THE U.S. TREASURY'S BIGGEST SHORT: DURATION IN THE SHADOWS *

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ABSTRACT

We analyze the U.S. Treasury's issuance strategy as a measurable policy choice and show taxpayers would benefit if the Treasury actively managed its debt duration. The Treasury absorbs fiscal shocks through bills while maintaining predictable longer-term issuance, and does not adjust duration supply in response to market signals, instead tilting toward maturities with the highest fixed-rate costs relative to floating. Using the 2024–2025 buybacks, the Treasury lowered the nominal value of debt with no change in market value. Exploiting staggered ESA 2010 adoption, which introduced duration-management incentives in Europe, we find sovereigns reduced term spreads by 41 basis points.

KEYWORDS: U.S. Treasury, Debt management, Duration risk, Debt maturity, Market value, Buybacks, Fiscal accounting, ESA 2010.

JEL CLASSIFICATION: H63, E43, G12, H62, G18, M41.

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1 Introduction

The U.S. Treasury manages its debt under a "regular and predictable issuance" principle (Garbade, 2007; Treasury Borrowing Advisory Committee, 2015). Treasury Secretary Scott Bessent has stated that "[o]ur guiding principle at the Treasury Department is to finance the government at the least cost over time," and that the "Regular and Predictable" issuance framework "has proven to be the most effective means of achieving those goals" (Bessent, 2025). Assistant Secretary Frost further articulates this commitment and states that the Treasury does "not respond to short-term changes in market pricing or attempt to time the market to capture technical rate dislocations" (Frost, 2024). By avoiding market timing, the Treasury reduces uncertainty, supports secondary market liquidity, and broadens auction participation (Garbade, 2007). However, by applying the "regular and predictable" principle to debt management broadly, the Treasury also foregoes the benefits of simply managing the duration risk of its liabilities and adjusting issuance composition in response to market demand.

Over the past two decades, the Treasury has expanded its unmanaged duration exposure dramatically, growing outstanding marketable debt from $3 trillion in 2002 to nearly $30 trillion in 2025 while keeping the weighted-average maturity narrowly between 4.0 and 6.0 years despite substantial changes in market conditions (see Figure 1). The Treasury issues approximately $20 trillion of this outstanding debt as fixed-rate notes and bonds, all of which carry duration exposure and on which the Treasury pays term spreads as compensation for investors' duration exposure. Because the weighted-average maturity barely changed over the past two decades from 5.5 years in 2002 to 6.0 years in 2025, the dollar duration of the total debt stock grew nearly tenfold, from $119 billion to $1.2 trillion for a one percentage-point change in interest rates. Therefore, on the one hand, the Treasury leaves taxpayers directly exposed to $1.2 trillion in economic losses, nearly 4% of GDP, for a 1% decline in interest rates. On the other hand, investors require term spreads as compensation for bearing this duration risk, and the Treasury passes these higher term spreads back to taxpayers through elevated borrowing costs. Therefore, by not acknowledging the market value of its liabilities and refusing to tactically manage duration supply, the Treasury forgoes systematic savings in borrowing costs.

We make three contributions to understanding the nature of the Treasury's debt-management strategy and its potential costs. First, we provide comprehensive evidence on the Treasury's approach to debt management. Second, we use evidence from issuance and buybacks to reveal the Treasury's insensitivity to market signals and its preference for nominal-debt management over market-value management. Third, we exploit the stag-

gered adoption of the European System of Accounts (ESA 2010) across European countries to show sovereigns lowered borrowing costs by introducing duration management in their debt-management framework. Overall, we show that the Treasury incurs large and avoidable borrowing costs by ignoring the market value of its liabilities and that it could lower borrowing costs by incorporating duration management within the current "regular and predictable" framework.

As a first step to analyze the Treasury's approach to debt management, we evaluate how the Treasury chooses between bill and coupon issuance and how it allocates coupon issuance across maturities. We show that the Treasury uses bills effectively as "shock absorbers" (Bessent, 2025) and not as a duration-management tool. First, we exploit the Treasury's quarterly refunding announcements to obtain data on issuance as planned up to five months ahead of actual issuance. We then compare the Treasury's planned issuance with the realized borrowing needs. We show that the Treasury allocates 97.8% of any borrowing surprise over the planned amount to bills. Furthermore, we use time-series data on government deficits, net bill issuance, and net coupon issuance to study how fiscal shocks are financed. Using an unobserved-component model, we decompose fiscal shocks into permanent and transitory components. We show that the Treasury immediately finances both temporary and permanent shocks with bills, but then gradually transitions permanent shocks to coupon issuance over approximately two years.[1]

We then analyze the Treasury's allocation of coupon issuance across maturities. To measure the amount of duration risk the Treasury supplies to the market, we measure the dollar duration at each maturity. To evaluate whether the Treasury shifts duration supply across maturities in response to market demand, we then compute the share of duration supplied at each maturity. Consistent with the Treasury's static approach to total coupon issuance, we find that issuance at each maturity largely matches the issuance announced at the previous quarter's refunding, which happened up to five months before actual issuance. The announced maturity structure correlates 96.8% with the maturity structure ultimately issued. We then analyze the Treasury's response to market signals, using spreads over the three-month bill and spreads over maturity-matched swap rates. We find that the Treasury does not adjust duration supply in response to market signals. If anything, the Treasury appears to tilt issuance toward maturities where intermediaries earn the highest margins in swapping floating to fixed rates.

Although some scholars argue that high Treasury yields over swap rates reflect strong demand for duration by certain investors, such as pension funds and insurance compa-

[1] In contrast, Angeletos (2002) shows that optimal maturity depends on the persistence of fiscal shocks: transitory shocks are optimally financed with short-term debt, but permanent fiscal needs should be immediately financed with longer maturities.

nies (Hanson et al., 2024; He et al., 2022; Jermann, 2020; Kashyap et al., 2025; Klingler and Sundaresan, 2019), this spread also captures an opportunity cost for the Treasury, as well as an intermediation margin for dealers. A dealer that holds the Treasury security, finances it at the floating rate, and hedges with a pay-fixed swap, earns the spread as a risk-free profit. The Treasury could then reduce its borrowing costs by issuing floating rate notes and swapping into fixed rates. However, the Treasury historically and currently rejects the use of interest rate swaps for debt management. Moreover, its floating rate note program is minimal, representing just 3% of outstanding debt. We argue these self-imposed constraints on debt management are costly.

To obtain an indicative estimate of how much the Treasury could save by managing duration supply more actively, we use auction-level demand elasticities estimated by Somogyi et al. (2025). According to our calculations, the Treasury could systematically save on borrowing costs by shifting issuance from the 5–7 year maturity bucket to the 2–3 year bucket and from the 20–30 year maturity bucket to the 10 year bucket, respectively. By shifting to lower-duration issuance, the Treasury benefits not only from lower term spreads, but also from reallocating duration supply to maturities with more elastic investor demand. At the peak of potential cost savings in 2021, the Treasury could have reduced annual borrowing costs by over $550 million by shifting, in a single quarter, 10% of its 5–7 and 20–30 year issuance, to 2–3 and 10 year issuance, respectively.

Then, we examine the recent buyback operations as additional evidence on the Treasury's debt-management approach. The Treasury launched its 2024–2025 buyback program to support liquidity in off-the-run securities. Because the Treasury runs a persistent deficit, these buybacks are financed with new issuance. From a market-value perspective, this financing leaves the overall burden of debt largely unchanged. From a face-value perspective, however, repurchasing below-par bonds and issuing new bonds near par can reduce nominal debt outstanding and increase nominal fiscal capacity.

We show that, after controlling for yield, coupon, time to maturity, and illiquidity proxies (bid-ask spreads, issue size, and vintage), bonds eligible for buybacks are on average more discounted than comparable ineligible bonds. This pattern was absent during the 2000–2002 buybacks, whose purpose was to reduce the value of outstanding debt in a period of fiscal surplus. By targeting discounted bonds during the 2024–2025 buybacks, the Treasury freed approximately $21 billion in nominal fiscal capacity on the $280 billion in par repurchased.[2]

[2]One interpretation is that the Treasury is purchasing relatively cheap, less-liquid bonds and thereby improving market functioning in a way that may benefit taxpayers (Duffie and Keane, 2023; Duffie, 2025; Zhou, 2025). Although our evidence is generally consistent with this interpretation, our goal is to highlight the additional implications of buybacks for debt and duration management.

Finally, we provide evidence that passive duration management is costly by exploiting the staggered adoption of market-value reporting requirements under ESA 2010 across European sovereigns. With ESA 2010, European governments agreed to report the market value of debt in national accounts, forcing European sovereigns to confront the market value of their debt and their duration exposure in official statistics and publications. Core European countries that adopted ESA 2010 experienced a drop in term spreads of 41 basis points. In comparison, the Treasury estimated that the reduction in borrowing costs attributable to its "regular and predictable" strategy was 13 basis points over the 1998–2015 period (Frost, 2024; Treasury Borrowing Advisory Committee, 2015).[3] Therefore, the Treasury and taxpayers could reap additional benefits by integrating active duration management within the established "regular and predictable" approach.

2 Related Literature

To the best of our knowledge, this is the first paper to identify nominal-value accounting and passive duration management as key and costly frictions in sovereign debt management. While the Treasury's regular-and-predictable issuance framework has received prior attention, the role of nominal-value accounting and the passive management of debt has gone unrecognized. In the past, researchers have discussed how accounting practices generate mismeasured estimates of the cost of public debt (Bohn, 1992; Boskin, 1982; Eisner and Pieper, 1984; Hall and Sargent, 2011; Penner, 1982). We argue that such practices not only introduce mismeasurement, but also generate real costs for taxpayers.

We contribute to the literature on the Treasury's "regular and predictable" issuance framework. Garbade (2007) traces how this norm emerged in the 1970s and became institutionally self-reinforcing. Glasserman et al. (2017) and Cassidy and Mirani (2025) study the implications of this framework on bill issuance. Specifically, Glasserman et al. (2017) estimates that the cost of a regular and predictable bill issuance is only one basis point higher than the cost-minimizing one. Cassidy and Mirani (2025) use the decline in net bill supply during debt-ceiling episodes as an instrument to estimate supply effects on convenience premia. A recent, high-frequency identification literature shows that surprise changes in issuance affect market yields (Bi et al., 2026; Hartley and Rigon, 2026; Joyce and Lengyel, 2024; Mustafi, 2026; Phillot, 2025). Wang and Zhao (2025) exploit the quarterly Refunding Announcement calendar to document a pre-announcement drift in bond

[3] In Treasury Borrowing Advisory Committee (2015), the Treasury Borrowing Advisory Committee estimates the Treasury saved $27 billion over the 18-year period from 1998 to 2015, during which the Treasury issued $20.78 trillion in fixed-coupon securities.

returns, which they attribute to fiscal uncertainty resolution rather than borrowing-need surprises.

Most of the literature on Treasury issuance focuses on demand-side factors, while the supply side is often treated as exogenous. Among the recent demand-side literature, Somogyi et al. (2025) measure the slope of auction demand schedules and find that the yield impact of a 1% supply increase has risen from 2 basis points pre-2010 to 10 basis points post-2010. Chaudhary et al. (2025) find that demand for Treasury is highly inelastic and varies across investors and over time. Using more than 5,000 Brazilian Treasury auctions, Andrade and Da Rocha (2026) show that dealers demand larger price concessions for larger offerings. These studies are related to a growing literature that studies investor demand in treasury auctions in the U.S. and internationally (Allen et al., 2022; Back and Zender, 1993; Boyarchenko et al., 2021; Cammack, 1991; Cole et al., 2022; Elsinger et al., 2019; Hamao and Jegadeesh, 1998; Hortaçsu and Kastl, 2012; Hortaçsu et al., 2018; Hortaçsu and McAdams, 2010; Keloharju et al., 2005; Nyborg et al., 2002; Simon, 1994; Umlauf, 1993). In another strand of demand-side literature, researchers have also documented the role of intermediary frictions and dealer's risk-bearing capacity in auction pricing and Treasury-market functionality (Albuquerque et al., 2024; Duffie, 2023; Du et al., 2023; Fleming et al., 2024; Kashyap et al., 2025; Klingler and Sundaresan, 2023; Lou et al., 2013; He et al., 2022).

Unlike this literature, our purpose is to analyze the issuance strategy of the Treasury and evaluate the benefits of a more active duration-management approach. We therefore study treasury issuance from the supply side. Our result that the Treasury does not respond to market signals stand in sharp contrast with the practice of corporate issuers. In corporate finance, the supply-side literature has documented how firms adjust the supply of securities in response to market conditions and risk management considerations. Previous literature has shown that, in response to changes in relative prices or nonfundamental demand by investors, firms adjust debt composition (Baker et al., 2003; Becker and Ivashina, 2014; Butler et al., 2006; Darmouni and Siani, 2021; De Santis and Zaghini, 2021; Grosse-Rueschkamp et al., 2019; Pegoraro and Montagna, 2025; Todorov, 2020), interest-rate exposure (Faulkender, 2005), equity issuance (Baker and Wurgler, 2000, 2002; Dong et al., 2012; Loughran and Ritter, 1995; Spiess and Affleck-Graves, 1995), and the mix of equity and debt financing (Alti, 2006; Baker and Wurgler, 2000; Gao and Lou, 2012; Ma, 2019).

The relative supply of long-term and short-term Treasuries has measurable effects on financial markets, private-sector issuance, and the real economy. Greenwood and Vayanos (2014) show that duration-weighted government debt supply positively predicts bond yields and excess returns, with effects that are increasing in maturity. Kr-

ishnamurthy and Vissing-Jorgensen (2012) further show that the safety and liquidity of Treasuries generate downward-sloping demand, so that changes in aggregate supply of short-term safe assets affect convenience premia and credit spreads across the economy. Greenwood et al. (2015) formalize this logic in a normative framework, showing that the government has a comparative advantage in supplying short-term safe claims and that increases in bill supply raise short-term money premia while crowding out private short-term debt issuance roughly one-for-two. These supply effects are amplified by market segmentation and intermediary constraints (d'Avernas and Vandeweyer, 2024; Stein and Wallen, 2025). Greenwood et al. (2010) show that corporations act as gap-fillers, absorbing government maturity shocks by adjusting their own debt maturity in the opposite direction. Hubert de Fraisse (2024) shows that a longer government maturity profile raises long-term discount rates and crowds out long-duration corporate investment.

We also contribute to the literature on government buybacks by showing that the Treasury freed fiscal capacity using the 2024–2025 buyback program. Prior work frames buybacks as operational or liquidity tools and does not consider their role in fiscal capacity management. Garbade and Rutherford (2007) provide the canonical institutional history of the 2000–2001 program and Duffie and Keane (2023) discuss the role of buybacks in ensuring market functionality. Han et al. (2007) find execution costs of only 4.4 cents per $100, yet show that the Treasury preferentially accepted high-coupon, long-maturity bonds, consistent with minimizing reported interest expense rather than the cost of capital. Zhou (2025) evaluates the 2024 program and finds that buybacks narrow bid-ask and off-the-run spreads and raise prices for eligible securities. Blommestein et al. (2012) survey 33 OECD debt managers and find that most cite reducing refinancing risk as their primary buyback motive. Greenwood and Vayanos (2010) and Connolly and Struby (2024) provide evidence that buybacks can move the term structure. Bulow and Rogoff (1988) establish that, in Latin American countries, buybacks of deeply discounted sovereign debt transfer most of the gain to creditors through an average-versus-marginal wedge.

Our policy prescription is that the Treasury should internalize the market value of debt and manage its duration risk. One solution would be to shorten the maturity of government debt, as also implied by the work of Greenwood et al. (2015), Greenwood et al. (2010) , and Krishnamurthy and Vissing-Jorgensen (2012). An alternative solution would be to issue more floating-rate notes (FRNs), which would provide both long-term funding and minimal duration-risk exposure. The Treasury, however, issues only marginal quantities of two-year FRNs, generating market incompleteness and costly intermediation (Georgievska and Saunders, 2025).

3 DATA

Our empirical analysis draws on three groups of data: U.S. fiscal and issuance data, bond and derivatives market pricing data, and cross-country fiscal and institutional data for ten European sovereigns.

3.1 U.S. FISCAL AND ISSUANCE DATA

Our U.S. analysis draws on four sources: Treasury auction records and refunding announcements for issuance and borrowing decisions, yield and swap rate data for market signals, monthly fiscal data for the deficit decomposition, and CRSP security-level data for buyback analysis.

3.1.1 ISSUANCE DECISIONS AND MARKET SIGNALS

We obtain gross issuance data from fiscaldata.treasury.gov, collecting Treasury auction results for Bills, Notes, Bonds, Treasury Inflation-Protected Securities (TIPS), and Floating Rate Notes (FRN). We subtract purchases by the Federal Reserve open-market-account (SOMA) from total accepted amounts so that all issuance measures reflect securities placed with private market participants. Gross issuance is aggregated at the quarterly level after netting bills that are issued and mature in the same quarter.

We supplement the realized issuance data with forward-looking guidance from quarterly Treasury Refunding Announcements (TRA), issued jointly by the U.S. Department of the Treasury and the Treasury Borrowing Advisory Committee (TBAC). For coupon issuance, each announcement publishes a *current recommendation*—the planned issuance for the current quarter—and an *indication for future*—forward guidance for the following quarter. Each announcement also reports total marketable borrowing needs at three successive information stages: the *Forecast* (next quarter's indicated borrowing, announced one quarter ahead), the *Estimate* (current quarter's recommended borrowing, announced at the start of the quarter), and the *Actual* (realized borrowing, reported in the following quarter's announcement).

U.S. Treasury yields come from the Federal Reserve Board's H.15 release (obtained from FRED), providing daily constant-maturity yields at maturities from one month to 30 years (`DGS1MO`–`DGS30`). The *term spread* at each maturity is defined as the constant-maturity yield at that maturity minus the three-month constant-maturity yield, both from H.15. Swap rates are obtained from Bloomberg at daily frequency, covering LIBOR-based and SOFR-based fixed-for-floating interest rate swaps at the same maturities as the yield

curve. The *swap spread* is defined as the Treasury constant-maturity yield minus the swap rate at the same maturity. This convention is the reverse of the definition in the swap spreads literature (Klingler and Sundaresan, 2019; Jermann, 2020), who define the swap spread as the swap rate minus the Treasury yield. Under our convention, a positive spread indicates that the sovereign is paying more for fixed-rate funding than the synthetic alternative via a floating-rate instrument and a pay-fixed swap. Because USD LIBOR was discontinued in June 2023, we construct a combined swap rate series that uses LIBOR-based rates through the transition date and SOFR-based rates thereafter. These daily series are converted to quarterly frequency using the last daily observation strictly before the quarter start date, so that all market variables are predetermined relative to the quarter's issuance decisions. An observation is set to missing if no reading falls within 15 calendar days of the quarter start date. Summary statistics for all market timing variables are reported in Table 1.

3.1.2 Financing Needs and Issuance Surprises

Using information on the forecast, estimate, and actual borrowing needs and coupon issuance from the TRA announcements, we construct measures of borrowing surprises at each stage of the information flow. We measure surprises as revisions between adjacent stages. The *planning surprise* is the Estimate minus the Forecast, capturing the revision to the borrowing outlook made at the start of the quarter relative to the prior quarter's forward guidance. The *execution surprise* is the Actual minus the Estimate, capturing financing developments that materialized within the quarter. The *total surprise* is the Actual minus the Forecast. Separate surprises are constructed for total marketable borrowing, coupon issuance, and bill issuance.

Because the Treasury does not separately publish planned bill issuance, we infer it at each stage from the following identity:

$$\text{Bill issuance} = \text{Marketable borrowing} + \text{Maturing debt} - \text{Coupon issuance}.$$

Maturing debt is computed as total gross SOMA-adjusted issuance (bills and coupons, excluding bills that mature within the same quarter) minus the quarterly change in Federal Debt Held by the Public (FRED series `FYGFDPUN`).

3.1.3 Monthly Issuance and Deficit Data

We also use monthly data on deficit and marketable borrowing to identify impulse-responses of issuance to deficit shocks. We construct monthly net issuance of bills and coupon se-

curities by first-differencing the outstanding amounts of privately held debt from the Monthly Statement of the Public Debt (MSPD), available from fiscaldata.treasury.gov, covering January 2002 through December 2025. Monthly deficits come from the Monthly Treasury Statement (MTS), also from fiscaldata.treasury.gov, over the same period. All nominal series are deflated by the lagged-quarter GNP deflator (FRED series `GNPDEF`) so that the price index is observable prior to each period's issuance decisions. Summary statistics for these monthly series are reported in Panel A of Table 3.

3.1.4 Buyback and Security-Level Data

For Treasury buyback operations, we collect security-level data from the Treasury Fiscal Data API for two distinct periods: 2000–2002 and 2024–2025. We also obtain the universe of outstanding Treasury securities from the CRSP Treasury issue file (accessed via WRDS), which provides issue characteristics (coupon rate, issue date, and maturity date). We then obtain data on daily nominal prices, bid and ask quotes, yield-to-maturity, and total face value outstanding from the CRSP Treasury daily file (accessed via WRDS). We aggregate all daily CRSP variables to the monthly level by taking the last available daily observation within each calendar month for each security, yielding a panel of security$\times$month observations. Bond age and remaining maturity are computed as the elapsed time from the issue date (respectively, to the maturity date) to the last calendar day of the month. A security is flagged as eligible (accepted) for buyback in month t if it appears as eligible (accepted) in at least one operation during month t. Summary statistics for both buyback samples are reported in Table 4.

3.2 Cross-Country Fiscal and Institutional Data

Our cross-country sample includes ten euro-area countries: Germany and Netherlands (classified as early adopters Core countries), Austria, Belgium, and France (classified as late adopters Core countries), and Greece, Ireland, Italy, Portugal, and Spain (classified as late adopters Periphery countries). The *early/late adopter* dimension captures staggered implementation of ESA 2010: Germany and the Netherlands adopted market-value reporting from January 2010, while all other euro-area countries complied at the mandatory deadline of September 2014. The *Core/Periphery* dimension reflects differences in fiscal fundamentals and sovereign borrowing conditions, following the standard classification in the European sovereign debt literature.

We use monthly sovereign zero-coupon yield curves and swap rates from Bloomberg spanning January 2000 through June 2023. Fiscal fundamentals and balance-sheet vari-

ables for the Euro-area sovereigns, in particular general government gross debt at face value, interest payable, the deficit are sourced from Eurostat. Data on GDP are from the ECB Statistical Data Warehouse. We obtain data on the ECB's Public Sector Purchase Programme (PSPP) from the History of cumulative purchase breakdowns under the PSPP available at https://www.ecb.europa.eu/mopo/implement/app/html/index.en.html.

4 The U.S. Treasury's Debt Management

We begin by analyzing the U.S. Treasury's "regular and predictable" approach to debt issuance as a measurable policy choice. First, we show that the U.S. Treasury uses bills as the residual financing instrument that absorbs borrowing surprises, preserving stable fixed-rate issuance. Then, we examine the maturity composition of fixed-rate debt through the lens of duration supply and find that the Treasury does not adjust the duration profile of its issuance in response to market signals indicating favorable or unfavorable conditions for long-term borrowing. We quantify potential cost savings from counterfactual maturity reallocations using auction-level demand elasticities. Finally, we document the Treasury's incentives to manage the nominal value of debt through buybacks operations.

4.1 Treasury Bills as Fiscal Shock Absorbers

This section presents empirical evidence that the Treasury systematically channels unexpected borrowing needs into short-term bill issuance, preserving the "regular and predictable" fixed-rate issuance schedule.

4.1.1 Absorption of Borrowing Surprises

Our empirical strategy exploits the information structure of Treasury refunding announcements to identify borrowing surprises at different horizons. As described in Section 3.1, we construct measures of total, planning, and execution surprises for marketable borrowing, coupon issuance, and bill issuance, yielding nine series in total. Summary statistics are in Table 2. A first look at the data is already suggestive: the standard deviation of total coupon issuance surprises is $43 billion, roughly one-eighth of the standard deviation of total borrowing surprises ($343 billion) and of total bill issuance surprises ($340 billion). A similar pattern holds across planning and execution horizons. Coupon surprises are not only small on average, but also tightly clustered around their mean, reflecting gradual, pre-announced build-ups in the fixed-rate schedule. Bill surprises, by contrast, mirror the

full dispersion of total borrowing surprises. This descriptive asymmetry anticipates the main finding: virtually all variation in financing needs is absorbed by bills, while coupon issuance follows a predetermined path.

We test whether borrowing surprises pass through differentially to bills versus coupons by estimating:

$$\text{IssuanceSurprise}_{j,t} = \alpha_j + \beta_j \cdot \text{BorrowingSurprise}_t + \varepsilon_{j,t} \tag{1}$$

where $j \in \{\text{Coupon}, \text{Bill}\}$ indexes the security type, $\text{IssuanceSurprise}_{j,t}$ is the issuance surprise for security type j, and $\text{BorrowingSurprise}_t$ is the total marketable borrowing surprise. Under perfect shock absorption, we expect $\beta_{\text{Coupon}} = 0$ and $\beta_{\text{Bill}} = 1$: all borrowing surprises flow entirely to bills while coupon issuance remains on its predetermined path. Inference uses Newey and West (1987) standard errors with bandwidth of 4 quarters. The sample spans 2002Q1 through 2025Q4.

Table 5 presents results from estimating equation (1) across three information stages: total surprise (forecast to actual), planning surprise (forecast to estimate), and execution surprise (estimate to actual). For total borrowing surprises, the coefficient on bill issuance is 0.978 (s.e. = 0.007), while the coefficient on coupon issuance is 0.022 (s.e. = 0.007). The R^2 values reinforce this interpretation: bill surprises explain 98.4% of borrowing surprise variation, while coupon surprises explain only 3.0%. This near-complete separation confirms that virtually all unexpected borrowing needs flow to bills.

The decomposition by information stage reveals that shock absorption operates at both the planning and execution margins. Planning surprises show coefficients of 0.980 for bills and 0.020 for coupons, indicating that even when the Treasury revises its borrowing estimate from the previous quarter's forecast, the adjustment occurs almost entirely through bills. Execution surprises exhibit even stronger absorption: the bill coefficient is precisely 1.000 while the coupon coefficient is exactly 0.000, indicating that within-quarter adjustments are channeled exclusively to bill issuance.

4.1.2 Dynamic Responses to Permanent and Transitory Shocks

To examine whether the Treasury differentiates between permanent and transitory financing needs, we decompose the federal deficit into its structural level and temporary components using an unobserved components (UC) model with local-level structure (Durbin and Koopman, 2012; Harvey, 1989). This approach follows Beveridge and Nelson (1981) and Watson (1986) in decomposing macroeconomic time series into trend and cycle. To remove trends attributable to inflation, we follow standard practice in the fiscal policy

literature (Blanchard and Perotti, 2002) and deflate all nominal deficit and issuance series by the GNP implicit price deflator. Summary statistics for the monthly deficit and net issuance series are reported in Panel A of Table 3.

The model specifies the GNP-deflated deficit series D_t as the sum of a stochastic level τ_t (the structural deficit) and transitory noise ε_t (cyclical fluctuations):

$$D_t = \tau_t + \varepsilon_t, \quad \varepsilon_t \sim N(0, \sigma_\varepsilon^2) \tag{2}$$

$$\tau_t = \tau_{t-1} + \eta_t, \quad \eta_t \sim N(0, \sigma_\eta^2) \tag{3}$$

where η_t represents permanent innovations to the deficit level (shifts in the structural deficit) and ε_t captures transitory fluctuations. By construction, permanent and transitory shocks are orthogonal, providing clean identification for the impulse response analysis that follows. Summary statistics for both shocks are reported in Panel B of Table 3.

We then trace the dynamic response of bill and coupon net issuance to each shock type using local projection impulse response functions (Jordà, 2005), which have become standard in applied macroeconomics for their robustness to model misspecification (Stock and Watson, 2018). For each horizon $h = 0, 1, \ldots, H$, we estimate:

$$Y_{i,t+h} - Y_{i,t-1} = \alpha_{i,h} + \beta_{i,h}^{\eta} \eta_t + \beta_{i,h}^{\varepsilon} \varepsilon_t + \mu_{q(t)} + u_{i,t+h} \tag{4}$$

where $Y_{i,t}$ is the GNP-deflated publicly held amount of security type $i \in \{\text{Bills}, \text{Coupons}\}$, so $Y_{i,t+h} - Y_{i,t-1}$ represents cumulative net issuance over the horizon. The coefficients $\beta_{i,h}^{\eta}$ and $\beta_{i,h}^{\varepsilon}$ trace the impulse response to permanent and transitory deficit shocks, respectively. The term $\mu_{q(t)}$ denotes within-quarter month-position fixed effects, where $q(t) \in \{1, 2, 3\}$ indicates whether month t is the first, second, or third month of its quarter, included to absorb within-quarter cyclicality in fiscal flows. We use Newey and West (1987) standard errors with bandwidth set by the Schwert (1989) lag-selection rule, $L = \lfloor 12 \cdot (T/100)^{1/4} \rfloor$, yielding $L = 15$ lags.

Figure 2 presents the UC decomposition and the local projection impulse responses. Panel 2(a) displays the decomposition of the GNP-deflated federal deficit into its permanent (trend) and transitory components, illustrating the identifying variation underlying the impulse response analysis. Panels 2(b) and 2(c) display local projection impulse responses tracing how bill and coupon net issuance respond dynamically to permanent and transitory deficit shocks, respectively. The responses are normalized so that a one-unit shock corresponds to a \$1 billion initial impact on the deficit. Panel 2(d) traces the response of cumulative coupon issuance to a \$1 billion increase in current bill net issuance.

Following a permanent deficit shock, coupon net issuance rises gradually over sub-

sequent quarters, covering the total amount of the additional deficit in 16 months. Bills show a complementary pattern: they absorb the initial shock but their cumulative response declines as coupons gradually take over the financing burden. The gradual transition from bill to coupon financing reflects the institutional lags in the Treasury's announcement and auction cycle.

The contrast with transitory deficit shocks is instructive. Coupon issuance shows essentially no response at any horizon: the point estimates are economically negligible and statistically indistinguishable from zero throughout. Bills absorb the entire transitory shock initially, and because the shock is mean-reverting, the cumulative bill response converges back toward zero as the transitory financing need dissipates. This dynamic pattern provides evidence that the Treasury, over time, distinguishes between permanent and transitory financing needs, channeling the latter entirely into bills while gradually transitioning permanent needs to coupon financing, in line with the prescriptions of theoretical models (Angeletos, 2002; Barro, 1979).

The permanent-shock impulse-response function implies a testable reduced-form prediction: elevated bill issuance today, which absorbs financing needs that will subsequently migrate to coupons, should predict higher coupon issuance at longer horizons. Panel 2(d) confirms this directly. The response of cumulative coupon issuance to a $1 billion increase in current bill net issuance is initially negative, suggesting bills and coupons are substitutes within the quarter. It turns positive and grows over the subsequent twelve to eighteen months, reaching a cumulative response of approximately $0.15 per dollar of initial bill issuance before plateauing. This hump-shaped pattern mirrors the permanent-shock coupon response in Panel 2(b) and is consistent with the Treasury using bills as a bridge instrument whose financing burden is gradually refinanced into the fixed-rate coupon schedule.

The evidence presented so far establishes two important findings. First, the Treasury operates a debt management framework in which bills serve as the residual financing instrument that absorbs borrowing uncertainty. Second, and critically for this paper's argument, this mechanism represents cash management rather than duration risk management.

4.2 Duration Supply and Market Signals

A rational cost-minimizing debt manager should increase duration supply when market conditions are favorable, specifically, when long-term yields are low or when the swap spread indicates strong private-sector demand for duration. We test whether the Treasury responds to these signals by adjusting the maturity composition of its issuance.

We measure Treasury issuance in terms of duration supply rather than dollar quantities. Duration supply is defined as each maturity bucket's share of total DV01-weighted issuance from fixed-rate securities. This choice reflects the economic principle that duration rather than principal determines the interest rate risk transferred to markets (Vayanos and Vila, 2021; Greenwood and Vayanos, 2014). The distinction matters quantitatively: a $1 billion issuance of 30-year bonds adds approximately six times more duration to the market than an equal-sized issuance of 5-year notes. This convention aligns with practice among primary dealers, who manage risk in DV01 terms (Tuckman and Serrat, 2022). For each maturity bucket m in quarter t, we compute:

$$\text{Duration Supply Share}_{m,t} = \frac{\text{DV01}_{m,t}}{\sum_{m'} \text{DV01}_{m',t}} \times 100 \tag{5}$$

where $\text{DV01}_{m,t}$ is the dollar value of a basis point for the issuance in bucket m, computed using the maturity-matched yield from the Treasury yield curve.

Before turning to the formal regression analysis, Figure 3 provides direct visual evidence of the Treasury's commitment to its announced plans. Panel 3(a) plots fixed-rate marketable issuance over time, showing that actual issuance tracks the TBAC quarterly recommendation closely throughout the sample. Panel 3(b) plots the actual duration supply share against the prior quarter's TBAC indication for each maturity-quarter observation, with observations clustering tightly around the 45-degree line; the correlation is 96.8% and deviations rarely exceed 5 percentage points (3.9% of all observations).

As a measure of market signal, we use term spreads at various maturities. We also use the swap spread, defined as the Treasury yield minus the interest rate swap rate at the same maturity. Both provide measures of the relative cost of issuing fixed-coupon debt at a certain maturity compared to others. A high term spread indicates that long-term yields are relatively expensive compared to short-term yields, signaling unfavorable conditions for issuing long-duration debt. A high swap spread indicates that the Treasury is paying more for fixed-rate funding than the synthetic alternative via a floating-rate instrument and a pay-fixed swap, signaling weaker private-sector demand for Treasury securities relative to the synthetic alternative. If the Treasury engages in market timing of its duration supply, we would expect to see higher duration supply at maturities where term spreads and swap spreads are low, and lower duration supply shares when these spreads are high.

Figure 4 presents scatter plots of duration supply against term spreads. Panel 4(a) plots actual duration supply against the term spread at the beginning of the quarter. Panel 4(b) plots the deviation of actual duration supply from the prior quarter's TBAC

indication against the change in the term spread over the previous quarter. If the Treasury timed markets, we would expect a negative relationship in both panels: lower term spreads (indicating relatively cheap long-term borrowing) should be associated with higher duration supply, and increases in the term spread should prompt the Treasury to issue less duration than indicated. Instead, we observe no systematic pattern in either panel.

Table 6 presents formal regression evidence. We estimate:

$$\text{Duration Supply Share}_{m,t} = \alpha_m + \mu_t + \sum_k \beta_k X_{k,t} + \varepsilon_{m,t} \tag{6}$$

where m indexes the maturity bucket, t indexes the quarter, α_m are maturity fixed effects (included in select specifications), μ_t are quarter fixed effects included throughout, and $X_{k,t}$ denotes the market signal variables measured at the start of quarter t: the term spread (Treasury yield minus the three-month bill rate at the corresponding maturity), the swap spread (Treasury yield minus the interest rate swap rate at the same maturity), and the swap rate. The panel is structured by maturity-bucket×quarter observations; standard errors follow Driscoll and Kraay (1998) with $L = 4$ quarterly lags, which permits arbitrary heteroskedasticity, serial correlation up to four quarters, and cross-sectional dependence across maturity buckets.

We estimate equation (6) separately with actual issuance and TBAC indication as the dependent variable. These two measures carry distinct timing implications for interpreting duration supply decisions. As documented so far in this paper, actual issuance follows the prior quarter's indication with a correlation of 96.8%, so market conditions prevailing at auction time have little scope to enter the realized quantity. TBAC indications, by contrast, represent the point at which the maturity decision is genuinely made and announced to the public.

Panel A examines the share of duration supply allocated to each maturity bucket as a function of term spreads, swap spreads, and swap rates. The results reveal no evidence that the Treasury increases duration supply when term spreads are low. The swap spread coefficient is even positive and statistically significant: a 1 basis point increase in the swap spread, indicating weaker demand for Treasury securities, is associated with a 14 to 23 basis point increase in the duration supply share. This pattern holds for both actual issuance and TBAC indications, suggesting it reflects systematic policy rather than implementation noise. The positive relationship between swap spreads and duration supply represents an inversion of optimal market timing behavior. When private-sector demand for duration through Treasury securities is strongest (low swap spreads), the Treasury supplies less duration. When demand weakens (high swap spreads), the Treasury supplies more.

Panel B of Table 6 examines heterogeneity across security types, comparing the issuance shares of Floating Rate Notes (FRNs) versus fixed-coupon securities and TIPS versus fixed-coupon securities. FRNs are issued exclusively at a 2-year maturity, so the FRN comparison pools FRN and fixed-coupon 2-year observations. TIPS are issued at 5-, 10-, 20-, and 30-year maturities, so the TIPS comparison pools TIPS and fixed-coupon observations at those four tenors. Optimal duration management would predict that the Treasury shifts toward FRNs, which carry no duration risk, when swap spreads are high. Instead, for the FRN versus fixed-coupon comparison, the interaction between the fixed-coupon indicator and the swap spread is positive and statistically significant, indicating that fixed-coupon securities comprise a larger share of issuance precisely when private-sector demand for duration is weaker. The corresponding interaction for TIPS versus fixed-coupon securities is economically negligible and statistically insignificant.

In Table 7, we repeat the analysis by explicitly looking at changes in duration supply and their relation to changes in market conditions. As dependent variables we use quarter-over-quarter changes in actual duration supply, changes in TBAC indications, and deviations of actual issuance from prior indications, which together span the full margin of potential adjustment. Across all three, the ΔSwap Spread coefficient is statistically insignificant. Changes in swap rates show a significant negative relation with actual duration supply (≈ -1.9 basis points per 1 basis point; $p < 0.05$), but the effect is absent for indication changes and for deviations from prior indications, the two measures where genuine policy revision would appear. Panel B mirrors the pattern in Panel B of Table 6: the interaction between the fixed-coupon indicator and ΔSwap Spread is positive for FRN comparisons, indicating that fixed-coupon share rises precisely when swap spreads widen rather than when they narrow, again opposite to active duration management. Taken together, the levels and changes evidence point to the same conclusion: Treasury does not appear to adjust duration supply in response to market signals at any decision margin.

Appendix Tables IA.1 and IA.2 report dynamic robustness specifications that augment the baseline regressions with one-quarter leads and lags of each market signal. The lag terms test whether the Treasury responds with a one-quarter delay to past conditions; the lead terms examine whether today's duration supply predicts future spreads, which would indicate markets reacting to issuance rather than the reverse. Neither lag nor lead is economically large or systematically significant across specifications, ruling out that the absence of market timing is an artifact of the timing of the regressors.

4.3 Counterfactual Cost Savings from Maturity Reallocation

To assess how much the Treasury could save by reallocating issuance across maturities, we compute counterfactual changes in financing using auction-level demand elasticities estimated by Somogyi et al. (2025).[4] For each Treasury auction, Somogyi et al. (2025) estimates the demand elasticity for four maturity buckets: 2 to 3 years, 5 to 7 years, 10 years, and 20 to 30 years. As in Somogyi et al. (2025), we winsorize elasticities at the 1st and 99th percentiles. We then aggregate data at the quarter and maturity-bucket level using the median elasticity and high yield, while summing offered amounts within each bucket. We then map the estimated elasticities into the slopes of yields with respect to quantity, and we denote with $s_{m,t} \equiv \partial y_{m,t}/\partial q_{m,t}$ the estimated marginal change in the yield of maturity bucket m in quarter t from a marginal change in the issued amount.

As a first step, we use this information to compute how the Treasury should optimally reallocate issuance across maturity buckets to minimize the annual cost of servicing the new issue of debt. For each quarter t, let $\mathcal{M} = \{2\text{–}3, 5\text{–}7, 10, 20\text{–}30\}$ denote the maturity buckets, let $q_{m,t}$ denote observed offered amount and $y_{m,t}$ the observed yield. We then minimize annual interest expenses of a new debt issue in quarter t:

$$\min_{\{\Delta_{m,t}\}_{m\in\mathcal{M}}} \quad \sum_{m\in\mathcal{M}} \left[y_{m,t} + s_{m,t}(q_{m,t} + \Delta_{m,t})\right](q + \Delta_{m,t}) \tag{7}$$

$$\text{s.t.} \quad \sum_{m\in\mathcal{M}} \Delta_{m,t} = 0, \tag{8}$$

where $\Delta_{m,t}$ is the counterfactual reallocation in bucket m. The first-order conditions deliver the quarter-specific optimizer $\Delta^*_{m,t}$.

In Panel 5(a), we plot the normalized direction of the reallocation $\widetilde{\Delta}_t = \Delta^*_t/\|\Delta^*_t\|_2$. A positive (negative) value for a maturity bucket indicates that the optimal reallocation involves increasing (decreasing) issuance in that bucket relative to the others. Overall, the data indicates that, for most of the sample period, the Treasury would have benefited from reallocating issuance to the 2–3 year bucket. In some periods, the optimal reallocation also involves increasing issuance in the 10-year bucket. Most of the time, optimal reallocation involves reducing issuance in the 5–7 and 20–30 year buckets.

These results on optimal reallocation provide a useful benchmark for the direction of change. However, because elasticities provide local estimates, the optimal reallocation may be large relative to the observed quantities, which would make the cost savings estimates unreliable. To address this concern, we also compute cost savings from a small, fixed reallocation of 10% of offered amount from the 5–7 year bucket to the 2–3 year

[4] We thank Fabricius Somogyi for sharing his auction-level elasticity estimates.

bucket and from the 20–30 year bucket to the 10-year bucket. This paired reallocation allows us to compute cost savings in a way that is consistent with the local nature of elasticity estimates while still providing a meaningful benchmark for potential savings. Specifically, letting $\Delta_{m\to m',t} = 0.10\, q_{m,t}$, we approximate the change in annual borrowing costs from reallocating issuance from bucket m to bucket m' as:

$$\Delta C_{m\to m',t} \approx \underbrace{\Delta_{m\to m',t}\left(y_{m,t} - y_{m',t}\right)}_{\text{savings on reallocated amount}} + \underbrace{\Delta_{m\to m',t}\left(q_{m,t}s_{m,t} - q_{m',t}s_{m',t}\right)}_{\text{savings on inframarginal amount}}. \tag{9}$$

The first component measures the cost savings on the marginal unit that is shifted and which corresponds to the term spread between maturity buckets. The second component measures the cost savings on the inframarginal units that are not shifted but whose yield changes as a result of the reallocation.

Panel 5(b) reports, for each quarter, the total savings in annual borrowing costs (in USD millions) from the 10% paired reallocations. Over the entire sample, the Treasury would save on borrowing costs by shifting issuance from the 20–30 year bucket to the 10-year bucket. For most of the sample, the Treasury would save also by shifting issuance from the 5–7 year bucket to the 2–3 year bucket, although in some periods this reallocation would have increased costs by a limited amount. At its peak in 2021, the Treasury would have saved over $550 million in annual borrowing costs by shifting, in a single quarter, 10% of issuance from the 5–7 and 20–30 year buckets to the 2–3 and 10-year buckets, respectively.

The figure shows that total cost savings are cyclical. A comparison with Panel 5(c) reveals that changes in cost savings mimic changes in term spreads, consistent with the first component of equation 9. Although term spreads and the savings on the reallocated issuance are an important source of cost savings, they are not the only one. Panel 5(d) shows that the inframarginal component of cost savings is economically meaningful. In the latest part of the sample, it accounts for a third of total savings. The data highlight that, even ignoring the benefit of reallocating to lower-yield maturity, the Treasury could lower its borrowing costs by shifting issuance toward more elastic maturity buckets. Overall, these results suggest that taxpayers could materially benefit if the Treasury implemented a more active maturity-management strategy that responds to market conditions.

4.4 Evidence from Treasury Buyback Operations

Whereas issuance auctions are institutionally designed so that bonds are issued at par, buyback operations allow the Treasury to select among eligible securities at market prices. In this section, we use recent Treasury buybacks to examine whether bond selection is associated with below-par pricing. During the 2024–2025 buybacks, the Treasury is more likely to select bonds trading below par, even after controlling for liquidity and other bond characteristics. One interpretation is that this selection supports liquidity in relatively cheap off-the-run bonds (Duffie and Keane, 2023; Duffie, 2025; Zhou, 2025); another is that financing below-par repurchases with near-par issuance reduces nominal debt outstanding while leaving market value broadly unchanged. Overall, the evidence is consistent with attention to nominal debt metrics, while not ruling out a liquidity-provision motive.

Figure 6 documents two distinct buyback periods with fundamentally different fiscal and market conditions. Panel 6(a) shows annual buyback volumes reaching $280 billion in 2024–2025, when bonds trade at discounts: the Treasury paid $259 billion in market value to retire $280 billion in par, freeing approximately $21 billion in fiscal capacity at an average discount of 7.4%. Moreover, in 2024–2025, the federal government is running large deficits, so the Treasury finances buybacks with new issuance at par, amplifying the nominal debt reduction: each dollar of buyback spending retires more than one dollar of outstanding par.

We contrast the 2024–2025 buybacks to an earlier wave of buybacks in 2000-2002, during which the government was running a fiscal surplus and used the surplus to finance the buybacks. Therefore, it did not engage in the fiscal-capacity arbitrage discussed for the 2024–2025 period. Panel 6(b) reveals that the two periods coincide with opposite pricing regimes, with starkly different fiscal consequences. During 2000–2002, older bonds traded at a premium and the Treasury paid $87 billion in market value to retire $68 billion in par.

Figure 7 provides distributional evidence using cumulative distribution functions. Panel 7(a) for 2024–2025 reveals that eligible bonds systematically trade at larger discounts than the overall bond universe. The Kolmogorov-Smirnov test identifies the maximum difference between distributions occurring at a discount level of 2.62 points below par (significant at the 1% level). At this specific price point, only 36.1% of eligible bonds trade at this discount or less, compared to 60.2% of all bonds. This 24.1 percentage point gap demonstrates that the Treasury disproportionately selects bonds from the deeper end of the discount distribution. Panel 7(b) for 2000–2002 shows the opposite pattern: eligible bonds concentrated at premiums, confirming that period's different selection criteria.

Internet Appendix Figure IA.3 provides complementary evidence through quantile-quantile plots. Panel IA.3(a) for 2024–2025 shows points systematically above the 45-degree line, meaning that at every percentile, eligible bonds have larger discounts than all bonds. The divergence is most pronounced in the upper tail, where the most deeply discounted bonds concentrate, suggesting the Treasury particularly targets bonds with the largest discounts.

To formally test whether the Treasury targets below-par bonds, we estimate:

$$P(\text{Eligible}_{i,t+1}) = \alpha + \beta_1 \text{DiscDepth}_{i,t} + \beta_2 \text{PremHeight}_{i,t} + \gamma X_{i,t} + \epsilon_{i,t} \tag{10}$$

where $\text{DiscDepth}_{i,t} = \max(100 - \text{Price}_{i,t},\, 0)$ captures the depth below par for bonds trading at a discount, $\text{PremHeight}_{i,t} = \max(\text{Price}_{i,t} - 100,\, 0)$ captures the height above par for bonds trading at a premium, and $X_{i,t}$ includes controls for bond characteristics (remaining maturity, yield to maturity, coupon rate) and liquidity measures (bid-ask spread, age, log total outstanding). This piecewise-linear specification allows the price-eligibility relation to differ on either side of par without imposing symmetry. Summary statistics for both samples are reported in Table 4.

Table 8 shows that, in 2024–2025, a one-percentage-point increase in discount depth raises eligibility probability significantly, while premium height enters with a near-zero or negative coefficient. This asymmetry is consistent with the Treasury targeting below-par bonds to reduce the nominal value of outstanding debt. In contrast, in 2000–2002, when the Treasury conducted buybacks to reduce debt using fiscal surplus, we find negative correlation with bond discounts, consistent with these fundamentally different institutional incentives. The results are robust to the inclusion of bond fixed effects (columns 2 and 4), which further controls for time-invariant heterogeneity across securities.[5]

5 The Benefit of Market-Value Incentives: European Sovereign Debt Management Under ESA 2010

Having studied the U.S. Treasury's approach to debt management, we provide evidence that, by managing the market value of debt rather than its nominal value, a sovereign debt manager would obtain significant cost savings for taxpayers. We exploit the staggered implementation of the 2010 European System of Accounts (ESA 2010) whereby European sovereigns were mandated to measure, report, and monitor the market value of their

[5]Internet Appendix Table IA.3 reports analogous regressions for the probability that a bond is accepted for buyback.However, unlike eligibility which is determined by the Treasury's preferences, acceptance for buyback combines information about of what the Treasury demands and what dealers tender.

liabilities.

5.1 Background: European Sovereign Debt Management Under ESA 2010

Unlike the U.S., European sovereigns operating under the ESA 2010 framework face fundamentally different institutional incentives for duration risk management. EU Regulation No 549/2013 established ESA 2010 as the mandatory accounting framework for all EU member states, with full implementation required by September 2014 (European Union, 2013). While fiscal surveillance under the Stability and Growth Pact continues to use face value measurement as specified in Council Regulation 479/2009, ESA 2010 introduced parallel market value reporting requirements that create visibility of duration risk exposure.

This dual reporting system requires governments to maintain two distinct debt metrics. Maastricht debt, used for the 60% debt-to-GDP fiscal rule and excessive deficit procedures, remains at nominal face value. Simultaneously, ESA 2010 mandates comprehensive market value reporting in national accounts balance sheets, published quarterly by Eurostat and national statistical offices. These reports explicitly show gains and losses from interest rate movements on government debt portfolios, creating transparency about duration risk exposure that does not exist in single-metric reporting frameworks.

ESA 2010 replaced a nominal view of sovereign debt with a market-value view. Under the previous rules, a government could reduce its reported interest expense (an accrual measure counted in the deficit definition of the excessive deficit procedure) by entering receive-fixed, pay-floating interest rate swaps. Regulation (EC) No 2558/2001 (European Parliament and Council, 2001) treated net swap receipts as negative interest, while the market value of the swap position appeared in no fiscal metric. ESA 2010 closed both sides of this asymmetry: net swap settlements no longer count as interest, and governments must report debt securities and financial derivatives at market value each quarter in national account balance sheets (Dutch State Treasury Agency, 2015, Section 5.6); Maastricht debt, used for fiscal surveillance, remains at face value (Council Regulation 479/2009). ESA 2010 therefore no longer rewards operations that reduce accrual interest expense without reducing the market value of the debt.

The regulation became binding for all member states in September 2014, which defines the treatment date for the late cohort. Germany and the Netherlands moved ahead of the mandate. We date their treatment from January 2010, when the content of the coming regulation became public: the 2008 System of National Accounts, which ESA 2010 transposes, was released in 2009 (European Commission, IMF, OECD, UN and World Bank, 2009); the ECOFIN Council discussed the revision in November 2010; and the Commis-

sion adopted the legislative proposal in December 2010 (European Commission, 2010a).[6]

European debt offices manage sovereign duration primarily through interest rate swaps, which alter a portfolio's interest-rate exposure without changing the issuance program. A sovereign that pays fixed and receives floating lengthens its effective duration; one that receives fixed shortens it. Germany and the Netherlands operated by far the largest swap programs in the sample, and their own publications document that both debt offices rebalanced their swap books over the 2010 to 2012 window, correcting positions that reduced accrual interest expenses but increased the market value of debt.[7] Among other member states, Belgium and France held essentially no derivative positions before the mandate; Italy and Greece carried legacy positions from earlier operations. The Greek case illustrates the pre-ESA incentive most starkly: under the old rules, Greece had used swaps to improve its reported debt and deficit figures (European Commission, 2010b; Piga, 2001). What distinguishes Germany and the Netherlands is therefore not the holding of swap positions but the documented rebalancing of those positions within the window.

All other EU member states adopted the framework at the mandatory compliance date of September 2014. Our empirical analysis exploits this staggered adoption by classifying countries into two treatment cohorts: early adopters (Germany and the Netherlands, treated from January 2010) and mandatory adopters (France, Belgium, Austria, Italy, Spain, Ireland, Portugal, and Greece, treated from September 2014). We further distinguish between Core Europe (Germany, the Netherlands, France, Belgium, Austria) and Periphery Europe (Italy, Spain, Ireland, Portugal, Greece), reflecting differences in fiscal conditions and institutional capacity that are important for interpreting the treatment effects.

[6] In Internet Appendix Table IA.9, discussed ahead, we show the robustness of the results to postdating the treatment of Germany and the Netherlands between 2010 and 2014.

[7] Both debt offices' own publications confirm this timeline. The Commission's legislative proposal dates to December 2010. Germany's borrowing reports disclose the average period for which the interest rate on the federal debt is fixed, computed with and without the effect of swaps. The difference between the two series is the debt office's own measure of the duration effect of its swap book: the swaps shorten the fixing period by about a quarter of a year through 2011; from 2012 onward the difference is approximately zero (Bundesministerium der Finanzen 2011, Table 8; Bundesministerium der Finanzen 2016, Table 15). The Dutch debt office reviewed its interest-rate-risk framework in 2011 and, from 2012, stopped entering the interest rate swaps that shortened its long-dated issues; its own policy review quantifies this shift at minus EUR 4.7 billion in market value over 2012 to 2014 (Dutch State Treasury Agency, 2015, pp. 5–7). In both cases, the rebalancing followed the Commission's proposal and was complete within roughly a year.

5.1.1 Empirical Design

We estimate the effect of ESA 2010 adoption on borrowing costs using a difference-in-differences (DiD) design with staggered treatment timing. Our main outcome variable is the sovereign term spread, defined as the 10-year minus 3-month zero-coupon yield, expressed in percentage points. This is the central measure in the empirical analysis because it captures the relative cost of long-term versus short-term sovereign funding.

The monthly panel spans January 2005 through December 2018. We classify countries into cohorts that map directly to the staggered ESA design. The early Core cohort contains Germany and the Netherlands, whose adoption date is January 2010. The late Core cohort contains France, Belgium, and Austria, whose mandatory compliance date is September 2014. In some specifications, we additionally include the periphery group (Italy, Spain, Ireland, Portugal, and Greece). Figure 8 focuses on the Core sample and compares the two adoption cohorts. The figure reports raw monthly cohort means of the term spread with no covariate adjustment.

Table 9 presents the main staggered difference-in-differences results using term spreads as dependent variable.[8] For country c in month t, we estimate

$$\text{TermSpread}_{ct} = \beta\,(\text{ESA} \times \text{Post})_{ct} + \Gamma' X_{ct} + \alpha_c + \delta_t + \varepsilon_{ct}, \tag{11}$$

where $(\text{ESA} \times \text{Post})_{ct}$ is an indicator that equals one from January 2010 onward for Germany and the Netherlands, and from September 2014 onward for France, Belgium, Austria, and, in full-sample specifications, Italy, Spain, Ireland, Portugal, and Greece. The September 2014 date is the mandatory ESA 2010 compliance deadline for all remaining EU member states established by EU Regulation No 549/2013. The control vector X_{ct} contains fiscal variables (debt-to-GDP; the deficit-to-GDP ratio) to control for changes in fiscal fundamentals, a country-specific short-term rate (the three-month rate) to control for changes in policy rates and country-level variations in short rates, crisis indicators (a GFC safe-haven indicator that equals one for Germany and the Netherlands from September 2008 through December 2009; a GIIPS-crisis indicator that equals one for Italy, Spain, Ireland, Portugal, and Greece from May 2010 through June 2013) to control for flight-to-safety demand and periphery-specific sovereign-stress, and a PSPP intensity measure to

[8] Because swap rates are currency-specific and not country-specific, every euro-area sovereign has the same swap rate at a given maturity. After controlling for the three-month sovereign rate, regression results that use swap spreads as the dependent variable are identical to those that use term spreads. Table IA.4 reports the results using swap spreads as dependent variable and they are identical to Table 9.

control for differential ECB balance-sheet support.[9] Finally, country fixed effects α_c absorb time-invariant cross-country differences in sovereign risk and market structure, and year-month fixed effects δ_t absorb common euro-area shocks, including global risk-off episodes and common monetary-policy news. We use Driscoll and Kraay (1998) standard errors with a Newey and West (1987) kernel and lag selection $L = \lfloor 12 \cdot (T/100)^{1/4} \rfloor$ for monthly data (Schwert, 1989), where T is the number of monthly time periods.

The estimated association is negative and statistically precise across all four columns. In the Core staggered sample (column 1), $\hat{\beta} = -0.408$. Expanding to the full sample that adds the periphery (column 2) yields $\hat{\beta} = -0.493$. The two cohort-comparison columns deliver the same sign. Focusing only on the change in term spreads among early adopters before the mandatory adoption deadline and using late adopters as a comparison group (column 3), we obtain $\hat{\beta} = -0.483$. Using the change in term spreads among late adopters after the early adoption period and using early adopters as a comparison group (column 4), we estimate $\hat{\beta} = -0.287$. The consistency of sign and magnitude across all four designs indicates that the result is not driven by any particular cohort comparison and survives changes in both the comparison group and sample composition.

Figure 9 examines the event-study dynamics and cross-country heterogeneity. Panel (a) plots the full event-time profile from the pooled Core specification, with event time measured in years relative to each country's own adoption date. Term spreads remain stable until one year befor adoption, when they begin declining, although the difference with the earlier years is not statistically significant.[10] The estimated effect turns negative in the adoption year and remains so through the four post-adoption years in the sample, consistent with a gradual accumulation of cost savings as the debt stock turns over. Panel (b) decomposes the pooled estimate into country-specific post-adoption coefficients. Each individual Core country shows negative point estimates, illustrating the directional consistency of the results across all sovereigns.

We then conduct a series of tests to assess the robustness of the headline term-spread

[9] We construct a country-specific PSPP exposure as follows:

$$\text{PSPPIntensity}_{ct} = 100 \times \text{key}_c \times \frac{\text{CumPSPP}_t}{\text{GDP}_c^{2015}},$$

where key_c is each country's ECB capital-key share, CumPSPP_t is cumulative net monthly PSPP purchases in EUR billions from the ECB's official monthly breakdown series, and GDP_c^{2015} is 2015 nominal GDP in EUR billions. The variable is zero before March 2015 (programme start) and rises with actual net purchases thereafter. Greece is assigned a capital-key share of zero, reflecting its exclusion from PSPP eligibility throughout the programme.

[10] The decline the year before adoption could reflect anticipation by financial markets. In Internet Appendix Table IA.8, discussed ahead, we assess the robustness of the results to failures of the parallel-trend assumption using the approach of Rambachan and Roth (2023) and find the results to be robust.

result. In Internet Appendix Table IA.5 we use term premia as dependent variable. Term premia are estimated using the model by Adrian et al. (2013), which decomposes the term structure into a short-rate component and a term premium component. We refer to these term premia as ACM term premia. The results are consistent with the headline term-spread result, with negative and statistically precise coefficients across all four designs.

In Internet Appendix Table IA.6 we use the year-over-year change in the implicit interest rate paid by the government as dependent variable. The implicit interest rate is defined as annual general-government interest expenditure divided by the face value of debt outstanding at the end of the previous year. Because this rate is a slow-moving stock that averages legacy coupons, we estimate the model in first differences. The results are again consistent with the headline term-spread result, with negative and statistically precise coefficients across both the Core and full samples.

We also perform tests to evaluate whether our approach is econometrically robust. In Internet Appendix Table IA.7 we re-estimate the staggered design used in Table 9 columns (1)–(2), dropping one Core country at a time. The coefficient is stable across rows, indicating that no single Core country drives the result. In Internet Appendix Table IA.8 we follow Rambachan and Roth (2023) to quantify how large a post-adoption departure from parallel trends must be, relative to the largest departure visible before adoption, for the estimated effect to include zero.[11] The reported $\bar{M}$ is this ratio for the term spread, computed for the specification that includes the flight-to-safety-by-GFC control as in Table 9. A value of $\bar{M} = 1$ means the effect survives a post-adoption violation as large as the worst pre-adoption movement; larger values indicate greater robustness. We obtain a value of $\bar{M} = 2.09$. In Internet Appendix Table IA.9 we postpone the treatment timing of the early adopters and find that results are robust to alternative treatment dates and linear phase-in of the early adoption between 2010 and the mandatory adoption deadline in 2014.[12] Finally, in Internet Appendix Table IA.10 we address two potential confounds. The Greek-crisis flight to quality coincides with the early cohort's January 2010 treatment date, and Regulation 549/2013 (published May 2013) creates a sixteen-month statutory-notice window before the late cohort's September 2014 compliance date. Even after excluding these windows, results remain robust.

[11] Roth et al. (2023) provide an overview of the method and its use in applied work.

[12] Linear phase-in adoption is analogous to designs in which treatment intensity accumulates with time under the policy (Duflo, 2001) and to anticipation effects that build between announcement and implementation (Malani and Reif, 2015), and graded policy treatments of this kind have already been used in finance (Rice and Strahan, 2010; Favara and Imbs, 2015). It is also analogous to designs with gradually increasing treatment intensity (de Chaisemartin and D'Haultfœuille, 2018; Callaway et al., 2024).

6 Conclusions

We analyze the U.S. Treasury's approach to debt management as a policy choice and identify nominal-value accounting and passive duration management as costly frictions. The Treasury commits to a regular-and-predictable issuance framework that pre-announces fixed-rate auction sizes months in advance. Because the Treasury commits to its coupon issuance months in advance, it uses bills as residual "shock absorbers" rather than a duration-management tool. The Treasury issues nearly $20 trillion of fixed-rate notes and bonds carrying the risk of a $1.2 trillion loss for a 1% decline in interest rates, yet it does not adjust the maturity composition in response to market signals about the cost of duration risk at various maturities. During the 2024–2025 buyback operations, the Treasury selected bonds that were more discounted than comparable bonds; as a result, they lowered the nominal value of debt outstanding by $21 billion, with virtually no change in aggregate market value. The Treasury therefore manages the nominal stock of debt and the cash needed to service it, but does not manage the duration risk borne by taxpayers.

Investors who bear the Treasury's static duration supply demand a spread as compensation, and the Treasury passes these spread back to taxpayers through elevated borrowing costs. We quantify this cost by exploiting the staggered adoption of the European System of Accounts (ESA 2010) across ten European countries. ESA 2010 required sovereigns to report the market value of their debt and of their derivative positions in the national accounts, making duration risk visible to parliaments, audit offices, and financial markets, and removed swap settlements from the accrual measure of interest expense used for fiscal surveillance, so that debt management is evaluated at market value rather than through the accrual accounting of current interest. In a staggered difference-in-differences design with country and time fixed effects, Core European sovereigns that adopted ESA 2010 enjoyed a drop of 41 basis points in their term spreads.

Our work points to three concrete and implementable reforms. First, the Treasury can expand its floating-rate note program, which currently represents only 3% of outstanding debt, eliminating duration exposure on new issuance without increasing rollover risk. Second, the Treasury can lift its self-imposed prohibition on interest rate swaps, allowing it to convert existing fixed-rate obligations into floating obligations to manage duration risk. Third, the Treasury can shorten the maturity of its new issuance, thus reducing the duration risk investors need to bear. Together, these three reforms would directly advance Secretary Bessent's stated objective of financing the government at the least cost over time (Bessent, 2025), while preserving the regular-and-predictable auction cadence that supports market liquidity.

REFERENCES

Adrian, T., Crump, R. K., and Moench, E. (2013). Pricing the term structure with linear regressions. *Journal of Financial Economics*, 110(1):110–138.

Albuquerque, R., Cardoso-Costa, J. M., and Faias, J. A. (2024). Price elasticity of demand and risk-bearing capacity in sovereign bond auctions. *Review of Financial Studies*, 37(10):3149–3187.

Allen, J., Kastl, J., and Wittwer, M. (2022). Maturity composition and the demand for government debt. Working paper.

Alti, A. (2006). How persistent is the impact of market timing on capital structure? *Journal of Finance*, 61(4):1681–1710.

Andrade, S. C. and Da Rocha, F. M. (2026). On the intermediation cost of public debt. Miami Herbert Business School working paper, University of Miami. First version February 2024.

Angeletos, G.-M. (2002). Fiscal policy with noncontingent debt and the optimal maturity structure. *Quarterly Journal of Economics*, 117(3):1105–1131.

Back, K. and Zender, J. F. (1993). Auctions of divisible goods: On the rationale for the Treasury experiment. *Review of Financial Studies*, 6(4):733–764.

Baker, M., Greenwood, R., and Wurgler, J. (2003). The maturity of debt issues and predictable variation in bond returns. *Journal of Financial Economics*, 70(2):261–291.

Baker, M. and Wurgler, J. (2000). The equity share in new issues and aggregate stock returns. *Journal of Finance*, 55(5):2219–2258.

Baker, M. and Wurgler, J. (2002). Market timing and capital structure. *Journal of Finance*, 57(1):1–32.

Barro, R. J. (1979). On the determination of the public debt. *Journal of Political Economy*, 87(5):940–971.

Becker, B. and Ivashina, V. (2014). Cyclicality of credit supply: Firm level evidence. *Journal of Monetary Economics*, 62(1):76–93.

Bessent, S. (2025). Parallel prosperity: Strengthening the Treasury market to build America's golden age. Remarks before the Treasury Market Conference. Available at https://home.treasury.gov/news/press-releases/sb0314.

Beveridge, S. and Nelson, C. R. (1981). A new approach to decomposition of economic time series into permanent and transitory components with particular attention to measurement of the "business cycle". *Journal of Monetary Economics*, 7(2):151–174.

Bi, H., Phillot, M., and Zubairy, S. (2026). Treasury supply shocks: Propagation through debt expansion and maturity adjustment. NBER Working Paper 35098, National Bureau of Economic Research.

Blanchard, O. and Perotti, R. (2002). An empirical characterization of the dynamic effects of changes in government spending and taxes on output. *Quarterly Journal of Economics*, 117(4):1329–1368.

Blommestein, H. J., Elmadag, M. E., and Ejsing, J. W. (2012). Buyback and exchange operations: Policies, procedures and practices among OECD public debt managers. OECD Working Papers on Sovereign Borrowing and Public Debt Management 5, OECD.

Bohn, H. (1992). Budget deficits and government accounting. *Carnegie-Rochester Conference Series on Public Policy*, 37:1–84.

Boskin, M. J. (1982). Federal government deficits: Some myths and realities. *American Economic Review*, 72(2):296–303. Papers and Proceedings.

Boyarchenko, N., Lucca, D. O., and Veldkamp, L. (2021). Taking orders and taking notes: Dealer information sharing in Treasury auctions. *Journal of Political Economy*, 129(2):607–645.

Bulow, J. and Rogoff, K. (1988). The buyback boondoggle. *Brookings Papers on Economic Activity*, 1988(2):675–704.

Bundesministerium der Finanzen (2011). Bericht über die kreditaufnahme des bundes im jahr 2010. Technical report, Bundesrepublik Deutschland Finanzagentur.

Bundesministerium der Finanzen (2016). Bericht über die kreditaufnahme des bundes im jahr 2015. Technical report, Bundesrepublik Deutschland Finanzagentur.

Butler, A. W., Grullon, G., and Weston, J. P. (2006). Can managers successfully time the maturity structure of their debt issues? *Journal of Finance*, 61(4):1731–1758.

Callaway, B., Goodman-Bacon, A., and Sant'Anna, P. H. C. (2024). Difference-in-differences with a continuous treatment. Working Paper 32117, National Bureau of Economic Research.

Cammack, E. B. (1991). Evidence on bidding strategies and the information in Treasury bill auctions. *Journal of Political Economy*, 99(1):100–130.

Cassidy, W. and Mirani, S. (2025). The debt ceiling's disruptive impact: Evidence from many markets. Olin School of Business, Washington University in St. Louis. SSRN 5360405.

Chaudhary, M., Fu, J. Z., and Zhou, H. (2025). Anatomy of the Treasury market: Who moves yields? Working paper, London School of Economics, Washington University in St. Louis, and University of Hong Kong.

Cole, H., Neuhann, D., and Ordóñez, G. (2022). Asymmetric information and sovereign debt: Theory meets Mexican data. *Journal of Political Economy*, 130(8).

Connolly, M. F. and Struby, E. (2024). Treasury buybacks, the Federal Reserve's portfolio, and changes in local supply. *Journal of Banking and Finance*, 168:107286.

Darmouni, O. and Siani, K. Y. (2021). Crowding out bank loans: Liquidity-driven bond issuance. Working paper, Columbia University.

d'Avernas, A. and Vandeweyer, Q. (2024). Treasury bill shortages and the pricing of short-term assets. *Journal of Finance*, 79(6):4083–4141.

de Chaisemartin, C. and D'Haultfœuille, X. (2018). Fuzzy differences-in-differences. *Review of Economic Studies*, 85(2):999–1028.

De Santis, R. A. and Zaghini, A. (2021). Unconventional monetary policy and corporate bond issuance. *European Economic Review*, 135:103727.

Dong, M., Hirshleifer, D., and Teoh, S. H. (2012). Overvalued equity and financing decisions. *Review of Financial Studies*, 25(12):3645–3683.

Driscoll, J. C. and Kraay, A. C. (1998). Consistent covariance matrix estimation with spatially dependent panel data. *Review of Economics and Statistics*, 80(4):549–560.

Du, W., Hébert, B., and Li, W. (2023). Intermediary balance sheets and the treasury yield curve. *Journal of Financial Economics*, 150(3):103722.

Duffie, D. (2023). Resilience redux in the US Treasury market. In *Jackson Hole Symposium*. Federal Reserve Bank of Kansas City; SSRN Working Paper 4552735.

Duffie, D. (2025). Hearing on U.S. Treasury debt in the monetary system. Congressional hearing testimony. May 2025.

Duffie, D. and Keane, F. (2023). Market-function asset purchases. Staff Report 1054, Federal Reserve Bank of New York.

Duflo, E. (2001). Schooling and labor market consequences of school construction in Indonesia: Evidence from an unusual policy experiment. *American Economic Review*, 91(4):795–813.

Durbin, J. and Koopman, S. J. (2012). *Time Series Analysis by State Space Methods*. Oxford University Press, Oxford, 2nd edition.

Dutch State Treasury Agency (2015). Risk management of the national debt: Policy review 2012–2015. Technical report, Ministry of Finance, the Netherlands.

Eisner, R. and Pieper, P. J. (1984). A new view of the federal debt and budget deficits. *American Economic Review*, 74(1):11–29.

Elsinger, H., Schmidt-Dengler, P., and Zulehner, C. (2019). Competition in Treasury auctions. *American Economic Journal: Microeconomics*, 11(1):157–184.

European Commission (2010a). Proposal for a regulation of the european parliament and of the council on the european system of national and regional accounts in the european union, com(2010) 774 final, 2010/0374 (cod).

European Commission (2010b). Report on greek government deficit and debt statistics. Technical report, European Commission, COM(2010) 1 final, Brussels.

European Commission, IMF, OECD, UN and World Bank (2009). *System of National Accounts 2008*. United Nations, New York.

European Parliament and Council (2001). Regulation (ec) no 2558/2001 amending council regulation (ec) no 2223/96 as regards the reclassification of settlements under swaps arrangements and under forward rate agreements. Official Journal of the European Communities, L 344.

European Union (2013). Regulation (EU) No 549/2013 of the European Parliament and of the Council of 21 May 2013 on the European system of national and regional accounts in the European Union. EU Regulation L 174/1, Official Journal of the European Union.

Faulkender, M. (2005). Hedging or market timing? Selecting the interest rate exposure of corporate debt. *Journal of Finance*, 60(2):931–962.

Favara, G. and Imbs, J. (2015). Credit supply and the price of housing. *American Economic Review*, 105(3):958–992.

Fleming, M. J., Nguyen, G., and Rosenberg, J. V. (2024). How do treasury dealers manage their positions? *Journal of Financial Economics*, 158(3):103885.

Frost, J. (2024). Remarks by Assistant Secretary for Financial Markets Joshua Frost on principles of U.S. debt management policy. Speech at the Money Marketeers of New York University. Available at https://home.treasury.gov/news/press-releases/jy2460.

Gao, P. and Lou, D. (2012). Cross-market timing in security issuance. Working paper.

Garbade, K. D. (2007). The emergence of "regular and predictable" as a treasury debt management strategy. *Federal Reserve Bank of New York Economic Policy Review*, 13(1):53–71.

Garbade, K. D. and Rutherford, M. (2007). Buybacks in Treasury cash and debt management. Staff Report 304, Federal Reserve Bank of New York.

Georgievska, L. and Saunders, A. (2025). The "Hairy premium": Incomplete markets and frictions. Working Paper, BI Norwegian Business School and NYU Stern School of Business.

Glasserman, P., Sirohi, A., and Zhang, A. (2017). The effect of 'regular and predictable" issuance on Treasury bill financing. *Federal Reserve Bank of New York Economic Policy Review*, pages 43–56.

Greenwood, R., Hanson, S. G., and Stein, J. C. (2010). A gap-filling theory of corporate debt maturity choice. *Journal of Finance*, 65(3):993–1028.

Greenwood, R., Hanson, S. G., and Stein, J. C. (2015). A comparative-advantage approach to government debt maturity. *Journal of Finance*, 70(4):1683–1722.

Greenwood, R. and Vayanos, D. (2010). Price pressure in the government bond market. *American Economic Review: Papers and Proceedings*, 100(2):585–590.

Greenwood, R. and Vayanos, D. (2014). Bond supply and excess bond returns. *Review of Financial Studies*, 27(3):663–713.

Grosse-Rueschkamp, B., Steffen, S., and Streitz, D. (2019). A capital structure channel of monetary policy. *Journal of Financial Economics*, 133(2):357–378.

Hall, G. J. and Sargent, T. J. (2011). Interest rate risk and other determinants of post-WWII US government debt/GDP dynamics. *American Economic Journal: Macroeconomics*, 3(3):192–214.

Hamao, Y. and Jegadeesh, N. (1998). An analysis of bidding in the Japanese government bond auctions. *Journal of Finance*, 53(2):755–772.

Han, B., Longstaff, F. A., and Merrill, C. (2007). The U.S. Treasury buyback auctions: The cost of retiring illiquid bonds. *Journal of Finance*, 62(6):2673–2693.

Hanson, S. G., Malkhozov, A., and Venter, G. (2024). Demand-and-supply imbalance risk and long-term swap spreads. *Journal of Financial Economics*, 154:103814.

Hartley, J. S. and Rigon, L. (2026). Does government debt management matter? High-frequency identification from U.S. Treasury quarterly refunding announcements. Stanford University working paper. SSRN 4772653.

Harvey, A. C. (1989). *Forecasting, Structural Time Series Models and the Kalman Filter*. Cambridge University Press, Cambridge.

He, Z., Nagel, S., and Song, Z. (2022). Treasury inconvenience yields during the COVID-19 crisis. *Journal of Financial Economics*, 143(1):57–79.

Hortaçsu, A. and Kastl, J. (2012). Valuing dealers' informational advantage: A study of Canadian Treasury auctions. *Econometrica*, 80(6):2511–2542.

Hortaçsu, A., Kastl, J., and Zhang, A. (2018). Bid shading and bidder surplus in the US Treasury auction system. *American Economic Review*, 108(1):147–169.

Hortaçsu, A. and McAdams, D. (2010). Mechanism choice and strategic bidding in divisible good auctions: An empirical analysis of the Turkish Treasury auction market. *Journal of Political Economy*, 118(5):833–865.

Hubert de Fraisse, A. (2024). Crowding out long-term corporate investment: The role of long-term government debt supply. HEC Paris job market paper. SSRN 4064763.

Jermann, U. J. (2020). Negative swap spreads and limited arbitrage. *Review of Financial Studies*, 33(1):212–238.

Jordà, Ò. (2005). Estimation and inference of impulse responses by local projections. *American Economic Review*, 95(1):161–182.

Joyce, M. and Lengyel, A. (2024). The yield curve impact of government debt issuance surprises and the implications for QT. Staff Working Paper 1097, Bank of England.

Kashyap, A. K., Stein, J. C., Wallen, J. L., and Younger, J. (2025). Treasury market dysfunction and the role of the central bank. *Brookings Papers on Economic Activity*, Spring:221–265.

Keloharju, M., Nyborg, K. G., and Rydqvist, K. (2005). Strategic behavior and underpricing in uniform price auctions: Evidence from Finnish Treasury auctions. *Journal of Finance*, 60(4):1865–1902.

Klingler, S. and Sundaresan, S. (2019). An explanation of negative swap spreads: Demand for duration from underfunded pension plans. *Journal of Finance*, 74(2):675–710.

Klingler, S. and Sundaresan, S. (2023). Diminishing treasury convenience premiums: Effects of dealers' excess demand and balance sheet constraints. *Journal of Monetary Economics*, 135:55–69.

Krishnamurthy, A. and Vissing-Jorgensen, A. (2012). The aggregate demand for treasury debt. *Journal of Political Economy*, 120(2):233–267.

Lou, D., Yan, H., and Zhang, J. (2013). Anticipated and repeated shocks in liquid markets. *Review of Financial Studies*, 26(8):1890–1912.

Loughran, T. and Ritter, J. R. (1995). The new issues puzzle. *Journal of Finance*, 50(1):23–51.

Ma, Y. (2019). Nonfinancial firms as cross-market arbitrageurs. *Journal of Finance*, 74(6):3041–3087.

Malani, A. and Reif, J. (2015). Interpreting pre-trends as anticipation: Impact on estimated treatment effects from tort reform. *Journal of Public Economics*, 124:1–17.

Mustafi, U. P. (2026). Deconstructing debt supply shocks using Treasury auction announcements. Frankfurt School of Finance & Management working paper. First version January 2024.

Newey, W. K. and West, K. D. (1987). A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica*, 55(3):703–708.

Nyborg, K. G., Rydqvist, K., and Sundaresan, S. M. (2002). Bidder behavior in multiunit auctions: Evidence from Swedish Treasury auctions. *Journal of Political Economy*, 110(2):394–424.

Pegoraro, S. and Montagna, M. (2025). Demand-driven bond financing in the Euro Area. *Journal of Financial and Quantitative Analysis*, 60(6):2847–2878.

Penner, R. G. (1982). How much is owed by the federal government? *Carnegie-Rochester Conference Series on Public Policy*, 16:233–256.

Phillot, M. (2025). US Treasury auctions: A high-frequency identification of supply shocks. *American Economic Journal: Macroeconomics*, 17(1):245–273.

Piga, G. (2001). *Derivatives and Public Debt Management*. International Securities Market Association, Zurich.

Rambachan, A. and Roth, J. (2023). A more credible approach to parallel trends. *Review of Economic Studies*, 90(5):2555–2591.

Rice, T. and Strahan, P. E. (2010). Does credit competition affect small-firm finance? *Journal of Finance*, 65(3):861–889.

Roth, J., Sant'Anna, P. H. C., Bilinski, A., and Poe, J. (2023). What's trending in difference-in-differences? a synthesis of the recent econometrics literature. *Journal of Econometrics*, 235(2):2218–2244.

Schwert, G. W. (1989). Tests for unit roots: A monte carlo investigation. *Journal of Business & Economic Statistics*, 7(2):147–159.

Simon, D. P. (1994). Markups, quantity risk, and bidding strategies at Treasury coupon auctions. *Journal of Financial Economics*, 35(1):41–62.

Somogyi, F., Wallen, J., and Xu, L. (2025). What treasury auctions reveal about investor demand. Working paper, Harvard Business School.

Spiess, D. K. and Affleck-Graves, J. (1995). Underperformance in long-run stock returns following seasoned equity offerings. *Journal of Financial Economics*, 38(3):243–267.

Stein, J. C. and Wallen, J. (2025). The imperfect intermediation of money-like assets. *Journal of Finance*, 80(6):3185–3217.

Stock, J. H. and Watson, M. W. (2018). Identification and estimation of dynamic causal effects in macroeconomics using external instruments. *The Economic Journal*, 128(610):917–948.

Todorov, K. (2020). Quantify the quantitative easing: Impact on bonds and corporate debt issuance. *Journal of Financial Economics*, 135(2):340–358.

Treasury Borrowing Advisory Committee (2015). The meaning and implications of "regular and predictable" (R&P) as a tenet of debt management. TBAC Charge, presented at the August 2015 Quarterly Refunding. Available starting on page 51 at https://home.treasury.gov/system/files/276/August2015TreasuryPresentationToTBAC.pdf.

Tuckman, B. and Serrat, A. (2022). *Fixed Income Securities: Tools for Today's Markets*. John Wiley & Sons, Hoboken, NJ, 4th edition.

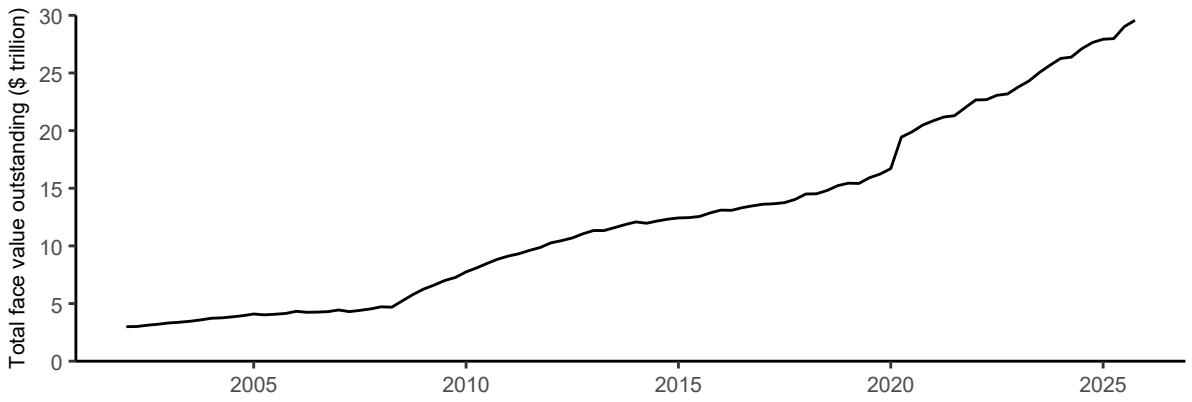
Umlauf, S. R. (1993). An empirical study of the Mexican Treasury bill auction. *Journal of Financial Economics*, 33(3):313–340.

Vayanos, D. and Vila, J.-L. (2021). A preferred-habitat model of the term structure of interest rates. *Econometrica*, 89(1):77–112.

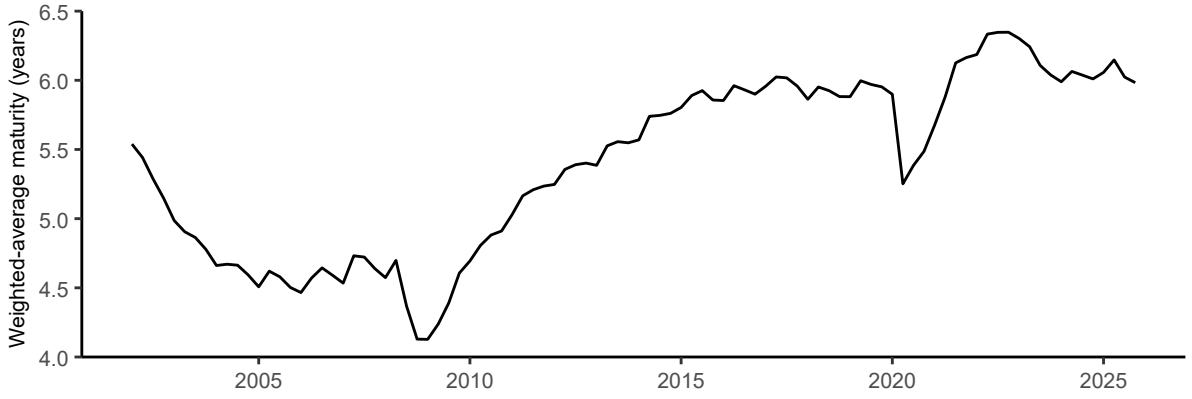
Wang, C. and Zhao, K. (2025). Pre-refunding announcement gains in U.S. Treasurys. Working paper, University of Notre Dame and Office of Financial Research. SSRN 4764295.

Watson, M. W. (1986). Univariate detrending methods with stochastic trends. *Journal of Monetary Economics*, 18(1):49–75.

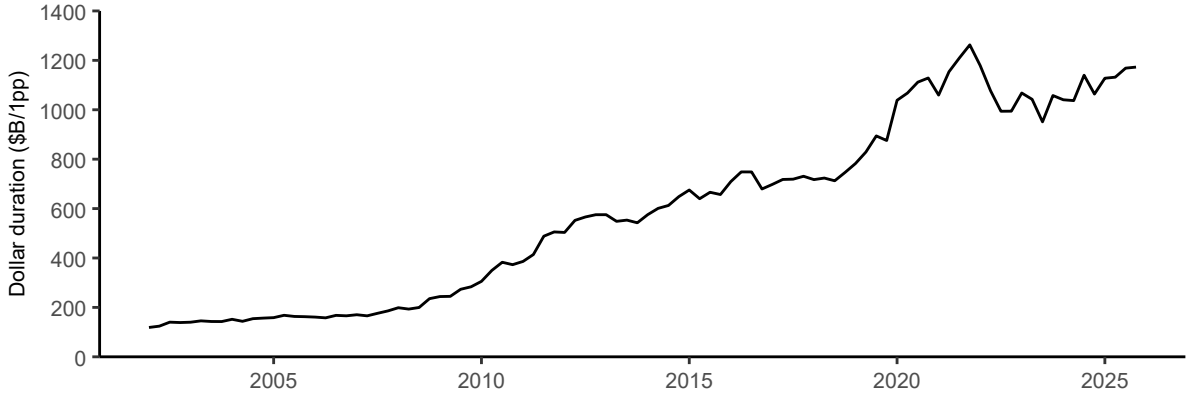
Zhou, J. (2025). Testing the liquidity support effects of the U.S. Treasury buyback program. IMF Working Paper WP/25/88, International Monetary Fund.



(a) Total face value outstanding

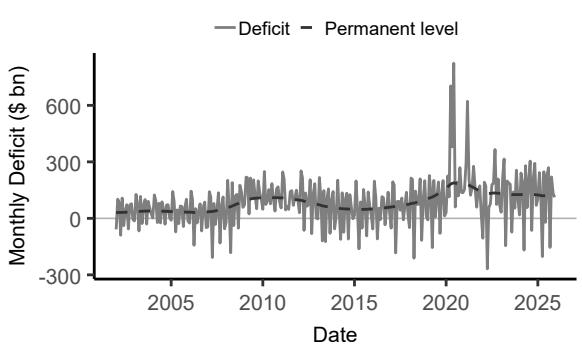


(b) Weighted-average maturity

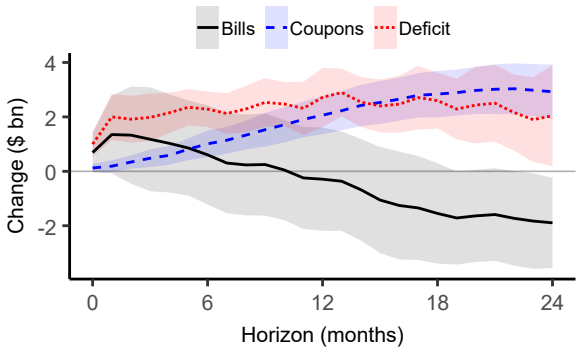


(c) Dollar duration

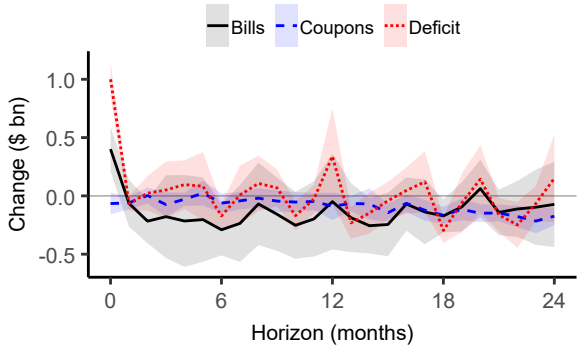
Figure 1: U.S. Treasury Supply Measures, 2002Q1–2025Q4. All series are constructed from the CRSP Treasury daily file. For each quarter we take the last trading-day snapshot of every outstanding Treasury security (bills, notes, bonds, TIPS, and FRNs). Panel 1(a) shows the sum of face values across all outstanding securities ($ trillions). Panel 1(b) shows the face-value-weighted average of the remaining time to maturity in years. Panel 1(c) shows the dollar duration of the total debt stock, defined as $\mathrm{DD}_t = \sum_i MV_{i,t} \times D^{\mathrm{mod}}_{i,t}/100$, where $MV_{i,t} = FV_{i,t} \times P_{i,t}/100$ is market value and $D^{\mathrm{mod}}_{i,t} = D^{\mathrm{Mac}}_{i,t}/(1 + y_{i,t}/2)$ is modified duration; this quantity measures the change in the market value of total debt (in $ billions) for a one-percentage-point increase in interest rates. Macaulay duration is taken from CRSP (`TDDURATN`, reported in days and converted to years).



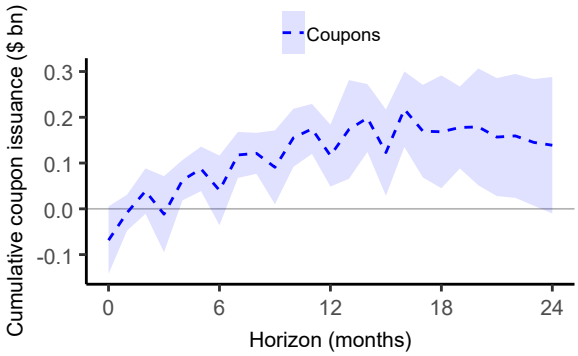
(a) Deficit decomposition



(b) Response to permanent shock

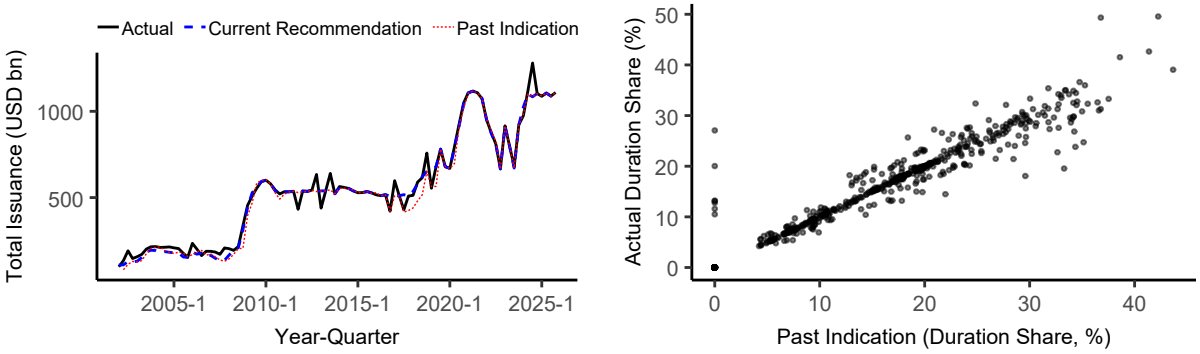


(c) Response to transitory shock



(d) Coupon response to bill issuance

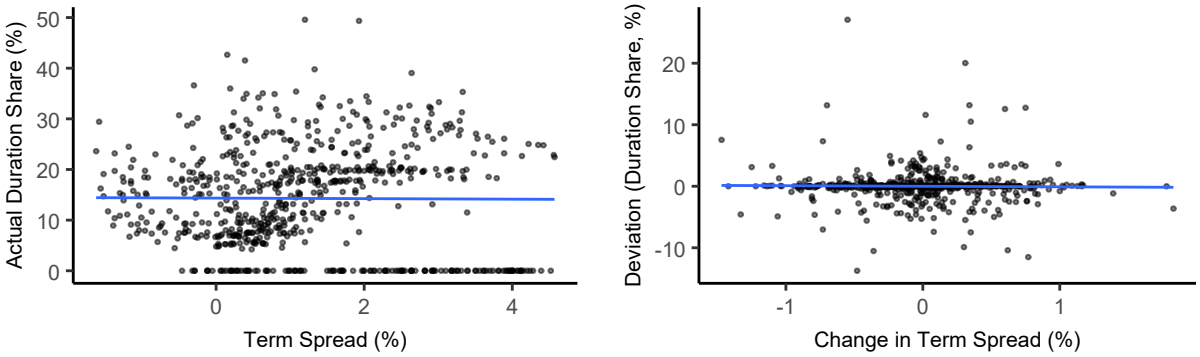
Figure 2: UC Decomposition and Local Projection Impulse Responses. Panel 2(a) plots the GNP-deflated federal deficit (solid gray) against the estimated permanent level τ_t (dashed black) from the local-level unobserved components model. Panels 2(b) and 2(c) display local projection impulse response functions tracing cumulative net issuance of bills (solid black) and coupons (dashed blue) following a permanent shock η_t and a transitory shock ε_t, respectively; responses are normalized so that a one-unit shock corresponds to GNP-deflated $1 billion initial impact on the deficit. Panel 2(d) traces the cumulative response of coupon net issuance to a GNP-deflated $1 billion increase in current bill net issuance. All specifications use monthly data (January 2002–December 2025) with within-quarter month-position fixed effects. Shaded areas represent 95% confidence intervals constructed using Newey and West (1987) standard errors with $L = 15$ lags.



(a) Total marketable issuance over time

(b) Actual vs. indicated duration supply share

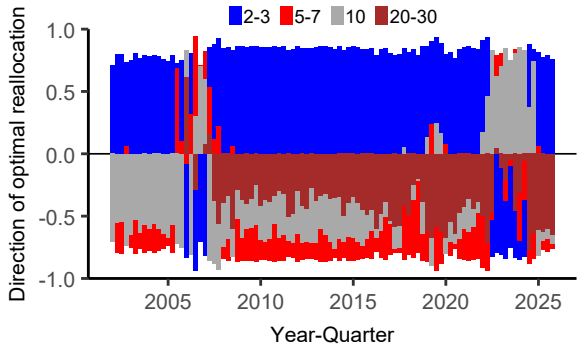
Figure 3: Regular and Predictable Fixed-Rate Issuance. Panel 3(a) plots total marketable fixed-rate issuance over time (USD billions), comparing actual issuance (solid) against the TBAC recommendation for each quarter (dashed). Panel 3(b) plots the actual duration supply share against the prior quarter's TBAC indication for each maturity-quarter observation; the dashed line is the 45-degree line representing perfect adherence. The sample includes all fixed-rate non-bill Treasury securities from 2002Q1 through 2025Q4.



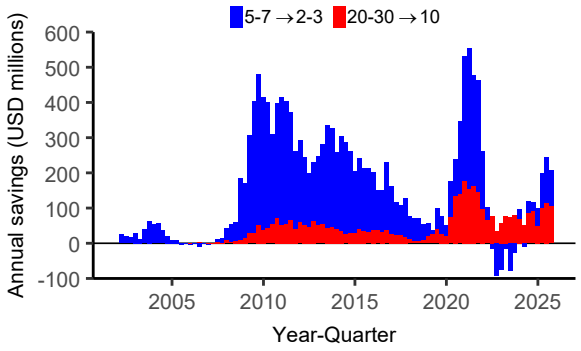
(a) Actual Duration Supply vs Term Spread

(b) Deviation of Actual from Indicated Duration Supply vs Change in Term Spread

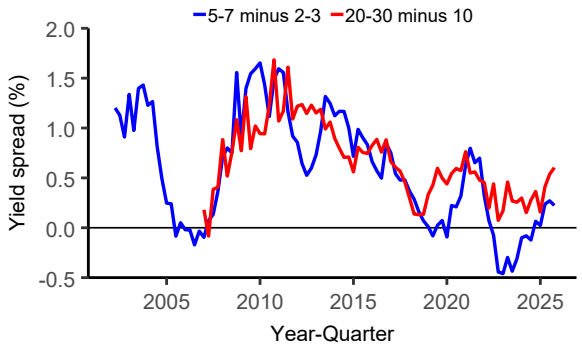
Figure 4: Duration Supply and Term Spreads. Panel 4(a) plots the actual share of duration supply at each maturity against the term spread at that maturity. Panel 4(b) plots the deviation of actual duration supply at each maturity from the prior quarter's TBAC indication against the change in the term spread at that maturity over the previous quarter. Each point represents a maturity-quarter observation. The sample includes all fixed-rate Treasury notes and bonds from 2002Q1 through 2025Q4.



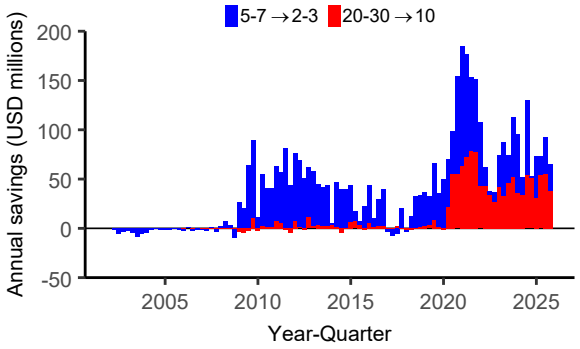
(a) Direction of optimal reallocation



(b) Total savings from a 10% reallocation

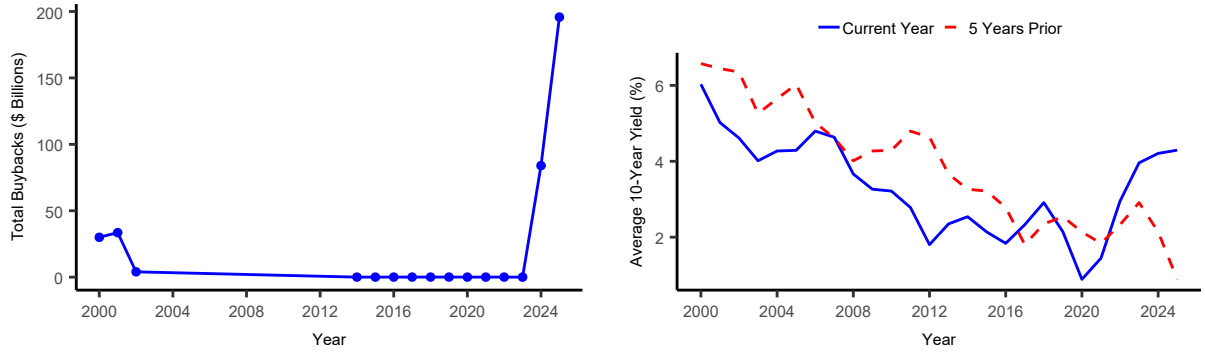


(c) Yield spreads across paired maturity buckets



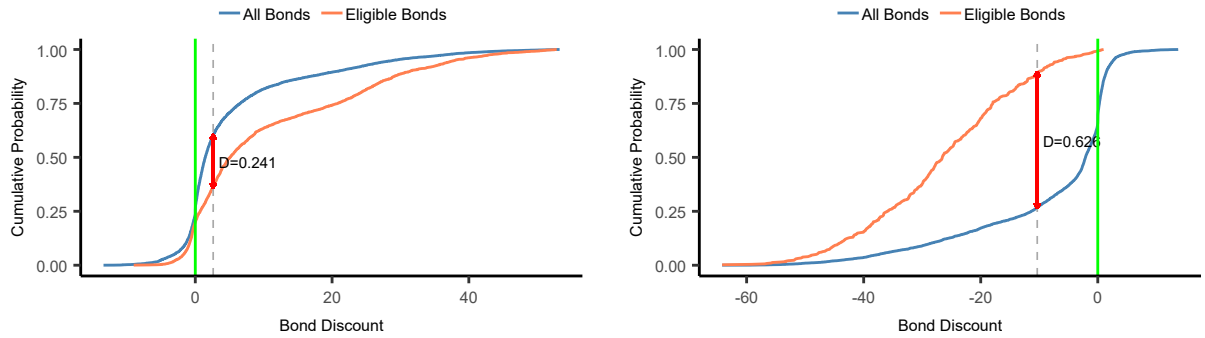
(d) Inframarginal savings from a 10% reallocation

Figure 5: Cost Savings from Reallocating Issuance Across Maturities. Both panels use quarter-by-maturity elasticities constructed from auction-level demand estimates by Somogyi et al. (2025). Elasticities are winsorized at the 1st and 99th percentiles, converted into local derivatives of yields with respect to quantities, and aggregated by quarter and maturity bucket (2–3, 5–7, 10, and 20–30 years) using median slopes and yields with offered amounts summed within each bucket. Panel 5(a) shows the directions along which issuance costs can be minimized. These quantities are obtained by computing the optimal reallocation of issuance subject to a zero-net-issuance constraint and by normalizing the vector of optimal reallocations to have unit Euclidean norm. Panel 5(b) reports the annual cost savings (in USD millions) from reallocating, for each quarter, 10% of issuance from the 5–7 year bucket to the 2–3 year bucket and from the 20–30 year bucket to the 10 year bucket. Panel 5(c) reports yield spreads for the two pairs of maturity groups (5–7 years minus 2–3 years and 20–30 years minus 10 years). Panel 5(d) reports the annual cost savings (in USD millions) on the inframarginal units that are not shifted but whose yield changes by reallocating, for each quarter, 10% of issuance from the 5–7 year bucket to the 2–3 year bucket and from the 20–30 year bucket to the 10 year bucket. The sample spans 2002Q1–2025Q4.



(a) Total Buybacks **(b)** 10-Year Treasury Yields

Figure 6: Treasury Buyback Operations and 10-Year Yields. Panel 6(a) shows annual total buyback operations measured by par amount accepted (in billions of dollars). Panel 6(b) shows the annual average 10-year Treasury yield (solid blue line) alongside the 10-year yield from five years prior (dashed red line).



(a) 2024-2025 Period **(b)** 2000-2002 Period

Figure 7: Cumulative Distribution Functions: Bond Discount Comparison. The figure compares the empirical cumulative distribution functions (CDFs) of bond discounts between all Treasury bonds and those eligible for buyback operations. Bond discount is defined as $100 - \text{Price}$, where price is the average monthly market price. The green vertical line marks par (discount = 0). The dashed vertical line indicates the location of maximum difference between distributions, with the red arrow showing the Kolmogorov-Smirnov statistic (maximum vertical distance between CDFs). Panel 7(a) shows the 2024–2025 buyback period; Panel 7(b) shows the 2000–2002 buyback period. The cumulative distribution functions compare bond discount distributions between all bonds and eligible bonds for two buyback periods. For 2024-2025, the maximum difference occurs at a discount of 2.62 (KS statistic D = 0.2410, $p < 0.0000$), where 36.1% of eligible bonds trade at or below this discount level compared to only 60.2% of all bonds, a difference of 24.1 percentage points. This indicates eligible bonds have discounts at least 2.62 points larger than typical bonds with significantly higher probability. For 2000-2002, the maximum difference occurs at a discount of -10.34 (KS statistic D = 0.6260, $p < 0.0000$), where 89.3% of eligible bonds trade at or below this level compared to 26.7% of all bonds, a difference of 62.6 percentage points.

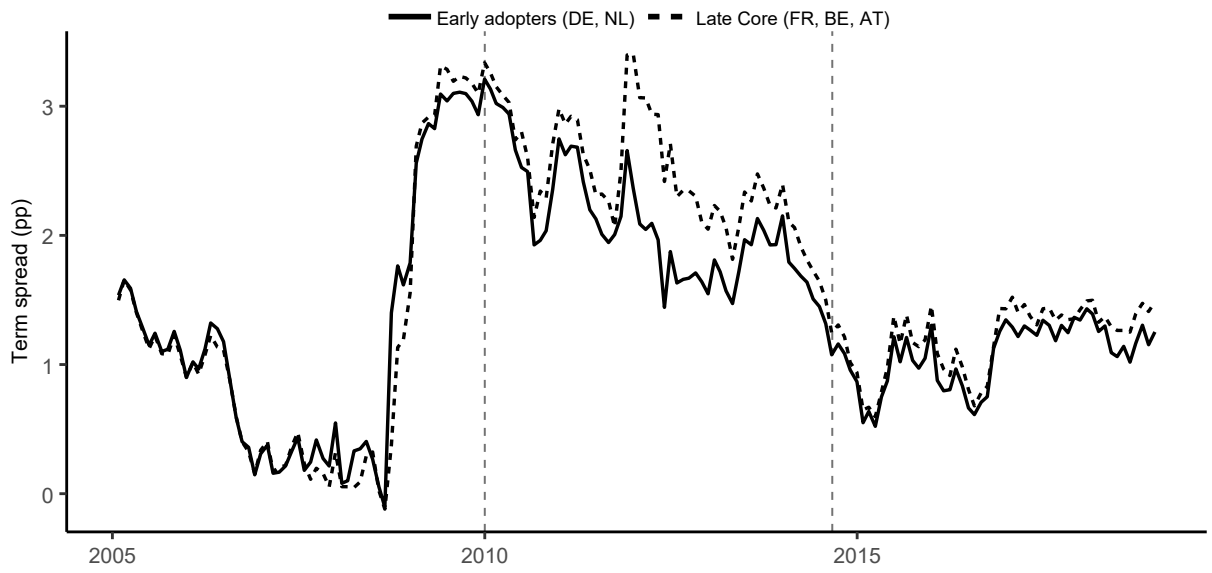
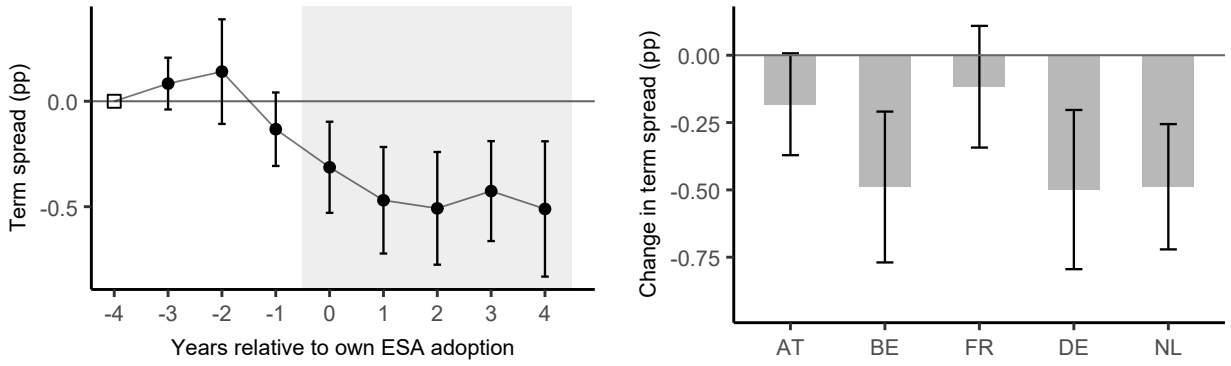


Figure 8: Term spread of Core European countries. The figure plots monthly means of the 10-year minus 3-month sovereign term spread in percentage points from 2005 to 2018 for the two early ESA 2010 adopters (Germany and the Netherlands, solid line) and the three late-adopting Core sovereigns (France, Belgium, and Austria, dashed line). The first vertical line marks early adoption (January 2010) and the second marks mandatory compliance (September 2014).



(a) Dynamic event-study coefficients

(b) Country-specific post-adoption coefficients

Figure 9: Dynamic and cross-country evidence on ESA 2010 and term spreads. Panel (a) reports dynamic event-study estimates from the Core sample, based on $y_{ct} = \sum_{k \neq -4} \beta_k \mathbf{1}\{\text{evt}_{ct} = k\} + \Gamma' X_{ct} + \alpha_c + \delta_t + \varepsilon_{ct}$, where y_{ct} is the 10-year minus 3-month term spread, evt_{ct} is years relative to each country's own ESA adoption (binned to $[-4, 4]$), and $k = -4$ is the omitted reference year. Points plot $\hat{\beta}_k$, whiskers are 95% confidence intervals, the open square at $k = -4$ marks the normalized coefficient of zero, and the shaded region denotes post-adoption years. Panel (b) reports country-specific post-adoption effects from the Core staggered specification $y_{ct} = \sum_{j \in \mathcal{C}} \theta_j \left(\mathbf{1}\{c = j\} \times \text{Post}_{ct}\right) + \Gamma' X_{ct} + \alpha_c + \delta_t + \varepsilon_{ct}$ with $\mathcal{C} = \{\text{Austria (AT), Belgium (BE), France (FR), Germany (DE), Netherlands (NL)}\}$. Bars plot $\hat{\theta}_j$ and whiskers are 95% confidence intervals. In both panels, controls are PSPP intensity, debt-to-GDP, the deficit-to-GDP, and the three-month rate, with country and year-month fixed effects; inference uses Driscoll and Kraay (1998) standard errors with monthly lag selection $L = \lfloor 12 \cdot (T/100)^{1/4} \rfloor$, where T is the number of months (Schwert, 1989).

Table 1: Summary statistics: quarterly panel of issuance and yield data at the security level. The sample is restricted to quarters in which fixed-coupon securities have both non-missing actual issuance and a TBAC indication, and includes fixed-coupon observations only. The upper panel covers issuance variables and the lower panel covers market condition variables. *Duration supply share, actual* is each maturity bucket's share of total duration (DV01) supply from fixed-coupon securities in that quarter (%). *Duration supply share, TBAC indication* is the corresponding share from the TBAC indication published at the start of the quarter (%). Δ *Duration supply share, actual* and Δ *Duration supply share, indication* are quarter-over-quarter changes in those shares (percentage points). *Deviation from prior indication* is the difference between realized actual share and the indication published one quarter earlier (percentage points). *Term spread* is the constant-maturity Treasury yield at each maturity minus the three-month Treasury yield (%). *Swap spread* is the Treasury constant-maturity yield minus the interest rate swap rate at the same maturity (%). *Swap rate* is the combined LIBOR/SOFR fixed-for-floating swap rate at the corresponding maturity (%). Δ variables are quarter-over-quarter changes (percentage points).

	Mean	SD	p25	p50	p75	N
Duration supply share, actual (%)	14.286	10.160	6.716	15.258	20.468	672
Duration supply share, TBAC indication (%)	14.286	10.306	6.657	15.090	20.550	672
Δ Duration supply share, actual (pp)	0.000	3.836	-0.613	0.000	0.398	672
Δ Duration supply share, indication (pp)	0.000	3.182	-0.310	0.000	0.235	665
Deviation from prior indication (pp)	0.000	2.597	-0.222	0.000	0.180	665
Term spread (%)	1.191	1.343	0.260	0.980	2.070	672
Swap spread (%)	-0.123	0.331	-0.358	-0.123	0.051	672
Swap rate (%)	2.994	1.490	1.779	2.936	4.133	672
Δ Term spread (pp)	-0.019	0.466	-0.300	-0.020	0.230	672
Δ Swap spread (pp)	0.011	0.105	-0.050	0.002	0.052	672
Δ Swap rate (pp)	-0.013	0.515	-0.310	0.027	0.314	672

Table 2: Summary statistics: quarterly panel of financing need and issuance surprises. The sample covers 2002Q1–2025Q4. *Total surprise* is the difference between the Actual and the one-quarter-ahead Forecast. *Planning surprise* is the difference between the Estimate (announced at the start of the quarter) and the Forecast. *Execution surprise* is the difference between the Actual and the Estimate. Borrowing surprises are constructed from Treasury Refunding Announcement data; coupon issuance surprises from TRA recommendations and realized auction results; bill issuance surprises are derived residually using the net-borrowing identity. All variables are in billions of dollars.

	Mean	SD	p25	p50	p75	N
Total borrowing surprise ($ bn)	27.305	342.603	-51.000	-2.000	74.500	95
Total coupon issuance surprise ($ bn)	20.319	42.927	0.001	4.001	30.001	95
Total bill issuance surprise ($ bn)	6.986	337.874	-77.997	-19.033	65.499	95
Planning borrowing surprise ($ bn)	49.274	358.479	-39.500	-1.000	60.000	95
Planning coupon issuance surprise ($ bn)	12.042	32.782	-1.000	0.000	8.000	95
Planning bill issuance surprise ($ bn)	37.232	352.903	-49.500	-4.000	57.000	95
Execution borrowing surprise ($ bn)	-21.968	124.483	-18.500	0.000	16.500	95
Execution coupon issuance surprise ($ bn)	8.277	39.847	0.001	0.002	21.420	95
Execution bill issuance surprise ($ bn)	-30.246	130.734	-45.001	-11.913	22.499	95

Table 3: Summary statistics: monthly data for the UC deficit decomposition analysis. The sample covers January 2002 through December 2025. All nominal series are deflated by the lagged-quarter GNP implicit price deflator. Panel A reports summary statistics for the three monthly series used as inputs to the UC model and the local-projection regressions. *Federal deficit* is the monthly surplus or deficit from the Monthly Treasury Statement (MTS), expressed as a positive number when the government runs a deficit. *Net bill issuance* and *Net coupon issuance* are the month-over-month changes in the privately held outstanding amounts of bills and coupon securities, respectively, from the Monthly Statement of the Public Debt (MSPD). Panel B reports summary statistics for the two orthogonal structural shocks extracted by the local-level Kalman smoother. The *permanent shock* $\eta_t = \Delta\tau_t$ is the period-t innovation to the random-walk level of the deficit; the *transitory shock* $\varepsilon_t = D_t - \tau_t$ is the deviation of the realized deficit from its smoothed permanent level. Both shocks are in GNP-deflated billions of dollars.

Panel A: Monthly deficit and net issuance series

	Mean	SD	p25	p50	p75	N
Federal deficit ($ bn, 2012 prices)	85.019	128.820	12.255	86.649	152.773	288
Net bill issuance ($ bn, 2012 prices)	18.435	127.637	-45.918	4.945	57.335	288
Net coupon issuance ($ bn, 2012 prices)	75.006	70.991	27.185	55.757	96.739	288

Panel B: Permanent and transitory deficit shocks

	Mean	SD	p25	p50	p75	N
Permanent deficit shock η_t ($ bn)	0.311	1.958	-0.789	0.100	1.135	287
Transitory deficit shock ε_t ($ bn)	0.310	116.570	-63.866	9.991	67.937	287

Table 4: Summary statistics: Treasury buyback sample. The sample consists of monthly bond-level observations constructed from CRSP daily transaction data. Panel A covers the 2024–2025 buyback period; Panel B covers the 2000–2002 buyback period. *Disc. Depth* is $\max(100 - \text{Price}, 0)$, the depth below par for bonds trading at a discount. *Prem. Height* is $\max(\text{Price} - 100, 0)$, the height above par for bonds trading at a premium. *Yield* is the annualized yield to maturity in percent. *Bid-Ask Spread* is the bid-ask spread relative to midpoint in basis points. *Log Outstanding* is the natural log of total face value outstanding (USD). *Age* is the number of years since issuance. *Remaining Maturity* is the number of years until maturity. *Coupon Rate* is the stated annual coupon rate in percent. $P(\text{eligible})$ equals 100 if the bond appeared on the Treasury's eligible list the following month, and zero otherwise. $P(\text{accepted})$ equals 100 if the bond was actually tendered and accepted in the following month's buyback operation, and zero otherwise. All price and yield variables are measured at month end.

Panel A: 2024–2025

	Mean	SD	p25	p50	p75	N
Disc. Depth (%)	5.866	9.781	0.000	1.464	6.555	8,934
Prem. Height (%)	0.460	1.334	0.000	0.000	0.000	8,934
Yield (%)	4.236	0.754	3.905	4.260	4.667	8,934
Bid-Ask Spread (bps)	3.818	2.982	1.703	3.175	5.004	8,934
Log Outstanding (log USD)	10.967	0.568	10.650	10.951	11.198	8,934
Age (years)	4.389	5.699	0.792	2.542	5.340	8,934
Remaining Maturity (years)	6.374	8.032	0.797	2.797	6.964	8,934
Coupon Rate (%)	2.671	1.727	1.250	2.875	4.125	8,934
$P(\text{eligible})$ (%)	26.203	43.976	0.000	0.000	100.000	8,934
$P(\text{accepted})$ (%)	8.238	27.496	0.000	0.000	0.000	8,934

Panel B: 2000–2002

	Mean	SD	p25	p50	p75	N
Disc. Depth (%)	0.480	1.289	0.000	0.000	0.281	4,987
Prem. Height (%)	8.329	12.507	0.000	2.094	11.303	4,987
Yield (%)	5.087	2.177	4.217	5.579	6.269	4,987
Bid-Ask Spread (bps)	3.012	1.567	2.791	3.074	3.202	4,987
Log Outstanding (log USD)	9.482	0.685	9.309	9.559	9.883	4,987
Age (years)	6.411	6.682	1.000	3.836	9.882	4,987
Remaining Maturity (years)	6.428	8.204	0.501	2.288	9.214	4,987
Coupon Rate (%)	6.163	3.564	5.250	6.250	7.875	4,987
$P(\text{eligible})$ (%)	9.565	29.414	0.000	0.000	0.000	4,987
$P(\text{accepted})$ (%)	6.818	25.208	0.000	0.000	0.000	4,987

Table 5: Absorption of borrowing surprises: Bills vs. coupons. This table reports regression results examining how borrowing surprises pass through to bill versus coupon issuance. Columns (1)–(2) examine total borrowing surprises (actual minus one-quarter-ahead forecast). Columns (3)–(4) examine planning surprises (current estimate minus prior forecast). Columns (5)–(6) examine execution surprises (actual minus current estimate). For each surprise measure, we regress the corresponding issuance surprise for coupons (odd columns) or bills (even columns) on the borrowing surprise. Under complete shock absorption, the bill coefficient should equal one and the coupon coefficient should equal zero. Sample period is 2002Q1–2025Q4. Newey and West (1987) standard errors with bandwidth of 4 quarters are reported in parentheses.

	Total		Planning		Execution	
	Coupon	Bill	Coupon	Bill	Coupon	Bill
	(1)	(2)	(3)	(4)	(5)	(6)
Borrowing Surprise (Total)	0.022***	0.978***				
	(0.007)	(0.007)				
Borrowing Surprise (Plan)			0.020***	0.980***		
			(0.007)	(0.007)		
Borrowing Surprise (Exec)					0.000	1.000***
					(0.017)	(0.017)
Observations	95	95	95	95	95	95
R^2	0.030	0.984	0.046	0.992	0.000	0.907
Notes:	$^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$					

Table 6: Relationship between market conditions and duration supply. This table reports regression results examining the relationship between term spreads and swap spreads and the share of duration (DV01) supply by maturity. Panel A examines duration (DV01) supply by maturity, expressed as each bucket's share of total duration supply from fixed-coupon securities. Panel B examines the relative issuance of FRNs and TIPS compared to fixed-coupon securities. In Panel A, the dependent variable is the percentage share of total duration (DV01) supply allocated to each maturity bucket. In Panel B, the dependent variable is the issuance share of each security type relative to fixed-coupon securities at the same maturity. *Term Spread* is the maturity-matched term spread from the Treasury yield curve. *Swap Spread* is the difference between the Treasury yield and the swap rate at the same maturity. *Swap Rate* is the interest rate swap rate at the corresponding maturity. *FC* indicates fixed-coupon securities. Columns (1)-(4) examine actual issuance; columns (5)-(8) examine TBAC indications. Driscoll and Kraay (1998) standard errors with Newey and West (1987) kernel (bandwidth = 4 quarters) are reported in parentheses.

Panel A: Duration Supply – Share by Maturity

	Duration Supply by Maturity (%)							
	Actual Issuance				Issuance Indication			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Term Spread	−0.161	−2.395			0.305	−1.989		
	(1.377)	(1.491)			(1.319)	(1.384)		
Swap Spread			14.871***	22.863***			14.042**	21.236***
			(5.488)	(6.032)			(5.535)	(6.009)
Swap Rate			−2.557	−2.613**			−1.886	−2.189*
			(1.658)	(1.291)			(1.560)	(1.211)
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maturity FE	No	Yes	No	Yes	No	Yes	No	Yes
Observations	672	672	672	672	672	672	672	672
R^2	0.000	0.437	0.055	0.511	0.001	0.466	0.045	0.526

Notes: $^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$

Panel B: Issuance Share by Maturity and Security Type

	Issuance by Maturity and Security Type (%)							
	Actual Issuance				Issuance Indication			
	FRN vs FC		TIPS vs FC		FRN vs FC		TIPS vs FC	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FC × Term Spread	−1.669***		−0.230		−2.111***		−0.130	
	(0.603)		(0.169)		(0.744)		(0.180)	
FC × Swap Spread		9.785***		1.088		11.074***		0.729
		(1.239)		(0.972)		(1.510)		(0.987)
FC × Swap Rate		−0.083		−0.175		0.047		−0.110
		(0.193)		(0.245)		(0.185)		(0.245)
Quarter × Maturity FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Security × Maturity FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	96	96	768	768	96	96	768	768
R^2	0.924	0.941	0.957	0.957	0.921	0.942	0.952	0.953

Notes: $^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$

Table 7: Relationship between changes in market conditions and duration supply adjustments. This table reports regression results examining the relationship between changes in swap spreads and swap rates and adjustments to Treasury duration supply. Panel A examines changes in duration supply for fixed-coupon securities. The dependent variables are: changes in actual duration supply share (columns 1–2), changes in TBAC indication share (columns 3–4), and deviations of actual issuance from prior indications (columns 5–6). Panel B examines changes in the relative issuance of FRNs and TIPS compared to fixed-coupon securities. Δ *Swap Spread* is the quarter-over-quarter change in the swap spread. Δ *Swap Rate* is the quarter-over-quarter change in the swap rate. *FC* indicates fixed-coupon securities. Driscoll and Kraay (1998) standard errors with Newey and West (1987) kernel (bandwidth = 4 quarters) are reported in parentheses.

Panel A: Changes in Duration Supply (Fixed Coupon)

	Δ Duration Supply and Adjustments (%)					
	Δ Duration Supply (%)		Δ Duration Indication (%)		Duration Deviation (%)	
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Swap Spread	−4.299	−4.374	−1.294	−1.394	−1.327	−1.071
	(4.069)	(4.092)	(3.920)	(3.889)	(2.915)	(2.899)
Δ Swap Rate	−1.915**	−1.872**	0.664	0.703	−0.671	−0.752
	(0.849)	(0.859)	(0.646)	(0.659)	(0.636)	(0.614)
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Maturity FE	No	Yes	No	Yes	No	Yes
Observations	672	672	665	665	665	665
R^2	0.009	0.012	0.002	0.005	0.002	0.048

Notes: $^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$

Panel B: Changes in Issuance Share by Security Type

	Changes and Adjustments in Issuance Share (%)					
	Δ Issuance (%)		Δ Indication (%)		Deviation (%)	
	FRN vs FC	TIPS vs FC	FRN vs FC	TIPS vs FC	FRN vs FC	TIPS vs FC
	(1)	(2)	(3)	(4)	(5)	(6)
FC × Δ Swap Spread	11.298**	0.752	9.030	−1.871	3.846	−0.470
	(5.384)	(1.267)	(6.121)	(1.956)	(3.062)	(0.795)
FC × Δ Swap Rate	−0.161	0.040	1.500	−0.082	0.426	0.045
	(0.960)	(0.320)	(1.046)	(0.410)	(0.502)	(0.174)
Quarter × Maturity FE	Yes	Yes	Yes	Yes	Yes	Yes
Security × Maturity FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	96	768	96	488	96	488
R^2	0.237	0.568	0.255	0.494	0.290	0.585

Notes: $^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$

Table 8: Relation between bond price and buyback eligibility. This table reports linear probability model estimates of the relation between bond characteristics and the probability that a bond appears on the Treasury's buyback-eligible list the following month. Columns (1)–(2) use the 2024–2025 buyback sample; columns (3)–(4) use the 2000–2002 sample. Even-numbered columns add bond fixed effects to the month fixed effects in odd-numbered columns; because bond fixed effects absorb time-invariant characteristics, *Log Outstanding* and *Coupon Rate* are omitted from those columns. *Disc. Depth* is $\max(100 - \text{Price}, 0)$; *Prem. Height* is $\max(\text{Price} - 100, 0)$. *Yield* is the annualized yield to maturity in percent. *Bid-Ask Spread* is the bid-ask spread relative to midpoint in basis points. *Log Outstanding* is the natural log of total face value outstanding (USD). *Age* and *Remaining Maturity* are in years. *Coupon Rate* is the stated annual coupon in percent. Standard errors clustered at the bond level are reported in parentheses.

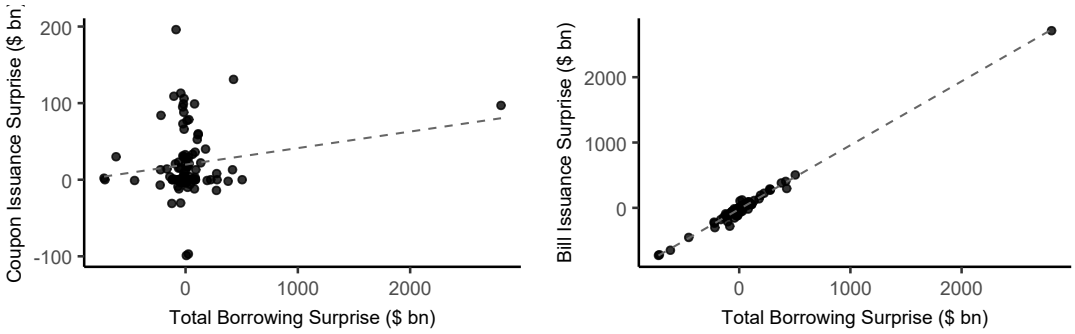
	$P(\text{eligible})$ in 2024–2025 (%)		$P(\text{eligible})$ in 2000–2002 (%)	
	(1)	(2)	(3)	(4)
Disc. Depth (%)	1.2705***	2.4451***	−2.8819***	−0.8578**
	(0.1587)	(0.3502)	(0.5063)	(0.3613)
Prem. Height (%)	−2.3155***	−0.1003	1.0294***	−0.7511***
	(0.5789)	(0.8966)	(0.0965)	(0.2003)
Yield (%)	3.1606***	1.7745***	−0.5034	−0.4328
	(0.5117)	(0.3286)	(0.3453)	(0.3214)
Bid-Ask Spread (bps)	1.7063***	2.5905***	5.3673***	0.8490
	(0.3732)	(0.3405)	(0.9740)	(1.5436)
Log Outstanding (log USD)	−5.6822***		2.5393*	
	(1.2888)		(1.3481)	
Age (years)	−1.1038***		0.7998***	
	(0.1776)		(0.2249)	
Remaining Maturity (years)	−0.0571		0.5032**	
	(0.1736)		(0.2056)	
Coupon Rate (%)	2.7914***		−3.3193***	
	(0.4931)		(0.4962)	
Month FE	Yes	Yes	Yes	Yes
Bond FE	No	Yes	No	Yes
Observations	8,934	8,934	4,987	4,987
R^2	0.201	0.308	0.363	0.431
Notes:	$^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$			

Table 9: ESA 2010 adoption and sovereign term spreads. Each column reports one regression on the within-Europe monthly panel, with the dependent variable equal to the 10-year minus 3-month sovereign term spread in percentage points. Columns (1)–(2) cover 2005–2018 and estimate the staggered difference-in-differences design in which *ESA* $\times$ *Post* switches on at each country's own ESA adoption date: January 2010 for Germany and the Netherlands, September 2014 for the late Core (France, Belgium, Austria), and the mandatory compliance date for the periphery. Column (1) uses the Core sample and column (2) adds the periphery (Italy, Spain, Ireland, Portugal, Greece). Columns (3)–(4) isolate the two cohort comparisons pooled by the staggered design: *Early vs. late* (column 3) stops one year before the mandatory September 2014 adoption date (through August 2013), while *Late vs. early* (column 4) starts one year after the early January 2010 adoption date (from January 2011 onward). Controls include PSPP intensity, the flight-to-safety-by-GFC interaction, the GIIPS-by-crisis interaction (full sample), debt-to-GDP, the deficit-to-GDP, and the three-month rate; country and year-month fixed effects throughout. Driscoll and Kraay (1998) standard errors with a Newey and West (1987) kernel use lag selection $L = \lfloor 12 \cdot (T/100)^{1/4} \rfloor$ for monthly data (Schwert, 1989), where T is the number of monthly time periods. $^{*}\, p \leq .10$; $^{**}\, p \leq .05$; $^{***}\, p \leq .01$.

	Term spread (10Y−3M, pp)			
	Core (staggered)	Full (staggered)	Early vs. late	Late vs. early
	(1)	(2)	(3)	(4)
ESA × Post	−0.408***	−0.493***	−0.483***	−0.287**
	(0.120)	(0.146)	(0.125)	(0.126)
Controls	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Observations	837	1,676	735	750
R^2	0.976	0.810	0.981	0.969

Internet Appendix for "The US Treasury's Biggest Short: Duration in the Shadows"

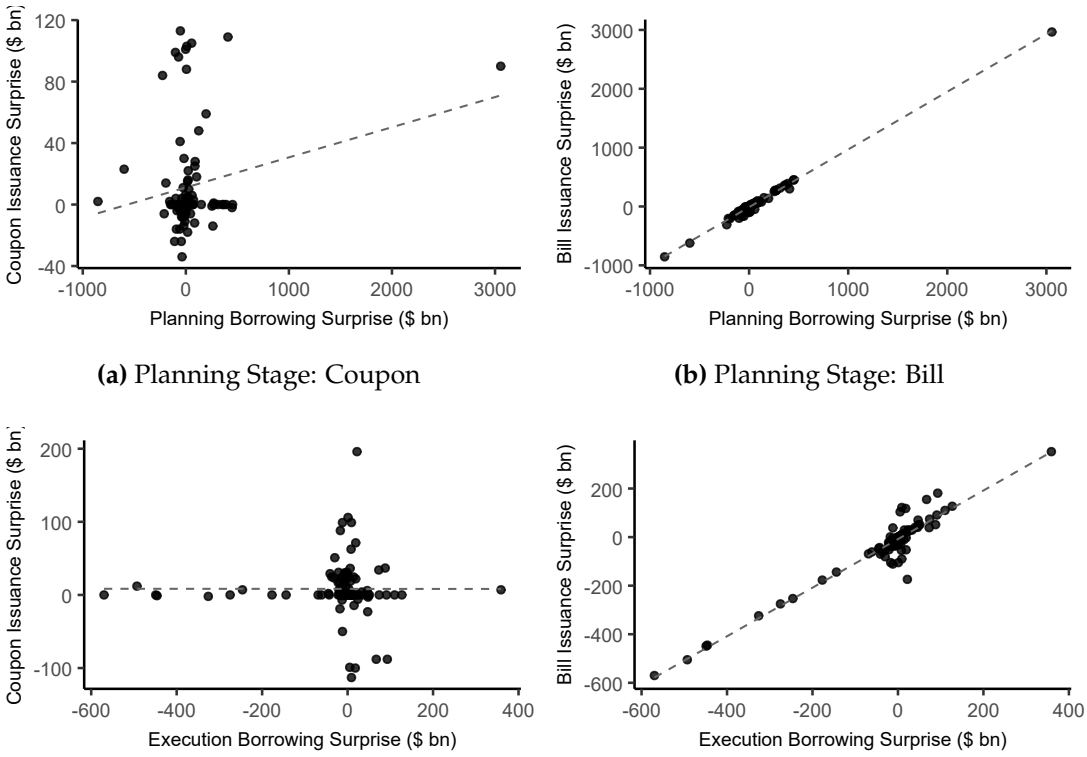
IA.1 Additional Figures and Tables



(a) Total Borrowing Surprise vs Coupon Surprise

(b) Total Borrowing Surprise vs Bill Surprise

Figure IA.1: Absorption of Borrowing Surprises: Bills vs. Coupons. This figure presents scatter plots of borrowing surprises against issuance surprises for coupons (Panel a) and bills (Panel b). Total borrowing surprise is the difference between actual marketable borrowing and the one-quarter-ahead forecast. Each point represents a quarter from 2002Q1 to 2025Q4. Colors and shapes indicate crisis periods: Normal (black circles), GFC 2007Q3–2009Q2 (red triangles), and COVID-19 2020Q1–2020Q2 (blue squares). The dashed line represents the OLS regression fit. Panel (a) shows near-zero passthrough of borrowing surprises to coupon issuance, while Panel (b) demonstrates near-unity passthrough to bill issuance, confirming that bills serve as the shock absorber for unexpected financing needs.



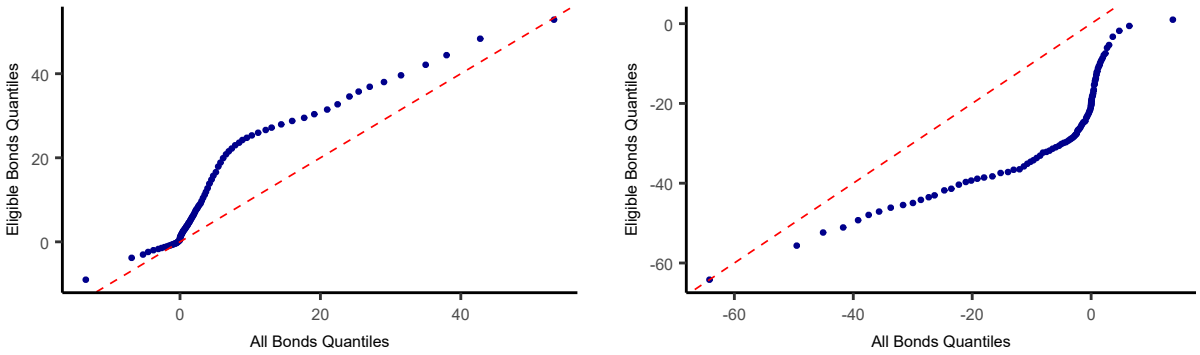
(a) Planning Stage: Coupon

(b) Planning Stage: Bill

(c) Execution Stage: Coupon

(d) Execution Stage: Bill

Figure IA.2: Shock Absorption by Information Stage. This figure decomposes borrowing surprises into planning surprises (Panels a–b) and execution surprises (Panels c–d). Planning surprise is the difference between the current quarter's estimate and the previous quarter's forecast. Execution surprise is the difference between actual borrowing and the current quarter's estimate. Colors indicate crisis periods as in Figure IA.1. Panels (a) and (c) show coupon issuance surprises; Panels (b) and (d) show bill issuance surprises. The results confirm that shock absorption operates at both the planning and execution margins, with bills absorbing virtually all unexpected changes in financing needs at each stage.



(a) 2024-2025 Period **(b)** 2000-2002 Period

Figure IA.3: Quantile-Quantile Plots: Bond Discount Comparison. The figure compares the quantile distributions of bond discounts between all Treasury bonds (x-axis) and eligible bonds (y-axis). Bond discount is defined as $100 - \text{Price}$, where price is the average monthly market price. Each point represents a percentile of the distribution (1st through 99th percentiles). The red dashed line is the 45-degree line representing identical distributions. Points above the line indicate that eligible bonds have higher discounts than all bonds at that percentile. Panel IA.3(a) shows the 2024–2025 buyback period; Panel IA.3(b) shows the 2000–2002 buyback period. The quantile-quantile plots compare discount distributions by matching percentiles between all bonds (x-axis) and eligible bonds (y-axis), with the 45-degree line representing identical distributions. For 2024–2025, points systematically lie above the diagonal line, indicating that eligible bonds have higher discounts than all bonds at nearly every percentile, with the effect most pronounced in the upper tail where bonds are most deeply discounted. For 2000–2002, the pattern is opposite with points below the line showing eligible bonds consistently trade at higher premium across the distribution.

Table IA.1: Relation between market conditions and duration supply: dynamic specification. This table extends the baseline levels regression in Table 6 by adding one-quarter leads and lags of the swap spread and swap rate. The lag terms test whether the Treasury responds with a one-quarter delay to past market conditions; the lead terms test whether today's duration supply predicts future spreads, which would indicate that markets react to issuance rather than the reverse. The dependent variable is the duration supply share allocated to each maturity bucket. Columns (1)–(2) use actual issuance as the dependent variable; columns (3)–(4) use TBAC indications. Even-numbered columns include maturity fixed effects in addition to quarter fixed effects. *Swap Spread* is the difference between the Treasury yield and the interest rate swap rate at the same maturity. *Swap Rate* is the interest rate swap rate at the corresponding maturity. Lag and Lead refer to one-quarter lags and leads of each variable, respectively. Driscoll and Kraay (1998) standard errors with Newey and West (1987) kernel (bandwidth = 4 quarters) are reported in parentheses.

Panel A: Duration Supply – Share by Maturity (Dynamic Specification)

	Duration Supply by Maturity (%)			
	Actual Issuance		Issuance Indication	
	(1)	(2)	(3)	(4)
Swap Spread	0.549	2.251	2.029	3.497
	(6.010)	(5.202)	(5.903)	(5.158)
Lag Swap Spread	4.887	10.268	4.856	9.988
	(10.060)	(6.842)	(10.057)	(6.465)
Lead Swap Spread	10.554	13.932*	8.297	10.702
	(11.070)	(7.724)	(11.228)	(8.202)
Swap Rate	−1.462	−1.331	1.536	1.645
	(2.142)	(1.716)	(2.062)	(1.597)
Lag Swap Rate	−0.549	−0.227	−1.759	−1.711
	(2.996)	(2.215)	(2.986)	(2.218)
Lead Swap Rate	−0.715	−0.976	−1.893	−2.233
	(3.018)	(2.396)	(2.982)	(2.240)
Quarter FE	Yes	Yes	Yes	Yes
Maturity FE	No	Yes	No	Yes
Observations	672	672	672	672
R^2	0.059	0.520	0.049	0.534
Notes:	$^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$			

Table IA.2: Relation between changes in market conditions and duration supply adjustments: dynamic specification. This table extends the baseline changes regression in Table 7 by adding one-quarter leads and lags of ΔSwap Spread and ΔSwap Rate. The lag terms test whether the Treasury responds with a one-quarter delay to past price signals; the lead terms test whether today's duration supply adjustments predict future spread changes. Columns (1)–(2) use the quarter-over-quarter change in actual duration supply; columns (3)–(4) use the change in TBAC indications; columns (5)–(6) use the deviation of actual issuance from prior indications. Even-numbered columns include maturity fixed effects in addition to quarter fixed effects. Δ *Swap Spread* is the quarter-over-quarter change in the swap spread. Δ *Swap Rate* is the quarter-over-quarter change in the swap rate. Lag and Lead refer to one-quarter lags and leads of each variable, respectively. Driscoll and Kraay (1998) standard errors with Newey and West (1987) kernel (bandwidth = 4 quarters) are reported in parentheses.

Panel B: Changes and Adjustments – Duration Supply by Maturity (Dynamic Specification)

	Δ Duration Supply and Adjustments (%)					
	Δ Duration Supply (%)		Δ Duration Indication (%)		Duration Deviation (%)	
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Swap Spread	−2.483	−2.586	−1.582	−1.686	−0.672	−0.363
	(3.587)	(3.601)	(3.575)	(3.529)	(2.835)	(2.801)
Lag Δ Swap Spread	2.004	1.882	1.582	1.513	2.459	2.663
	(2.702)	(2.646)	(2.205)	(2.179)	(1.821)	(1.839)
Lead Δ Swap Spread	4.735	4.639	−0.844	−0.910	0.764	0.994
	(2.968)	(2.982)	(3.081)	(3.145)	(2.090)	(2.117)
Δ Swap Rate	−1.950**	−1.918**	0.801	0.828	−0.722	−0.780
	(0.891)	(0.898)	(0.684)	(0.695)	(0.617)	(0.599)
Lag Δ Swap Rate	1.452*	1.476*	−1.069	−1.040	0.215	0.154
	(0.767)	(0.780)	(0.811)	(0.813)	(0.544)	(0.539)
Lead Δ Swap Rate	1.627*	1.660*	−0.731	−0.716	0.769	0.733
	(0.930)	(0.928)	(0.647)	(0.658)	(0.593)	(0.582)
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Maturity FE	No	Yes	No	Yes	No	Yes
Observations	672	672	665	665	665	665
R^2	0.024	0.027	0.007	0.010	0.008	0.054

Notes: $^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$

Table IA.3: Relation between bond price and buyback acceptance. This table reports linear probability model estimates of the relation between bond characteristics and the probability that a bond is tendered and accepted in the Treasury's buyback operation the following month. The sample consists of all monthly bond-level observations in the regression sample (not restricted to eligible bonds). Columns (1)–(2) use the 2024–2025 buyback sample; columns (3)–(4) use the 2000–2002 sample. Even-numbered columns add bond fixed effects to the month fixed effects in odd-numbered columns; because bond fixed effects absorb time-invariant characteristics, *Log Outstanding* and *Coupon Rate* are omitted from those columns. *Disc. Depth* is $\max(100 - \text{Price}, 0)$, the depth below par for bonds trading at a discount. *Prem. Height* is $\max(\text{Price} - 100, 0)$, the height above par for bonds trading at a premium. *Yield* is the annualized yield to maturity in percent. *Bid-Ask Spread* is the bid-ask spread relative to midpoint in basis points. *Log Outstanding* is the natural log of total face value outstanding (USD). *Age* and *Remaining Maturity* are in years. *Coupon Rate* is the stated annual coupon in percent. The dependent variable $P(\text{accepted})$ equals 100 if the bond was tendered and accepted in the following month's buyback operation, and zero otherwise. All variables are measured at month end. Standard errors clustered at the bond level are reported in parentheses.

	$P(\text{accepted})$ in 2024–2025 (%)		$P(\text{accepted})$ in 2000–2002 (%)	
	(1)	(2)	(3)	(4)
Disc. Depth (%)	0.6247***	−0.4859*	−2.5895***	−1.0257***
	(0.0978)	(0.2726)	(0.4203)	(0.3462)
Prem. Height (%)	−0.9535***	0.1606	0.8484***	−0.7431***
	(0.2563)	(0.3796)	(0.1200)	(0.1917)
Yield (%)	−0.6266**	−0.0408	−0.4948	−0.4408
	(0.2851)	(0.1573)	(0.3209)	(0.3068)
Bid-Ask Spread (bps)	0.2613	0.4530*	3.5970***	1.1143
	(0.2409)	(0.2531)	(0.9883)	(1.6597)
Log Outstanding (log USD)	−1.7431*		0.9629	
	(0.9051)		(1.6353)	
Age (years)	−0.2556***		0.1815	
	(0.0825)		(0.2512)	
Remaining Maturity (years)	−0.3907***		0.4818**	
	(0.0919)		(0.1972)	
Coupon Rate (%)	1.0710***		−2.3763***	
	(0.3156)		(0.4991)	
Month FE	Yes	Yes	Yes	Yes
Bond FE	No	Yes	No	Yes
Observations	8,934	8,934	4,987	4,987
R^2	0.047	0.157	0.291	0.401

Notes: $^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$

Table IA.4: ESA 2010 adoption and swap spreads. The dependent variable is the swap spread, defined as the sovereign yield minus the maturity-matched euro swap rate (percentage points), so positive values indicate sovereign yields above swaps. Columns (1)–(4) repeat the four Table 9 designs exactly: Core staggered, full-sample staggered, early-vs-late, and late-vs-early. For columns (3)–(4), early-vs-late stops one year before the mandatory September 2014 adoption date (through August 2013), and late-vs-early starts one year after the early January 2010 adoption date (from January 2011 onward). Controls include PSPP intensity, the flight-to-safety-by-GFC interaction, the GIIPS-by-crisis interaction (full sample), debt-to-GDP, the deficit-to-GDP, and the three-month rate; country and year-month fixed effects throughout. Driscoll and Kraay (1998) standard errors with a Newey and West (1987) kernel use lag selection $L = \lfloor 12 \cdot (T/100)^{1/4} \rfloor$ for monthly data (Schwert, 1989), where T is the number of monthly time periods. $^{*}p \leq .10$; $^{**}p \leq .05$; $^{***}p \leq .01$.

	Swap spread (sovereign over swaps, pp)			
	Core (staggered)	Full (staggered)	Early vs. late	Late vs. early
	(1)	(2)	(3)	(4)
ESA × Post	−0.408***	−0.493***	−0.483***	−0.287**
	(0.120)	(0.146)	(0.125)	(0.126)
Controls	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Observations	837	1,676	735	750
R^2	0.843	0.885	0.855	0.850

Table IA.5: ESA 2010 adoption and ACM term premia. The dependent variable is the ten-year ACM term premium of Adrian et al. (2013) (percentage points). Columns (1)–(4) repeat the four Table 9 designs exactly: Core staggered, full-sample staggered, early-vs-late, and late-vs-early. For columns (3)–(4), early-vs-late stops one year before the mandatory September 2014 adoption date (through August 2013), and late-vs-early starts one year after the early January 2010 adoption date (from January 2011 onward). Controls include PSPP intensity, the flight-to-safety-by-GFC interaction, the GIIPS-by-crisis interaction (full sample), debt-to-GDP, the deficit-to-GDP, and the three-month rate; country and year-month fixed effects throughout. Driscoll and Kraay (1998) standard errors with a Newey and West (1987) kernel use lag selection $L = \lfloor 12 \cdot (T/100)^{1/4} \rfloor$ for monthly data (Schwert, 1989), where T is the number of monthly time periods. $^{*}\, p \leq .10$; $^{**}\, p \leq .05$; $^{***}\, p \leq .01$.

	ACM term premium (10Y, pp)			
	Core (staggered)	Full (staggered)	Early vs. late	Late vs. early
	(1)	(2)	(3)	(4)
ESA × Post	-0.424^{***}	-0.289^{*}	-0.480^{***}	-0.278^{**}
	(0.135)	(0.152)	(0.146)	(0.128)
Controls	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Observations	837	1,676	735	750
R^2	0.952	0.761	0.925	0.946

Table IA.6: ESA 2010 adoption and interest expenses. The panel is annual. The dependent variable is the year-over-year change in the implicit interest rate paid by the government, where the implicit rate is annual general-government interest expenditure divided by the face value of debt outstanding at the end of the previous year. Because this rate is a slow-moving stock that averages legacy coupons, the model is estimated in first differences. *ESA* $\times$ *Post* switches on in each country's adoption year (2010 for early adopters and 2015 for the remaining countries). Columns (1) and (2) use the Core and full samples, respectively. Controls include PSPP intensity, debt-to-GDP, the fiscal balance, and the three-month rate, all in first differences, plus the flight-to-safety-by-GFC and GIIPS-by-crisis indicators (full sample); country and year fixed effects throughout. Driscoll and Kraay (1998) standard errors with a Newey and West (1987) kernel use lag selection $L = 2$ for annual data. $^{*}\, p \leq .10$; $^{**}\, p \leq .05$; $^{***}\, p \leq .01$.

	First difference of the implicit rate (pp)	
	Core	Full
	(1)	(2)
ESA $\times$ Post	-0.091^{***}	-0.105^{**}
	(0.030)	(0.043)
Controls	Yes	Yes
Country FE	Yes	Yes
Year FE	Yes	Yes
Observations	106	214
R^2	0.733	0.578

Table IA.7: Robustness of ESA 2010 adoption and sovereign term spreads: leave-one-out. Each row re-estimates the staggered design used in Table 9 columns (1)–(2), dropping one Core country at a time. Stability of the coefficient across rows indicates that no single Core country drives the result. Controls include PSPP intensity, the flight-to-safety-by-GFC interaction, debt-to-GDP, the deficit-to-GDP, and the three-month rate, plus the GIIPS-by-crisis interaction (full sample); country and year-month fixed effects throughout. Driscoll and Kraay (1998) standard errors with a Newey and West (1987) kernel use lag selection $L = \lfloor 12 \cdot (T/100)^{1/4} \rfloor$ for monthly data (Schwert, 1989), where T is the number of monthly time periods. $^{*}\, p \leq .10$; $^{**}\, p \leq .05$; $^{***}\, p \leq .01$.

	Term spread (10Y−3M, pp)	
	Core	Full
None (baseline)	−0.408***	−0.493***
	(0.120)	(0.146)
Excluding Germany	−0.313***	−0.354***
	(0.115)	(0.121)
Excluding Netherlands	−0.467***	−0.650***
	(0.127)	(0.196)
Excluding France	−0.431***	−0.519***
	(0.132)	(0.155)
Excluding Belgium	−0.302***	−0.360**
	(0.107)	(0.141)
Excluding Austria	−0.450***	−0.562***
	(0.114)	(0.178)
Controls	Yes	Yes
Country & time FE	Yes	Yes

Table IA.8: Robustness of ESA 2010 adoption and sovereign term spreads: sensitivity to violations of parallel trends following Rambachan and Roth (2023). The relative-magnitudes analysis asks how large a post-adoption departure from parallel trends must be, relative to the largest departure visible before adoption, for the estimated effect to include zero. The reported breakdown $\bar{M}$ is this ratio for the term spread, computed for the specification that includes the flight-to-safety-by-GFC control as in Table 9. A value of $\bar{M} = 1$ means the effect survives a post-adoption violation as large as the worst pre-adoption movement; larger values indicate greater robustness. $\hat{\tau}$ is the peak post-adoption effect.

	Peak effect ($\hat{\tau}$)	Breakdown $\bar{M}$
Term spread	−0.63	2.09

Table IA.9: Timing of the early ESA 2010 adoption: term spreads. Each column reports one regression on the within-Europe monthly panel over 2005–2018, Core sample (Germany, the Netherlands, France, Belgium, Austria), with the dependent variable equal to the 10-year minus 3-month sovereign term spread in percentage points. The columns vary only the treatment timing of the early adopters, with the late Core treated from the mandatory September 2014 compliance date throughout: column (1) reproduces the headline design of Table 9, column (1), with the early cohort treated from January 2010; column (2) re-dates the early cohort to January 2012; column (3) assigns the early cohort a treatment intensity rising linearly from zero in January 2010 to one in September 2014; column (4) phases the early adoption in linearly from July 2009 to July 2010; column (5) excludes the early cohort's January 2010 to December 2012 observations, identifying its effect from pre-2010 against post-2012 observations only. The cohort comparisons that isolate each adoption separately are in Table 9, columns (3) and (4). Controls include PSPP intensity, the flight-to-safety-by-GFC interaction, debt-to-GDP, the deficit-to-GDP, and the three-month rate; country and year-month fixed effects throughout. Driscoll and Kraay (1998) standard errors with a Newey and West (1987) kernel use lag selection $L = \lfloor 12 \cdot (T/100)^{1/4} \rfloor$ for monthly data (Schwert, 1989), where T is the number of monthly time periods. $^{*}\, p \leq .10$; $^{**}\, p \leq .05$; $^{***}\, p \leq .01$.

	Headline	Early re-dated 2012	Phased 2010–2014	12-month phase-in	Excl. 2010–2012
	(1)	(2)	(3)	(4)	(5)
ESA × Post	−0.408***	−0.338**	−0.482*	−0.417***	−0.226***
	(0.120)	(0.143)	(0.257)	(0.120)	(0.050)
Controls	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Observations	837	837	837	837	765
R^2	0.976	0.972	0.972	0.977	0.984

Table IA.10: Robustness of ESA 2010 adoption and sovereign term spreads: safe-haven confound and anticipation. The Greek-crisis flight to quality coincides with the early cohort's January 2010 treatment date, and Regulation 549/2013 (published May 2013) creates a sixteen-month statutory-notice window before the late cohort's September 2014 compliance date. This table quantifies how much of the headline term-spread result in Table 9 these two confounds can explain. Row 1 reproduces the headline estimate. Rows 2–3 address safe-haven confounding: row 2 drops May 2010–June 2012 for all countries, and row 3 adds a Germany-Netherlands safe-haven indicator over that same window. Rows 4–5 address anticipation: row 4 drops June 2013–August 2014 for the late cohort, and row 5 additionally drops July–December 2009 for the early cohort. Controls include PSPP intensity, the flight-to-safety-by-GFC interaction, debt-to-GDP, the deficit-to-GDP, and the three-month rate, plus the GIIPS-by-crisis interaction (full sample); country and year-month fixed effects throughout. Driscoll and Kraay (1998) standard errors with a Newey and West (1987) kernel use lag selection $L = \lfloor 12 \cdot (T/100)^{1/4} \rfloor$ for monthly data (Schwert, 1989), where T is the number of monthly time periods. $^{*}\, p \leq .10$; $^{**}\, p \leq .05$; $^{***}\, p \leq .01$.

	Term spread (pp)	
	Core	Full
Headline	-0.408^{***}	-0.493^{***}
	(0.120)	(0.146)
Excluding May 2010–June 2012	-0.279^{***}	-0.530^{***}
	(0.063)	(0.099)
Adding DE/NL safe-haven indicator	-0.269^{***}	-0.466^{***}
	(0.078)	(0.173)
Excl. regulation-notice window (late cohort)	-0.492^{***}	-0.603^{***}
	(0.136)	(0.152)
Excl. six months pre-adoption (both cohorts)	-0.443^{***}	-0.583^{***}
	(0.122)	(0.133)
Controls	Yes	Yes
Country & time FE	Yes	Yes