The Safe-Debt Laffer Curve

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Abstract

Safe public debt can become a drag on aggregate demand even while the sovereign remains solvent. Its safety requires rollover support, market-making, and balance-sheet capacity. As these resources become scarce, the marginal cost of producing safe Treasury claims rises. The resulting fiscal adjustment reduces aggregate expenditure and can eventually outweigh the expansionary effect of increasing the supply of safe assets. Debt's stationary contribution to aggregate demand then peaks, and the equilibrium safe rate reaches its maximum at the same debt stock. Beyond this point, further issuance lowers aggregate demand and the safe rate even though the debt remains safe. Empirically, I combine cash-Treasury and real-duration premia with estimates of how additional private supply reprices the outstanding Treasury stock. Over the past decade, the benchmark marginal cost more than doubled, rising from about 80 basis points in 2015Q1 to 187 basis points in 2026Q1. Using a 330-basis-point benchmark for the rate-equivalent wealth benefit, the safe-debt margin—the difference between this benefit and marginal cost—fell from about 250 to 143 basis points. At the CBO's 2026 borrowing pace, the remaining safe-debt margin shrinks by about 18 basis points in one year, with further erosion accelerating as debt rises relative to financial capacity.

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1 Introduction

Public debt in the major developed economies is approaching levels rarely seen outside major wars, and it continues to rise. The familiar concern is fiscal stability: mounting debt may become unsustainable and end in implicit or explicit default. I ask a different question. Suppose the sovereign remains solvent and its debt remains safe. Can a larger stock of safe public debt nevertheless become a drag on aggregate demand? The canonical answer is no.

Government debt is the economy's reference safe asset, both a store of value and collateral for private contracting. Issuance expands the supply of safe financial wealth and normally raises the equilibrium safe rate required to place it. At the inherited rate, finite-horizon private owners spend part of the additional wealth, while debt service reduces government purchases. Absent an additional cost of sustaining the debt's safety, the wealth effect of additional debt raises aggregate expenditure.[1] A chronic demand for stores of value, as emphasized in the safe-asset-shortage literature, reinforces this expansionary force.

That reasoning treats the production of safety as costless. In practice, government debt is liquid and safe because the financial system supplies market-making, warehousing, and rollover support. The fiscal authority supplies the promise; intermediaries supply the balance-sheet capacity that allows investors to treat it as a safe claim. I call the resulting spread the Treasury absorption premium. It enters the government budget even though households continue to hold a safe claim. Safety can be preserved while becoming more expensive to produce.

The model builds this production mechanism around rollover episodes. Over any fixed interval, part of the debt stock comes due. Financial institutions must mobilize balance-sheet services to place the refinancing flow. The least costly capacity is used first. As rollover needs rise relative to available capacity, institutions must use balance sheets more intensively or draw on progressively more expensive sources of support. The Treasury absorption premium consequently rises with debt and falls with financial capacity. The empirical capacity interaction tests this implication directly.

The Treasury absorption premium is the financing term on one dollar of debt. Marginal issuance is more expensive because it changes both the payment on the new dollar and the terms at which the outstanding stock will be refinanced. The stock effect is forward-looking: each unit of existing debt enters the refinancing flow when it matures, so a higher premium changes the cost of rolling over the stock. In steady state, the sequence of rollover payments is represented as an annualized cost on outstanding debt. The marginal Treasury absorption cost is the sum of the premium on the new claim and the repricing of the refinancing stock. Even a moderate movement in the premium can have a large fiscal effect when refinancing needs are large.

Producing safe public debt affects aggregate demand through the fiscal cost of sustaining its safety. Higher Treasury absorption payments require a fiscal adjustment. Because private recipients spend only part of these payments, the adjustment produces a net reduction in aggregate expenditure. An additional unit of debt increases private financial wealth but also raises the cost of supporting the debt stock as it rolls over. At low debt, the stationary non-Ricardian wealth effect dominates: debt generates positive aggregate-demand pressure at the inherited safe rate,

[1] This is a stock experiment rather than a deficit-financed stimulus experiment: the object is the steady-state aggregate-demand contribution of the outstanding stock of safe public debt.

and the equilibrium safe rate rises to reduce the capitalized value of nonfinancial income and restore equilibrium. As financial capacity becomes scarce, the marginal Treasury absorption cost increases and the expenditure effect weakens. Beyond the turning point, the fiscal drag exceeds the wealth effect, so additional debt generates negative aggregate-demand pressure and the equilibrium safe rate falls. The aggregate-demand Laffer curve describes this stationary contribution. The safe-rate schedule reaches its maximum at the same debt stock because both slopes depend on the difference between the rate-equivalent wealth benefit of an additional safe claim and its marginal Treasury absorption cost.

Financial capacity moves both the onset and the severity of rollover stress. More capacity permits a larger refinancing flow before additional balance-sheet compensation is required. Once the economy enters the active region, additional capacity lowers utilization, reduces the gross support premium, and flattens its response to debt. It raises the equilibrium safe rate at a given debt stock. Holding the rate-equivalent wealth benefit fixed, the flatter marginal-cost schedule also pushes the Laffer peak to a larger debt stock.

Maturity changes how the same rollover exposure is transmitted. Longer maturity reduces the share of debt that must be refinanced during a given interval, lowering the direct rollover shortfall. The claims that remain outstanding, however, have greater duration, so their prices respond more strongly to a change in gross rollover-support compensation. Duration is the multiplier on this price effect and is jointly determined with the total premium. Shorter maturity raises the quantity exposed to rollover while reducing the price amplification of each remaining claim; longer maturity does the reverse. Financial capacity lowers both gross rollover compensation and its transmission into bond prices.

This maturity structure supplies the empirical decomposition. I measure the marginal Treasury absorption cost using the levels of the cash-Treasury and real-duration premia and the repricing of the outstanding private Treasury stock through each component. The cash-Treasury premium captures direct financing and warehousing costs. The real-duration premium captures the price amplification associated with longer claims. In each case, the premium level values a marginal unit at prevailing prices, while the supply response measures how that unit changes the price of the stock already in private hands. This level-plus-repricing decomposition is the empirical counterpart of the model's distinction between the financing term on one claim and the marginal cost of issuance.

Figure 1 summarizes the empirical results. Its upper panel reports the estimated marginal Treasury absorption cost and separates its rollover and real-duration components. The lower panel subtracts that cost from the benchmark rate-equivalent wealth benefit of additional safe debt, yielding the remaining safe-debt margin.

For cash-Treasury repricing, I follow D'Amico and King (2013) and compare changes in the share held in the Federal Reserve's System Open Market Account (SOMA) with Treasury–swap spreads within maturity buckets. Start-month effects remove aggregate news and curve-wide repricing, while maturity effects absorb persistent differences across buckets. The within-bucket coefficient measures how a change in the private supply of a maturity segment changes its cash-Treasury premium. I then scale that response by the private float in each bucket and aggregate across maturities, producing a repricing term for the outstanding private Treasury stock.

For duration repricing, I combine Federal Reserve purchase and runoff announcements with the real term premium of D'Amico, Kim, and Wei (2018). The event-study coefficient measures

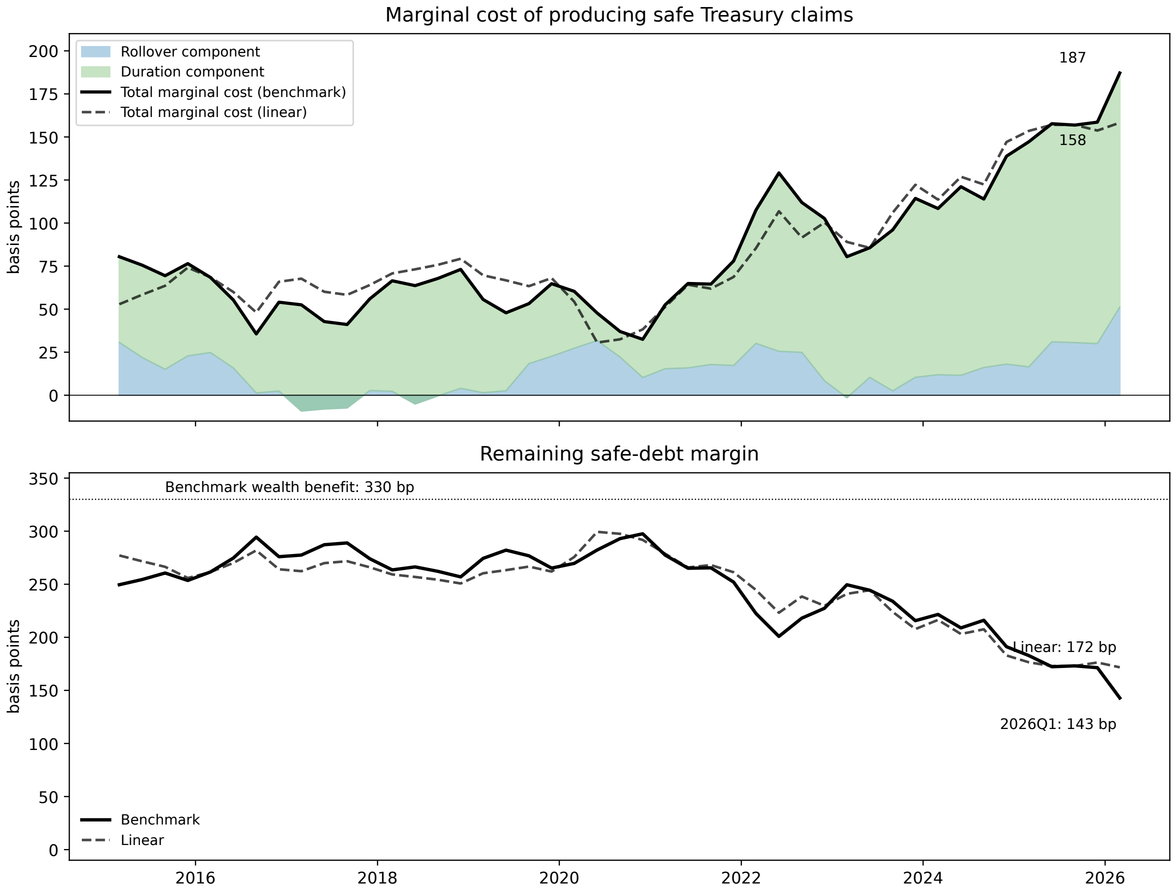

Figure 1: Marginal Treasury absorption cost and the remaining safe-debt margin. The solid lines use the benchmark capacity-dependent estimates; the dashed lines use the corresponding linear estimates. The upper panel separates the cash-Treasury and real-duration components of marginal cost. The lower panel subtracts marginal cost from the benchmark 330-basis-point rate-equivalent wealth benefit to obtain the safe-debt margin. Section 6 describes the construction.

how the real-duration premium responds when announced purchases change the quantity of Treasury duration held by private investors. Multiplying this response by the private coupon stock gives the corresponding stock-wide repricing term. The cash-Treasury and duration estimates are thereby placed on the same annualized basis-point scale and can be combined with their observed premium levels.

The benchmark marginal Treasury absorption cost more than doubles, rising from about 80 basis points in 2015Q1 to about 187 basis points in 2026Q1. The increase reflects both higher premium levels and the repricing of a much larger private Treasury stock. The supply response also steepens when dealer-parent capacity is scarce: the capacity interaction has the sign predicted by the model and is statistically significant under overlap-robust inference. Under the benchmark rate-equivalent wealth benefit, the safe-debt margin falls from about 250 to 143 basis points. At the 2026 borrowing pace projected by the Congressional Budget Office, a local calculation at current financial-capacity conditions implies that one year of additional debt issuance would reduce the remaining margin by about 18 basis points. Because marginal Treasury absorption costs are convex in debt relative to financial capacity, the erosion would accelerate if debt continued to rise without a corresponding expansion in absorption capacity.

Literature Review. The natural starting point is the safe-asset-shortage literature. Caballero, Farhi, and Gourinchas (2008, 2016, 2017, 2021) and Caballero and Farhi (2018) show how scarcity depresses safe rates and contributes to global imbalances and recessions. The same view appears in work on 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). Recent formulations include Itskhoki and Mukhin (2026) and Brunnermeier, Merkel, and Sannikov (2024). These papers ask what happens when safe claims are scarce. I ask how far their supply can expand before the marginal cost of supporting them absorbs their contribution to demand.

Convenience-yield models supply part of the answer. When safety and liquidity services enter preferences or constraints, Treasury demand slopes downward and the convenience yield 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). Here the corresponding stock effect operates through the cost of refinancing and supporting safe debt, and the outcome of interest is its marginal contribution to aggregate demand. This argument also belongs to the broader asset-shortage tradition linking a shortage of stores of value to low real rates, high valuations, bubbles, and macroeconomic fragility (Caballero, 2006, 2015). Auclert, Malmberg, Rognlie, and Straub (2025) provide a recent framework connecting asset supply, U.S. wealth, real rates, and fiscal sustainability.

On the demand side, Barro (1974) provides the Ricardian benchmark, while Blanchard (1985) and Weil (1989) show how finite horizons shape private wealth demand. Mian, Straub, and Sufi (2021, 2025) emphasize the aggregate consequences of differences in saving behavior across owners. 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 routes from fiscal policy to demand. Here the relevant fiscal composition is between government purchases and the compensation paid to the owners of Treasury-absorption capacity.

The supply side combines risk-bearing capacity with rollover support. Caballero (2010) emphasizes that meeting strong demand for safe assets uses financial-system balance sheets and can concentrate risk within them. Risk-centric macroeconomic models make asset prices, financial conditions, and intermediary capacity central to aggregate demand (Caballero and Simsek, 2020, 2021, 2023); Caballero, Caravello, and Simsek (2024) study the associated financial-conditions target. In Treasury markets, limited dealer balance sheets can turn a larger supply into market dysfunction (Kashyap, Stein, Wallen, and Younger, 2025). Evidence from March 2020 and subsequent work on market resilience is provided by Duffie (2020); Duffie and Keane (2023), Schrimpf, Shin, and Sushko (2020), Kruttli, Monin, Petrasek, and Watugala (2021), He, Nagel, and Song (2022), and Du, Hébert, and Li (2023). The rollover structure draws on Calvo (1988) and Cole and Kehoe (2000), as well as the sovereign-spread and repayment literature (Eaton and

Gersovitz, 1981; Arellano, 2008; Aguiar and Amador, 2014). He, Krishnamurthy, and Milbradt (2019) is especially close in making safety depend on the debt stock. I use these ingredients to put the cost of safety in the government budget and the goods-market equilibrium.

Empirically, the paper is related 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; Jiang, Richmond, and Zhang, 2025). The empirical object here is the marginal Treasury absorption cost. The maturity extension connects that object to debt-management models (Angeletos, 2002; Buera and Nicolini, 2004; Faraglia, Marcet, Oikonomou, and Scott, 2019) and to the government's comparative advantage in supplying short safe debt (Greenwood, Hanson, and Stein, 2015). It separates the amount that must be rolled over from the price amplification created by duration.

Section 2 develops household demand and the fiscal closure. Section 3 derives the rollover premium from debt relative to financial capacity. Section 4 combines the two sides of the model and derives the Laffer curve. Section 5 introduces maturity, and Section 6 measures the U.S. marginal Treasury absorption cost. The appendices contain formal derivations, the maturity-choice extension, and the empirical construction details.

2 Household Demand and Fiscal Closure

This section maps the cost of producing safe debt into aggregate expenditure. Higher Treasury absorption payments require a fiscal adjustment. Government purchases fall by the full payment, while the recipients consume only part of the corresponding increase in persistent income and save the remainder. Treasury absorption reduces aggregate expenditure at a fixed safe rate. The model below provides one tractable representation of this broader demand drag.

2.1 Private owners and their budget constraints

Output is an exogenous endowment normalized to one. The government has outstanding debt b, levies a fixed flow of taxes $\bar{\tau}$, and purchases the output left after servicing the debt and meeting the cost associated with Treasury absorption. For the moment, take the annualized Treasury absorption payment S as given. Section 3 derives it from rollover pressure and financial-system capacity.

There are two unit-mass household groups, indexed by $j \in \{H, I\}$. Both receive endowment income and own financial assets. They may differ in their effective horizons and hence in their consumption and saving behavior. Group I comprises the households that receive Treasury absorption income: financial-firm owners and investors whose income is exposed to the cost of absorbing Treasury debt.

Members of group j die with Poisson intensity $\lambda_j > 0$ and are replaced one-for-one by newborns with no initial holdings of safe government debt. They discount utility at rate $\rho > 0$ and have logarithmic flow utility. Actuarially fair annuity markets operate within each group: the safe-asset holdings of owners who die are transferred to the surviving members of the same group. Appendix A embeds the resulting consumption functions in Epstein–Zin preferences and derives the limiting demand for supported safe claims when risk aversion to rollover losses is high.

Index an individual by birth date v. Conditional on being alive at date t, a member of group j chooses consumption to maximize

$$\int_t^{\infty} e^{-(\rho+\lambda_j)(u-t)} \log c_{j,v,u}\, du. \tag{1}$$

The mortality hazard enters the effective discount rate because utility ends at death. Let $w_{j,v,t}$ denote the individual's safe financial wealth and let every living member of the group receive the nontradable income flow $y_{j,t}$. Because the annuity market transfers the wealth of deceased members to survivors, a survivor earns the mortality credit $\lambda_j w_{j,v,t}$. The individual budget constraint is

$$\dot{w}_{j,v,t} = (r_t+\lambda_j) w_{j,v,t} + y_{j,t} - c_{j,v,t}. \tag{2}$$

The safe return is r_t. The additional λ_j is the actuarially fair annuity payment rather than an aggregate return on wealth.

Let $h_{j,t}$ denote the capitalized value of nontradable income received while the owner remains alive. At date t, it is

$$h_{j,t} = \int_t^{\infty} \exp\left[-\int_t^u (r_v+\lambda_j)\, dv\right] y_{j,u}\, du. \tag{3}$$

For a constant safe rate and a permanent income flow y_j, this becomes

$$h_j = \frac{y_j}{r+\lambda_j}. \tag{4}$$

The mortality hazard enters the discount rate because the income flow ends when the current owner dies.

The Euler equation from (1)–(2) is

$$\frac{\dot{c}_{j,v,t}}{c_{j,v,t}} = r_t - \rho. \tag{5}$$

Substituting this consumption path into the intertemporal budget constraint gives the consumption function

$$c_{j,v,t} = (\rho+\lambda_j)(w_{j,v,t}+h_{j,t}). \tag{6}$$

Thus $\rho+\lambda_j$ is the annual propensity to consume out of total wealth. The annuity credit cancels the mortality hazard in the Euler equation, but the hazard remains in the level of consumption because it shortens the horizon over which total wealth is spent. A longer effective horizon lowers this propensity and makes the group save more of a change in permanent income. This is the first object governing the incidence of Treasury absorption payments.

For a given safe rate and current financial wealth, the marginal propensity to consume out of a permanent increase in nontradable income is

$$m_j(r) \equiv \left.\frac{\partial c_j}{\partial y_j}\right|_{a_j,r} = \frac{\rho+\lambda_j}{r+\lambda_j}. \tag{7}$$

This response follows directly from the consumption function: a permanent dollar of income raises its capitalized value by $1/(r+\lambda_j)$. Because the consumption function is linear, the same expression applies at the individual and group levels. The stationary capitalization factor derived below determines how much financial wealth the group ultimately holds against that income flow.

We next aggregate across individuals. With a unit population and one-for-one replacement, the density at date t of the cohort born at $v \le t$ is $\lambda_j e^{-\lambda_j(t-v)}$. Aggregate safe financial wealth and consumption are therefore

$$a_{j,t} = \int_{-\infty}^{t} \lambda_j e^{-\lambda_j(t-v)} w_{j,v,t}\, dv, \qquad c_{j,t} = \int_{-\infty}^{t} \lambda_j e^{-\lambda_j(t-v)} c_{j,v,t}\, dv. \tag{8}$$

Differentiating aggregate wealth, using the individual budget constraint, and using the fact that newborns begin with zero safe financial wealth gives

$$\begin{aligned} \dot{a}_{j,t} &= (r_t + \lambda_j)a_{j,t} + y_{j,t} - c_{j,t} - \lambda_j a_{j,t} \\ &= r_t a_{j,t} + y_{j,t} - c_{j,t}. \end{aligned} \tag{9}$$

The first $\lambda_j a_{j,t}$ is the annuity credit received by survivors; the second is the wealth transferred from the accounts of members who die. They are the two sides of the same within-group transfer and cancel from the aggregate budget.

Because the individual consumption function is linear in wealth and all living members of a group have the same capitalized nontradable income, aggregation also gives

$$c_{j,t} = (\rho + \lambda_j)(a_{j,t} + h_{j,t}). \tag{10}$$

In a stationary allocation, aggregate wealth is constant. The aggregate budget constraint can therefore be written

$$0 = r a_j + y_j - c_j. \tag{11}$$

Combining this budget identity with the consumption function gives stationary desired financial wealth:

$$a_j = \kappa_j(r) y_j, \qquad \kappa_j(r) = \frac{r-\rho}{(r+\lambda_j)(\rho+\lambda_j-r)}. \tag{12}$$

The adjustment toward this stationary position follows from the same two aggregate equations. Holding r and y_j constant, equations (9) and (10) imply

$$\dot{a}_{j,t} = -(\rho + \lambda_j - r)\left[a_{j,t} - \kappa_j(r) y_j\right]. \tag{13}$$

An initial position above desired stationary wealth is run down at rate $\rho + \lambda_j - r$. The annuity market does not prevent this adjustment: it reallocates the holdings of deceased members to survivors within the same group, while the group's aggregate consumption function determines how quickly excess wealth is spent. A larger mortality hazard accelerates this convergence, but convergence does not require the two groups to have different mortality hazards.

Positive wealth requires

$$\rho < r < \rho + \lambda_j. \tag{14}$$

The lower inequality makes saving attractive relative to immediate consumption. The upper inequality ensures that finite lives prevent wealth from growing without bound. Inside this interval,

$$\kappa_j'(r) = \frac{\rho\lambda_j + \lambda_j^2 + (r-\rho)^2}{(r+\lambda_j)^2(\rho+\lambda_j-r)^2} > 0. \tag{15}$$

A higher safe return raises the stationary stock of safe wealth that the group wishes to hold per unit of permanent nontradable income.

The household MPC in (7) and the stationary capitalization factor are linked by

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

The left-hand side is the amount of a permanent income increase that is accumulated as stationary financial wealth, expressed as an annual flow. The right-hand side is the share not consumed at the current wealth position. This identity will connect the non-Ricardian wealth effect of additional debt to the fiscal drag generated by Treasury absorption payments.

Remark 1 (Why the model has two household groups)**.** The two-group structure allows the households receiving Treasury absorption income to have a different saving response from the other households holding the existing debt stock. Aggregate desired wealth determines the level and adjustment of the safe rate. The capitalization factor of group I determines how recurring Treasury absorption income changes stationary desired wealth. Section 6.6 disciplines this factor using the income and wealth of households exposed to marginal Treasury financing terms.

2.2 Taxes, Treasury absorption income, and government purchases

Let s denote the annualized Treasury absorption spread. In a stationary allocation, the aggregate Treasury absorption payment is

$$S = bs. \tag{17}$$

The private-income counterpart of this payment accrues to group I. Both groups continue to hold government bonds according to their portfolio demands.

The government levies the fixed tax flow $\bar{\tau}$. Its budget constraint is

$$g = \bar{\tau} - rb - S, \tag{18}$$

where g denotes government purchases. Taxes do not adjust when Treasury absorption becomes more expensive. At a given debt stock and safe rate, an additional dollar of S reduces government purchases by one dollar.

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

$$x_H + x_I = 1 - \bar{\tau}. \tag{19}$$

Group I receives the Treasury absorption payment as a nontradable income flow attached to its members.[2] The two groups' total nontradable incomes are therefore

$$y_H = x_H, \qquad y_I = x_I + S. \tag{20}$$

The analysis considers allocations in which both income flows remain positive. This condition also permits a signed empirical net premium: a convenience benefit can make the measured net absorption payment negative without making either group's total income negative.

Substituting the two income flows into (12) gives

$$a_H = \kappa_H(r)x_H, \qquad a_I = \kappa_I(r)(x_I + S). \tag{21}$$

Both groups demand safe wealth out of their baseline incomes. Group I also saves part of the recurring Treasury absorption income it receives. One dollar of persistent Treasury absorption income generates $\kappa_I(r)$ dollars of desired stationary safe wealth.

2.3 Asset-market and goods-market clearing

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

$$b = a_H + a_I = \kappa_H(r)x_H + \kappa_I(r)(x_I + S). \tag{22}$$

For given b and S, desired safe wealth is continuous and strictly increasing in r over the common admissible interval $\big(\rho, \rho + \min\{\lambda_H, \lambda_I\}\big)$. It ranges from zero to infinity as r crosses this interval: both capitalization factors vanish at the lower boundary, while at least one diverges at the upper boundary. Hence, for every $b > 0$ and positive income flows, equation (22) admits a unique stationary safe rate.

Goods-market clearing follows from the same budgets. Writing the steps explicitly traces the absorption payment from government purchases into household income. In a stationary allocation, equations (9) and (20) imply the stationary budget constraints

$$0 = ra_H + x_H - c_H, \tag{23}$$
$$0 = ra_I + x_I + S - c_I. \tag{24}$$

Adding private consumption and government purchases gives

$$\begin{aligned} c_H + c_I + g &= r(a_H + a_I) + x_H + x_I + S + \bar{\tau} - rb - S \\ &= 1 + r(a_H + a_I - b). \end{aligned} \tag{25}$$

Consequently, asset-market clearing implies

$$c_H + c_I + g = 1. \tag{26}$$

[2] The benchmark treats Treasury absorption income as a nontradable flow attached to members of group I. If the payment were instead a dividend on tradable equity, its capitalization would depend on the required equity return. The fiscal drag remains positive when the required equity return exceeds $\rho + \lambda_I$, equivalently when the equity premium over the safe rate exceeds $\rho + \lambda_I - r$.

The payment S cancels from the resource identity because it is a transfer from the government to private owners. Its incidence nevertheless matters for expenditure. Government purchases fall by the full payment, whereas the recipients consume only part of the associated increase in persistent Treasury absorption income and save the remainder.

Section 3 now derives the Treasury absorption payment from rollover pressure and financial-system capacity. Section 4 then uses the household budgets and market-clearing condition above to derive the stationary response to additional debt.

3 Producing Safe Public Debt

Section 2 took the aggregate Treasury absorption payment S as given. We now derive this payment from the spread required to absorb the debt that must be refinanced. Placing Treasury debt uses dealer balance sheets, funding, market-making resources, and investors' willingness to warehouse positions. The least costly sources of support are used first. As rollover needs become large relative to available capacity, progressively more expensive balance-sheet services must be mobilized. The Treasury absorption spread consequently rises with debt and falls with financial capacity.

3.1 Rollover exposure and gross support compensation

We begin with a unit-length rollover interval, so the entire debt stock comes due within the interval. Section 5 introduces positive maturity, so only part of the stock must be refinanced during any given interval. In either case, financing terms apply to outstanding claims as they are refinanced, and the stationary payment records the annualized cost of that sequence of rollovers.

Let $N > 0$ denote effective Treasury-absorption capacity. It summarizes the balance-sheet room, funding capacity, and market-making resources that can be brought to the refinancing market. This production-side capacity is separate from the capitalization of group I. In the short-maturity benchmark, the rollover exposure is b, and utilization is b/N. If debt and capacity grow in the same proportion, the burden per unit of debt is unchanged.

Let $\pi^R(b,N)$ denote the annualized gross rollover-support spread on outstanding debt. Market financing terms are summarized by an inverse supply schedule

$$\pi^R(b,N) = p\left(\frac{b}{N}\right). \tag{27}$$

The schedule is flat while ordinary balance-sheet capacity is sufficient. In the active region, additional utilization requires more intensive use of existing balance sheets or the mobilization of higher-cost capacity. Accordingly, throughout that region,

$$p'\left(\frac{b}{N}\right) > 0, \qquad p''\left(\frac{b}{N}\right) \geq 0 \tag{28}$$

Differentiating the inverse supply schedule makes the role of capacity precise. In the active region,

$$\pi_b^R(b,N) = \frac{1}{N}p'\left(\frac{b}{N}\right) > 0, \tag{29}$$

$$\pi_N^R(b,N) = -\frac{b}{N^2}p'\left(\frac{b}{N}\right) < 0. \tag{30}$$

More debt raises the utilization of financial capacity; more capacity reduces it. The curvature and debt-capacity interaction are

$$\pi_{bb}^R(b,N) = \frac{1}{N^2}p''\left(\frac{b}{N}\right) \geq 0, \tag{31}$$

$$\pi_{bN}^R(b,N) = -\frac{1}{N^2}\left[p'\left(\frac{b}{N}\right) + \frac{b}{N}p''\left(\frac{b}{N}\right)\right] < 0. \tag{32}$$

Thus capacity lowers both gross compensation and its sensitivity to debt. The cross-partial is the production-side nonlinearity measured by the capacity interaction in Section 6.

3.2 Convenience services and the net cash spread

A cash Treasury claim provides services that a maturity-matched interest-rate swap does not. It can be used for liquidity management, collateral, and transactions. Let $\nu(b) > 0$ denote the annual convenience value per unit of debt. As the privately held stock expands, these services become less scarce:

$$\nu'(b) < 0. \tag{33}$$

The annualized cash-Treasury spread is the gross rollover-support spread net of the convenience value,

$$s^R(b,N) = \pi^R(b,N) - \nu(b). \tag{34}$$

This is the model counterpart of the Treasury-minus-swap spread used in the empirical section. A negative s^R means that convenience services exceed the gross balance-sheet burden. It does not imply that rollover support itself has a negative cost.

The response of the net spread to debt is

$$s_b^R(b,N) = \pi_b^R(b,N) - \nu'(b) > 0. \tag{35}$$

This response contains two economic forces. Additional private supply dilutes convenience services, and it raises balance-sheet utilization. If convenience services do not depend on dealer-parent capacity, then

$$s_{bN}^R(b,N) = \pi_{bN}^R(b,N) < 0. \tag{36}$$

The baseline cash-supply coefficient in the empirical analysis contains both convenience dilution and balance-sheet pressure. The interaction with financial capacity isolates the capacity-dependent part.

In the short-maturity economy, the net cash spread is the Treasury absorption spread, $s = s^R$. Substitution into (17) gives $S(b,N) = b\,s^R(b,N)$. Section 2 assigns the private-income counterpart of this net payment to group I, while stationary bond holdings are determined by household portfolio demand.

3.3 From financing terms to marginal Treasury absorption cost

The macroeconomic block requires the change in the annualized Treasury absorption payment when the debt stock rises. Since $S = bs^R$ in the short-maturity economy,

$$S_b(b,N) = s^R(b,N) + b s_b^R(b,N). \tag{37}$$

The first term values the marginal claim at prevailing financing terms. The second records the annualized steady-state cost of refinancing the outstanding stock at the new terms as those bonds mature.

Separating the gross rollover and convenience components is informative:

$$S_b = \left(\pi^R + b\pi_b^R\right) - \left(\nu + b\nu'\right). \tag{38}$$

The first bracket is the marginal gross cost of mobilizing rollover support. The second is the marginal fiscal value of Treasury convenience services. The data measure their net effect through the level and supply sensitivity of the cash-Treasury spread.

Convenience dilution reinforces the rise in marginal cost when its own marginal fiscal value falls with supply. For the complete Treasury absorption payment, the turning-point analysis requires the economically relevant condition

$$S_{bb}(b,N) > 0 \tag{39}$$

over the debt range under consideration. This condition allows the individual components of the cash spread to have different curvature.

Capacity lowers the gross marginal cost:

$$\frac{\partial}{\partial N}\left(\pi^R + b\pi_b^R\right) < 0 \tag{40}$$

in the active region. When convenience services are independent of N, this is also $S_{bN} < 0$. Financial capacity improves the safe-debt margin by flattening the production-side cost schedule.

3.4 A smooth stress schedule

For the quantitative illustrations, it is useful to make the transition from ordinary utilization to scarce capacity explicit. Let $\bar{q} > 0$ be the utilization level that can be supported without an additional balance-sheet premium. The gross rollover-support spread is

$$\pi^R(b,N) = \frac{\phi}{2}\left[\frac{b}{N} - \bar{q}\right]_+^2, \qquad \phi > 0. \tag{41}$$

The balance-sheet stress threshold is

$$\widehat{b}(N) = \bar{q}N. \tag{42}$$

Below this threshold, the gross support spread is zero. Above it, the spread and its slope rise smoothly from zero. This smooth onset makes marginal Treasury absorption cost continuous when the economy enters the active region.

In the active region,

$$\pi_b^R(b,N) = \frac{\phi}{N}\left(\frac{b}{N} - \bar{q}\right) > 0, \tag{43}$$

$$\pi_{bb}^R(b,N) = \frac{\phi}{N^2} > 0, \tag{44}$$

$$\pi_{bN}^R(b,N) = -\frac{\phi}{N^2}\left(2\frac{b}{N} - \bar{q}\right) < 0. \tag{45}$$

The same capacity state governs both the level and the slope of gross rollover compensation, and the negative capacity interaction remains throughout the active region.

The gross component of marginal cost is

$$\pi^R + b\pi_b^R = \frac{\phi}{2}\left(\frac{b}{N} - \bar{q}\right)\left(3\frac{b}{N} - \bar{q}\right) \tag{46}$$

above the threshold. Its slope is

$$\frac{\partial}{\partial b}\left(\pi^R + b\pi_b^R\right) = \frac{\phi}{N}\left(3\frac{b}{N} - 2\bar{q}\right) > 0. \tag{47}$$

Thus the gross marginal burden rises as debt uses more of the available capacity.

As debt rises into the active region, marginal Treasury absorption cost increases. The next section combines this production schedule with household demand to derive the stationary response of aggregate expenditure and the equilibrium safe rate.

4 Equilibrium and the Safe-Debt Laffer Curve

Section 2 derived the stationary non-Ricardian wealth effect of additional public debt and the fiscal drag created by Treasury absorption payments. Section 3 derived those payments from rollover pressure and financial-system capacity. This section combines the two blocks. At low debt, additional safe claims generate positive stationary aggregate-demand pressure. As marginal Treasury absorption cost rises, that pressure weakens and eventually reverses. The equilibrium safe rate reaches its maximum at the same stationary turning point.

4.1 The stationary expenditure margin

Hold the safe rate and financial capacity fixed and compare nearby stationary debt positions. Group H's nontradable income and desired safe wealth are unchanged at that rate. Group I receives the change in Treasury absorption income and is the group whose stationary holdings can adjust. A newly issued claim may initially be distributed more broadly; the portfolio adjustment that produces the stationary allocation is described below.

At the inherited safe rate, one additional unit of debt adds one unit to private financial wealth. The consumption function in (10) implies that a marginal claim held by group I raises its consumption by $\rho+\lambda_I$, while servicing the claim lowers government purchases by r. The net expenditure contribution of the claim is therefore $\rho+\lambda_I-r>0$.

The associated increase dS in the Treasury absorption payment works in the opposite direction. Government purchases fall by dS. Group I's consumption rises by $m_I(r)dS$, and it saves the remaining share $1-m_I(r)$. Combining the wealth effect and the fiscal drag, and using (16), gives

$$d(c_H+c_I+g)\big|_{r,N}=(\rho+\lambda_I-r)db-\left[1-m_I(r)\right]dS=(\rho+\lambda_I-r)\left[db-\kappa_I(r)dS\right]. \tag{48}$$

This is a comparison of stationary expenditure pressure at the inherited rate. It does not describe a transition path. When $S=S(b,N)$,

$$\left.\frac{\partial(c_H+c_I+g)}{\partial b}\right|_{r,N}=(\rho+\lambda_I-r)\left[1-\kappa_I(r)S_b(b,N)\right]. \tag{49}$$

The first factor is positive. The expression in square brackets is the additional supply of safe claims net of the desired stationary wealth generated by Treasury absorption income.

Define the safe-debt margin

$$H(b,N)\equiv\frac{1}{\kappa_I(r(b,N))}-S_b(b,N). \tag{50}$$

Both terms are annual rates. The empirical section estimates the second and uses a benchmark for the first. When H is positive, the wealth effect dominates and additional debt creates positive stationary expenditure pressure at the inherited rate. When H is negative, the fiscal drag is larger.

4.2 The equilibrium safe rate: an asset-market interpretation

The same comparison appears in the market for safe wealth. Substituting $S(b,N)$ into the stationary wealth demands in (21) and differentiating gives

$$da_H=\kappa_H'(r)x_H\,dr, \tag{51}$$
$$da_I=\kappa_I'(r)(x_I+S)\,dr+\kappa_I(r)\,dS. \tag{52}$$

Group H's stationary holdings change only through the safe rate. Group I's holdings also change because Treasury absorption is a persistent source of nontradable income.

For given b and N, the existence and uniqueness argument following (22) determines a unique stationary safe rate whenever both income flows are positive. Differentiating the asset-market condition with respect to debt yields

$$r_b=\frac{1-\kappa_I(r)S_b(b,N)}{\kappa_H'(r)x_H+\kappa_I'(r)(x_I+S(b,N))}. \tag{53}$$

One more dollar of public debt adds one dollar to the supply of safe claims. It also raises persistent Treasury absorption income by S_b, generating $\kappa_I S_b$ dollars of desired stationary safe wealth. When the supply effect is larger, the safe rate rises to increase desired holdings and reduce the capitalized value of nontradable income. When the income-induced demand for safe wealth is larger, the safe rate falls.

The bracket in (49) is the numerator of (53). The fixed-rate expenditure effect and the equilibrium safe-rate response therefore have the same sign. The expenditure formulation emphasizes the non-Ricardian wealth effect and the fiscal drag. The asset-market formulation provides an equivalent account through the supply of and demand for safe claims.

Remark 2 (Initial incidence and the stationary allocation)**.** A newly issued bond may initially be held by both groups. At a fixed safe rate, however, group H's desired stationary holdings remain $\kappa_H(r)x_H$. If its initial holdings exceed that position, (13) implies that the group runs down the excess as it finances consumption. The annuity market transfers claims within group H, but does not preserve excess aggregate wealth for the group. Group I, meanwhile, saves part of the recurring Treasury absorption income. Initial incidence therefore drops out of the stationary fixed-rate comparison. In equilibrium away from the turning point, the safe rate changes and both groups' capitalization factors affect the adjustment.

The portfolio allocation is especially transparent at the turning point. There $r_b = 0$, and equations (51)–(52) imply

$$\frac{da_H}{db} = 0, \qquad \frac{da_I}{db} = \kappa_I(r)S_b(b,N) = 1. \tag{54}$$

At the peak, group I's additional desired wealth absorbs the marginal claim exactly. Below the peak, the higher equilibrium safe rate also raises group H's desired holdings. Beyond the peak, the lower rate reduces them, and group I absorbs the new claim together with part of group H's previous holdings.

4.3 The turning point

At low debt, assume that the rate-equivalent wealth benefit exceeds marginal Treasury absorption cost, so the safe-debt margin is positive and the safe rate rises with debt. Convenience services can already vary with supply in this region. When b exceeds the balance-sheet threshold $\widehat{b}(N) = \bar{q}N$, gross rollover-support compensation begins to rise as well. Section 3 imposes the economically relevant condition that marginal Treasury absorption cost rises strictly over the debt range under consideration:

$$S_{bb}(b,N) = 2s_b(b,N) + bs_{bb}(b,N) > 0.$$

The increasing marginal cost compresses the safe-debt margin. The Laffer peak is reached at the debt stock b^L satisfying

$$\frac{1}{\kappa_I(r(b^L,N))} = S_b(b^L,N) = s(b^L,N) + b^L s_b(b^L,N). \tag{55}$$

At this point, the stationary non-Ricardian wealth effect of the marginal claim is exactly offset by the fiscal drag from the additional absorption payment. Equivalently, the absorption income generated by marginal issuance induces exactly one additional unit of desired safe wealth. Stationary aggregate-demand pressure is zero and the new claim is absorbed without a change in the safe rate. Equation (54) shows how the initial broad incidence of the bond converges to this marginal stationary allocation.

Beyond the peak, public debt remains safe, but preserving that safety requires a larger fiscal and financial burden. Marginal issuance reduces government purchases and creates sufficiently persistent income for the households exposed to marginal Treasury financing terms that their desired safe wealth rises by more than the supply of new claims. The equilibrium safe rate must then fall. The Laffer curve traces this reversal in the marginal contribution of safe debt to expenditure and the equilibrium safe rate.

Proposition 1 (Safe-debt Laffer curve)**.** *Suppose both income flows remain positive over the debt range under consideration. Suppose there is a low debt stock b_0 at which $H(b_0,N) > 0$. If there is a debt stock $\bar{b} > b_0$ such that $S_{bb}(b,N) > 0$ for $b \in [b_0, \bar{b}]$ and*

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

then there is a unique $b^L(N) \in (b_0, \bar{b})$ satisfying (55). Debt generates positive stationary aggregate-demand pressure and raises the equilibrium safe rate below $b^L(N)$, and reverses both effects above it. The equilibrium safe-rate schedule has a strict maximum at $b^L(N)$.

The existence argument follows from continuity. At b_0, the numerator of (53) is positive. By assumption, it is negative at $\bar{b}$, and hence it must cross zero. Strictly increasing marginal Treasury absorption cost makes the crossing unique. To see this directly, evaluate the derivative of the numerator at any candidate peak. Since $r_b = 0$ there,

$$\begin{aligned}&\frac{d}{db}\left\{1 - \kappa_I(r(b,N))S_b(b,N)\right\}\bigg|_{b=b^L} \\ &\quad = -\kappa_I(r)S_{bb}(b^L,N) < 0.\end{aligned} \tag{56}$$

Every zero is a crossing from the increasing branch to the decreasing branch. There cannot be a second crossing, because returning to the positive branch would require a zero with the opposite slope. Equation (56) also establishes that the peak is strict.

Figure 2 illustrates the common turning point using the smooth utilization schedule in (41). The illustration holds the convenience component and the positive adjustment denominator fixed, isolating the sign change generated by rising marginal Treasury absorption cost.

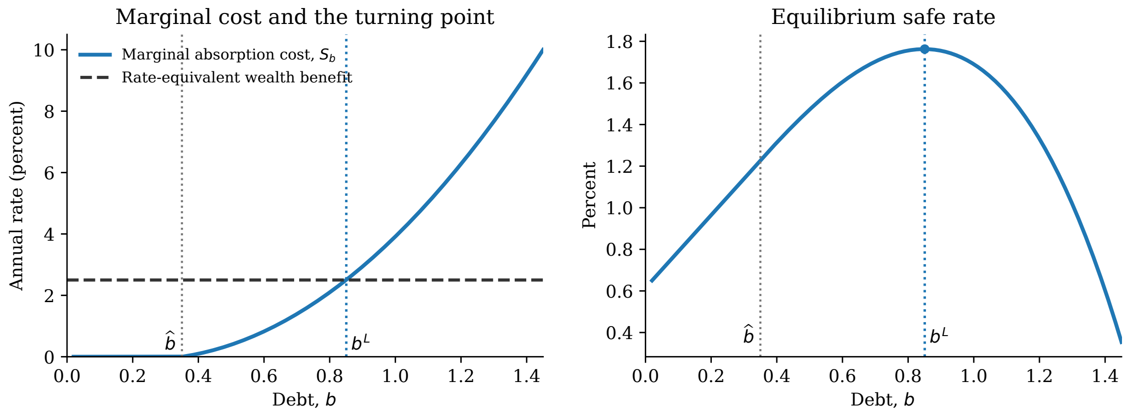

Figure 2: Marginal Treasury absorption cost and the equilibrium safe rate. The vertical dashed line marks the balance-sheet stress threshold $\widehat{b}$, and the dotted line marks the common stationary turning point b^L. Above $\widehat{b}$, the gross rollover-support component makes marginal Treasury absorption cost rise with debt. At b^L, this cost equals the rate-equivalent wealth benefit of additional safe debt, stationary aggregate-demand pressure is zero, and the safe-rate schedule in the right panel reaches its maximum. The illustration holds the convenience component and the positive denominator in (53) fixed.

4.4 Financial capacity

Financial capacity affects the equilibrium through the production schedule derived in Section 3. More capacity moves the stress threshold outward because $\widehat{b}(N) = \bar{q}N$. Conditional on being in the active region, it also lowers the absorption payment and flattens its marginal cost:

$$S_N(b,N) < 0, \qquad S_{bN}(b,N) < 0.$$

These are production-side results. They say that a given debt stock is cheaper to support when more balance sheets are available and that further issuance puts less pressure on the premium.

At a fixed debt stock, differentiating (22) with respect to capacity gives

$$r_N = -\frac{\kappa_I(r) S_N(b,N)}{\kappa_H'(r) x_H + \kappa_I'(r)(x_I + S(b,N))}. \tag{57}$$

Thus $r_N > 0$ when $S_N < 0$. Greater capacity reduces Treasury absorption income. At the fixed rate, desired safe wealth falls while the debt stock is unchanged. The safe rate rises to increase desired holdings. From the expenditure side, lower absorption payments release more government purchases than they subtract from private consumption.

Capacity also improves the safe-debt margin directly. Holding the safe rate fixed,

$$\left.\frac{\partial H(b,N)}{\partial N}\right|_r = -S_{bN}(b,N) > 0. \tag{58}$$

This is the nonlinear capacity interaction measured in the empirical section: when capacity is scarce, debt has a larger effect on marginal Treasury absorption cost.

The effect of capacity on the equilibrium location of the peak contains one additional term. Differentiating (55) yields

$$\frac{db^L}{dN} = \frac{-S_{bN}(b^L,N) - \dfrac{\kappa_I'(r)}{\kappa_I(r)^2} r_N(b^L,N)}{S_{bb}(b^L,N)}. \tag{59}$$

All terms are evaluated at the peak. The first term in the numerator is positive: more capacity flattens marginal Treasury absorption cost and pushes the peak outward. The second is negative: capacity raises the equilibrium safe rate, which increases group I's capitalization factor and lowers the rate-equivalent wealth benefit. Thus the peak moves outward when the direct flattening of marginal cost dominates this equilibrium effect. If the benefit-side benchmark is held fixed, as in the quantitative diagnostic and Figure 3, equation (59) reduces to

$$\frac{db^L}{dN} = -\frac{S_{bN}}{S_{bb}} > 0.$$

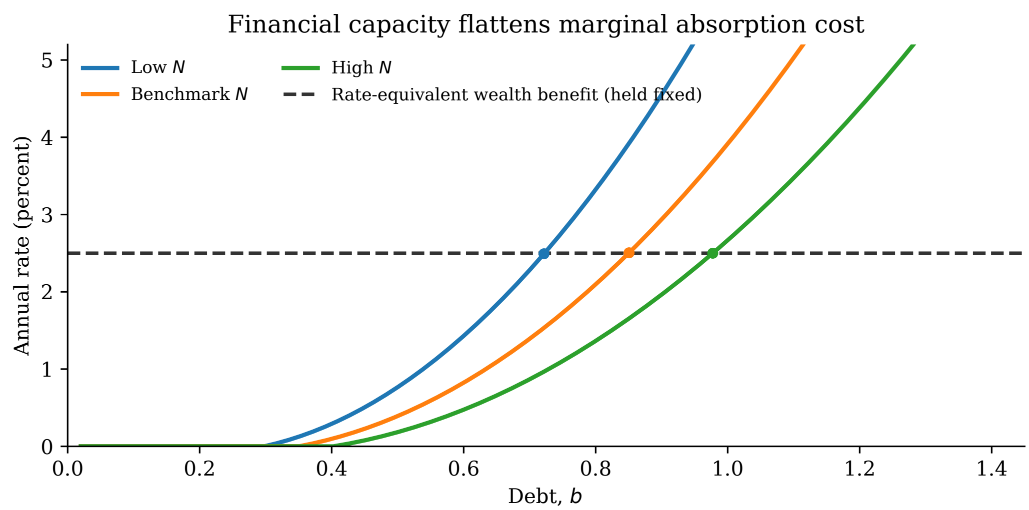

Figure 3: Financial capacity and marginal Treasury absorption cost. Higher N moves the stress threshold outward and flattens the marginal-cost schedule. The figure holds the benchmark rate-equivalent wealth benefit fixed, isolating the direct production-side effect through which greater capacity moves the peak to a larger debt stock.

Section 5 now extends the same comparison to positive-maturity debt.

5 Quantity and Price Dimensions of Rollover Risk

Sections 3 and 4 use a unit rollover interval in which the full debt stock is refinanced. Actual Treasury debt has positive maturity, so only part of the inherited stock reaches rollover over a given interval. Maturity also determines how strongly expected future refinancing terms affect the current price of claims that remain outstanding. These quantity and price effects are two dimensions of the same rollover mechanism.

The extension is needed to measure marginal Treasury absorption cost in the data. The analysis first determines the quantity reaching rollover, then derives the price amplification created by duration, and finally combines them into the decomposition used in Section 6.

5.1 The quantity reaching rollover

Let $\delta > 0$ be the Poisson maturity intensity of each unit of debt. Average maturity is $1/\delta$, so a larger δ means shorter maturity. During a unit-length interval, the probability that an inherited claim matures at least once is

$$\mu(\delta) = 1 - e^{-\delta}, \qquad \mu'(\delta) = e^{-\delta} > 0. \tag{60}$$

The inherited quantity requiring refinancing support is $\mu(\delta)b$. Reissued claims enter the next interval. This timing counts each unit of the inherited stock once and converges to the full-stock benchmark as δ becomes large.

The gross rollover-support spread is now

$$\pi^R(b,N,\delta) = p\left(\frac{\mu(\delta)b}{N}\right). \tag{61}$$

Shorter maturity increases utilization because a larger share of the debt stock must be refinanced. In the active region, the relevant derivatives are

$$\pi^R_b = \frac{\mu(\delta)}{N} p'\left(\frac{\mu(\delta)b}{N}\right) > 0, \tag{62}$$

$$\pi^R_N = -\frac{\mu(\delta)b}{N^2} p'\left(\frac{\mu(\delta)b}{N}\right) < 0, \tag{63}$$

$$\pi^R_\delta = \frac{\mu'(\delta)b}{N} p'\left(\frac{\mu(\delta)b}{N}\right) > 0. \tag{64}$$

Debt and rollover intensity raise the amount that must be placed relative to capacity. More capacity lowers that utilization.

Capacity also reduces the slope of the gross spread:

$$\pi^R_{bN} = -\frac{\mu(\delta)}{N^2}\left[p'\left(\frac{\mu(\delta)b}{N}\right) + \frac{\mu(\delta)b}{N} p''\left(\frac{\mu(\delta)b}{N}\right)\right] < 0. \tag{65}$$

Similarly,

$$\pi^R_{\delta N} = -\frac{\mu'(\delta)b}{N^2}\left[p'\left(\frac{\mu(\delta)b}{N}\right) + \frac{\mu(\delta)b}{N} p''\left(\frac{\mu(\delta)b}{N}\right)\right] < 0. \tag{66}$$

Financial capacity thus attenuates both the effect of more debt and the effect of faster rollover.

The signed cash-Treasury component continues to subtract the convenience value:

$$s^R(b,N,\delta) = \pi^R(b,N,\delta) - \nu(b). \tag{67}$$

Hence $s^R_b = \pi^R_b - \nu' > 0$ and, when convenience services do not depend on N, $s^R_{bN} = \pi^R_{bN} < 0$. Positive maturity changes rollover exposure in the gross component while preserving the interpretation of the net cash spread.

For the smooth illustration, the finite-maturity counterpart of (41) is

$$\pi^R(b,N,\delta) = \frac{\phi}{2}\left[\frac{\mu(\delta)b}{N} - \bar{q}\right]_+^2. \tag{68}$$

The stress threshold becomes

$$\widehat{b}(N,\delta) = \frac{\bar{q}N}{\mu(\delta)}. \tag{69}$$

Longer maturity moves the threshold outward because less inherited debt reaches refinancing during the interval.

5.2 Duration and the price of rollover exposure

A longer claim is more sensitive to changes in the terms expected when it is refinanced. Consider a unit flow paid while the claim remains outstanding. With Poisson maturity intensity δ and all-in yield $r+s(b,N,\delta)$, its price is

$$\frac{1}{r+s(b,N,\delta)+\delta}. \tag{70}$$

The magnitude of its price response to the total premium is

$$-\frac{\partial}{\partial s}\left[\frac{1}{r+s+\delta}\right] = \frac{1}{(r+s+\delta)^2}. \tag{71}$$

This squared-duration term is the price dimension of rollover exposure. A smaller δ lengthens the claim and magnifies the current price response to a change in expected refinancing terms.

Let $\vartheta(N) > 0$ scale the compensation required for this balance-sheet price exposure, with $\vartheta_N(N) < 0$. The duration-price component is

$$s^D(b,N,\delta) = \frac{\vartheta(N)}{[r+s(b,N,\delta)+\delta]^2}\pi^R(b,N,\delta). \tag{72}$$

The multiplier applies to the gross rollover-support burden. This is the source of the price movement that duration amplifies. The net cash spread may be negative because of convenience services, while the gross rollover burden and the duration component remain nonnegative.

The total Treasury absorption premium is the sum of the signed cash and duration components:

$$s(b,N,\delta) = s^R(b,N,\delta) + s^D(b,N,\delta). \tag{73}$$

Substituting the two components yields

$$s = -\nu(b) + \pi^R(b,N,\delta)\left[1 + \frac{\vartheta(N)}{(r+s+\delta)^2}\right]. \tag{74}$$

The total premium enters the duration denominator because higher all-in yields shorten the price response. This feedback moderates the amplification produced by a given increase in gross rollover pressure.

The economically admissible domain satisfies

$$r+s+\delta>0. \tag{75}$$

On that domain, the right side of (74) is strictly decreasing in s whenever $\pi^R>0$, while the left side is strictly increasing. As s approaches the lower boundary, the duration term becomes arbitrarily large; as s grows, the right side converges to the finite cash component $-\nu+\pi^R$. The fixed point is unique. When $\pi^R=0$, it reduces to $s=-\nu(b)$, provided (75) holds.

5.3 Comparative statics of the total premium

The derivatives in this subsection hold the safe rate r fixed; Section 4 determines its equilibrium adjustment. Implicit differentiation displays how the quantity and price channels work together. With all functions evaluated at (b,N,δ), debt changes the total premium according to

$$s_b=\frac{-\nu'(b)+\left[1+\dfrac{\vartheta(N)}{(r+s+\delta)^2}\right]\pi_b^R}{1+\dfrac{2\pi^R\vartheta(N)}{(r+s+\delta)^3}}>0. \tag{76}$$

Convenience dilution and higher gross rollover utilization both raise the numerator. The denominator is the stabilizing feedback from endogenous duration: a higher total premium raises the all-in yield and reduces price sensitivity.

Financial capacity lowers the total premium through both rollover support and duration pricing:

$$s_N=\frac{\left[1+\dfrac{\vartheta(N)}{(r+s+\delta)^2}\right]\pi_N^R+\dfrac{\pi^R\vartheta_N(N)}{(r+s+\delta)^2}}{1+\dfrac{2\pi^R\vartheta(N)}{(r+s+\delta)^3}}<0. \tag{77}$$

The first term lowers the gross rollover burden. The second lowers the compensation required for the resulting price exposure. Both effects are present even though group I's saving behavior is calibrated independently of N.

The effect of rollover intensity contains opposing forces:

$$s_\delta=\frac{\left[1+\dfrac{\vartheta(N)}{(r+s+\delta)^2}\right]\pi_\delta^R-\dfrac{2\pi^R\vartheta(N)}{(r+s+\delta)^3}}{1+\dfrac{2\pi^R\vartheta(N)}{(r+s+\delta)^3}}. \tag{78}$$

Shorter maturity exposes more debt to rollover, producing the positive first term. It also reduces the duration of the claim, producing the negative second term. The total Treasury absorption premium can rise or fall as maturity shortens even though gross rollover-support compensation always rises.

Proposition 2 (Positive maturity and rollover-price amplification)**.** *Fix a finite maturity intensity δ and hold the safe rate fixed. In the active region, gross rollover-support compensation satisfies $\pi_b^R > 0$, $\pi_N^R < 0$, $\pi_\delta^R > 0$, and $\pi_{bN}^R < 0$. The total premium is the unique solution to (74) on the admissible domain and satisfies $s_b > 0$ and $s_N < 0$. Its response to rollover intensity is given by (78). As δ becomes large, the exposed share approaches one, duration-price amplification vanishes, and the short-maturity model of Section 3 is recovered.*

The limiting result connects the two versions of the production block. With rapid rollover, every unit of inherited debt reaches refinancing during the interval and the claim has negligible duration. With slower rollover, a smaller quantity must be placed, but the price of the remaining long claim responds more strongly to future financing terms.

The empirical analysis holds the observed maturity structure fixed, so marginal Treasury absorption cost separates into cash-Treasury and duration-price levels and their stock-repricing terms; Section 6 measures these four components, while Appendix C studies optimal maturity when uncertainty about future rollover conditions adds to the price cost of long debt.

6 Measuring the U.S. Marginal Treasury Absorption Cost

This section measures the U.S. marginal Treasury absorption cost. With the maturity structure held fixed, $S = b(s^R + s^D)$, so

$$S_b = \left(s^R + bs_b^R\right) + \left(s^D + bs_b^D\right). \tag{79}$$

The first bracket is the cash-Treasury component and the second is the real-duration component. Each contains the financing terms on a marginal claim and the repricing of the outstanding private stock. This distinction matters quantitatively: even a modest movement in the premium per dollar can have a large marginal effect when it changes the terms on a large stock as that stock rolls over.

The empirical exercise compares 2015Q1, the first quarter for which the capacity measure is available, with 2026Q1, the latest common observation, and also produces a quarterly series over the intervening period. Throughout, marginal issuance is distributed across maturity buckets in proportion to the current private maturity structure, so the calculation holds the maturity mix fixed. The benchmark marginal Treasury absorption cost rises from about 80 to 187 basis points. The capacity interaction is statistically significant and implies a larger cash-Treasury repricing term when dealer-parent balance-sheet capacity is scarce. The remainder of the section constructs the four components underlying these results.

To implement the theoretical decomposition in the data, write the measured Treasury absorption premium as

$$s_t = s_t^R + s_t^D, \tag{80}$$

where (R) denotes the cash-Treasury component and (D) the duration-price component. Let $\mathscr{M}_t^R$ and $\mathscr{M}_t^D$ denote the empirical counterparts of bs_b^R and bs_b^D. Substituting those estimates into (79) gives

$$S_{b,t} = s_t^R + s_t^D + \mathscr{M}_t^R + \mathscr{M}_t^D. \tag{81}$$

Every entry in this expression is measured in annualized basis points per dollar of additional privately held debt. The remainder of the section constructs the four entries in the order in which they appear, then adds them to obtain $S_{b,t}$.

6.1 The two premium levels

The cash-Treasury component, s_t^R, is the Treasury par yield minus the maturity-matched par swap rate. An interest-rate swap supplies duration exposure without requiring an investor to finance and warehouse a cash Treasury security. The Treasury–swap spread isolates pricing that is specific to holding the cash claim. The measure is signed. A negative spread means that the cash-specific benefits of Treasuries, including their liquidity and convenience services, outweigh the balance-sheet cost of absorbing them—in the model, $\nu(b) > \pi^R(b,N)$. A rise in the spread means that this net advantage has diminished.

I construct a debt-weighted spread from the two-, three-, five-, seven-, ten-, and thirty-year maturity buckets. In each bucket, the swap-spread series follows a continuous chain of Treasury benchmarks and interest-rate swaps; the seven-year series is constructed from Treasury and swap par yields on a LIBOR-consistent basis. The weights are the shares of each bucket in privately held Treasury notes and bonds. The resulting cash-Treasury premium rises from -18.2 basis points in 2015Q1 to -0.5 basis points in 2026Q1.

The duration-price component, s_t^D, is the D'Amico–Kim–Wei real term premium (D'Amico, Kim, and Wei, 2018). DKW jointly prices nominal and inflation-indexed Treasuries and separates compensation for real-duration risk from inflation-risk compensation. I interpolate or extrapolate its five- and ten-year estimates to the six benchmark maturities and use the same private-debt weights as for the cash measure. This premium is the empirical counterpart of the price amplification in Section 5: when the terms expected at rollover change, a longer-duration claim experiences a larger current price movement. The debt-weighted real term premium rises from 8.4 basis points in 2015Q1 to 38.9 basis points in 2026Q1.

Table 1 reports the two levels and their sum. Together they rise by 48.2 basis points. This is the part of the increase in marginal cost that is visible directly in premium levels, before accounting for the repricing of the private stock.

Table 1: Measured Treasury absorption premia

Date	Cash-Treasury s_t^R	Real duration s_t^D	Total s_t
2015Q1	−18.2	8.4	−9.9
2026Q1	−0.5	38.9	38.3
Change	17.7	30.5	48.2

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 use unrounded components, so displayed entries need not add exactly.

6.2 Cash-Treasury repricing

The next step estimates how the cash-Treasury premium changes when the private market must absorb more debt. The identifying variation comes from the Federal Reserve's holdings across the six maturity buckets. Following D'Amico and King (2013), at each horizon h I estimate the local projection

$$\Delta_h s^R_{m,t} = \phi_m + \psi_t + \beta_h \Delta_h share_{m,t} + \varepsilon_{m,t}, \tag{82}$$

where m indexes maturity buckets, t is the starting month, and

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

The variable

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

is the percentage of Treasury debt in bucket m held in the Federal Reserve's System Open Market Account. Thus β_h is measured in basis points of spread per percentage-point increase in the SOMA share.

The two fixed effects give the regression a useful interpretation. Maturity-bucket effects, ϕ_m, absorb persistent differences in pricing and Federal Reserve holdings across tenors. Start-month effects, ψ_t, absorb aggregate news and curve-wide repricing between t and $t+h$. The coefficient is identified from the relative change in Federal Reserve absorption and the relative change in the cash-Treasury spread across maturity buckets that share the same starting month. The sample excludes the first half of 2020, when emergency market interventions and market dysfunction make it difficult to interpret the persistent supply response measured here.

A negative β_h means that an increase in the SOMA share lowers the Treasury–swap spread in the affected maturity segment. Equivalently, moving debt from the Federal Reserve to private portfolios raises the spread. Converting this slope into the stock-repricing term in equation (81) requires keeping track of both the maturity weights in the aggregate spread and the maturity distribution of marginal issuance.

Let $b_{m,t}$ be private float in bucket m, let $b_t = \sum_m b_{m,t}$, and let $w_{m,t} = b_{m,t}/b_t$. The debt-weighted cash-Treasury spread is $s^R_t = \sum_m w_{m,t} s^R_{m,t}$. The calculation allocates a marginal increase in private debt according to the current maturity distribution, so $db_{m,t} = w_{m,t} db_t$ and the weights remain fixed. Let

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

Because $share_{m,t} = 100\, SOMA_{m,t}/out_{m,t}$, the marginal increase in private supply changes the SOMA share by

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

The resulting change in the aggregate spread is

$$ds^R_t = \sum_m w_{m,t} \beta_h \, dshare_{m,t}.$$

Finally, $b_{m,t} = (1-\varpi_{m,t})out_{m,t} = w_{m,t}b_t$. Substitution cancels one of the two maturity weights and gives

$$\mathscr{M}^R_{h,t} = -100\,\beta_h \sum_m w_{m,t}(1-\varpi_{m,t}). \tag{83}$$

The minus sign changes an increase in Federal Reserve holdings into an increase in private supply. The weighting sum is 0.781 in 2015Q1 and 0.837 in 2026Q1 in the Monthly Statement of the Public Debt notes-and-bonds universe.

I average the estimates over horizons $h = 12, \ldots, 24$ months. This window asks whether a change in private supply produces persistent repricing rather than a short-lived announcement response. Adjacent observations have heavily overlapping outcome windows, so the reported 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. Substitution into equation (83) gives a 2026Q1 repricing term of

$$-100 \times (-0.27) \times 0.837 \simeq 23 \quad \text{basis points.}$$

The corresponding estimates are 40 basis points for the sample beginning in 2010 and 31 basis points for the IV sensitivity in Table 2. These linear estimates will be useful for decomposing the change over time. The benchmark level allows the slope to depend on financial capacity.

Table 2: Linear cash-Treasury repricing estimates

Specification	Sample	Average β_h, $h = 12$–24	$\mathscr{M}^R_{2026Q1}$
OLS, no capacity interaction	2015+	-0.27	23
OLS, no capacity interaction	2010+	-0.48	40
IV sensitivity, no capacity interaction	2015+	-0.37	31

Notes: Coefficients are basis points per percentage point of the SOMA share within a maturity bucket; repricing terms are basis points. The labels 2015+ and 2010+ denote sample starting years. 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 D gives the specification and inference details.

6.3 Financial capacity and the nonlinear benchmark

Equation (82) imposes the same supply response in every state of the financial system. The model instead predicts $s^R_{bN} < 0$: the premium rises more steeply with private supply when absorption capacity is scarce. Because convenience services depend on debt but not financial capacity, this cross-partial is also the capacity interaction in gross rollover-support compensation. Effective Treasury-absorption capacity is not directly observed. I index its variation using balance-sheet room and existing Treasury inventories at the holding companies that own Treasury dealers, referred to below as dealer parents.

Let k denote the applicable leverage-ratio requirement. If dealer parent i has Tier 1 capital $T1_{i,t}$ and total leverage exposure $LE_{i,t}$, the regulatory requirement is

$$\frac{T1_{i,t}}{LE_{i,t}} \geq k. \tag{84}$$

Holding capital fixed, $T1_{i,t}/k$ is the largest total leverage exposure consistent with that requirement. The difference $T1_{i,t}/k - LE_{i,t}$ is unused leverage-exposure room. A dealer parent can absorb Treasuries using this room, and it can continue to hold the Treasury inventory already on its balance sheet. I measure total potential Treasury absorption as

$$N_t(k) = \sum_i \left(\frac{T1_{i,t}}{k} - LE_{i,t} \right) + \sum_i UST_{i,t}, \tag{85}$$

where $UST_{i,t}$ is Treasury inventory already held by dealer parent i. This common-rule index combines the inventory already supported by dealer parents with their unused leverage-exposure room. It is a state variable for marginal absorption capacity, rather than a measure of total financial wealth or the wealth of group I. Dealer parents are central to Treasury intermediation, so movements in their balance-sheet room provide a natural proxy for the capacity that is likely to be marginal. The identifying requirement is that this index load positively on marginal effective capacity; the index need not exhaust the capacity supplied elsewhere in the financial system.

The benchmark uses $k = 0.05$, the historical holding-company requirement for affected U.S. global systemically important bank parents. A tighter mapping uses $k = 0.06$, the historical well-capitalized requirement for their insured depository subsidiaries. For each mapping, I standardize $N_t(k)$ separately relative to its 2015–2024 mean and standard deviation. Denote the standardized series by $\widetilde{N}_t$, with higher values indicating more capacity. Because the regression uses the standardized series, a constant rescaling of the dollar measure cannot affect the estimates. The standardized series identifies capacity-dependent variation in the supply response. The theoretical scale of N and the threshold $\bar{q}$ remain outside this empirical mapping. The two regulatory mappings matter because they generate somewhat different capacity paths, especially in low-capacity states.

I estimate

$$\Delta_h s^R_{m,t} = \phi_m + \psi_t + \beta_h \Delta_h share_{m,t} + \gamma_h \left(\Delta_h share_{m,t} \times \widetilde{N}_t \right) + \varepsilon_{m,t}. \tag{86}$$

At capacity state $\widetilde{N}_t$, the response of the spread to the SOMA share is

$$\beta_h + \gamma_h \widetilde{N}_t. \tag{87}$$

Since an increase in the SOMA share reduces private supply, the model predicts $\beta_h < 0$ over the relevant states and $\gamma_h > 0$. Greater capacity then makes the negative slope less steep; scarce capacity makes it more steep. This is the empirical counterpart of the model's negative cross-partial between private debt and capacity.

Under the benchmark 5 percent mapping, the averages over $h = 12, \ldots, 24$ are $\beta_h = -0.24$ and $\gamma_h = 0.19$. The overlap-robust t-statistics on the interaction range from 2.4 to 2.9, with a mean of 2.6. Thus the data reject a state-invariant cash-Treasury supply response over this horizon window. The 2026Q1 capacity observation is approximately -2.0 standard deviations. Evaluating equation (87) at that state gives

$$-0.24 + 0.19 \times (-2.0) \simeq -0.62.$$

Using the 2026Q1 private-float weight, the stock-repricing term is therefore

$$\mathscr{M}^R_{h,t} = -100\left(\beta_h + \gamma_h \widetilde{N}_t\right)\sum_m w_{m,t}(1-\varpi_{m,t}) \simeq 52 \text{ basis points.} \tag{88}$$

The last number follows from $-100 \times (-0.62) \times 0.837$. Both endpoints are low-capacity states. The 2015Q1 observation is also approximately -2.0 standard deviations and, together with the 2015Q1 private-float weight, implies a repricing term of approximately 49 basis points. The 2026Q1 observation is slightly below the lowest state in the 2015–2024 estimation sample, although both endpoint states round to -2.0 standard deviations. Under the tight 6 percent mapping, the 2026Q1 state is -3.1 standard deviations and the corresponding repricing term is 72 basis points. The full coefficient paths and IV sensitivities are reported in Appendix D.

Table 3: Capacity-dependent cash-Treasury repricing

Mapping	Average β_h	Average γ_h	Overlap-robust t_{γ_h}	$\widetilde{N}_{2026Q1}$	$\mathscr{M}^R_{2026Q1}$
5 percent (benchmark)	−0.24	0.19	2.4–2.9	−2.0	52
6 percent (tight)	−0.34	0.17	1.0–1.6	−3.1	72

Notes: Coefficients are averages over $h = 12$–24. The t-statistics use Driscoll–Kraay/Newey–West standard errors with 24 monthly lags. Capacity is standardized separately for each mapping over 2015–2024. Repricing terms are basis points and apply equation (88) at the reported capacity state.

6.4 Real-duration repricing

The duration-price term requires a different source of variation. I use twelve Federal Reserve announcements that changed expected Treasury purchases or balance-sheet runoff. For each announcement e, I measure the two-trading-day change in the DKW real term premium and estimate

$$\Delta s^D_e = c_D + \beta_D Amount_e + u_e. \tag{89}$$

The variable $Amount_e$ is the announced change in expected cumulative Treasury purchases, in billions of dollars. A positive value represents greater Federal Reserve purchases and hence less debt left for private investors to absorb. Tapering and runoff announcements enter with negative values. Appendix D lists the events and explains the sizing of fixed and open-ended programs.

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

$$\beta_D \simeq -0.0055$$

basis points per billion dollars. Greater Federal Reserve purchases lower the real term premium, so greater private supply raises it. Let b^{priv}_t denote the privately held stock of Treasury notes and bonds, measured in billions of dollars. Scaling the announcement response to that stock and reversing the sign gives

$$\mathscr{M}^D_t = -\beta_D b^{priv}_t. \tag{90}$$

Private coupon float rises from \$7.525 trillion in 2015Q1 to \$17.642 trillion in 2026Q1. The corresponding calculations are

$$0.0055 \times 7{,}525 \simeq 41.4 \quad \text{and} \quad 0.0055 \times 17{,}642 \simeq 97.1$$

basis points. This increase is driven by the growth of the private stock to which the estimated duration response applies.

The benchmark uses the debt-weighted, average-maturity real term premium and measures purchase announcements in dollars. Two alternatives change one choice at a time. Using the ten-year DKW premium produces a 2026Q1 duration repricing term of 116 basis points. Dividing announced purchase amounts by contemporaneous private float produces a 53-basis-point term. The first alternative places more weight on long-duration price sensitivity; the second treats a purchase program of a given size as smaller when the market has more debt outstanding.

The cash-Treasury and duration repricing terms come from different empirical designs. The cash-Treasury regression identifies a response to relative supply within maturity buckets, whereas the duration event study identifies a response to the dollar amount of duration removed from private portfolios. Each slope is converted into $b\,\partial s/\partial b$ in the units in which it is estimated. The benchmark duration conversion retains the dollar units of the event study and applies the estimated price response to the contemporaneous private stock. The share-normalized specification instead assumes that the effect of a given dollar purchase declines proportionally with the size of the Treasury market.

The event study contains only twelve observations, and several open-ended programs must be converted into expected cumulative purchases. The uncertainty is correspondingly substantial. With HC3 heteroskedasticity-robust inference and a small-sample t critical value, the 95 percent interval for β_D is $[-0.0109, -0.0001]$. At the 2026Q1 stock, this maps into a 1–193 basis point interval for $\mathscr{M}^D_{2026Q1}$. Conditional on the 330-basis-point wealth benchmark and the other point estimates, the safe-debt margin remains positive, between 47 and 239 basis points across these endpoints. Applying the same duration coefficient at both dates, the 2026Q1-to-2015Q1 marginal-cost ratio remains between 2.30 and 2.33. Leave-one-event-out estimates imply 74–116 basis points, while excluding the two March 2020 announcements gives 151 basis points. These ranges describe uncertainty in the duration component; they do not alter the cash-Treasury estimates.

6.5 Assembling marginal Treasury absorption cost

Table 4 assembles the four components in (81). The benchmark combines the capacity-dependent 2015+ OLS estimate under the 5 percent mapping with the average-maturity duration estimate. Marginal Treasury absorption cost rises from 80.4 basis points in 2015Q1 to 187.1 basis points in 2026Q1, an increase of approximately 107 basis points. The detailed entries show that both less favorable premium levels and the repricing of the growing private stock contribute to the increase.

The nonlinear cash-Treasury term is large at both endpoints because both are low-capacity states under the benchmark capacity measure. This fact explains why the linear specification gives almost the same increase in marginal Treasury absorption cost even though it gives lower levels. In the 2015+ linear specification, $S_{b,t}$ rises from 52.9 to 158.3 basis points, an increase of 105.4 basis points. The 2010+ and IV linear specifications produce increases of 106.6 and 106.0 basis points.

The linear specification is especially useful for decomposing the change because its cash-Treasury slope does not vary with the capacity state. Measured premium levels account for 48.2

basis points of the 105.4-basis-point increase. Growth in the private coupon stock raises duration repricing by 55.7 basis points. The change in the cash-Treasury private-float weights raises cash-Treasury repricing by a further 1.5 basis points. The first two forces account for nearly all of the rise: Treasury absorption premia become less favorable, and the duration response is applied to a much larger private debt stock. The nonlinear estimate adds the economically important result that the level of cash-Treasury repricing is substantially greater when dealer-parent capacity is scarce.

Table 4: Marginal Treasury absorption cost and the safe-debt margin

Date and specification	s_t^R	s_t^D	$\mathscr{M}_t^R$	$\mathscr{M}_t^D$	$S_{b,t}$	H_t
2015Q1, nonlinear OLS benchmark	−18.2	8.4	48.9	41.4	80.4	249.6
2026Q1, nonlinear OLS benchmark	−0.5	38.9	51.7	97.1	187.1	142.9
2015Q1, 2015+ linear OLS	−18.2	8.4	21.3	41.4	52.9	277.1
2026Q1, 2015+ linear OLS	−0.5	38.9	22.9	97.1	158.3	171.7
2015Q1, 2010+ linear OLS	−18.2	8.4	37.4	41.4	69.0	261.0
2026Q1, 2010+ linear OLS	−0.5	38.9	40.1	97.1	175.5	154.5
2015Q1, linear IV sensitivity	−18.2	8.4	29.3	41.4	60.8	269.2
2026Q1, linear IV sensitivity	−0.5	38.9	31.4	97.1	166.8	163.2

Notes: Entries are annualized basis points. The nonlinear benchmark uses the OLS capacity interaction under the 5 percent mapping. Linear rows use the indicated cash-Treasury specification. Repricing terms apply the date-specific mappings in equations (83), (88), and (90) to the MSPD notes-and-bonds universe. Sums use unrounded components. The last column uses the 330-basis-point wealth-benefit benchmark defined below.

Figure 1, introduced in the introduction, plots the quarterly benchmark and linear series. The benchmark series is the paper's preferred estimate of the level of marginal Treasury absorption cost. The linear series shows how much of the movement comes from the observed premium levels and debt stocks without the capacity interaction.

Table 5 varies the duration term while retaining the benchmark capacity-dependent cash-Treasury estimate. The resulting 2026Q1 marginal Treasury absorption costs range from 143 to 206 basis points, with the average-maturity benchmark at 187 basis points. Under the tight 6 percent capacity mapping, the average-maturity calculation gives approximately 207 basis points. All three duration constructions imply a high cost relative to its level a decade earlier.

Table 5: Duration sensitivity of the 2026Q1 marginal Treasury absorption cost

Benchmark nonlinear specification	$S_{b,2026Q1}$	Safe-debt margin H_{2026Q1}
Share-normalized duration (53 bp)	143	187
Average-maturity duration (97 bp)	187	143
Ten-year duration (116 bp)	206	124

Notes: Entries are basis points and use the cash-Treasury premium and 52-basis-point repricing term from the benchmark 5 percent capacity mapping. The safe-debt margin uses the 330-basis-point wealth-benefit benchmark. Differences of one basis point can arise from unrounded regression coefficients and premium levels.

6.6 From marginal Treasury absorption cost to the safe-debt margin

The preceding subsections estimate marginal Treasury absorption cost, $S_{b,t}$. Translating that cost into distance from the stationary Laffer peak requires a benchmark for the rate-equivalent wealth benefit of an additional safe claim. Let

$$m_I(r) = \frac{\rho + \lambda_I}{r + \lambda_I}$$

denote group I's MPC out of a persistent income flow at a fixed safe rate. Since group I receives Treasury absorption income, equations (12) and (16) imply that the rate-equivalent stationary benefit is

$$\frac{1}{\kappa_I(r)} = \frac{\rho + \lambda_I - r}{1 - m_I(r)}. \tag{91}$$

The denominator is the share of persistent Treasury absorption income that group I saves. The numerator is the net consumption effect of additional stationary financial wealth. Group H remains important for the level of the safe rate and the size of its adjustment through aggregate desired wealth. It does not enter the stationary turning-point condition because its nontradable income is unchanged; at the peak, its desired holdings are therefore unchanged as well. Group I, which receives Treasury absorption income, absorbs the entire marginal claim in the stationary allocation.

I use $1/\kappa_I = 330$ basis points as the benchmark. Its magnitude is guided by a suggestive back-of-the-envelope calculation for households likely to be exposed to marginal Treasury financing terms. The top 0.1 percent receives close to 10 percent of national income, with slightly less than one-third coming from non-capital income (Piketty, Saez, and Zucman, 2018; Saez and Zucman, 2020). Applied to the \$26.36 trillion of national income reported for 2026Q1 (Bureau of Economic Analysis, 2026), these shares imply \$0.83–\$0.88 trillion of non-capital income. The Federal Reserve's Distributional Financial Accounts report \$25.1 trillion of net worth for the top 0.1 percent in 2026Q1 (Federal Reserve Board, 2026). The corresponding non-capital-income-to-net-worth ratio is approximately 330–350 basis points. I use the lower end of this range. The calculation uses the broader wealth capitalization of households exposed to marginal Treasury financing terms as a proxy for κ_I. The dealer-parent capacity index separately measures variation in the production-side capacity N. The benchmark converts the estimated marginal Treasury absorption cost into the safe-debt margin

$$H_t = 330 - S_{b,t} \tag{92}$$

in basis points. The calculation disciplines the scale of the benchmark; the estimates of $S_{b,t}$ come from the preceding subsections.

Under the benchmark nonlinear estimates, the safe-debt margin falls from approximately 250 basis points in 2015Q1 to 143 basis points in 2026Q1. Because the wealth-benefit benchmark is fixed, the estimated increase in marginal Treasury absorption cost reduces the remaining margin one-for-one. The calculation places the United States on the positive side of the stationary peak in 2026Q1, but with a substantially narrower margin than eleven years earlier.

6.7 A local calculation at the 2026 borrowing pace

The remaining margin measures the rate-equivalent distance from the stationary peak at the current debt stock. To measure how quickly that distance is narrowing, I evaluate a one-year increase in debt at 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). Net borrowing is therefore approximately 6.1 percent of the debt stock. Holding the maturity composition, Federal Reserve share, and financial-capacity state fixed over this local increment, the private Treasury stock rises in the same proportion.

For each premium component, write its stock-repricing term as $\mathscr{M} = bs_b$. Holding its estimated local slope fixed over a small increase in debt gives

$$dS_b \simeq 2s_b\,db = 2\mathscr{M}\frac{db}{b}. \tag{93}$$

At the 2026Q1 benchmark, the cash-Treasury and duration repricing terms are 51.7 and 97.1 basis points. Applying the 6.1 percent borrowing rate gives

$$2(51.7+97.1)\times 0.061 \simeq 18.2$$

basis points. Thus, at the CBO's 2026 borrowing pace, one year of additional issuance would reduce the remaining safe-debt margin by about 18 basis points at the current state.

Equation (93) measures the local erosion of the margin with the financial-capacity state held fixed. In the model's active region, a higher debt stock relative to capacity steepens the marginal-cost schedule. The empirical capacity interaction provides the corresponding state dependence: the cash-Treasury supply response is steeper when capacity is scarce. If continued debt growth raises debt relative to capacity, subsequent erosion of the safe-debt margin will be faster than the fixed-state calculation reported here.

7 Conclusion

Safe public debt is jointly produced. The fiscal authority supplies the promise, but the financial system supplies the market-making, warehousing, and rollover capacity that makes the promise liquid and safe. Solvency therefore leaves open a second limit to issuance: the cost of mobilizing that capacity.

The safe-debt Laffer curve follows from the interaction between the non-Ricardian wealth effect of public debt and the fiscal adjustment required to sustain its safety. At the inherited safe rate, an additional claim raises private financial wealth and desired consumption. Treasury absorption payments work in the opposite direction: government purchases fall by the full payment, while the recipients spend only part of the associated income and save the remainder. At low debt, the wealth effect dominates. As rollover pressure builds, the Treasury absorption premium rises and the required fiscal reduction becomes larger. The turning point is reached when marginal Treasury absorption cost exactly offsets the rate-equivalent wealth benefit of the new claim. Beyond it, further issuance generates negative stationary aggregate-demand pressure and lowers the equilibrium safe rate, even though the claims remain safe.

The Laffer curve describes debt's stationary contribution to aggregate-demand pressure at a fixed safe rate. The equilibrium safe-rate schedule describes the rate that clears the market across stationary allocations. Their peaks coincide because the same safe-debt margin determines the sign of both effects: the rate-equivalent non-Ricardian wealth benefit of the marginal claim minus its marginal Treasury absorption cost.

Maturity changes the form of the exposure. Short debt puts more of the stock through rollover; long debt reduces that flow but magnifies the price response of the claims left outstanding. Financial capacity dampens both the direct rollover premium and this duration-price amplification. These are the two pieces measured empirically by the cash-Treasury and real-duration components.

For the United States, the benchmark marginal Treasury absorption cost more than doubles over the last decade, rising from about 80 basis points in 2015Q1 to about 187 basis points in 2026Q1. Under the benchmark 330-basis-point wealth benefit, the safe-debt margin falls from about 250 to 143 basis points. The estimated interaction between Treasury supply and dealer-parent capacity has the sign predicted by the model and is statistically significant under overlap-robust inference. In the linear decomposition, premium levels account for 48.2 basis points of the increase, expansion of the private coupon stock raises duration repricing by 55.7 basis points, and cash-Treasury repricing contributes 1.5 basis points.

Greater Treasury-intermediation capacity lowers marginal Treasury absorption cost and raises the equilibrium safe rate. Holding the rate-equivalent wealth benefit fixed, it also pushes the peak outward. Past the peak, additional debt lowers the equilibrium safe rate; if that rate cannot adjust, the burden appears directly as weaker demand (Caballero and Farhi, 2018). The supply of safe public debt and the financial capacity that sustains its safety are therefore two sides of the same object.

The model considers a single market for safe public debt. In actual economies, however, sovereign and corporate fixed-income claims draw on shared financial capacity. Simultaneous debt expansion by major sovereigns and large corporations can therefore raise the cost of supporting any one government's safe claims. The relevant pressure is not one sovereign's debt stock in isolation, but the aggregate demand placed on the financial capacity that sustains safe and liquid claims. The local 18-basis-point calculation holds these competing demands fixed and is therefore conservative when issuance is expanding simultaneously across sovereign and corporate bond markets.

Appendix

A Safe-Asset Demand

This appendix shows how high aversion to rollover losses leads both household groups to hold supported safe claims. Section 2 derives their individual budgets, consumption functions, aggregation, and stationary wealth demands. Financial firms supply rollover support at the opportunity cost studied in Section 3; households choose between claims with and without that support.

A.1 Rollover losses and supported claims

Members of group $j \in \{H, I\}$ have Epstein–Zin preferences with unit intertemporal elasticity and risk aversion σ_j across aggregate payoff states (Epstein and Zin, 1989). If ω indexes rollover conditions and $c_{j,i,t}(\omega)$ is state-contingent consumption, the within-date certainty equivalent is

$$C_{j,t}^{\sigma_j} = \left(\mathbb{E}_t[c_{j,i,t}(\omega)^{1-\sigma_j}]\right)^{1/(1-\sigma_j)}. \tag{94}$$

The logarithmic time aggregator delivers the consumption functions used below, while σ_j governs aversion to rollover-state risk.

Consider a household with total government-bond holdings $b_{j,i}$. It chooses the supported safe position $\iota_{j,i} \in [0, b_{j,i}]$ and hence the unsupported exposure

$$u_{j,i} = b_{j,i} - \iota_{j,i} \geq 0. \tag{95}$$

A supported claim earns the safe return r. An unsupported claim offers an additional promised return χ, but suffers the rollover-state loss $\ell(\omega) \geq 0$. Relative to the supported position, one unit of unsupported exposure therefore adds $\chi - \ell(\omega)$ to the household's payoff. If other financial wealth is held in the safe annuitized asset, the state-contingent wealth law of a surviving household can be written

$$\dot{w}_{j,i}(\omega) = (r + \lambda_j)w_{j,i} + y_j - c_{j,i}(\omega) + \left[\chi - \ell(\omega)\right]u_{j,i}. \tag{96}$$

This portfolio problem determines whether households are willing to bear rollover-state losses. The financial system's cost of supplying the supported claim is determined separately by the capacity-utilization problem in Section 3.

The normalized state-price weight induced by (94) is

$$\Lambda_j^{\sigma_j}(\omega) = \frac{c_{j,i}(\omega)^{-\sigma_j}}{\mathbb{E}[c_{j,i}(\omega)^{-\sigma_j}]}. \tag{97}$$

An interior unsupported position satisfies

$$\mathbb{E}\left[\Lambda_j^{\sigma_j}(\omega)\big(\chi - \ell(\omega)\big)\right] = 0, \tag{98}$$

with a weak inequality toward a smaller unsupported position at the corner $u_{j,i} = 0$.

Let $\ell^{\max} = \operatorname{ess\,sup}_\omega \ell(\omega)$. Suppose the promised excess return is smaller than the worst rollover loss, $\chi < \ell^{\max}$. For any fixed positive unsupported position, the certainty equivalent converges to consumption in the worst rollover state as σ_j becomes large. Replacing that position with a supported claim raises worst-state resources by $\ell^{\max} - \chi > 0$ per unit. The optimal unsupported position therefore converges to zero as $\sigma_j \to \infty$. In the limiting allocation, $u_{j,i} = 0$ and $\iota_{j,i} = b_{j,i}$: both groups hold government debt as a supported safe claim.

The result supplies the asset demanded by the household block. Section 3 determines the Treasury absorption premium from the gross balance-sheet burden and Treasury convenience services. Section 2 specifies the private incidence of the associated payment and derives its effect on stationary saving.

B Utilization-Based Rollover Premia

This appendix collects the production-side derivatives used in Sections 3–5. The formulas retain positive maturity. Setting $\mu(\delta) = 1$ gives the short-maturity benchmark.

The gross rollover-support spread is

$$\pi^R(b,N,\delta) = p\left(\frac{\mu(\delta)b}{N}\right). \tag{99}$$

In the active region, $p' > 0$ and $p'' \geq 0$. Differentiating with respect to debt and capacity gives

$$\pi^R_b = \frac{\mu(\delta)}{N} p'\left(\frac{\mu(\delta)b}{N}\right) > 0, \tag{100}$$

$$\pi^R_N = -\frac{\mu(\delta)b}{N^2} p'\left(\frac{\mu(\delta)b}{N}\right) < 0, \tag{101}$$

$$\pi^R_{bb} = \frac{\mu(\delta)^2}{N^2} p''\left(\frac{\mu(\delta)b}{N}\right) \geq 0, \tag{102}$$

$$\pi^R_{bN} = -\frac{\mu(\delta)}{N^2}\left[p'\left(\frac{\mu(\delta)b}{N}\right) + \frac{\mu(\delta)b}{N} p''\left(\frac{\mu(\delta)b}{N}\right)\right] < 0. \tag{103}$$

These signs follow from utilization rather than the absolute scale of the debt stock. A proportional increase in b and N leaves π^R unchanged.

Maturity changes gross compensation through the fraction of inherited debt reaching rollover:

$$\pi^R_\delta = \frac{\mu'(\delta)b}{N} p'\left(\frac{\mu(\delta)b}{N}\right) > 0, \tag{104}$$

$$\pi^R_{\delta N} = -\frac{\mu'(\delta)b}{N^2}\left[p'\left(\frac{\mu(\delta)b}{N}\right) + \frac{\mu(\delta)b}{N} p''\left(\frac{\mu(\delta)b}{N}\right)\right] < 0. \tag{105}$$

Thus capacity weakens the additional rollover pressure created by shorter maturity.

The gross annualized payment associated with rollover support is $b\pi^R$. Its marginal cost is

$$\frac{\partial(b\pi^R)}{\partial b} = \pi^R + b\pi^R_b. \tag{106}$$

Its slope and capacity interaction satisfy

$$\frac{\partial^2(b\pi^R)}{\partial b^2} = 2\pi_b^R + b\pi_{bb}^R > 0, \tag{107}$$
$$\frac{\partial^2(b\pi^R)}{\partial b\,\partial N} = \pi_N^R + b\pi_{bN}^R < 0. \tag{108}$$

A larger debt stock therefore raises the marginal gross burden, while more capacity lowers it.

The cash-Treasury spread nets out convenience services:

$$s^R = \pi^R - \nu(b), \qquad \nu'(b) < 0. \tag{109}$$

Consequently,

$$s_b^R = \pi_b^R - \nu'(b) > 0. \tag{110}$$

When convenience services do not depend on dealer-parent capacity,

$$s_{bN}^R = \pi_{bN}^R < 0. \tag{111}$$

The marginal cash-Treasury component is

$$\frac{\partial(bs^R)}{\partial b} = \pi^R + b\pi_b^R - \nu - b\nu'. \tag{112}$$

The complete slope of this expression depends on the curvature of convenience dilution as well as on gross rollover support. The main Laffer result therefore imposes $S_{bb} > 0$ directly on the Treasury absorption payment over the relevant range.

B.1 Smooth closed form

The figures use the smooth-onset quadratic schedule

$$\pi^R(b,N,\delta) = \frac{\phi}{2}\left[\frac{\mu(\delta)b}{N} - \bar{q}\right]_+^2. \tag{113}$$

Gross balance-sheet stress becomes active at

$$\widehat{b}(N,\delta) = \frac{\bar{q}N}{\mu(\delta)}. \tag{114}$$

Both the spread and its first derivative are zero at this threshold.

In the active region,

$$\pi_b^R = \frac{\phi\mu(\delta)}{N}\left[\frac{\mu(\delta)b}{N} - \bar{q}\right], \tag{115}$$
$$\pi_{bb}^R = \frac{\phi\mu(\delta)^2}{N^2}, \tag{116}$$
$$\pi_{bN}^R = -\frac{\phi\mu(\delta)}{N^2}\left[2\frac{\mu(\delta)b}{N} - \bar{q}\right]. \tag{117}$$

The gross component of marginal Treasury absorption cost is

$$\pi^R + b\pi_b^R = \frac{\phi}{2}\left[\frac{\mu(\delta)b}{N} - \bar{q}\right]\left[3\frac{\mu(\delta)b}{N} - \bar{q}\right], \tag{118}$$

and its slope is

$$\frac{\partial}{\partial b}\left(\pi^R + b\pi_b^R\right) = \frac{\phi\mu(\delta)}{N}\left[3\frac{\mu(\delta)b}{N} - 2\bar{q}\right] > 0. \tag{119}$$

Because the active region has $\mu(\delta)b/N > \bar{q}$, the last bracket is positive. The marginal-cost schedule is continuous as it leaves the flat region and then steepens with utilization. Capacity continues to lower its level and slope throughout the active region.

C Duration-Price Amplification and Maturity Choice

This appendix first verifies the fixed point used in Section 5. It then extends the benchmark debt-management problem to include uncertainty about future rollover conditions. The additional uncertainty matters for maturity choice because long claims have greater price exposure even when the current expected rollover burden is small.

C.1 Benchmark fixed point

The benchmark total premium satisfies

$$s = -\nu(b) + \pi^R(b,N,\delta) + \frac{\pi^R(b,N,\delta)\vartheta(N)}{(r+s+\delta)^2}. \tag{120}$$

Moving all terms to the left and differentiating with respect to s gives

$$1 + \frac{2\pi^R(b,N,\delta)\vartheta(N)}{(r+s+\delta)^3} > 0 \tag{121}$$

on the admissible domain $r+s+\delta > 0$. The residual is therefore strictly increasing. It tends to negative infinity at the lower boundary when $\pi^R > 0$ and to positive infinity as s grows, establishing a unique fixed point. When $\pi^R = 0$, the solution is $s = -\nu(b)$ whenever the duration denominator remains positive.

Implicit differentiation gives

$$s_b = \frac{-\nu'(b) + \left[1 + \frac{\vartheta(N)}{(r+s+\delta)^2}\right]\pi_b^R}{1 + \frac{2\pi^R\vartheta(N)}{(r+s+\delta)^3}}, \tag{122}$$

and

$$s_N = \frac{\left[1 + \frac{\vartheta(N)}{(r+s+\delta)^2}\right]\pi_N^R + \frac{\pi^R\vartheta_N(N)}{(r+s+\delta)^2}}{1 + \frac{2\pi^R\vartheta(N)}{(r+s+\delta)^3}}. \tag{123}$$

The first derivative is positive because $-\nu' > 0$ and $\pi_b^R > 0$. The second is negative because $\pi_N^R < 0$ and $\vartheta_N < 0$. The maturity derivative is

$$s_\delta = \frac{\left[1 + \dfrac{\vartheta(N)}{(r+s+\delta)^2}\right]\pi_\delta^R - \dfrac{2\pi^R\vartheta(N)}{(r+s+\delta)^3}}{1 + \dfrac{2\pi^R\vartheta(N)}{(r+s+\delta)^3}}. \tag{124}$$

The numerator displays the quantity-price tradeoff: faster rollover raises gross support compensation but shortens the duration of the claim.

C.2 Rollover uncertainty and debt management

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

For this extension, denote the total premium relevant for maturity choice by s^M. Its three components are

$$s^R = \pi^R(b,N,\delta) - \nu(b), \tag{125}$$

$$s^D = \frac{\vartheta(N)\pi^R(b,N,\delta)}{[r+s^M(b,N,\delta)+\delta]^2}, \tag{126}$$

$$s^X = \frac{\vartheta_X(N)\sigma_X^2}{[r+s^M(b,N,\delta)+\delta]^2}. \tag{127}$$

The first two are the benchmark cash and duration components. The third prices the duration exposure to uncertainty in future rollover conditions. It remains present when the current gross rollover burden is small, giving the government a cost of extending maturity.

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

$$s^M = -\nu(b) + \pi^R(b,N,\delta) + \frac{\pi^R(b,N,\delta)\vartheta(N) + \vartheta_X(N)\sigma_X^2}{[r+s^M+\delta]^2}. \tag{128}$$

The derivative of the left-side residual with respect to s^M is

$$1 + \frac{2\left[\pi^R\vartheta + \vartheta_X\sigma_X^2\right]}{(r+s^M+\delta)^3} > 0. \tag{129}$$

The same boundary argument as in the benchmark establishes a unique solution on the admissible domain.

Holding b and N fixed, implicit differentiation gives

$$s_\delta^M = \frac{\left[1 + \dfrac{\vartheta}{(r+s^M+\delta)^2}\right]\pi_\delta^R - \dfrac{2\left[\pi^R\vartheta + \vartheta_X\sigma_X^2\right]}{(r+s^M+\delta)^3}}{1 + \dfrac{2\left[\pi^R\vartheta + \vartheta_X\sigma_X^2\right]}{(r+s^M+\delta)^3}}. \tag{130}$$

Shorter maturity raises the fraction of debt requiring rollover support, which is the first term in the numerator. It reduces the price exposure of both the expected rollover burden and the uncertainty around future rollover conditions, which is the second term.

The capacity derivative is

$$s_N^M = \frac{\left[1+\dfrac{\vartheta}{(r+s^M+\delta)^2}\right]\pi_N^R + \dfrac{\pi^R\vartheta_N+\vartheta_{X,N}\sigma_X^2}{(r+s^M+\delta)^2}}{1+\dfrac{2\left[\pi^R\vartheta+\vartheta_X\sigma_X^2\right]}{(r+s^M+\delta)^3}} < 0. \tag{131}$$

Capacity lowers current rollover compensation, the price amplification of that compensation, and the price of exogenous rollover uncertainty.

C.3 Optimal maturity

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

$$\delta^*(b,N) \in \arg\min_{\delta>0} s^M(b,N,\delta). \tag{132}$$

At an interior optimum,

$$s_\delta^M(b,N,\delta^*) = 0, \qquad s_{\delta\delta}^M(b,N,\delta^*) > 0. \tag{133}$$

Using (130), the first-order condition is

$$\left[1+\frac{\vartheta(N)}{(r+s^M+\delta)^2}\right]\pi_\delta^R = \frac{2\left[\pi^R\vartheta(N)+\vartheta_X(N)\sigma_X^2\right]}{(r+s^M+\delta)^3}. \tag{134}$$

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 gives the right side a component that does not vanish with the current expected rollover burden.

The response of optimal maturity to capacity follows from differentiating the first-order condition:

$$\frac{d\delta^*(b,N)}{dN} = -\frac{s_{\delta N}^M(b,N,\delta^*)}{s_{\delta\delta}^M(b,N,\delta^*)}. \tag{135}$$

At the optimum, the cross-derivative can be read from the derivative of the numerator of (130):

$$\begin{aligned} s_{\delta N}^M = \Bigg\{ &\left[1+\frac{\vartheta}{(r+s^M+\delta)^2}\right]\pi_{\delta N}^R + \left[\frac{\vartheta_N}{(r+s^M+\delta)^2} - \frac{2\vartheta s_N^M}{(r+s^M+\delta)^3}\right]\pi_\delta^R \\ &- \frac{2\left[\pi_N^R\vartheta+\pi^R\vartheta_N+\vartheta_{X,N}\sigma_X^2\right]}{(r+s^M+\delta)^3} + \frac{6\left[\pi^R\vartheta+\vartheta_X\sigma_X^2\right]s_N^M}{(r+s^M+\delta)^4}\Bigg\} \\ &\times\left[1+\frac{2\left[\pi^R\vartheta+\vartheta_X\sigma_X^2\right]}{(r+s^M+\delta)^3}\right]^{-1}. \end{aligned} \tag{136}$$

Capacity reduces the rollover-utilization effect of shorter maturity through $\pi^R_{\delta N} < 0$, and it lowers both price-exposure coefficients. Its effect on the endogenous duration denominator works in the opposite direction because $s^M_N < 0$. The sign of the complete cross-derivative therefore depends on the relative strength of these forces.

Proposition 3 (Maturity choice and financial capacity)**.** *Let $\delta^*(b,N)$ be an interior solution of the maturity problem and suppose the second-order condition in* (133) *holds. If the parameters and capacity schedules imply*

$$s^M_{\delta N}(b,N,\delta^*) < 0, \tag{137}$$

then

$$\frac{d\delta^*(b,N)}{dN} > 0. \tag{138}$$

Higher financial capacity then supports faster rollover and shorter maturity; scarce capacity tilts debt management toward longer maturity.

This maturity-choice extension adds one object, σ^2_X, to study debt management. It does not enter the Treasury absorption premium, the safe-debt turning point at an observed maturity structure, or the four empirical components of marginal Treasury absorption cost.

D Empirical Construction

The data, inference, and sensitivity exercises below support the cash-Treasury and real-duration components in Section 6.

D.1 Data construction

Dealer-parent Treasury capacity comes from FR Y-9C filings and the leverage-ratio mapping in (85). The measure assigns all unused leverage-exposure room to potential Treasury intermediation and adds Treasury inventory already held. It is a broad system-capacity diagnostic. Constant rescalings leave the standardized interaction unchanged. Each leverage-ratio mapping produces its own capacity series, so I standardize the 5 and 6 percent measures separately over 2015–2024.

The 5 percent series applies the historical U.S. GSIB holding-company threshold, and the 6 percent series applies the tighter historical well-capitalized threshold for insured depository subsidiaries. Effective April 1, 2026, a final rule tied U.S. GSIB standards to firm-specific systemic-risk surcharges and capped the depository-subsidiary enhancement at one percentage point (Federal Reserve Board, FDIC, and OCC, 2025). The 2026Q1 diagnostic extends each historical mapping through the final observation, preserving a fixed-rule comparison with the estimation sample.

The monthly interaction state interpolates the quarterly regulatory measure using dealer-parent market equity. Equity supplies the monthly movement and is less mechanically tied to Treasury positions within individual maturity buckets than dealer holdings or sector size. The interpolation preserves each quarterly regulatory mean, so leverage-room data determine the level of N_t.

The cash-Treasury component s^R is the Treasury par yield minus the maturity-matched par swap rate. The two-, three-, five-, ten-, and thirty-year buckets use continuous benchmark-versus-IRS spread chains available from 2003. The seven-year bucket uses a LIBOR-consistent spread constructed from Treasury and swap par yields. This produces a continuous six-bucket panel through the transition in the underlying swap benchmark. Higher s^R denotes a higher cash-Treasury premium.

The duration component s^D is the DKW real term premium (D'Amico, Kim, and Wei, 2018). Jointly pricing nominal and inflation-indexed Treasuries removes inflation-risk compensation within one term-structure model. This distinction matters: a debt-related inflation premium could reflect dilution or fiscal risk, whereas the empirical object is the real price component associated with duration. The DKW series is available at five and ten years; the debt-weighted level interpolates between these anchors and extrapolates beyond them.

Table 6 lists the data sources used to construct the debt, capacity, premium, Federal Reserve holdings, and dealer-parent equity series.

Table 6: 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 Committee on Uniform Securities Identification Procedures (CUSIP) identifier	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 equity values from the Center for Research in Security Prices (CRSP)	CRSP dealer-parent equity data	Daily

D.2 Cash-Treasury repricing details

The cash-Treasury design is a monthly maturity panel. Equations (82) and (86) include maturity and start-month fixed effects and exclude the first half of 2020, focusing on persistent repricing outside the emergency-market episode. Because adjacent $h = 12$–24 changes overlap, inference uses Driscoll–Kraay/Newey–West standard errors with 24 monthly lags. I refer to the resulting confidence bands as overlap-robust bands; the figures also show month-clustered bands to display the inference correction.

The conversion in (83) accounts for percentage-point units and the maturity distribution of both the aggregate spread and marginal issuance. These two steps initially contribute $w_{m,t}^2$. Since $out_{m,t} = w_{m,t} b_t / (1 - \varpi_{m,t})$, one weight cancels when the bucket response is converted into $b_t \, \partial s_t^R / \partial b_t$. The resulting sum $\sum_m w_{m,t}(1 - \varpi_{m,t})$ is 0.781 in 2015Q1 and 0.837 in 2026Q1.

Start-month effects absorb curve-wide repricing, so $\mathscr{M}_{h,t}^R$ measures 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 scarce 2026Q1 capacity state.

Figure 4 reports the linear estimates for the 2015+ and 2010+ samples. 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, while the negative point-estimate profile is preserved in both samples.

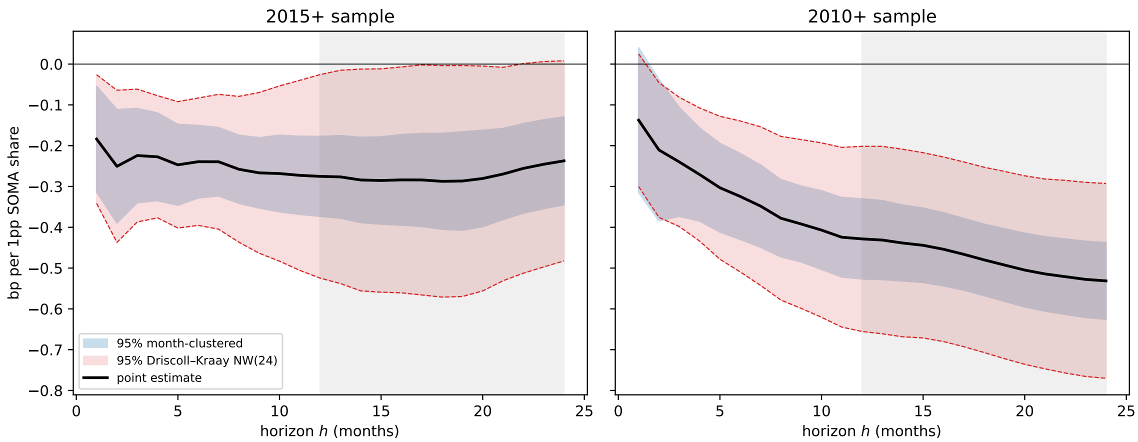

Figure 4: Linear cash-Treasury repricing estimates. The panels report β_h for the 2015+ and 2010+ samples. Black lines are point estimates; blue bands are month-clustered 95 percent confidence intervals; red dashed bands use Driscoll–Kraay/Newey–West inference with 24 monthly lags. The shaded region is the $h = 12$–24 averaging window. The average slopes in that window are -0.27 and -0.48, respectively.

Figure 5 reports the benchmark nonlinear estimates and both sets of confidence bands. The interaction remains positive throughout the persistent window and is statistically significant under overlap-robust inference.

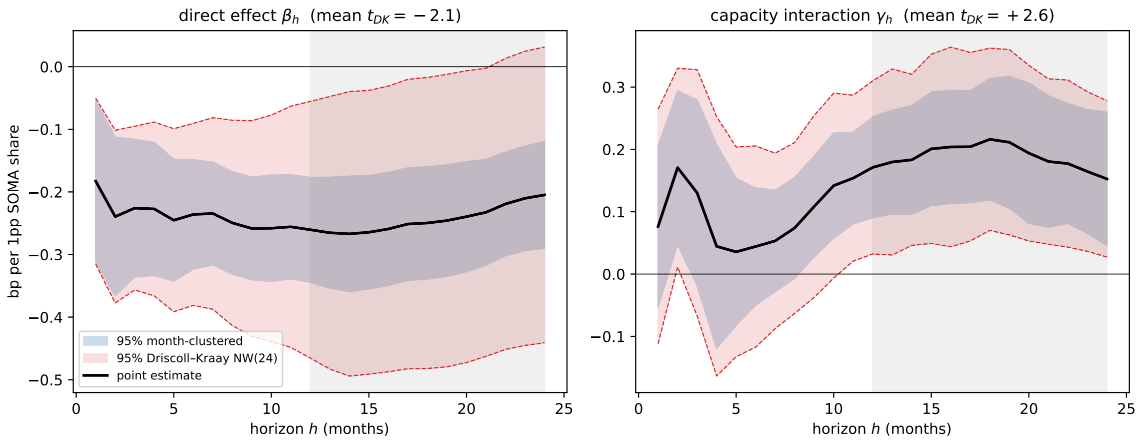

Figure 5: Benchmark nonlinear cash-Treasury repricing estimates. The left panel reports the direct slope β_h, and the right panel reports the capacity interaction γ_h, using the 5 percent leverage mapping. Black lines are point estimates; blue bands are month-clustered 95 percent confidence intervals; 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.

Figure 6 compares the 5 and 6 percent leverage-ratio mappings. The interaction path is similar under both; the larger 2026Q1 reading under 6 percent chiefly reflects a more extreme standardized capacity state.

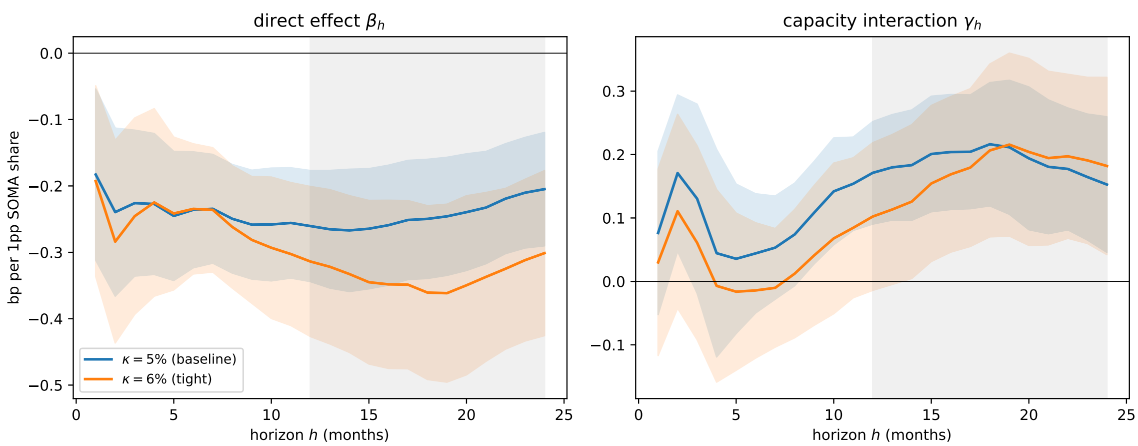

Figure 6: Nonlinear estimates under 5 and 6 percent leverage-ratio mappings. Point estimates and bands are shown for the direct slope β_h and capacity interaction γ_h; the shaded region is the $h = 12$–24 averaging window. The interaction paths are similar, while the standardized 2026Q1 capacity states differ. Evaluated at those states, the implied cash-Treasury repricing terms are approximately 52 and 72 basis points, respectively.

The IV sensitivity 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. Lagged holdings and recent issuance can also reflect persistent security-specific pricing conditions, so OLS remains the empirical anchor. A pricing residual from a fitted Nelson–Siegel yield curve is excluded because overidentification tests reject when it is included. Figure 7 reports the linear two-instrument sensitivity specification alongside the linear OLS comparison.

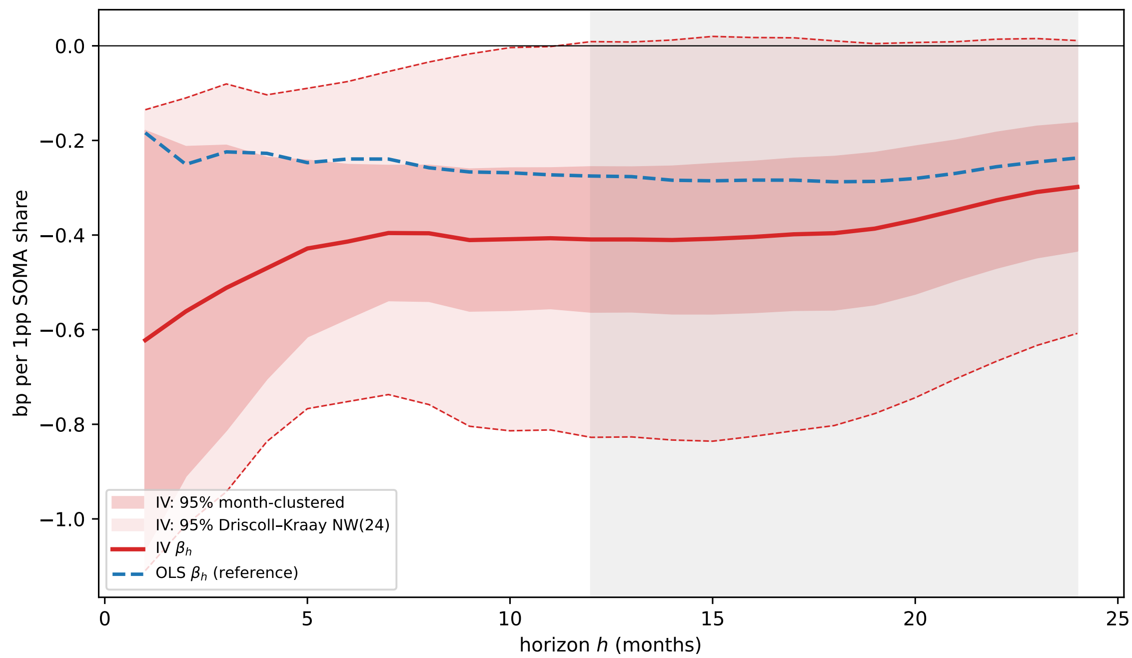

Figure 7: Linear IV sensitivity with overlap-robust inference. The instruments, measured at $t-6$, are lagged maturity-bucket SOMA share and a trailing-issuance on-the-run proxy. The solid red line is the IV estimate and the dashed blue line is the OLS benchmark; the bands show month-clustered and Driscoll–Kraay/Newey–West 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.

D.3 Real-duration repricing details

The duration event study regresses two-trading-day changes in the DKW real term premium on announced changes in expected cumulative Treasury purchases or runoff. The Maturity Extension Program changed SOMA's maturity composition while leaving face amount roughly unchanged, so it belongs to a maturity-composition design rather than the aggregate private-supply experiment in (89).

The baseline with-intercept slope is $\beta_D = -0.0055$ basis points per billion dollars. Applied to the 2026Q1 MSPD private coupon float of \$17.642 trillion, it gives $\mathscr{M}^D_{2026Q1} = 97$ basis points. A ten-year specification gives 116 basis points, while scaling announcements by contemporaneous private float gives 53 basis points. These are alternative specifications of the same twelve-event design; Table 8 reports statistical uncertainty. Table 7 lists the announcements and sizing assumptions.

Table 7: Treasury-relevant asset-purchase and runoff announcements

Date	Event	Amount	Date	Event	Amount
2009-03-18	QE1 Treasury purchases	+300	2013-12-18	Taper start	-200
2010-08-10	QE2 pre-announcement	+300	2020-03-15	COVID QE	+500
2010-11-03	QE2	+600	2020-03-23	COVID open-ended QE	+1000
2012-12-12	QE3	+540	2021-11-03	Taper	-120
2013-05-22	Taper hint	-300	2022-05-04	QT plan	-540
2013-06-19	Taper timeline	-200	2024-05-01	QT slowdown	+210

Notes: Amounts are announced changes in expected cumulative Treasury purchases, in billions of dollars, with negative values denoting tapering or balance-sheet runoff. QE denotes quantitative easing; QT denotes quantitative tightening. The Maturity Extension Program left the face amount of Treasury supply approximately unchanged and therefore belongs to a maturity-composition design. Open-ended and pace-change announcements require judgment in translating statements into cumulative amounts.

Table 8 reports HC3 heteroskedasticity-robust standard errors with small-sample t critical values. The baseline slope barely excludes zero at the 5 percent level, producing a wide stock-level confidence interval. Removing the two March 2020 announcements increases the point estimate, while the leave-one-event-out estimates bracket the baseline. The point estimate is stable to removing any single announcement.

Table 8: Duration event-study inference

Specification	β_D	HC3 standard error	95 percent interval	$\mathscr{M}^{D}_{2026Q1}$
Baseline, with intercept	-0.0055	0.0024	$[-0.0109, -0.0001]$	97 $[1, 193]$
Excluding March 2020	-0.0086	0.0051	$[-0.0204, 0.0032]$	151
Leave-one-event-out range	$[-0.0066, -0.0042]$	—	—	$[74, 116]$

Notes: Slopes are basis points per billion dollars; repricing terms are basis points. The baseline and March-2020 intervals use HC3 standard errors and t critical values with 10 and 8 degrees of freedom. The baseline intercept is 0.10 basis points with an HC3 standard error of 1.57. The leave-one-event-out row reports ranges of point estimates, not confidence intervals.

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