aged 41–55 in the top 10 percent, the response to portfolio capital gains is 1.8 cents per dollar (Table IX).[1]

With $m_I^w = 0.02$ and the common annual discount rate $\rho = 0.01$, the model implies $\lambda_I = 0.01$. I set the reference safe rate to $r_0 = 1.5$ percent, informed by the medium-run natural-rate estimate in Cúrdia (2026). Equation (15) then gives

$$\kappa_I(r_0) = \frac{r_0 - 0.01}{(r_0 + 0.01)(0.02 - r_0)} = 40. \tag{47}$$

Thus, an additional dollar of permanent annual absorption income raises desired safe holdings by $40 in steady state.

The consumption and income responses explain this magnitude. At the reference rate, a dollar of additional annual income raises consumption by 80 cents at unchanged financial wealth. Each additional dollar of safe holdings raises annual consumption by 2 cents and interest receipts by 1.5 cents. Stationary budget balance therefore requires $40 of additional holdings: the resulting 20 cents of consumption net of interest receipts absorbs the part of the income increment not consumed through capitalization.

5.2 The net contribution of additional issuance

An additional dollar of public debt supplies one dollar of safe assets. I assign the payments measured by $S_{b,t}$ to the high-saving group as permanent annual absorption income. The additional dollar of debt therefore generates $S_{b,t}$ dollars of annual income and $\kappa_I(r_0)S_{b,t}$ dollars of desired safe holdings. The marginal net contribution of issuance is

$$1 - \kappa_I(r_0)S_{b,t}. \tag{48}$$

The comparison evaluates desired holdings at r_0 for both dates, before the safe rate adjusts, so the change in the marginal net contribution comes entirely from measured absorption costs.

At the 2015Q1 marginal absorption cost of 86.1 basis points, an extra dollar of debt requires approximately 0.86 cent of additional annual payments. With $\kappa_I = 40$, these payments generate about 34 cents of desired safe holdings, leaving 66 cents of issuance net of induced demand. At the 2026Q2 cost of 222.6 basis points, the annual payment rises to 2.23 cents and the induced demand to approximately 89 cents, leaving 11 cents. With the assumed 2 percent annual wealth MPC, the

[1] Their pooled-age baseline estimate for the top 5 percent is 2.8 percent (standard error 0.7 percentage point); adding detailed demographic and financial controls gives 2.2 percent (Tables III and XI). Complementary U.S. evidence comes from Beach, Gamber, and Moran (2025), who estimate 0.8 percent for the top income quintile using aggregate consumption and total wealth by income group.

higher absorption cost reduces the marginal net contribution by about 55 cents per dollar, or 83 percent.

Table 3 reports this calculation alongside the 2.1 and 1.8 percent wealth MPCs motivated by the estimates above. Each row uses the same measured costs, reference safe rate, and discount rate; the model maps the wealth MPC into the corresponding permanent-income consumption response and desired holdings.

Table 3: Issuance net of induced safe-asset demand

Annual wealth MPC	$\kappa_I(r_0)$	2015Q1	2026Q2	Reduction
2 percent	40.0	65.6	11.0	54.6
2.1 percent	32.1	72.4	28.7	43.8
1.8 percent	72.5	37.6	−61.3	98.9

Notes: The last three columns report cents per dollar of issuance, computed from (48) using unrounded inputs. The dated columns evaluate the marginal net contribution at each date's estimated absorption cost; the final column reports their difference. Each row evaluates the household response at the reference safe rate, $r_0 = 1.5$ percent, with $\rho = 1$ percent and $\lambda_I = m_I^w - \rho$. The 2.1 and 1.8 percent cases use the wealth-MPC estimates described above; the model supplies their implications for permanent-income consumption and safe holdings.

Across these wealth MPCs, the increase in absorption costs substantially reduces the net contribution of issuance. Lower consumption out of wealth produces a larger desired stock of safe assets and a larger offset to new supply. In the 1.8 percent case, induced demand exceeds issuance at the 2026Q2 cost, giving a negative net contribution and a downward safe-rate response.

5.3 Net safe-asset supply as the debt stock expands

To trace net safe-asset supply as debt expands, I combine the 2026Q2 pricing and maturity inputs with a specified absorption schedule and household parameters. Financial capacity, maturity, household preferences, and taxes remain fixed as the debt stock varies, while the safe rate adjusts to clear the asset market.

I normalize annual output to one. On June 30, 2026, federal debt held by the public was $31.681 trillion, of which the Federal Reserve held $4.492 trillion (U.S. Department of the Treasury, 2026; Federal Reserve, 2026). The resulting $27.189 trillion outside the Fed includes bills, TIPS, floating-rate notes, and publicly held nonmarketable debt. Dividing by 2026Q2 annualized nominal GDP of $32.563 trillion gives $b_0 \simeq 0.835$ (Bureau of Economic Analysis, 2026). I set the annual tax flow to $\bar{\tau} = 0.25$, close to U.S. general-government tax revenue of 25.6 percent of GDP in 2024 (OECD, 2025).

Di Maggio, Kermani, and Majlesi (2020, Table III) estimate that households between the 5th and 50th percentiles of financial wealth consume 23.3 cents per dollar of capital gains. I round this annual wealth MPC to 23 percent for group H. With the common discount rate $\rho = 0.01$, this gives $\lambda_H = m_H^w - \rho = 0.22$.

The pricing schedule uses the participation model in Section 3.4.1, with a linear support assessment, $\Gamma(\zeta) = c_\Gamma \zeta$, and an inelastic participation share $\underline{\alpha} = 0.8$. The convenience value declines inversely with debt toward a 12-basis-point floor:

$$\nu(b) = 0.0012 + \nu_a \frac{b_0}{b}.$$

I use the nominal note-and-bond pricing moments and maturity as representative inputs for this broader debt stock. The average remaining maturity of nominal Treasury notes and bonds held outside the Federal Reserve is approximately 7.3 years in 2026Q2. Approximating maturity by the model's Poisson structure gives $\delta \simeq 0.137$ per year. Duration compensation follows (31) and enters the pricing fixed point (32).

The four 2026Q2 moments in Table 2 determine the remaining financial parameters: the cash and duration premia are 2.0 and 46.3 basis points, and their stock-repricing terms are 59.1 and 115.2 basis points. The premium levels imply $s_0 = 48.3$ basis points and, with the maturity intensity above, a reference duration $D_0 = (r_0 + s_0 + \delta)^{-1}$ of approximately 6.4 years. Matching these moments gives

$$c_\Gamma \simeq 0.00337, \qquad N_0 \simeq 0.0756, \qquad \nu_a \simeq 0.000569, \qquad \vartheta_0 \simeq 0.0577.$$

The duration premium and the two repricing terms determine baseline utilization and hence effective capacity N_0, accounting for the shortening of duration as yields rise. The cash premium and its repricing separate gross support compensation from convenience, determining c_Γ and ν_a; the level of the duration premium determines ϑ_0. The dealer-parent index measures variation in capacity. Appendix D and Supplemental Appendix SE report the calibration details and sensitivity calculations.

At the reference safe rate and absorption payment $S_0 = b_0 s_0$, asset-market clearing and $x_H + x_I = 1 - \bar{\tau}$ determine $x_I \simeq 0.0150$ and $x_H \simeq 0.7350$. Group I's high wealth–income ratio allows it to hold 91 percent of the debt with this small endowment income and the absorption payments it receives. These income allocations remain fixed along the curve; government purchases adjust to finance debt service and absorption payments.

Figure 2 shows net safe-asset supply rising from 67.4 percent of annual model output at the reference allocation to a maximum of 67.7 percent, reached at debt of 91.2 percent of output. Increasing debt by about 8 percent of annual output from the reference allocation adds only 0.3 percent of output to net safe-asset supply. The crossing in the left panel locates the peak in the right

panel: marginal absorption cost reaches the critical value $1/\kappa_I(r(b,N))$, and the desired holdings induced by the marginal dollar of debt absorb that dollar in full. Above that debt stock, induced demand exceeds additional issuance and net supply falls.

At the reference allocation, issuance contributes 11.0 cents per dollar before the safe rate adjusts, and this contribution reaches zero at the peak. Along the curve, changes in the market-clearing safe rate affect both desired holdings per dollar of absorption income and the duration component of absorption payments. The plotted slope, $\mathscr{B}_b$, incorporates these equilibrium responses and therefore differs in magnitude from the marginal net contribution $1-\kappa_I(r)S_b$. Both measures have the same sign and vanish at the same debt stock.

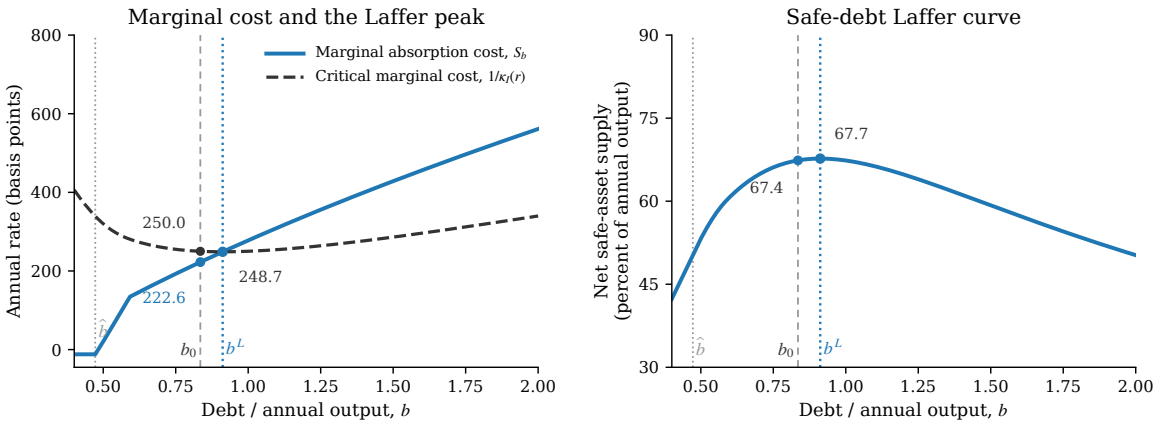


Figure 2: Marginal absorption cost and net safe-asset supply. The left panel plots marginal absorption cost and its critical value in annualized basis points. The right panel plots $100\mathscr{B}(b,N) = 100[b-\kappa_I(r(b,N))S]$, as a percentage of annual model output, evaluated at each debt stock's market-clearing safe rate. Its maximum occurs where marginal absorption cost equals its critical value. The illustration uses the pricing schedule and household parameters described in the text, with 2026Q2 pricing and maturity inputs and the measured reference debt ratio $b_0 \simeq 0.835$. Debt b is measured in units of annual model output. Vertical lines mark the onset of additional rollover support, $\widehat{b}$ (gray dotted), the reference stock b_0 (gray dashed), and the Laffer peak b^L (blue dotted).

6 Conclusion

I estimate that marginal Treasury absorption cost rose from approximately 86 to 223 basis points between 2015Q1 and 2026Q2. Repricing the outstanding stock accounts for 174 of the 223 basis points in 2026Q2. The premium on new debt alone therefore substantially understates the annual payment generated by additional issuance once the outstanding stock has rolled over.

These payments also create demand for safe assets. In the model, institutions require compensation for rollover commitments and duration exposure, and the payments accrue to households with a low propensity to consume out of wealth. Their desired safe holdings rise with absorption income. As debt expands relative to financial capacity, the payments generated by additional issuance can induce more demand than the new debt supplies. Net safe-asset supply and the market-clearing safe rate then decline. Greater financial capacity reduces the required payments and raises the maximum net safe-asset supply.

In the illustrative household calculation, the estimated increase in absorption costs between 2015Q1 and 2026Q2 reduces the marginal net contribution of issuance from approximately 66 to 11 cents per dollar.

A Empirical Construction

A.1 Data construction

Dealer-parent capacity uses the Federal Reserve's Consolidated Financial Statements for Holding Companies (FR Y-9C) and equation (5), assigning unused leverage room to potential Treasury absorption and adding existing Treasury inventory. Each fixed-rule measure is standardized separately using its estimation-sample moments. For the 5 percent measure, the twelve-month-horizon panel contains 119 starting months from January 2015 through March 2025, omitting March–June 2020 starting months. The estimation-sample mean and standard deviation are \$8.960 trillion and \$0.585 trillion.

The 5 and 6 percent thresholds are motivated by the former U.S. global systemically important bank (GSIB) holding-company and well-capitalized depository-subsidiary standards, respectively. Each index applies its chosen threshold uniformly to all reporting dealer parents, including those subject to different requirements. A final rule effective April 1, 2026 tied U.S. GSIB standards to firm-specific systemic-risk surcharges and capped the depository-subsidiary enhancement at one percentage point; banks could elect early adoption from January 1, 2026 (Federal Reserve Board, FDIC, and OCC, 2025). The empirical index retains fixed 5 and 6 percent requirements to measure balance-sheet room on a common scale over time. Its level is therefore a common-threshold capacity proxy.

The monthly capacity measure used in the interaction regression interpolates the quarterly regulatory measure using monthly changes in dealer-parent market equity. The interpolation preserves each quarterly regulatory mean, so leverage-room data determine the level of N_t. The 2026Q2 observation uses quarter-end FR Y-9C filings and the estimation-sample standardization moments. It covers sixteen dealer parents, compared with nine in 2015Q1. Eight appear at both endpoints; their fixed 5 percent capacity falls from \$7.632 trillion to \$6.421 trillion, while the corresponding full-sample values are \$7.772 trillion and \$7.527 trillion.

For cash-Treasury spreads, the two-, three-, five-, ten-, and thirty-year buckets use London Stock Exchange Group (LSEG) series identified by Reuters Instrument Codes (RICs), `US2IRS2Y=RR`, `US3IRS3Y=RR`, `US5IRS5Y=RR`, `US10IRS10Y=RR`, and `US30IRS30Y=RR`. The seven-year series uses the LSEG IRS-spread chain, `0#USIRSSPD=RR`, where available from February 7, 2017; missing observations are filled with the Treasury par yield from `US7YT=RR` minus the swap par rate from `USDSB3L7Y=`. All six series use a LIBOR-consistent basis: the floating leg is three-month U.S. dollar LIBOR before July 2023 and compounded Secured Overnight Financing Rate (SOFR) plus the fixed 26.161-basis-point contractual fallback thereafter.

The cash-premium level uses the two-, five-, ten-, and thirty-year anchors, with remaining maturity clipped to the two- to thirty-year range before linear interpolation. Quarter-end nominal

notes and bonds held outside the Federal Reserve determine the weights. I subtract Federal Reserve holdings at their remaining maturities using the last System Open Market Account observation in each month.

The duration component uses DKW real term premia at five and ten years (D'Amico, Kim, and Wei, 2018). Let $\overline{M}_t$ denote the average remaining maturity of nominal notes and bonds held outside the Federal Reserve, weighted by holdings after clipping each security's maturity to the one- to fifteen-year range. The daily mapped premium is the five-year estimate plus $(\overline{M}_t - 5)/5$ times the difference between the ten- and five-year estimates; the quarterly level averages this daily series. The mapped real term premium excludes inflation-risk compensation. I use the DKW data release covering observations through July 31, 2026. The June 30, 2026 stock held outside the Fed combines the June 30 Monthly Statement of the Public Debt (MSPD) stock with the June 24 SOMA observation.

The data sources in Table 4 are U.S. Department of the Treasury (n.d.); Federal Reserve Bank of New York (n.d.) for Treasury debt and Federal Reserve holdings, Federal Reserve Board (n.d.); Center for Research in Security Prices (n.d.) for capacity and monthly equity movements, and LSEG (n.d.); Kim, Walsh, and Wei (2019) for premia.

Table 4: Data sources for the empirical section

Series	Source	Frequency
Marketable debt, maturing share, and maturity buckets	Monthly Statement of the Public Debt and Treasury Fiscal Data	Monthly
Federal Reserve Treasury holdings by security	Federal Reserve SOMA holdings	Weekly/monthly
Tier 1 capital, leverage exposure, and Treasuries held by dealer parents	FR Y-9C regulatory filings	Quarterly
Treasury swap spreads	LSEG (RIC: 0#USIRSSPD=RR)	Daily
Real term premia	DKW estimates (D'Amico, Kim, and Wei, 2018)	Daily
Dealer-parent market equity	Center for Research in Security Prices (CRSP)	Daily

A.2 Cash-Treasury estimation and inference

Let m index maturity buckets, t starting months, and h horizons in months. The horizon change in a series x is

$$\Delta_h x_{m,t} = x_{m,t+h} - x_{m,t}.$$

Let $SOMA_{m,t}$ be SOMA holdings and $out_{m,t}$ total outstanding debt in bucket m. The Federal Reserve share is

$$share_{m,t} = 100 \times \frac{SOMA_{m,t}}{out_{m,t}}.$$

Thus β_h in (3) is basis points of spread per percentage-point increase in that share. Let $b_{m,t}^{priv}$ be notes and bonds held outside the Fed in the bucket, $b_t^{priv} = \sum_m b_{m,t}^{priv}$, and $w_{m,t} = b_{m,t}^{priv}/b_t^{priv}$. The SOMA share as a fraction is

$$\varpi_{m,t} = \frac{SOMA_{m,t}}{out_{m,t}}.$$

Allocate marginal issuance according to $db_{m,t}^{priv} = w_{m,t} db_t^{priv}$. At fixed bucket outstanding, a supply-equivalent transfer from SOMA implies

$$dshare_{m,t} = -100 \frac{db_{m,t}^{priv}}{out_{m,t}} = -100 \frac{w_{m,t}\, db_t^{priv}}{out_{m,t}}.$$

The aggregate spread response is

$$ds_t^R = \sum_m w_{m,t} \beta_h\, dshare_{m,t}.$$

Using $b_{m,t}^{priv} = (1 - \varpi_{m,t}) out_{m,t}$ yields (4). The weighted fraction held outside the Fed is 0.781 in 2015Q1 and 0.840 in 2026Q2.

With capacity-dependent slopes, the conversion is

$$\mathscr{M}_{h,t}^R = -100 \left(\beta_h + \gamma_h \widetilde{N}_t \right) \sum_m w_{m,t} (1 - \varpi_{m,t}). \tag{A1}$$

The monthly panel includes maturity and start-month fixed effects and omits March–June 2020 starting months. Persistent repricing averages horizons 12–24 months. Driscoll–Kraay/Newey–West inference uses 24 monthly lags to allow for overlapping outcome windows.

A.3 Real-duration event study

The event study relates two-trading-day changes in the DKW real term premium to revisions in cumulative Federal Reserve Treasury purchases. For each announcement, I subtract anticipated purchases from the announced or assigned amount. Positive values indicate more Federal Reserve holdings than expected, including slower runoff. I measure anticipated purchases from New York Fed dealer surveys where available and the policy in place otherwise. The construction uses Treasury purchases, excluding agency securities and mortgage-backed securities, and cumulates the announced and expected paths over the same window. A monthly pace with no announced end date

is annualized over twelve months. Table 5 gives the amounts, horizons, calculations, and linked sources.

The twelve announcements include two with zero measured purchase surprises. The September 2011 Maturity Extension Program is excluded because it exchanged long- for short-maturity Treasuries at unchanged face amount: the announcement specified $400 billion on each side, and the dealer survey anticipated $325 billion on each side.

Table 5: Treasury purchase surprises: amounts and construction

Date and event	Amount	Construction and sources
2009-03-18 QE1 Treasuries	+300	The FOMC statement announced up to $300 billion of longer-term Treasury purchases over six months. The benchmark is zero purchases under the policy in place. Earlier statements of December 2008 and January 2009 discussed possible purchases without specifying an amount. The assigned change is $300 - 0 = 300$.
2010-08-10 Reinvestment	+300	The FOMC statement directed reinvestment of agency principal payments in longer-term Treasuries. I assign $300 billion, based on the August 5 staff memorandum's projection of more than $300 billion of repayments through end-2011. The benchmark is zero reinvestment under the preceding policy. The change is $300 - 0 = 300$.
2010-11-03 QE2	+100	The FOMC statement announced $600 billion through 2011Q2. The Desk survey reported in the November FOMC transcript found that about two-thirds of respondents expected $500 billion over six months. The surprise is $600 - 500 = 100$.
2012-12-12 QE3 Treasuries	0	The FOMC statement announced $45 billion per month from January 2013. The December dealer survey, received December 3, reported the same median pace and $270 billion in each half of 2013. Annualizing both paces gives $12(45 - 45) = 0$.
2013-05-22 Taper discussion	−25	Following the May 22 testimony, expected total SOMA holdings at end-2014 fell from $3,982 billion in the April 22 survey to $3,932 billion in the June 10 survey. These are means computed from the surveys' probability bins. Multiplying the decline by the Treasury share of purchases, $45/85$, gives approximately -27, assigned as -25. The bin calculation is given below.

Continued on next page

Table 5 continued

Date and event	Amount	Construction and sources
2013-06-19 Taper timeline	-25	The press conference described reductions later in 2013 and an end around mid-2014. For July 2013–June 2014, median monthly purchases in the June 24 survey update are $45, 45, 45, 40, 35, 35, 30, 25, 25, 15, 10, 10$, totaling 360. The June 10 survey has six months at 45 followed by $30, 25, 25, 15, 10, 10$, totaling 385. The revision is $360 - 385 = -25$.
2013-12-18 Taper start	-60	The FOMC statement reduced the pace to \$40 billion per month from January. The December 9 dealer survey reported a median expected pace of \$45 billion immediately after the meeting. Annualizing these paces over twelve months gives $12(40 - 45) = -60$.
2020-03-15 COVID purchases	$+500$	The FOMC statement announced at least \$500 billion over the coming months. I use a zero benchmark for the new coupon-purchase program, giving $500 - 0 = 500$. The March 9 dealer survey's anticipated \$208 billion of bill purchases over March–June is excluded from this coupon-purchase measure.
2020-03-23 Open-ended purchases	$+1{,}000$	The FOMC statement made purchases open-ended; the Desk announcement replaced the March 15 plan for \$500 billion. I assign an additional \$1 trillion. Treasury holdings subsequently rose by approximately \$1.6 trillion from mid-March to June 10, about \$1.1 trillion beyond the earlier plan (June 2020 Monetary Policy Report).
2021-11-03 Taper	0	The FOMC statement set purchases at \$70 billion from mid-November, \$60 billion in December, and similar monthly reductions thereafter. Using half-month weights, the calendar-month path for November 2021–June 2022 is $75, 65, 55, 45, 35, 25, 15, 5$, totaling 320. The October 25 dealer survey reports the same median path. The surprise is $320 - 320 = 0$.
2022-05-04 Runoff plan	$+60$	For June 2022–May 2023, the announced caps imply runoff of $3 \times 30 + 9 \times 60 = 630$. The April 25 dealer survey implies $40 + 50 + 10 \times 60 = 690$. Treating runoff as negative purchases, the surprise is $-630 - (-690) = 60$.
2024-05-01 Runoff slowdown	$+60$	The FOMC statement reduced the monthly Treasury runoff cap to \$25 billion from June. The April 22 dealer survey reports a \$30 billion monthly decline in holdings. Over June 2024–May 2025, the surprise is $-12 \times 25 - (-12 \times 30) = 60$.

Amounts are billions of dollars. For May 22, 2013, I use bin midpoints of 2,250, 2,750, 3,250, 3,750, 4,250, 4,750, and 5,250 billion dollars, extending the $500 billion bin width to the two open-ended bins. The April probabilities are $0, 1, 12, 42, 30, 12, 2$ percent and the June probabilities are $0, 1, 12, 46, 31, 8, 1$ percent. Normalizing each rounded probability vector to sum to one gives means of 3,982.3 and 3,931.8; multiplying their difference by $45/85$ gives -26.7 billion dollars.

Table 6 reports HC3 inference with small-sample t critical values. The leave-one-event-out row reports point-estimate ranges.

Table 6: Duration event-study inference

Specification	β_D	HC3 standard error	95 percent interval	$\mathscr{M}^D_{2026Q2}$
Estimate with intercept	-0.0064	0.0079	$[-0.0241, 0.0113]$	115 $[-203, 433]$
Excluding March 2020	-0.0380	0.0213	$[-0.0872, 0.0111]$	683
Leave-one-event-out range	$[-0.0136, -0.0047]$	—	—	$[85, 245]$

Notes: Slopes are basis points per billion dollars; repricing terms are basis points. The first two rows use HC3 standard errors and t critical values with 10 and 8 degrees of freedom. The intercept in the first row is 0.26 basis points with an HC3 standard error of 1.75. The leave-one-event-out row reports the range of point estimates obtained by omitting each event in turn.

B Household Demand for Safe Debt

The household allocation in Section 3 combines logarithmic consumption and saving with portfolios fully invested in supported safe claims. Epstein–Zin preferences with unit intertemporal elasticity recover this allocation as aversion to rollover losses becomes infinite.

B.1 Logarithmic households

For group $j \in \{H, I\}$, mortality has intensity λ_j, the utility discount rate is ρ, and income is nontradable. Actuarially fair annuities transfer the assets of members who die to survivors within the same group.

Index an individual by birth date v. Let $c_{j,v,u}$ be consumption at future date u. Conditional on being alive at date t, a member of group j chooses consumption to maximize

$$\int_t^\infty e^{-(\rho+\lambda_j)(u-t)} \log c_{j,v,u}\, du. \tag{B1}$$

Let $w_{j,v,t}$ denote safe financial wealth, $y_{j,t}$ the nontradable income flow received by each living member, and r_t the safe interest rate. With actuarially fair annuities, the individual budget constraint is

$$\dot{w}_{j,v,t} = (r_t + \lambda_j) w_{j,v,t} + y_{j,t} - c_{j,v,t}. \tag{B2}$$

The return r_t excludes the Treasury absorption premium.

The capitalized value of nontradable income received while the member remains alive is

$$h_{j,t} = \int_t^\infty \exp\left[-\int_t^u (r_z + \lambda_j)\, dz\right] y_{j,u}\, du. \tag{B3}$$

For constant r and permanent income y_j, $h_j = y_j/(r+\lambda_j)$. The optimal consumption function is

$$c_{j,v,t} = (\rho + \lambda_j)(w_{j,v,t} + h_{j,t}). \tag{B4}$$

A longer effective horizon lowers the propensity to consume out of wealth and increases saving from permanent income.

In aggregation, the annuity return $\lambda_j w_{j,v,t}$ to survivors offsets the removal of deceased members' holdings; newborns enter with zero assets. Aggregate financial income is therefore $r_t a_{j,t}$. Aggregating the individual budget and consumption rule gives (12) and (13). At constant income and safe rate, solving the stationary aggregate budget gives (15).

At constant r and y_j, the aggregate budget and consumption function imply

$$\dot{a}_{j,t} = -(\rho + \lambda_j - r)[a_{j,t} - \kappa_j(r) y_j]. \tag{B5}$$

Excess financial wealth is spent at rate $\rho + \lambda_j - r$.

B.2 Preferences and investment opportunities

For group $j \in \{H, I\}$, hold the safe rate r and permanent nontradable income $y_j > 0$ fixed. Let $\beta_j = \rho + \lambda_j$ denote the effective discount rate and $R_j = r + \lambda_j$ the annuitized safe return. Preferences weight utility by survival through the temporal discount rate; risk aversion $\sigma_j > 0$ concerns financial payoff risk conditional on survival.

Let $U_{j,t} > 0$ be continuation utility in consumption units. Preferences are the continuous-time limit, as $\Delta \downarrow 0$, of the Epstein–Zin recursion with unit intertemporal elasticity (Epstein and Zin, 1989; Duffie and Epstein, 1992):

$$\log U_{j,t} = (1 - e^{-\beta_j \Delta}) \log c_{j,t} + e^{-\beta_j \Delta} \log \mathrm{CE}_{j,t}(U_{j,t+\Delta}), \tag{B6}$$

where $\mathrm{CE}_{j,t}(Z) = (\mathbb{E}_t Z^{1-\sigma_j})^{1/(1-\sigma_j)}$, with $\mathrm{CE}_{j,t}(Z) = \exp(\mathbb{E}_t \log Z)$ at $\sigma_j = 1$. Expectations are over rollover risk conditional on being alive. On a deterministic consumption path, these preferences give the logarithmic objective in (B1), up to a positive normalization.

Capitalized income is $h_j = y_j / R_j$, and total wealth is $X_j = w_j + h_j$, where w_j is financial wealth. The deterministic income flow can collateralize annuitized borrowing, subject to the natural debt bound $X_j > 0$. Assets with rollover support earn R_j. A position without this support $u_j \geq 0$ earns an additional promised flow χu_j, with $\chi \geq 0$, but is exposed to rollover losses. Let J_t be a compound Poisson loss process with intensity $\eta > 0$ and independent loss fractions $\ell \in [0, \bar{\ell}]$, where $\bar{\ell} < 1$ and $\Pr(\ell > 0) > 0$. The position's share in total wealth is $\theta_j = u_j / X_j \in [0, 1]$. Conditional on survival, wealth obeys

$$dX_{j,t} = \left[R_j X_{j,t} - c_{j,t} + \chi u_{j,t}\right] dt - u_{j,t-} \, dJ_t. \tag{B7}$$

The loss changes financial wealth while leaving the income flow unchanged. Investment opportunities are constant, and rollover losses are the household's only source of financial risk.

B.3 The finite-risk-aversion solution

Write $L_j(X) = \log U_j(X)$ for the optimized logarithmic continuation value. The recursive Bellman equation is

$$0 = \max_{c>0,\,0\le\theta\le 1} \left\{ \beta_j[\log c - L_j(X)] + L_j'(X)[(R_j+\chi\theta)X - c] \right. \\ \left. + \frac{\eta}{1-\sigma_j}\mathbb{E}\left[e^{(1-\sigma_j)[L_j(X(1-\theta\ell))-L_j(X)]} - 1\right] \right\}, \tag{B8}$$

with the jump term interpreted by continuity at $\sigma_j = 1$.

Define the risk-adjusted portfolio gain

$$Q_\sigma(\theta) = \chi\theta + \frac{\eta}{1-\sigma}\mathbb{E}\left[(1-\theta\ell)^{1-\sigma} - 1\right], \qquad \theta_\sigma \in \arg\max_{\theta\in[0,1]} Q_\sigma(\theta). \tag{B9}$$

At $\sigma = 1$, $Q_1(\theta) = \chi\theta + \eta\mathbb{E}\log(1-\theta\ell)$. For any $\sigma > 0$, the objective is strictly concave. Let $Q_\sigma^* = Q_\sigma(\theta_\sigma)$. The household solution is

$$c_j(X) = \beta_j X, \qquad u_j(X) = \theta_{\sigma_j} X, \tag{B10}$$

$$U_j(X) = \beta_j X \exp\left[\frac{R_j - \beta_j + Q_{\sigma_j}^*}{\beta_j}\right]. \tag{B11}$$

The infinite-horizon value follows by taking the horizon to infinity in discounted recursions with terminal utility proportional to total wealth. The homogeneous value has $L_j'(X) = 1/X$; the Bellman equation then separates consumption from the portfolio choice in (B9). Unit intertemporal elasticity gives the consumption fraction β_j, while risk aversion determines the unsupported share and the value of investment opportunities.

An interior unsupported share satisfies

$$\chi = \eta\mathbb{E}\left[\ell(1-\theta_\sigma\ell)^{-\sigma}\right]. \tag{B12}$$

If $\chi \le \eta\mathbb{E}\ell$, the optimum is $\theta_\sigma = 0$. Otherwise it is the unique interior root when that root is below one, and the upper corner when it is not. For a fixed loss fraction $\ell = L \in (0,1)$ and $\chi > \eta L$, the closed-form share is

$$\theta_\sigma = \min\left\{1, \frac{1-(\eta L/\chi)^{1/\sigma}}{L}\right\}. \tag{B13}$$

B.4 The limit of infinite risk aversion

Keep the promised excess return and loss distribution fixed as $\sigma \to \infty$. At any positive optimum, $\chi \geq \eta \mathbb{E}[\ell(1-\theta_\sigma \ell)^{-\sigma}]$, with equality at an interior solution. For any share bounded away from zero, this risk-weighted loss diverges: choose $\ell_0 > 0$ with positive probability of $\ell \geq \ell_0$. Its contribution is bounded below by a positive constant times $(1-\theta\ell_0)^{-\sigma}$. Hence

$$\theta_\sigma \longrightarrow 0, \qquad 0 \leq Q_\sigma^* \leq \chi \theta_\sigma \longrightarrow 0. \tag{B14}$$

For a fixed loss and $\chi > \eta L$, $\theta_\sigma = \log(\chi/\eta L)/(\sigma L) + O(\sigma^{-2})$. Unsupported holdings and wealth losses vanish, so (B7) converges to the budget in (B2). The consumption rule $c_j = (\rho + \lambda_j)(w_j + h_j)$ already holds at every finite σ_j.

B.5 Aggregation and stationary wealth demand

Because the policies are linear in total wealth, within-group aggregation gives $c_j = \beta_j(a_j + h_j)$ and unsupported exposure $u_j = \theta_{\sigma_j}(a_j + h_j)$. Here a_j is aggregate financial wealth. When rollover losses are common, finite-risk-aversion aggregate wealth is stochastic. Let $\bar{a}_j$ denote its stationary mean and define $d_j = (\chi - \eta \mathbb{E}\ell)\theta_{\sigma_j}$, the expected excess-return contribution. If $\rho + \lambda_j - r - d_j > 0$, the mean budget implies

$$\bar{a}_j = \frac{r - \rho + d_j}{(r+\lambda_j)(\rho + \lambda_j - r - d_j)} y_j. \tag{B15}$$

For a fixed safe rate in the main text's admissible interval, stationary risk also vanishes. Write $k_j = \beta_j - r - d_j$ for the mean adjustment rate and $v_j = \eta \theta_{\sigma_j}^2 \mathbb{E}\ell^2$ for the jump-variance coefficient. For sufficiently large σ_j, $2k_j > v_j$, and the stationary second moment gives

$$\mathrm{Var}(a_j) = \frac{v_j(\bar{a}_j + h_j)^2}{2k_j - v_j} \longrightarrow 0. \tag{B16}$$

The stationary allocation therefore converges in mean square to the main text's deterministic wealth demand:

$$a_j = \kappa_j(r) y_j, \qquad \kappa_j(r) = \frac{r - \rho}{(r+\lambda_j)(\rho + \lambda_j - r)}, \tag{B17}$$

on the main text's admissible interval $\rho < r < \rho + \lambda_j$. With $y_H = x_H$ and $y_I = x_I + S$, these are the two wealth demands entering asset-market clearing in (19). The MPC out of permanent income is $\beta_j/(r+\lambda_j)$, as in (14).

With both groups' portfolios fully supported, these wealth demands and the government budget recover the main text's stationary equilibrium.

B.6 Aggregate expenditure

For an arbitrary allocation of an initial bond issue satisfying $a_H + a_I = b$, the household consumption rules and the government budget imply the expenditure gap

$$c_H + c_I + g - 1 = \sum_{j \in \{H,I\}} (\rho + \lambda_j - r)[a_j - \kappa_j(r) y_j].$$

Holding group H at its desired position isolates group I's deviation from stationary wealth demand. With $a_H = \kappa_H(r) x_H$ and $a_I = b - a_H$, the consumption and fiscal schedules give

$$c_H + c_I + g - 1 = (\rho + \lambda_I - r)\left[b - \kappa_H(r) x_H - \kappa_I(r)(x_I + S)\right]. \tag{B18}$$

Differentiating with respect to debt at fixed r, N, and δ, and using (16), gives the marginal expenditure response in (46).

At a stationary allocation, differentiating (B18) with respect to the safe rate gives minus $\rho + \lambda_I - r$ times the denominator in (37). Expenditure therefore declines with the safe rate on the positive-response branch considered here, including the effect of duration on absorption income.

C Participation, Duration, and Treasury Absorption

This appendix derives the rollover-support and duration-pricing schedules in Sections 3.4.1 and 3.4.3 from institutional participation. A unit mass of financial institutions supplies rollover commitments that keep Treasury claims safe. Participation determines how much ordinary balance-sheet capacity is available. Institutions choose participation without observing the full active pool and require compensation for the support they may have to provide beyond ordinary capacity.

C.1 Rollover exposure and participation

Hold maturity fixed. Let $R = \mu(\delta)b$ be the inherited debt requiring rollover during the interval, where $\mu(\delta) = 1 - e^{-\delta}$; the short-maturity benchmark sets $\mu = 1$. Potential ordinary absorption capacity is N. An inelastic fraction $\underline{\alpha} \in (0,1)$ always participates. The remaining, elastic institutions choose whether to participate in response to compensation and opportunity costs. If their participation share is $\widetilde{\alpha}$, total participation is $\alpha = \underline{\alpha} + (1-\underline{\alpha})\widetilde{\alpha}$, and active ordinary capacity is αN.

Define utilization $q = R/N$. The rollover shortfall and the associated stress per unit of active capacity are

$$X = [R - \alpha N]_+, \qquad \zeta(q,\alpha) = \frac{X}{\alpha N} = \left[\frac{q}{\alpha} - 1\right]_+. \tag{C1}$$

Normalizing the shortfall by active capacity makes the cost schedule homogeneous in debt and capacity. Lower participation raises the exposure borne by each unit of active capacity.

Let $\Gamma(\zeta)$ be the annualized compensation per dollar of supported debt required for this exposure. It reflects the nonpecuniary cost of committing balance-sheet resources to rollover support. Assume $\Gamma(0) = 0$, $\Gamma'(\zeta) > 0$ for $\zeta > 0$, and $\Gamma''(\zeta) \geq 0$. The state-contingent assessment borne by a participant is $a(q,\alpha) = \Gamma(\zeta(q,\alpha))$. Convexity captures the increasing marginal cost of expanding support beyond ordinary capacity.

C.2 The participation game and premium

Elastic institutions observe private signals $z_i = \theta + \eta\varepsilon_i$. The fundamental $\theta \in \mathbb{R}$ is an additive change in the annual opportunity cost of committing balance-sheet resources, measured relative to the reference state $\theta = 0$. Signal noise has scale $\eta > 0$; the independent noises have continuous distribution F, strictly positive log-concave density f, and finite first absolute moment. The prior over θ is flat. The private-signal structure follows Morris and Shin (1998).

Institutions maximize expected net compensation at the participation margin. Contracts are allocated equally across active institutions. A participant supports notional debt b/α and receives

$$\frac{b}{\alpha}\left[\pi^R - a(q,\alpha) - \theta\right]. \tag{C2}$$

High opportunity costs discourage participation even with a large active pool. Aggregate gross payments remain $b\pi^R$. A symmetric cutoff strategy, $e_i = 1$ if $z_i \leq z^*$, implies

$$\alpha(\theta; z^*) = \underline{\alpha} + (1-\underline{\alpha})F\left(\frac{z^* - \theta}{\eta}\right). \tag{C3}$$

Under the flat prior, conditional on the marginal signal, $(z^* - \theta)/\eta$ has density f, so α is uniform on $[\underline{\alpha}, 1]$. Equal contract allocation weights this posterior by exposure $1/\alpha$. Define

$$\begin{aligned} p(q) &= \frac{1}{\log(1/\underline{\alpha})}\int_{\underline{\alpha}}^{1} \Gamma\left(\left[\frac{q}{\alpha} - 1\right]_+\right)\frac{d\alpha}{\alpha}, \\ c_F &= \frac{1}{\log(1/\underline{\alpha})}\int_{\underline{\alpha}}^{1} F^{-1}\left(\frac{\alpha - \underline{\alpha}}{1-\underline{\alpha}}\right)\frac{d\alpha}{\alpha}. \end{aligned} \tag{C4}$$

The marginal institution's indifference condition is

$$\pi^R = p(q) + z^* - \eta c_F. \tag{C5}$$

For a given quote, this equation determines a unique cutoff. Conditional on that cutoff, the payoff numerator decreases strictly with θ: participation falls, the exposure assessment rises, and the outside opportunity cost increases. It crosses zero once, with positive payoffs at sufficiently low fundamentals and negative payoffs at sufficiently high ones. Log-concavity gives the monotone likelihood ratio property. Marginal indifference then implies positive expected payoffs below z^* and negative expected payoffs above it, establishing the unique symmetric cutoff equilibrium.

Before opportunity costs are realized, the Treasury quotes the lowest spread that induces a target ordinary-capacity share $\alpha^T \in (\underline{\alpha}, 1)$ in the reference state $\theta = 0$. Equation (C3) fixes $z^* = \eta F^{-1}((\alpha^T - \underline{\alpha})/(1-\underline{\alpha}))$, so the required spread is

$$\pi_\eta^R(q) = p(q) + \eta\left[F^{-1}\left(\frac{\alpha^T - \underline{\alpha}}{1-\underline{\alpha}}\right) - c_F\right]. \tag{C6}$$

As signal noise vanishes, $\pi_\eta^R(q) \to p(q)$ for every interior target. The main text uses this limit.

C.3 Implications for the absorption schedule

Proposition C1 (Participation and the gross support spread)**.** *The premium in* (C4) *is zero for $q \le \underline{\alpha}$, increasing for $q > \underline{\alpha}$, and convex. Thus $\pi^R(b,N,\delta) = p(\mu(\delta)b/N)$ has the active-region debt and capacity properties used in Sections 3.4.1 and 3.4.*

For each participation state, the assessment is increasing and convex in utilization, and the fixed exposure-weighted average preserves these properties. Once $q > \underline{\alpha}$, a positive measure of participants faces strictly positive stress, giving $p' > 0$. The negative debt-capacity interaction follows because additional capacity lowers both utilization and the sensitivity of the premium to debt. Derivatives at changes in the stress region can be interpreted as one-sided limits.

The quadratic illustration also has a participation interpretation. If Γ is smooth at zero with $\Gamma'_+(0) > 0$, the onset of stress satisfies

$$p(q) = \frac{\Gamma'_+(0)}{2\underline{\alpha}^2 \log(1/\underline{\alpha})}(q-\underline{\alpha})^2 + o\left((q-\underline{\alpha})^2\right), \qquad q \downarrow \underline{\alpha}. \tag{C7}$$

Thus the smooth-onset specification in (26) captures the local expansion of the stress region as debt rises. In these capacity units, $\bar{q} = \underline{\alpha}$ and $\phi = \Gamma'_+(0)/[\underline{\alpha}^2 \log(1/\underline{\alpha})]$. Extending the quadratic beyond this local region supplies the curvature used in Figure S5.

Treasury convenience enters through $s^R = \pi^R - \nu(b)$, and the short-maturity absorption payment is $S = bs^R$. The net-cost restriction $S_{bb} > 0$ also depends on convenience dilution, as specified in Section 3.4.1. The participation game determines gross support compensation, and the household block assigns the net payment S to group I as lifetime income.

C.4 Duration exposure and balance-sheet compensation

The participation game extends to the duration-price component when ordinary rollover support and the associated mark-to-market exposure use the same balance-sheet resources. Let $D = (r+s+\delta)^{-1}$ be the duration of a claim with Poisson maturity. A mean-zero yield innovation with annualized variance $\sigma_y^2 > 0$ gives the claim local return variance

$$\sigma_y^2 D^2 = \frac{\sigma_y^2}{(r+s+\delta)^2}. \tag{C8}$$

Assume that balance-sheet resources reserved against price risk (economic capital) are proportional to this return variance. Let $\chi(N) > 0$ be the capital requirement per unit of variance, relative to the resources committed to ordinary support. Both uses face the same state-dependent cost of committing capacity, including its fundamental component θ. The additional duration-

capital requirement is therefore $\chi(N)\sigma_y^2 D^2$ times ordinary support. With $\vartheta(N) = \chi(N)\sigma_y^2$, the total assessment per dollar of supported debt is

$$a^T(q, \alpha, \theta; r, s, \delta) = [a(q, \alpha) + \theta]\left[1 + \vartheta(N)D^2\right]. \tag{C9}$$

The restriction $\chi_N < 0$, and hence $\vartheta_N < 0$, captures the lower capital intensity of duration exposure when financial capacity is abundant.

Let π_η^{gross} denote the combined gross quote. Replacing the assessment by a^T gives $\pi_\eta^{\text{gross}} = [1 + \vartheta(N)D^2]\pi_\eta^R$ under the same procurement target. Taking the small-noise limit yields

$$\pi^{\text{gross}} = \left[1 + \vartheta(N)D^2\right] p(q) = \left[1 + \vartheta(N)D^2\right] \pi^R. \tag{C10}$$

At a given quote s, holding r, N, and δ fixed, the capital multiplier is common across participation states. Scaling both the quote and the full assessment multiplies net payoffs by the same positive factor, preserving the cutoff and procurement condition. Netting out convenience services yields the fixed point in (32), with $s^D = \vartheta(N)\pi^R D^2$. The squared-duration factor reflects return variance; the proportionality to π^R follows from the shared capital-cost technology. Supplemental Appendix SB adds an independent component of uncertainty about future rollover conditions for the maturity-choice problem.

D Parameters and Numerical Illustration

The reference allocation used for Figure 2 combines 2026Q2 pricing and maturity inputs with the measured reference debt-to-GDP ratio and the 2 percent wealth MPC used in Section 5.

D.1 Pricing inputs and reference allocation

I set the reference safe rate to $r_0 = 1.5$ percent, informed by the medium-run natural-rate estimate in Cúrdia (2026). The reference absorption premium is $s_0 = 48.3$ basis points. I use the nominal note-and-bond pricing moments and maturity as representative inputs for federal debt held by the public excluding the Fed. I approximate maturity by the model's Poisson structure. Let $\overline{M}_0$ be the average remaining maturity of nominal notes and bonds held outside the Federal Reserve, weighted by those holdings, approximately 7.3 years in 2026Q2. The maturity intensity and implied yield duration are

$$\delta = \overline{M}_0^{-1}, \qquad D_0 = \frac{1}{r_0 + s_0 + \delta}. \tag{D1}$$

These inputs imply $\delta \simeq 0.137$ per year and $D_0 \simeq 6.4$ years. The remaining-maturity measure uses the debt and Federal Reserve holdings described in Appendix A, before the clipping used to interpolate the real term premium.

The absorption schedule matches the four 2026Q2 moments in Table 2. I use the participation schedule in Appendix C with a support cost proportional to rollover shortfalls and convenience that declines inversely with debt toward a 12-basis-point floor. The two premium levels and two stock-repricing terms jointly determine the support-cost scale, baseline utilization, convenience above the floor, and the duration coefficient. The dealer-parent index measures capacity variation; fitting these pricing moments determines the model's effective capacity level. Baseline utilization exceeds ordinary capacity at every participation rate, so the gross support spread is affine in debt between the baseline and the peak. Supplemental Appendix SE reports the fit and Table S5 lists the parameters. The fitted model capacity is $N_0 \simeq 0.0756$, in model units.

D.2 Household parameters and the absorption-cost margin

Section 5 motivates the assumed annual wealth MPC of $m_I^w = 0.02$. I set $m_H^w = 0.23$, rounding the 0.233 estimate for financial-wealth percentiles 5–50 in Di Maggio, Kermani, and Majlesi (2020, Table III), and set $\rho = 0.01$. Since $m_j^w = \rho + \lambda_j$, these choices imply $\lambda_I = 0.01$ and $\lambda_H = 0.22$. At the reference safe rate, group I's permanent-income MPC is 0.8 and its desired safe holdings per unit of annual income are $\kappa_I = 40$.

The annual net spending rate out of additional wealth is $m_I^w - r_0 = 0.005$. Relative to the share of additional income not consumed at unchanged financial wealth, this net spending rate determines

the critical marginal cost:

$$\frac{1}{\kappa_I(r)} = \frac{m_I^w - r}{1 - m_I(r)}. \tag{D2}$$

At the reference allocation this critical cost is 250 basis points.

I use the measured reference debt-to-GDP ratio $b_0 \simeq 0.835$ and the tax flow $\bar{\tau} = 0.25$, as described in Section 5. At the reference safe rate and absorption payment, asset-market clearing and $x_H + x_I = 1 - \bar{\tau}$ determine the two after-tax endowment incomes. Their allocation is then held fixed as debt varies. Group I holds 91.3 percent of safe debt. Its after-tax endowment income is approximately 0.0150 units of output and its income including absorption payments is approximately 0.0191. These shares are implied by market clearing and the household parameters.

With one household type, asset-market clearing would require $b = \kappa(r)(1 - \bar{\tau} + S)$. Matching the same reference debt stock, safe rate, tax flow, and absorption payment gives a wealth–income ratio of 1.11 and a critical cost of approximately 9,031 basis points, compared with 250 in the two-group illustration. These aggregates pin down the one-group threshold across preferences consistent with the reference allocation. The lower two-group threshold depends on concentrating absorption income among households whose desired wealth–income ratio substantially exceeds the aggregate ratio.

For comparisons of measured costs at a common household response, define

$$\mathscr{G}_t^{\text{ref}} = \frac{1}{\kappa_I(r_0)} - S_{b,t}. \tag{D3}$$

The margin falls from 163.9 basis points at the 2015Q1 cost to 27.4 at the 2026Q2 cost. Multiplying by $\kappa_I(r_0)$ gives the marginal net contribution per dollar of debt, the comparison in Section 5. Along the full equilibrium debt experiment, the safe rate and the critical cost adjust together.

D.3 Debt issuance and financial capacity

I increase debt holding financial capacity, the duration coefficient ϑ, maturity intensity, household preferences, and taxes fixed. Government purchases adjust to the stationary budget constraint. At each stock, I jointly solve the absorption-pricing condition (32) and asset-market clearing (19).

Before the peak, issuance expands the net supply of safe assets while raising the absorption premium and the cost of repricing the outstanding stock. The accompanying increase in the safe rate raises recipients' desired wealth per unit of income, reducing the critical marginal cost. It also shortens duration, which moderates the rise in absorption cost. Along the computed schedule, marginal cost rises and the critical value falls, narrowing the absorption-cost margin.

Greater financial capacity lowers the cost of supporting a given debt stock and reduces the duration-capital requirement. Let N_0 and ϑ_0 denote reference capacity and the duration coefficien-

t. I vary capacity with $\vartheta(N) = \vartheta_0 N_0/N$, holding the support-cost and convenience parameters, household preferences, and taxes fixed. At the reference debt stock, a 10 percent capacity increase raises net safe-asset supply from 67.4 to 72.8 percent of annual model output; a 25 percent increase raises it to 79.9 percent. The corresponding maxima are 74.0 and 83.4 percent, compared with 67.7 percent at reference capacity (Table S7).

D.4 The illustrative Laffer peak

Table 7 compares the reference allocation with the computed maximum of net safe-asset supply.

Table 7: Illustrative stationary allocation and peak of net safe-asset supply

	Reference allocation	Laffer peak
b (annual model output units)	0.835	0.912
Net safe-asset supply, $\mathscr{B}$ (annual model output units)	0.674	0.677
Real safe rate (percent)	1.500	1.501
Real Treasury funding rate (percent)	1.983	2.142
Absorption premium (bp)	48.3	64.1
Marginal absorption cost (bp)	222.6	248.7
Critical marginal cost (bp)	250.0	248.7
Absorption-cost margin (bp)	27.4	0.0

Notes: The reference allocation uses 2026Q2 pricing and maturity inputs and the measured reference debt ratio $b_0 \simeq 0.835$. Debt service and absorption payments are financed by lower government purchases. Net safe-asset supply is defined in (36). Its peak satisfies $1 - \kappa_I(r)S_b = 0$, and the denominator in (37) is positive along the reported schedule. The wealth MPCs are 2 and 23 percent, and the common discount rate is 1 percent. These preferences remain fixed as debt changes. Calculations use unrounded inputs.

In this illustration, net safe-asset supply rises from 0.674 units of annual output at the reference allocation to a maximum of 0.677. The safe rate rises by 0.1 basis point over this interval, while the funding rate rises by 15.9 basis points, of which 15.8 come from the absorption premium. Elastic stationary wealth demand limits the safe-rate adjustment: a 1-basis-point increase raises desired holdings by approximately 3.4 percent at the reference allocation. The critical cost falls from 250 to 248.7 basis points. Supplemental Tables S6 and S7 report how the illustrative curve changes with pricing assumptions and financial capacity.

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Supplemental Appendix

SA Additional Empirical Results

SA.1 Cash-Treasury repricing details

The cash-Treasury design is a monthly maturity panel. The term $\mathscr{M}^{R}_{h,t}$ is the stock-repricing contribution at horizon h and date t; γ_h is the capacity interaction coefficient. Omitting h from the repricing term denotes its average over the reported horizons. Equations (3) and (6) include maturity and start-month fixed effects and omit March–June 2020 starting months. Because adjacent $h = 12$–24 changes overlap, inference uses Driscoll–Kraay/Newey–West standard errors with 24 monthly lags. The figures show overlap-robust and month-clustered confidence bands.

Start-month effects absorb curve-wide repricing, so the regressions identify maturity-specific movements around the Treasury curve. The interaction sample begins in 2015Q1, when regulatory capacity becomes available. The linear estimates use the average supply slope, while the interacted estimates evaluate how that slope changes at the 2026Q2 capacity level.

Figure S1 reports linear estimates for samples beginning in 2015 and 2010. The average slopes over the persistent $h = 12$–24 window are -0.27 and -0.48, respectively. The overlap-robust bands are wider than the month-clustered bands, especially in the shorter sample. Point estimates are negative in both samples.

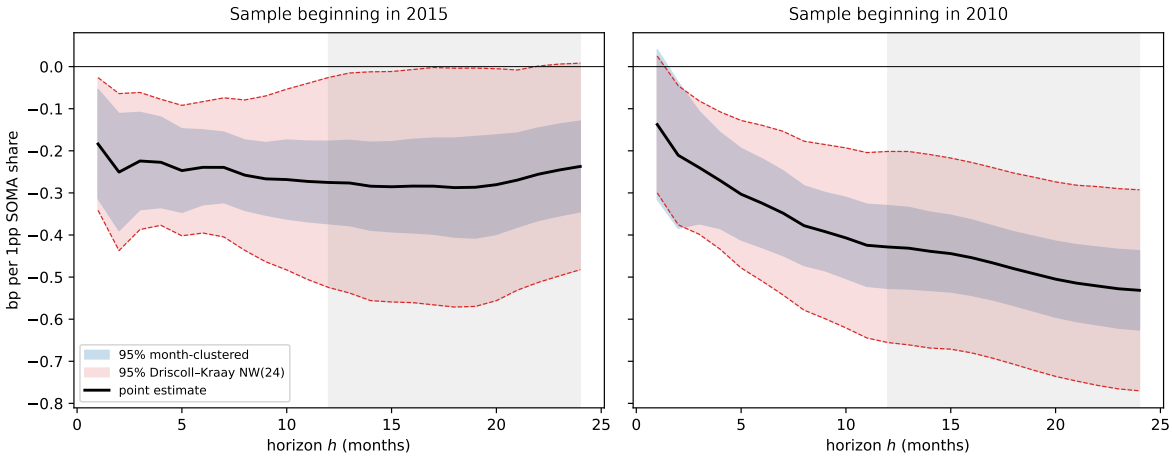


Figure S1: Linear cash-Treasury repricing estimates. The panels report β_h for samples beginning in 2015 and 2010. Black lines are point estimates; blue bands are month-clustered 95 percent confidence intervals; red dashed bands use Driscoll–Kraay/Newey–West inference with 24 monthly lags. The shaded region is the $h = 12$–24 averaging window. The average slopes in that window are -0.27 and -0.48, respectively.

Table S1: Capacity-dependent cash-Treasury repricing

Leverage threshold	Average β_h	Average γ_h	Overlap-robust t_{γ_h}
Fixed 5 percent	−0.24	0.19	2.4–2.9
Fixed 6 percent	−0.34	0.17	1.0–1.6

Notes: Coefficients are averages over $h = 12$–24. Here t_{γ_h} is the t-statistic for the interaction coefficient, using Driscoll–Kraay/Newey–West standard errors with 24 monthly lags. Capacity is standardized separately for each leverage threshold using fixed estimation-sample moments.

Under the fixed 5 percent leverage threshold, the interaction is positive throughout the 12–24-month horizon range and statistically significant under the reported inference (Figure S2).

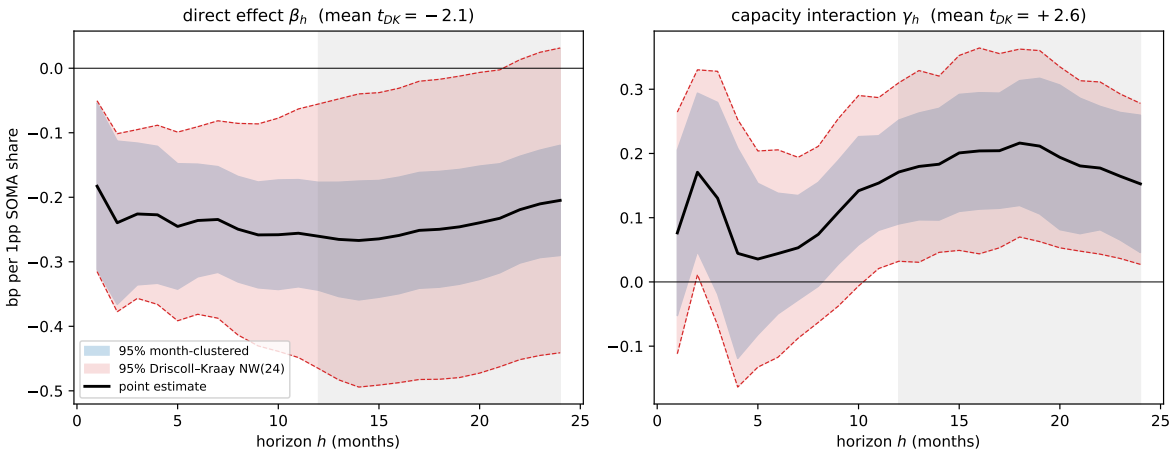


Figure S2: Capacity-dependent cash-Treasury repricing estimates. The left panel reports the supply slope at mean capacity β_h, and the right panel reports the capacity interaction γ_h, using the fixed 5 percent leverage threshold. Black lines are point estimates; blue bands are month-clustered 95 percent confidence intervals; red dashed bands use Driscoll–Kraay/Newey–West inference with 24 monthly lags. Over $h = 12$–24, the interaction averages 0.19 and its overlap-robust t-statistics average 2.6.

The interaction is positive under both the 5 and 6 percent leverage thresholds (Figure S3). Its overlap-robust t-statistics range from 2.4 to 2.9 under the 5 percent threshold and from 1.0 to 1.6 under the 6 percent threshold.

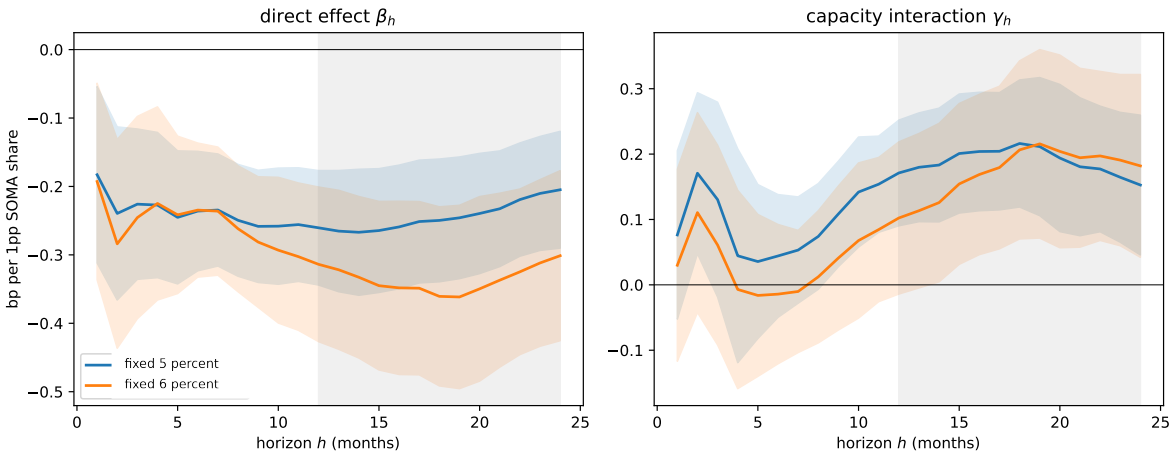


Figure S3: Capacity-dependent estimates under fixed 5 and 6 percent leverage thresholds. Point estimates and bands are shown for the supply slope at mean capacity β_h and capacity interaction γ_h; the shaded region is the $h = 12$–24 averaging window.

The instrumental-variables (IV) specification instruments the SOMA share within each maturity bucket with its $t-6$ level and trailing six-month issuance into the bucket relative to bucket outstanding, a proxy for the on-the-run status of recently issued securities. These variables adapt the pre-program security characteristics in D'Amico and King (2013); maturity effects absorb time-invariant maturity attributes. The exclusion restriction is that, conditional on the fixed effects, the instruments affect subsequent spread changes through the SOMA share. Figure S4 reports the linear two-instrument specification alongside the linear OLS comparison.

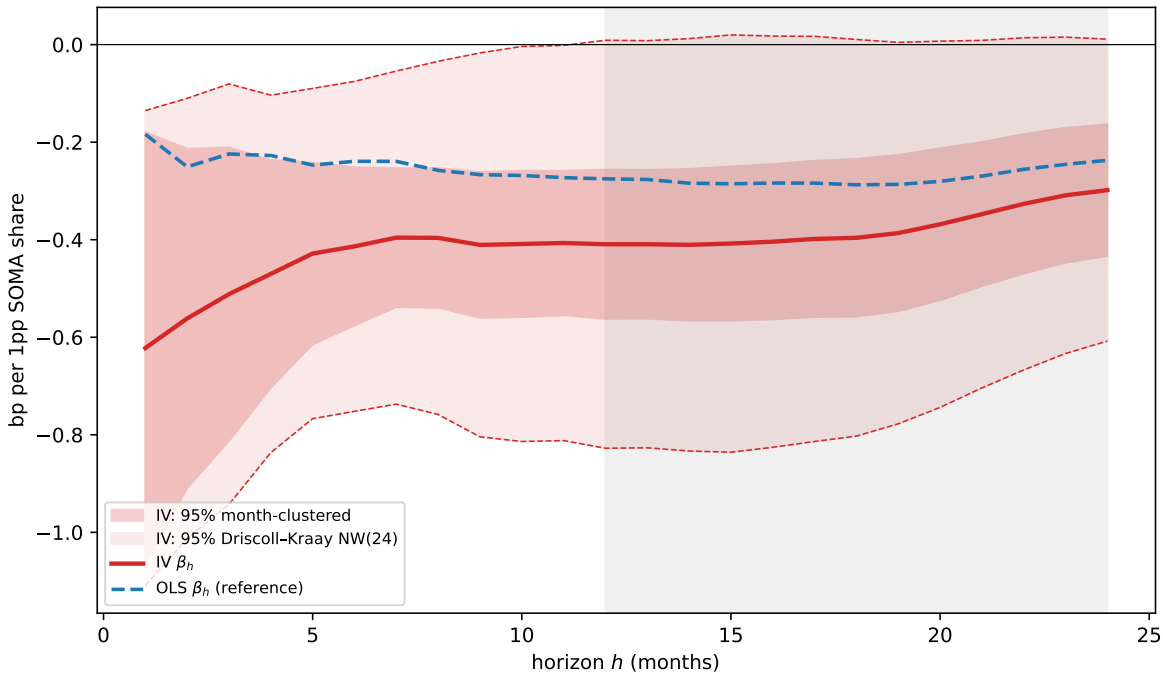


Figure S4: Linear IV estimates with overlap-robust inference. The instruments, measured at $t-6$, are lagged maturity-bucket SOMA share and a trailing-issuance on-the-run proxy. The solid red line is the IV estimate and the dashed blue line is the OLS estimate; the bands show month-clustered and Driscoll–Kraay/Newey–West 95 percent confidence intervals. The shaded region is the $h = 12$–24 averaging window, over which the IV and OLS slopes average -0.37 and -0.27.

Table S2: Linear cash-Treasury repricing estimates

Specification	Sample	Average β_h, $h = 12$–24	$\mathscr{M}^R_{2026Q2}$
OLS, no capacity interaction	2015–2026	-0.273	23
OLS, no capacity interaction	2010–2026	-0.480	40
IV, no capacity interaction	2015–2026	-0.375	32

Notes: Coefficients are basis points per percentage point of the SOMA share within a maturity bucket; repricing terms use the 2026Q2 maturity weights and are rounded to whole basis points. Inference allows for serial dependence across overlapping starting months. The IV row instruments the change in the SOMA share with lagged SOMA share and trailing issuance, an on-the-run proxy for recently issued securities. Appendix A describes the cash-Treasury design and inference.

SA.2 Comparisons across empirical specifications

Between 2015Q1 and 2026Q2, marginal absorption cost rises by 136.5 basis points in the capacity-dependent specification and 127.9 in the linear specification estimated on the sample beginning in 2015. The corresponding increases in the linear OLS sample beginning in 2010 and the linear IV specification are 129.1 and 128.5 basis points.

The 127.9-basis-point increase in the linear specification consists of 59.3 basis points from higher premium levels, 66.9 from growth in the stock held outside the Fed through duration repricing, and 1.6 from changes in the cash-Treasury maturity weights. The capacity-dependent specification also allows the cash-supply response to steepen as dealer-parent capacity falls.

Table S3 varies the duration estimate using the 2026Q2 data. The share-normalized estimate regresses the two-day average-maturity premium change on assigned purchase amounts divided by the contemporaneous stock of notes and bonds held outside the Fed. The ten-year estimate uses the two-day change in the ten-year DKW real term premium. Both use the twelve announcements and an intercept.

Table S3: Duration sensitivity of the 2026Q2 marginal Treasury absorption cost

Capacity-dependent specification	$S_{b,2026Q2}$	Reference margin $\mathscr{G}^{\text{ref}}_{2026Q2}$
Share-normalized duration (99.5 bp)	207	43
Average-maturity duration (115.2 bp)	223	27
Ten-year duration (163 bp)	271	−21

Notes: Entries are rounded to whole basis points. The cash-Treasury premium, real-duration premium level, and cash repricing term are measured in 2026Q2; the latter uses the fixed 5 percent leverage threshold. The reference margin compares measured marginal cost with the illustrative threshold of 250 basis points defined in Appendix D.2.

Table S4: Marginal Treasury absorption cost across specifications, 2026Q2

Specification	s_t^R	s_t^D	$\mathscr{M}_t^R$	$\mathscr{M}_t^D$	$S_{b,t}$
Capacity-dependent OLS	2	46	59	115	223
Linear OLS, 2015–2026	2	46	23	115	186
Linear OLS, 2010–2026	2	46	40	115	204
Linear IV, 2015–2026	2	46	32	115	195

Notes: Entries are annualized basis points rounded to whole numbers. The capacity-dependent row uses the OLS interaction under the fixed 5 percent leverage threshold. Linear rows use the slopes in Table S2. Repricing terms apply the 2026Q2 debt stock and maturity weights to equations (4), (A1), and (8). Totals are computed before rounding.

SA.3 Local cost changes

The local calculation in Section 2.7 uses the CBO's end-of-year debt stock. Using the implied beginning-of-year stock raises the borrowing ratio to approximately 6.5 percent and the calculation to about 19 basis points. Under the share-normalized duration conversion, both repricing terms are held fixed; a 99.5-basis-point duration term implies approximately 10 basis points at the 6.1 percent ratio.

SB Maturity Choice

SB.1 Rollover uncertainty and debt management

This appendix extends the maturity specification in Section 3.4 to allow uncertainty about future rollover conditions. Longer duration increases exposure to this uncertainty, including when the current expected rollover burden is small. Let b denote the debt stock, N absorption capacity, r the safe rate, δ the maturity intensity, and $\pi^R = p(\mu(\delta)b/N)$ the gross rollover-support spread, with $\mu(\delta) = 1 - e^{-\delta}$. The convenience value is $\nu(b)$, and $\vartheta(N)$ scales duration-price compensation.

The duration component in Section 3.4 prices the current expected rollover burden. For the debt-management problem, future rollover conditions can also vary around that expectation. Let $\sigma_X^2 > 0$ denote the variance of exogenous uncertainty about future rollover conditions or compensation, and let $\vartheta_X(N) > 0$ price the associated balance-sheet exposure, with $\vartheta_{X,N}(N) < 0$.

Let s^M denote the total premium for maturity choice. Its cash, duration, and rollover-uncertainty components are s^R, s^D, and s^X, respectively:

$$s^R = \pi^R(b,N,\delta) - \nu(b), \tag{SB1}$$

$$s^D = \frac{\vartheta(N)\pi^R(b,N,\delta)}{[r + s^M(b,N,\delta) + \delta]^2}, \tag{SB2}$$

$$s^X = \frac{\vartheta_X(N)\sigma_X^2}{[r + s^M(b,N,\delta) + \delta]^2}. \tag{SB3}$$

Combining the three components gives the maturity-choice fixed point:

$$s^M = -\nu(b) + \pi^R(b,N,\delta) + \frac{\pi^R(b,N,\delta)\vartheta(N) + \vartheta_X(N)\sigma_X^2}{[r + s^M + \delta]^2}. \tag{SB4}$$

Equation (SB4) has a unique solution on $r + s^M + \delta > 0$, conditional on the safe rate. Shorter maturity raises rollover utilization but reduces the duration exposure to both expected rollover costs and uncertainty about future conditions.

Capacity lowers gross rollover compensation and both price-exposure coefficients, implying $s_N^M < 0$ at a fixed safe rate and maturity.

SB.2 Optimal maturity

This exercise holds the convenience value fixed across maturities. For fixed b, minimizing total funding cost $b[r + s^M]$ at a given safe rate is equivalent to minimizing s^M. The government chooses

the optimal maturity intensity $\delta^*(b,N)$:

$$\delta^*(b,N) \in \arg\min_{\delta>0} s^M(b,N,\delta). \tag{SB5}$$

At an interior local minimum with $s^M_{\delta\delta} > 0$, the optimality condition balances the marginal rollover cost of shorter maturity against its reduction in duration exposure:

$$\left[1 + \frac{\vartheta(N)}{(r+s^M+\delta)^2}\right] \pi^R_\delta = \frac{2\left[\pi^R \vartheta(N) + \vartheta_X(N)\sigma_X^2\right]}{(r+s^M+\delta)^3}. \tag{SB6}$$

The left side is the amplified increase in rollover-support cost from shortening maturity. The right side is the reduction in price exposure obtained by shortening the claim. The exogenous uncertainty term remains positive even if the current expected rollover burden is zero.

At a given safe rate and debt stock, the capacity response of this interior optimum is

$$\frac{d\delta^*(b,N)}{dN} = -\frac{s^M_{\delta N}(b,N,\delta^*)}{s^M_{\delta\delta}(b,N,\delta^*)}. \tag{SB7}$$

The effect is generally ambiguous. Capacity attenuates the rollover-utilization effect of shorter maturity and lowers both price-exposure coefficients, while the endogenous duration denominator adds an offsetting effect. When $s^M_{\delta N} < 0$ at the optimum, greater capacity raises the optimal maturity intensity; a reduction in capacity therefore increases optimal average maturity.

SC Capitalization and Demand for Safe Assets

Absorption payments create demand for safe assets when the additional payments exceed the consumption they induce, including through capitalization. This appendix states the condition and develops an implementation in which households can trade a perpetual claim on the payments. A nonpecuniary assessment of owners' duration exposure determines its value and their optimal portfolios.

SC.1 The consumption condition

Keep the main text's stationary environment. Output is one, taxes are fixed at $\bar{\tau}$, and government purchases satisfy

$$g = \bar{\tau} - rb - S(b,r). \tag{SC1}$$

Financial capacity N and maturity intensity δ are held fixed and suppressed from the arguments. Group I receives the absorption payment S; $x_H, x_I > 0$ are fixed after-tax endowment incomes, with $x_H + x_I = 1 - \bar{\tau}$. Let a_I be group I's safe holdings and let $c_I(a_I, b; r)$ be its consumption schedule, including the wealth value of future absorption payments. The partial derivative $c_{I,b}$ holds safe holdings and the safe rate fixed and includes all capitalization effects of issuance.

Within a stationary allocation, asset prices and aggregate holdings are constant. Group I's budget therefore gives

$$c_I(a_I, b; r) = ra_I + x_I + S(b,r). \tag{SC2}$$

Suppose $c_{I,a} > r$, so excess safe wealth is spent down. Differentiating this budget at a fixed safe rate gives the response of desired safe holdings:

$$a^d_{I,b} = \frac{S_b - c_{I,b}}{c_{I,a} - r}. \tag{SC3}$$

The numerator is the additional payment less the consumption it induces at unchanged safe holdings. The denominator is the net spending generated by each unit of accumulated safe wealth.

Group H's desired safe holdings depend only on r. On an equilibrium branch with $a'_H(r) + a^d_{I,r} > 0$, market clearing implies

$$r_b = \frac{1 - a^d_{I,b}}{a'_H(r) + a^d_{I,r}}. \tag{SC4}$$

Issuance lowers the safe rate precisely when

$$S_b - c_{I,b} > c_{I,a} - r. \tag{SC5}$$

Thus a positive saving response to absorption payments is not by itself sufficient for reversal: induced demand must exceed the additional debt. In the goods market, hold group H at its desired holdings and assign the additional debt to group I. The expenditure response is $c_{I,a} - r + c_{I,b} - S_b$, giving the same condition.

SC.2 Nontradable income and tradable claims

The two implementations below share a linear consumption rule. As in the main text, mortality intensities satisfy $\lambda_H > \lambda_I > 0$. Write

$$m = \rho + \lambda_I, \qquad h = \frac{x_I}{r + \lambda_I}, \qquad \rho < r < m,$$

where ρ is the common discount rate and λ_I is group I's mortality intensity. Let $V(b,r)$ denote the wealth value of absorption payments entering consumption, so

$$c_I = m(a_I + h + V). \tag{SC6}$$

In the baseline, V is human wealth from the nontradable entitlement. In the alternative, it is the market value of the tradable claim.

For $j \in \{H, I\}$, retain

$$\kappa_j(r) = \frac{r - \rho}{(r + \lambda_j)(\rho + \lambda_j - r)}.$$

Combining (SC6) with the stationary budget yields

$$a_I = \kappa_I(r) x_I + T(b,r), \qquad T(b,r) = \frac{S(b,r) - mV(b,r)}{m - r}. \tag{SC7}$$

Here T is the change in desired safe holdings attributable to the absorption payment stream. The marginal response is

$$T_b = \frac{S_b - mV_b}{m - r}. \tag{SC8}$$

For the baseline entitlement, $V = S/(r + \lambda_I)$. Equation (SC7) then gives $T = \kappa_I S$, recovering the main text. The mortality adjustment applies because the entitlement expires at death.

For a tradable perpetual claim with value $Q = S/R$, R is its stationary capitalization yield. The claim survives its owner's death, and $V = Q$. At a fixed capitalization yield, an additional unit of annual payments raises desired safe holdings by

$$\left.\frac{\partial a_I^d}{\partial S}\right|_{r,R} = \frac{1 - m/R}{m - r}. \tag{SC9}$$

This response is positive when $R > m$. More generally, issuance can change the required yield as well as the payment, and the relevant consumption response is mQ_b. The next subsection determines both the yield and ownership from portfolio choice.

SC.3 A tradable absorption franchise

Replace group I's personal absorption entitlement with one unit of a tradable perpetual franchise paying $S > 0$. The available financial assets are safe claims and the franchise. The franchise has no operating expenditure, so its dividend equals the absorption transfer. Its value is Q, its capitalization yield is $R = S/Q$, and its yield duration, holding the dividend fixed, is $D_S = 1/R$.

The main text assesses institutional duration exposure using

$$s^D = \vartheta(N)\pi^R(b,N,\delta)D_B^2, \qquad D_B = (r+s+\delta)^{-1},$$

where π^R is gross rollover compensation and ϑ incorporates yield variance and the capital requirement per unit of variance. Extend this assessment to owners of the franchise by setting

$$k(b,N,\delta) = \zeta\,\vartheta(N)\pi^R(b,N,\delta), \qquad \zeta > 0. \tag{SC10}$$

The coefficient ζ allows owners' exposure cost and the franchise's yield-shock loading to differ from those of institutions holding Treasuries. Setting $\zeta = 1$ uses the same coefficient.

For an individual in group I, let w be financial wealth, $X = w + h > 0$ total wealth, and q the market value of franchise holdings. Define the portfolio share $\alpha = q/X$. Fair annuities cover both financial assets, and the individual faces

$$\dot{X} = \big[r + \lambda_I + (R-r)\alpha\big]X - c. \tag{SC11}$$

Borrowing in the safe account is allowed subject to lifetime solvency. I assume that franchise owners incur a nonpecuniary cost proportional to squared portfolio duration, $(\alpha/R)^2$. At constant prices, the individual chooses consumption and the portfolio to maximize

$$\int_0^\infty e^{-mt}\left[\log c_t - \frac{k}{2mR^2}\alpha_t^2\right]dt. \tag{SC12}$$

A sale transfers the dividend entitlement and duration exposure to the buyer.

The Bellman equation admits $v(X) = \log X/m + C$. Substitution gives

$$c = mX, \qquad \alpha = \frac{(R-r)R^2}{k}. \tag{SC13}$$

The portfolio objective is strictly concave, so the holding is unique at given prices. The consumption rule follows from the homogeneity of the objective, including the exposure assessment.

Group H has access to the same franchise, with a nonpecuniary assessment $k_H|\alpha_H|/(m_H R^2)$, where $m_H = \rho + \lambda_H$. Its optimal holding is zero whenever $k_H > (R-r)R^2$. On a branch with $0 < \alpha < 1$, any $k_H > k$ suffices. Consumption remains $c_H = m_H(a_H + x_H/(r+\lambda_H))$, and stationary safe demand is $a_H = \kappa_H x_H$.

SC.4 Stationary equilibrium

All group I members choose the same portfolio share. Annuity transfers cancel mortality losses in aggregation, and newborns enter with zero financial wealth. Franchise-market clearing requires aggregate holdings $q = Q$. The stationary budget and consumption rule are therefore

$$ra_I + S + x_I = m(a_I + Q + h). \tag{SC14}$$

They give (SC7) with $V = Q$. They also imply

$$X = \frac{\lambda_I h + S(1 - r/R)}{m - r}, \qquad \alpha(R;S,r) = \frac{S(m-r)}{\lambda_I hR + S(R-r)}. \tag{SC15}$$

Combining this share with optimal portfolio choice determines the capitalization yield:

$$(R-r)R^2 = k\,\frac{S(m-r)}{\lambda_I hR + S(R-r)}. \tag{SC16}$$

For fixed $r, S, k > 0$, the left side is zero at $R = r$ and strictly increasing for $R > r$. The right side is positive and strictly decreasing. There is exactly one root $R > r$.

With the main text's convenience schedule $\nu(b)$, the complete stationary equilibrium solves

$$s = -\nu(b) + \pi^R(b, N, \delta)\left[1 + \frac{\vartheta(N)}{(r+s+\delta)^2}\right], \qquad S = bs, \tag{SC17}$$

$$(R-r)R^2 = k\alpha(R;S,r), \qquad Q = S/R, \tag{SC18}$$

$$b = \kappa_H(r)x_H + \kappa_I(r)x_I + \frac{S - mQ}{m-r}. \tag{SC19}$$

Admissibility requires $\rho < r < m$, $S > 0$, nonnegative safe holdings and purchases, and the stated inequality for group H's assessment. The safe-rate response condition below selects a locally regular branch.

The aggregate allocation is supported by a stationary cohort distribution. A newborn has $X = h$; at age u, its total wealth is $he^{\gamma u}$, where

$$\gamma = r + \lambda_I + (R - r)\alpha - m.$$

Equation (SC15) implies

$$\lambda_I - \gamma = m - r - (R - r)\alpha = \frac{\lambda_I h}{X} > 0. \tag{SC20}$$

Integrating over the age density $\lambda_I e^{-\lambda_I u}$ gives total wealth X and franchise holdings $\alpha X = Q$. Hence the aggregate equations are consistent with individual optimization, entry, and mortality. The franchise itself remains outstanding when an owner dies.

Finally, stationary consumption satisfies $c_H = ra_H + x_H$ and $c_I = ra_I + x_I + S$. The two asset-market conditions and the government budget imply $c_H + c_I + g = 1$.

SC.5 Issuance and the Laffer curve

Define endowment-generated safe demand and net safe-asset supply by

$$M(r) = \kappa_H(r)x_H + \kappa_I(r)x_I, \qquad \mathscr{B} = b - T. \tag{SC21}$$

Equilibrium gives $\mathscr{B} = M(r)$, and $M'(r) > 0$ on the admissible interval. Let

$$\mathscr{D} = M'(r) + T_r$$

be the response of desired safe holdings to the safe rate, including the induced changes in payments and capitalization.

Proposition S1 (Capitalization and the Laffer condition)**.** *Consider an admissible equilibrium branch with $\mathscr{D} > 0$. In either implementation,*

$$r_b = \frac{1 - T_b}{\mathscr{D}}, \qquad \mathscr{B}_b = M'(r)r_b. \tag{SC22}$$

Issuance reduces net safe-asset supply and the safe rate if and only if

$$S_b - mV_b > m - r. \tag{SC23}$$

At a point where equality holds and $T_{bb} > 0$, both schedules have a strict local maximum. If $T_{bb} > 0$ throughout a connected debt interval and T_b crosses one, the maximum in that interval is unique.

Proof. Differentiate $b = M(r) + T(b,r)$ and use (SC8). At a crossing, $r_b = 0$, so differentiating the numerator gives $-T_{bb} < 0$. Thus $r_{bb} = -T_{bb}/\mathscr{D} < 0$ and $\mathscr{B}_{bb} = M' r_{bb} < 0$. If every crossing is downward, there can be only one on the interval. □

In the tradable-franchise model, debt issuance affects the required capitalization yield. Holding r fixed, the share in (SC15) satisfies $\alpha_R < 0$ and $\alpha_S > 0$. Differentiating (SC16) gives

$$R_b = \frac{k_b \alpha + k \alpha_S S_b}{R(3R - 2r) - k\alpha_R} > 0 \tag{SC24}$$

when $S_b > 0$ and $k_b \geq 0$. At a given yield, higher payments increase the franchise's share of recipients' wealth; a higher exposure assessment further increases the required yield. Consequently,

$$T_b = \frac{(1 - m/R)S_b + mSR_b/R^2}{m - r}. \tag{SC25}$$

The first term is saving out of the higher payment at a fixed yield. The second is the additional saving induced by the lower capitalization of the payment stream as the yield rises. A yield above the wealth MPC, $R > m$, is sufficient for a positive safe-demand response when $R_b \geq 0$, but the Laffer condition still requires $T_b > 1$.

If the exposure assessment vanishes and the claim is a perfect substitute for the safe asset, $R = r$. Then $T = -S/r$ and $T_b = -S_b/r$. For $S_b > 0$, capitalization therefore makes recipients' desired holdings of safe government debt decline with additional issuance. The duration assessment supplies the valuation wedge in the tradable implementation.

SC.6 Existence and interpretation

The tradable model has an admissible interior peak using the main paper's unchanged household parameters, endowments, and Treasury absorption schedule, with $\zeta = 1$. The solution is approximately

$$b = 0.703, \qquad r = 1.503\%, \qquad R = 2.182\%, \qquad \alpha = 0.050.$$

Both groups' safe holdings are positive, government purchases are about 0.238, and the cohort condition (SC20) holds. At this allocation, $T_b = 1$, $\mathscr{D} \simeq 236.4 > 0$, and $T_{bb} \simeq 11.5 > 0$. These strict inequalities imply that a nearby peak survives small changes in parameters.

In both economies, absorption payments generate demand for safe assets when their capitalization induces less consumption than the payments themselves. The precise issuance condition compares the marginal payment S_b, the marginal consumption response mV_b, and the net wealth

effect $m - r$. Nontradable lifetime income limits capitalization through the mortality adjustment. A tradable franchise can do so through the compensation required to bear duration exposure.

SD Financial Capacity

The smooth-onset quadratic premium in (26) illustrates how greater financial capacity lowers marginal absorption cost. Holding the household threshold fixed isolates the effect of lower marginal absorption costs; the equilibrium threshold and absorption cost can also respond through the safe rate, as shown in (44).

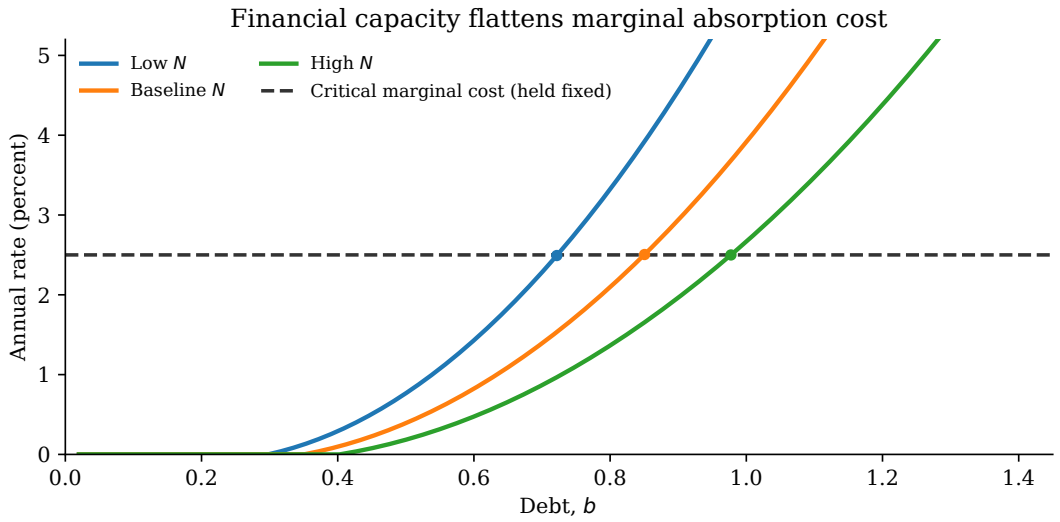


Figure S5: Schematic illustration of financial capacity and marginal Treasury absorption cost. Higher N moves the stress threshold outward and flattens the marginal-cost schedule. The figure holds the critical marginal cost fixed, isolating the effect of lower marginal absorption costs on the peak debt stock.

SE Quantitative Calibration

The calibration in Appendix D uses the exposure-weighted participation schedule in (C4), with $\Gamma(\zeta) = c_\Gamma \zeta$, where $c_\Gamma > 0$ scales the stress assessment. The inelastic participation share is $\underline{\alpha} = 0.8$. Let b_0 denote debt per unit of annual model output at the reference allocation: federal debt held by the public excluding Federal Reserve holdings on June 30, 2026, divided by 2026Q2 annualized nominal GDP. The pricing moments are those of nominal Treasury notes and bonds held outside the Federal Reserve, including foreign official holdings. The convenience value takes the form

$$\nu(b) = \nu_\infty + \nu_a (b/b_0)^{-\xi}, \qquad \nu_\infty \geq 0, \quad \nu_a, \xi > 0. \tag{SE1}$$

I set $\nu_\infty = 12$ basis points and $\xi = 1$. The four 2026Q2 pricing estimates determine the support-cost scale, baseline utilization, the remaining convenience value, and the duration coefficient.

The reference safe rate of 1.5 percent and the measured absorption premium of 48.3 basis points imply a real Treasury funding rate of approximately 1.98 percent. Together with the maturity intensity in (D1), it implies duration $D_{\mathrm{Q2}} \simeq 6.4$ years. Both subscript Q2 and subscript zero refer to the 2026Q2 allocation. Define the baseline support elasticity by $E_0 = b_0 \pi_b^R / \pi_0^R$. Differentiating the duration fixed point at a fixed safe rate gives

$$E_0 = \frac{\mathscr{M}^D_{\mathrm{Q2}}}{s^D_{\mathrm{Q2}}} + 2 D_{\mathrm{Q2}} (\mathscr{M}^R_{\mathrm{Q2}} + \mathscr{M}^D_{\mathrm{Q2}}), \qquad \pi_0^R = \frac{\mathscr{M}^R_{\mathrm{Q2}} + \xi (s^R_{\mathrm{Q2}} + \nu_\infty)}{E_0 + \xi}. \tag{SE2}$$

All premia and repricing terms in this expression are annual decimal rates. The convenience coefficient is $\nu_a = \pi_0^R - s^R_{\mathrm{Q2}} - \nu_\infty$, and $\vartheta_0 = s^D_{\mathrm{Q2}} / (\pi_0^R D^2_{\mathrm{Q2}})$. Baseline utilization solves $q_0 p'(q_0)/p(q_0) = E_0$. The scale and $N_0 = \mu(\delta) b_0 / q_0$ then match π_0^R. The solution is $q_0 = 1.414 > 1$, so every participation state uses capacity beyond its ordinary allotment between the baseline and the peak. The dealer-parent index in Section 2 measures capacity variation; the pricing estimates determine the effective capacity level N_0.

At the Q2 calibration point, a 1 percent increase in debt raises marginal cost by approximately 2.9 basis points at a fixed safe rate, close to the 2.9-basis-point local conversion in Section 2.

For the household calibration, I divide the June 2026 stock of federal debt held by the public excluding the Fed, \$27.189 trillion, by annualized nominal GDP of \$32.563 trillion to obtain $b_0 \simeq 0.835$, and set $\bar{\tau} = 0.25$ as in Section 5. At the reference safe rate, asset-market clearing and $x_H + x_I = 1 - \bar{\tau}$ give

$$x_I = \frac{b_0 - \kappa_H(r_0)(1-\bar{\tau}) - \kappa_I(r_0) S_0}{\kappa_I(r_0) - \kappa_H(r_0)}, \qquad x_H = 1 - \bar{\tau} - x_I. \tag{SE3}$$

The resulting group I debt share is $\kappa_I(r_0)(x_I + S_0)/b_0 = 0.913$.

Table S5: Parameters of the stationary equilibrium

Financial parameter	Value	Household or fiscal parameter	Value
$\underline{\alpha}$	0.8	b_0	0.83497
δ	0.13693	$\bar{\tau}$	0.25000
N_0	0.07558	ρ	0.01000
c_Γ (bp)	33.74114	λ_I	0.01000
ν_∞ (bp)	12	λ_H	0.22000
ν_a (bp)	5.68547	x_I	0.01502
ξ	1	x_H	0.73498
ϑ_0	0.05770		

Notes: Rates and intensities are annual decimals except where basis points are indicated. Debt, capacity, and income are in units of annual model output. The x_j terms are after-tax endowment income and exclude financial and absorption income. Numerical solutions use unrounded parameters.

The debt experiment holds these parameters fixed. At each debt stock, the pricing fixed point and asset-market equation are solved jointly. The peak solves $1 - \kappa_I(r)S_b = 0$. Marginal cost increases with debt from the baseline onward.

SE.1 Pricing specifications

Table S6 varies the stress assessment, the duration-repricing estimate, convenience services, and participation. Each specification holds the annual wealth MPCs at 2 and 23 percent; the common discount rate is 1 percent. Initial asset-market clearing determines income allocations and debt ownership. The financial parameters are calibrated to the four pricing estimates, using the indicated $\mathscr{M}^D_{\mathrm{Q2}}$ in the duration rows. The share-normalized row uses the 99.5-basis-point estimate in Table S3.

Table S6: Illustrative maxima of net safe-asset supply across pricing specifications

Specification	Peak net safe-asset supply (percent of output)	Debt at peak (output units)	Safe-rate rise to peak (bp)
Reference specification	67.70	0.912	0.1
Quadratic stress assessment	67.56	0.877	0.1
Duration repricing $\times 0.75$	68.86	1.015	0.6
Duration repricing $\times 1.20$	67.38	0.846	< 0.01
Share-normalized duration repricing (99.5 bp)	68.21	0.964	0.4
Convenience floor 0–20 bp; $\xi = 0.5$–2	67.69–67.76	0.910–0.928	0.1–0.2
Participation floor $\underline{\alpha} = 0.5$–0.9	67.70	0.912	0.1

Notes: Net safe-asset supply is $\mathscr{B} = b - \kappa_I(r)S$; output denotes annual model output. Each specification starts from debt $b_0 \simeq 0.835$ and net safe-asset supply equal to 67.4 percent of output. Convenience ranges use the 28 fits with positive ν_a among 35 combinations of floors from 0 to 20 basis points in 5-basis-point steps and elasticities from 0.5 to 2 in steps of 0.25. The endpoints in different columns can correspond to different specifications. Participation uses floors of 0.5, 0.8, and 0.9. As a separate conditional calculation, holding the safe rate at its reference value gives a maximum net safe-asset supply of 67.8 percent of output at debt 0.916, where $S_b = 250$ basis points. This fixed-rate calculation measures the net supply before the market-clearing rate adjusts.

The quadratic stress assessment makes the gross support spread convex within each participation state, increasing the curvature of marginal absorption cost. The participation floor affects the exposure weights, but the locally fitted affine support schedule is the same for all three reported floors between the baseline and peak. The peak is less sensitive to convenience than to the stress-cost and duration-repricing specifications.

SE.2 Financial capacity

I vary effective capacity holding the support-cost and convenience parameters fixed and specify

$$\vartheta(N) = \vartheta_0 \frac{N_0}{N}. \tag{SE4}$$

With household preferences and taxes fixed, greater capacity lowers gross rollover compensation and the duration-capital requirement. Lower absorption payments increase net safe-asset supply at the reference debt stock because recipients seek fewer safe holdings from this income. The reduction in marginal absorption cost also increases the debt stock at the Laffer peak in this illustration.

Table S7: Financial capacity and the peak of net safe-asset supply

Capacity relative to reference	Net safe-asset supply at reference debt (percent of output)	Peak net safe-asset supply (percent of output)	Debt at peak (output units)
1.00	67.37	67.70	0.912
1.10	72.80	73.99	0.979
1.25	79.89	83.40	1.076

Notes: Capacity is the model's effective support capacity N. Net safe-asset supply is $\mathscr{B} = b - \kappa_I(r)S$, evaluated at each allocation's market-clearing safe rate; output denotes annual model output. The reference debt stock is $b_0 \simeq 0.835$. Household parameters remain fixed. A 10 percent capacity increase raises the safe rate at reference debt by 2.3 basis points, followed by a further 0.5-basis-point rise to the peak; the corresponding changes for a 25 percent increase are 5.0 and 1.2 basis points. At reference capacity, the rise from reference debt to the peak is 0.1 basis point.