What Treasury Auctions Reveal About Investor Demand*

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Abstract

We directly measure the demand elasticity for US Treasuries at auction using the slope of the demand curve. From 1992 to 2010, investors demanded 2 basis points for a 1% increase in the supply of Treasuries of the same tenor. Since 2010, Treasury demand at auction has become increasingly inelastic with bidders demanding 10 basis points per 1% increase in supply. This deterioration of demand is also apparent in the secondary market. Prior to 2010, long-term yields declined on average by 1.6 to 1.8 basis points at auctions with declines concentrated over auctions with strong demand. After 2010, this trend has reversed and yields no longer fall at auctions. We show that this weaker demand for Treasuries coincides with less foreign investor demand and reduced secondary market liquidity.

J.E.L. classification: E43, E52, G12, G15

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1. Introduction

Since World War II, the US dollar has served as the world's safe asset and underpinned the international monetary and financial system. Global investors' demand for safe assets has enabled the United States government to borrow relatively cheaply and to issue Treasuries at below market interest rates. This position, as the supplier of the world's safe assets, has been described as an exorbitant privilege. However, there is growing concern about the erosion of the dollar's status as the global reserve currency.

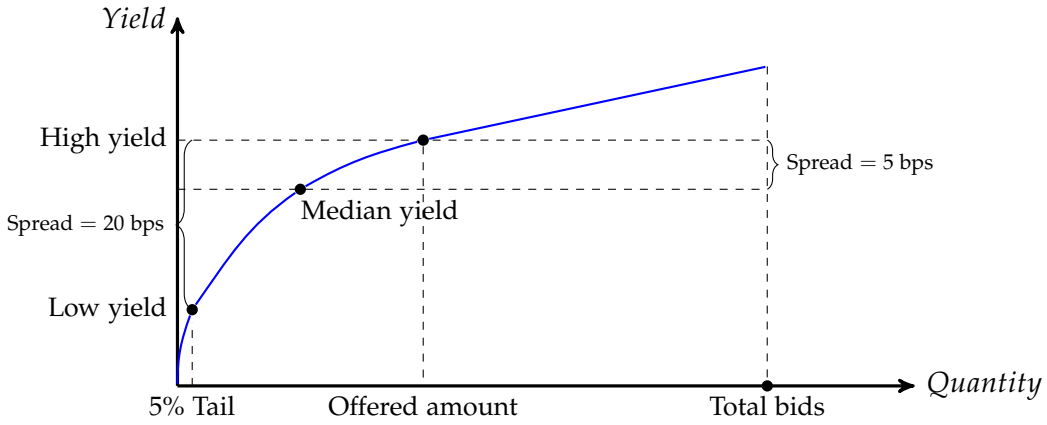
In this paper, we argue that this erosion has been apparent in investor demand for Treasuries at US Treasury auctions. We focus on auctions for two reasons. First, supply is known prior to the auction such that at the auction the market only learns about global investor demand for Treasuries. Second, we may directly compute the *observed* elasticity of demand by investors for Treasuries at auctions. This provides a high-power setting to understand how investor demand for Treasuries has changed over time. In contrast, studies that provide *structural* estimates of the elasticity of investor demand for Treasuries depend on time-series instruments and often assume that demand elasticities have not changed over time.[1]

The US Treasury holds a quarterly refunding press conference, where it announces expected Treasury auctions in a regular and predictable manner (Garbade, 2007), with the correlation between planned and actual issuance exceeding 90% (Ljubica Georgievska, 2024). In order to be predictable, the US Treasury announces the offering amount and auction date about a week prior to the auction of a *long-term* Treasury, which we define as auctions with maturities of beyond 5 years. Therefore, at the auction itself, there is no (new) supply information released, and the market learns about global investor demand for Treasuries. These global investors bid for Treasuries by submitting demand curves in a single-price auction since 1992, which is the starting point of our main sample period. These data are aggregated and three points on the curve are publicly disclosed. Figure 1 illustrates an aggregate demand curve for Treasuries. The demand curve is upward sloping in yields as investors demand higher yields (lower prices) to buy greater quantities of Treasuries.

From this aggregate demand curve, we directly measure information about investor de-

[1] A notable exception to this is the work by Allen, Kastl, and Wittwer (2025b), which leverages the simultaneous occurrence of auctions for identification and hence, does not require an instrument for identification.

Figure 1: Treasury Auction Demand Schedule



Note: This figure plots a hypothetical US Treasury demand schedule that is based on the available information released shortly after Treasury auctions. *High yield* is the market clearing yield paid by every market participant in a uniform price auction. *Median yield* is the yield where 50% of the competitive tenders is reached. At the *Low yield* 5% of the amount of competitive tenders were tendered at or below this yield. *Offered amount* is the total amount offered for purchase of the security being announced/ auctioned, whereas *Total bids* is the sum of all bids received for the security being auctioned. The high vs median and median vs low yield spreads are computed based on the sample period from January 1992 to December 2025.

mand: the slope of the demand curve and the market clearing level of yields. Both are directly measured from the data for each auction, which enables us to explore the time series variation in global investor demand for Treasuries.

Our first fact is that there is a negative trend in the observed elasticity of demand for Treasuries at auction. The slope of the demand curve observed at auction has steepened, meaning that investors are demanding higher yields to absorb increases in the supply of Treasuries. This decrease in demand elasticity is driven by changes in both the numerator and the denominator. For the numerator, the size of auctions has shrunk relative to the outstanding supply of Treasuries. For the denominator, the market clearing yield has become more sensitive to the quantity auctioned. Since 2011, the yield elasticity of demand has declined in magnitude from -0.8 (average over 1992 to 2010) to -0.2 (average over 2011 to 2025). These estimates correspond to yield multipliers of 2 bps and 10 bps, respectively, per 1% increase in US Treasury supply for a given tenor.

There are two possible concerns with our approach to estimating demand elasticities. The primary concern is that we are measuring an elasticity of demand for primary dealers that reflects short-term balance sheet constraints rather than end-user investors' demand elasticity.

This is because at Treasury auctions both end-user investors and primary dealers participate and hence, we are measuring a mix of investor and dealer elasticities. Thus, one might ask whether the deterioration in auction demand elasticity since the global financial crisis (GFC) is related to changes in the bidder composition at auction. Since the GFC, dealer participation at auction has declined dramatically as tighter regulatory constraints have reduced dealers' ability to warehouse inventory (e.g., Duffie, Fleming, Keane, Nelson, Shachar, and Van Tassel, 2023) and share information with clients (Boyarchenko, Lucca, and Veldkamp, 2021), thereby curtailing position-taking at auctions (Fleming, Nguyen, and Rosenberg, 2024). To quantitatively address the role of the declining dealer share at auction, we compute two boundary cases: one in which we assume that dealers are perfectly inelastic, and one in which investors are perfectly inelastic. The decomposition shows that the erosion of auction demand elasticity has been mainly driven by the increase in the share of inelastic end-user investors over time.

A secondary concern with our approach is that we linearly approximate the demand curve using only two data points from the publicly available aggregate demand curve. If the true underlying demand curve is non-linear, investors may be more inelastic to larger changes in supply. However, our average change in supply is $12.5 billion, which is relatively small compared to the secondary market trading volume. Furthermore, there are two main appeals of our approach: First, our measure is model-free, that is, we make no explicit assumptions about optimal equilibrium bidding strategies, bid shading, and cross-asset demand elasticities. Second, we can trace out the time-variation of auction demand elasticities. In contrast, most existing studies that use (proprietary) auction data focus on foreign countries[2] and there is only limited evidence for the US. In fact, to the best of our knowledge, we are the first to estimate demand elasticities for US Treasuries using auction data.

Our second fact is that changes in the level of secondary market yields over long-term Treasury auctions also show that the demand for Treasuries has weakened over the past few decades. We use changes in 10-year Treasury yields over long-term Treasury auctions to measure unexpected investor demand at auction. From 1992 to 2010, US yields have risen prior to auctions and fallen afterwards, resulting in an inverse V-shaped pattern in yields around auctions. This well-known inverse V-shaped pattern includes both a transitory and a permanent

[2]See, for instance, Albuquerque, Cardoso-Costa, and Faias (2024) for Portuguese, Cavaleri, Ranaldo, and Rossi (2024) for Swiss, and Chang (2023) as well as Allen et al. (2025b) for Canadian Treasury auctions.

component.[3] The former is associated with primary dealers' limited risk-bearing capacity (see Lou, Yan, and Zhang, 2013; Fleming, Liu, and Nguyen, 2016; Fleming et al., 2024; Lou, Pinter, Üslü, and Walker, 2025), resulting in transitory price pressure. The permanent component amounts to an average decline of 1.6 bps in long-term yields at Treasury auctions from 1992 to 2010. We interpret this average decline in yields over Treasury auctions as evidence that demand for Treasuries was stronger than expected. This interpretation is consistent with recent quantity-based portfolio choice models (Gourinchas, Ray, and Vayanos, 2022; Greenwood, Hanson, Stein, and Sunderam, 2023), which predict that positive bond demand shocks lower yields through both risk premium and convenience yield channels. In contrast, from 2010 to 2025, US yields no longer tend to permanently decline over Treasury auctions.

To better distinguish the permanent component from the transitory intermediation effect, we use long-term sovereign bond yields for G10 countries. For global bond investors, these foreign sovereign bonds are close substitutes for Treasuries, but the foreign sovereign bonds are not directly affected by intermediary price pressures. Indeed, we find no inverse V-shaped pattern in long-term G10 yields over Treasury auctions. However, we find similar patterns for the permanent decline in yields over Treasury auctions. From 1992 to 2010, G10 yields permanently declined by 1.8 bps over Treasury auctions, and from 2010 to 2025 there was on average no change in G10 yields.

These two pieces of evidence, taken together with the fact that Treasury auctions do not reveal any new supply information, point towards an explanation based on changes in investor demand for Treasuries and, more generally, sovereign long-term debt. In other words, up until the global financial crisis (GFC), the market has on average been positively surprised by global demand for long-term sovereign debt at US Treasury auctions. These positive surprises have been associated with both US and G10 yields falling after auctions. After the crisis, demand for Treasuries has softened, and yields do *not* fall after Treasury auctions.

It is natural to ask whether the spillover effect from Treasury auctions to foreign yields is unique to US Treasury auctions or whether we observe similar patterns for foreign sovereign bond auctions (e.g., Gilt auctions in the UK). Global bond yields tend *not* to fall over foreign sovereign bond auctions, even those of similar size to that of Treasury auctions. Similar to

[3]Similar V-shaped patterns have been documented for various European sovereign bond auctions (see, e.g., Beetsma, Giuliodori, de Jong, and Widijanto, 2016; Albuquerque et al., 2024; Sigaux, 2024).

how Treasuries are the global safe asset, Treasury auctions have served as a special venue for the market to learn about global demand for long-term bonds.

Next, we examine a commonly referenced measure of demand at auction, the bid-to-cover ratio. We find that large declines in global bond yields tend to be concentrated in auctions with surprisingly high bid-to-cover ratios. This suggests that the decline in long-term bond yields over Treasury auctions is related to unexpected positive shifts in demand for Treasuries at auction. However, we show that the bid-to-cover ratio is stationary and strongly mean reverting. High-frequency changes to the bid-to-cover ratio capture demand shocks, but the low-frequency trend does not show an erosion in Treasury demand. This may be because primary dealers are required to bid at auctions and the bid-to-cover ratio is a demand metric closely monitored by the Treasury. Specifically, while the overall bid-to-cover ratio at auction has been close to 2.5 over the full sample period the ratio of primary dealer tendered-to-accepted bids has almost doubled since the financial crisis.

There are many plausible reasons why the demand for Treasuries at auction has deteriorated since 2010. For example, falling Treasury convenience yields (Krishnamurthy and Vissing-Jorgensen, 2012; Du, Keerati, and Schreger, 2025), fiscal concerns related to the expansion of Treasury supply (Chen, Jiang, Lustig, Van Nieuwerburgh, and Xiaolan, 2025), increased illiquidity in the secondary market (Duffie et al., 2023), and changes in investor composition (e.g., declining share of Treasuries held by foreigners) (Fang, Hardy, and Lewis, 2025) may all have played a role.[4] Identifying any of these channels is empirically challenging due to endogeneity. We address this challenge by leveraging plausible exogenous variation in the participation of foreign investors at auction. Specifically, we instrument for foreign demand using overlapping auction dates: these are days when foreign auctions happen to coincide with Treasury auctions. Consistent with a home region bias, foreign investors demand fewer Treasuries at auction when they have the opportunity to buy local sovereign bonds. On these "overlapping" Treasury auction days, investor demand for Treasuries is weaker, as reflected in both higher market clearing yields and a steeper auction demand curve. In sum, our findings suggest that a decline in foreign demand for Treasuries is indeed one possible

[4]Foreign holdings of Treasuries increased from 17% in 2001 to a peak of 34% in 2015 and have since declined to 24% as of 2025. This low-frequency time series trend in foreign holdings of US Treasuries closely aligns with the share of Treasuries allocated to foreigners at auction.

reason why demand at auction has eroded since the global financial crisis.

Finally, we examine the implications of declining Treasury demand elasticity for secondary market fragility. Specifically, we show that more inelastic investor demand at auction is associated with worsening Treasury market conditions, which we measure by both option-implied volatility (the MOVE Index) and yield curve noise (Hu, Pan, and Wang, 2013). This relationship has strengthened considerably after the financial crisis. A one standard deviation decline in demand elasticity is associated with a 0.7 percentage point increase in implied volatility prior to 2010, whereas the association is more than four times as large after 2010. Similarly, more inelastic Treasury auction demand is associated with significantly higher secondary market illiquidity (i.e., yield curve noise) after but not before 2010. In sum, our findings suggest that the relation between Treasury demand elasticities and market conditions is non-linear and that the erosion of primary market demand has spilled over to increased fragility in the secondary market for Treasuries.

This paper aims to make three contributions. First and most concretely, we show that the demand for Treasuries at auction has exhibited a negative trend since 2010. This precedes the more recent concerns about fragility and illiquidity in the Treasury market (e.g., Duffie, 2023; Duffie et al., 2023; d'Avernas, Petersen, and Vandeweyer, 2025; Kashyap, Stein, Wallen, and Younger, 2025). We provide supporting empirical evidence of the interpretation that US Treasury auctions are special in revealing global demand for long-term bonds. This suggests that Treasury auctions may be an important mechanism for revealing demand effects of slow moving macroeconomic trends about the global demand for long-term bonds, such as trends in inflation (Jotikasthira, Le, and Lundblad, 2015), demographics (Coeurdacier, Guibaud, and Jin, 2015), savings rates (Caballero and Farhi, 2017), and Treasury convenience yields (Du et al., 2025; Jiang, Richmond, and Zhang, 2025b). This empirical fact also supports a growing theoretical literature where global yields are determined by the substitution patterns of global bond investors in response to changes in the quantity of long-term bonds (e.g., Gourinchas et al., 2022; Greenwood et al., 2023).

Second, and more broadly, we also hope to contribute to a large and growing literature on demand based asset pricing[5] by showing how demand curves from auctions can provide

[5]Initially applied to the cross-section of stocks in Koijen and Yogo (2019), the original framework has been adapted to study various asset classes, including equities (e.g., Gabaix and Koijen, 2020; Haddad, Huebner, and

a direct estimate of investors' elasticity of demand. In related work, Eren, Schrimpf, and Xia (2023), Chaudhary, Fu, and Zhou (2024), Jansen, Li, and Schmid (2024), and Fang et al. (2025) apply a demand system to the US Treasury market and provide structural estimates of demand elasticities. A key challenge in this literature is addressing the endogeneity between quantities and prices. Unfortunately, finding valid instruments often proves difficult in practice. To address identification concerns, recent work (see, e.g., Gomez Cram, Kung, and Lustig, 2024; Hartley and Rigon, 2024; Phillot, 2025) uses high-frequency data to extract Treasury supply shocks. An alternative approach is to leverage auction data to directly estimate investors' demand curves without requiring price instruments. For example, Hortaçsu, Kastl, and Zhang (2018) recover bidders' demand curves from US Treasury auctions using a structural model, while Chang (2023), Albuquerque et al. (2024), and Cavaleri et al. (2024) quantify price elasticities directly from Canadian, Portuguese, and Swiss sovereign bond auction bids, respectively. Similarly, Allen et al. (2025b) introduce a framework for estimating demand systems across multiple assets using Canadian auction bidding data. Cole, Neuhann, and Ordoñez (2022) use bid-level data from Mexican government bond auctions and show that asymmetric information about default risk is a key friction in developing sovereign bond markets. Our paper contributes to this strand of the literature by directly estimating US Treasury demand elasticities from auction data.

Lastly, we contribute to the literature on the demand for safe government debt (e.g., Krishnamurthy and Vissing-Jorgensen, 2012; Caballero and Farhi, 2017; Caballero, Farhi, and Gourinchas, 2017; Cavaleri, 2025) and how the demand for safe debt affects both bond yields and exchange rates (e.g., Feunou, Fontaine, and Krohn, 2025; Krohn, Uthemann, Vala, and Yang, 2025; Zou, 2024). Similarly, a large body of work has focused on the role of Treasury securities as the global reserve asset and sought to estimate the effect of this privilege on Treasury yields (see, e.g., Greenwood, Hanson, and Stein, 2015; Du, Im, and Schreger, 2018; Jiang, Krishnamurthy, and Lustig, 2021). Moreover, a series of papers highlights the influence of institutional demand for Treasury yields, such as the Federal Reserve (e.g., Gagnon, Raskin, Remache, and Sack, 2010; D'Amico and King, 2013; Bauer and Neely, 2014; Chris-

Loualiche, 2025b), corporate bonds (e.g., Bretscher, Schmid, Sen, and Sharma, 2025; Chaudhary, Fu, and Li, 2022), and exchange rates (e.g., Koijen and Yogo, 2026; An and Huber, 2024; Camanho, Hau, and Rey, 2022; Jiang, Richmond, and Zhang, 2024b).

tensen and Krogstrup, 2017; Haddad, Moreira, and Muri, 2024), foreign investors (e.g., He, Nagel, and Song, 2022; Jiang et al., 2021; Kekre and Lenel, 2024; Tabova and Warnock, 2021), banks (e.g., Jiang, Matvos, Piskorski, and Seru, 2024a), mutual funds (e.g., Huang, Jiang, Liu, and Liu, 2024; Selgrad, 2024), insurance companies (e.g., Chaudhary, 2024; Jansen, 2024; Koijen and Yogo, 2023), and broker-dealers (e.g., Du, Hébert, and Li, 2023; Greenwood and Vayanos, 2014; Vayanos and Vila, 2021). We contribute to this literature by showing that not just Treasury securities but also Treasury auctions themselves are special compared to auctions of foreign sovereign bonds. The specialness of Treasuries and Treasury auctions shares a common underlying mechanism, which is the demand from global bond investors.

The remainder of this paper is organized as follows. In Section 2 we describe the data and provide institutional details about sovereign bond auctions and global long-term yields. In Section 3, we document and discuss our two core empirical facts about trends in the slope and level of demand for long-term Treasuries at auction. In Section 4 we summarize additional robustness tests. In Section 5 we conclude with policy implications.

2. Data and Institutional Details

In this section, we describe the data that we use for long-term government bond yields and sovereign debt auctions for the US and foreign G10 countries. Specifically, for the G10 we consider the following ten countries: Australia, Canada, France, Germany, Japan, New Zealand, Norway, Sweden, the UK, and Switzerland. In describing the data, we also discuss institutional features of sovereign bond auctions and measures of Treasury market liquidity.

2.1. Interest Rates

We measure interest rates by retrieving long-term government bond yields from Bloomberg and Thomson Reuters Refinitiv. We augment bond yields from Bloomberg with Refinitiv yields if the former are not available on any given day. Specifically, we use 10-year constant maturity sovereign bond yields measured from close-to-close. We have consistent coverage of these yields for the US as well as Australia, Canada, France, Germany, Japan, and the UK over our main sample period from 1 January 1992 to 30 December 2025. For Switzerland,

Norway, New Zealand, and Sweden our sample starts on 1 February 1994, 18 February 1994, 14 July 1994, and 9 May 1997, respectively. For our baseline results we use German 10-year yields as a proxy for EUR yields but our findings are similar when using French yields.

2.2. *Sovereign Bond Auctions*

From 1 January 1992 to 30 December 2025, we collect data on sovereign bond auctions for the US and the same set of G10 countries as above. We have consistent coverage of auctions for the full sample for the US as well as Australia, Japan, New Zealand, and Switzerland. For Canada, France, Germany, Norway, Sweden, and the UK the first available auction is on 28 October 1998, 7 January 1999, 6 January 1999, 24 January 1994, 28 February 1996, and 20 May 1998, respectively. We employ French and German auctions as proxies for Eurozone debt. We define long-term auctions to include issuances of sovereign bonds with a time to maturity of 5-years or more. For US Treasury auctions we restrict our sample to sufficiently large auctions with offering amounts of at least $500 million. We collect these data from the Treasury website of each country. The key pieces of information that we collect for all auctions are the auction date, maturity of the auctioned debt instrument, amount offered and issued. We provide additional information on auction data in Table A.1 in the Online Appendix.

Unique to US Treasury auctions, we have publicly available information on the aggregate demand curve that the Treasury observes at auction. Specifically, the Treasury publishes three data points on the aggregate demand curve: market clearing high yield, median yield (50% of bids), and low yield (5% of bids). The high yield refers to the highest yield (lowest price) accepted by the Treasury. It corresponds to the stop-out rate at which the auction is fully subscribed. Moreover, in a single-price auction the high yield corresponds to the yield that every successful bidder receives. In contrast, at the median (low) yield the Treasury could only allocate 50% (5%) of the offering amount. These data allow us to estimate the elasticity of demand for Treasuries from the slope of the aggregate demand curve at auction (see Section 3.1 for more details). Note that we do *not* have access to any individual demand curves and the three data points on the aggregate demand curve all correspond to competitive winning bids.[6] Hence, we cannot infer individual bidding strategies nor estimate the slope

[6]Winning bids constitute on average 40% of all bids submitted at auction, whereas non-competitive bids make up on average less than 0.5% of the total offering amount.

of individual demand curves.

Table 1: Summary Statistics of US Treasury and Foreign Auctions

	5–7 years			8–10 years			>11 years		
Country	#Issues	Mean	Std.	#Issues	Mean	Std.	#Issues	Mean	Std.
USD	574	31.61	15.34	297	22.22	9.57	306	16.02	4.86
AUD	266	0.55	0.32	407	0.60	0.33	585	0.51	0.29
CAD	181	2.95	0.75	162	2.84	0.84	125	1.58	0.54
CHF	41	0.36	0.23	138	0.39	0.22	319	0.36	0.23
EUR	258	4.34	2.12	631	4.92	2.14	570	2.22	1.17
DEM	171	5.28	1.77	289	5.64	2.14	136	2.51	1.67
FRF	87	2.44	1.38	342	4.30	1.94	434	2.13	0.94
GBP	168	5.12	1.38	205	4.61	0.99	362	3.32	0.96
JPY	123	14.49	8.84	407	17.39	5.82	670	7.26	2.88
NOK	70	0.37	0.19	241	0.43	0.38	46	0.43	0.35
NZD	309	0.10	0.05	440	0.11	0.06	522	0.07	0.04
SEK	175	0.33	0.19	354	0.31	0.15	227	0.40	0.38

Note: This table reports summary statistics of US Treasury and foreign auctions for various maturities: 5–7 years, 8–10 years, and >11 years. *#Issues* is the total number of auctions for a given country and maturity combination. *Mean* and *Std.* are the average and standard deviation (in billion dollars) of the total dollar amount offered for purchase of the security being auctioned. Countries are abbreviated by their domestic currency prior to the formation of the Eurozone (e.g., DEM stands for the German mark and FRF for the French franc). The sample is in event time and spans the period from January 1992 to December 2025.

2.3. Macroeconomic Announcements

We collect data on alternative potential sources of information about the demand for long-term bonds, including US and G10 macroeconomic announcements from Bloomberg's macroeconomic calendar. These macroeconomic announcements include monetary policy, GDP, unemployment and inflation announcements. For the US, we obtain data on macroeconomic disclosure dates for Consumer Price Index growth and unemployment from the Bureau of Labor Statistics (BLS); retrieve information about GDP growth from the Bureau of the Census; and download data on Federal Open Market Committee (FOMC) meetings from the Federal Reserve. The sample period for these macroeconomic disclosure dates matches our main sample running from 1 January 1992 to 30 December 2025.

3. Empirics

In this section, we begin by documenting our two key empirical facts about trends in the slope and the level of the demand for long-term Treasuries at auction. We then compare our

demand elasticity measure to the bid-to-cover ratio and show that changes in this ratio (but not its level) are correlated with auction demand elasticities. We also highlight the role of intermediary constraints and discuss their impact on auction demand elasticities. We then employ a novel identification strategy based on overlapping foreign and Treasury auction days to provide evidence that a decline in foreign demand for Treasuries is one possible reason why auction demand has eroded. Moreover, we explore the implications of declining Treasury demand elasticity for secondary market liquidity. We end with a brief robustness section addressing alternative explanations unrelated to demand.

3.1. Elasticity of Demand at Auction

To establish our first empirical fact, we estimate the slope of the aggregate Treasury demand curve. There are two main approaches in the literature for estimating the slope of the aggregate demand curve: The first one leverages a structural asset demand system to compute *structural* elasticities. Recent examples of this line of work include Eren et al. (2023), Chaudhary et al. (2024), Jansen et al. (2024), Allen et al. (2025b), and Fang et al. (2025). The second approach estimates *observed* elasticities directly from the aggregate demand curve that prevails at auction as in, for example, Albuquerque et al. (2024) and Cavaleri et al. (2024). While both approaches aim to uncover the *true* elasticity of demand for Treasuries, they rest on different assumptions and hence, the resulting estimates carry different interpretations. In particular, conditional on the validity of the underlying assumptions of the asset demand system and with sufficiently granular data, it is possible to uncover investors' willingness to pay while accounting for both bid-shading (see, e.g., Hortaçsu et al., 2018) and cross-asset substitutability (Allen et al., 2025b). Besides being model-free, the main appeal of the latter approach is that it allows the econometrician to directly *observe* time-variation in the auction demand elasticities. Thus, given that our goal is to study the time-varying nature of Treasury demand at auction, we view the second approach as best suited for our purpose.

To implement our empirical approach, we leverage publicly available information disseminated at Treasury auctions that allows us to directly observe the slope of the aggregate demand curve. As discussed in the previous section, we have coarse data on the aggregate bidder demand curve at Treasury auctions. To reiterate, the Treasury provides both quantity

and price information for the market clearing (high) yield, the median yield (50% of bids), and the low yield (top 5% of bids). On average, the market clearing yield is 20 bps and 5 bps higher than the low and median yield, respectively. Figure 1 illustrates an interpolated shape of a hypothetical auction demand curve based on these average spreads.

From the slope of the demand curve, we measure the observed elasticity of demand ($\epsilon_{b,t}$) for all winning bidders at each single-price Treasury auction.[7] The yield elasticity of demand is defined as minus one times the inverse of the slope of the demand curve in Figure 1:

$$\epsilon_{a,\tau} = -\frac{\Delta q_{a,\tau}/Q_{a,\tau}}{\Delta y_{a,\tau}}, \tag{1}$$

where $\Delta q_{a,\tau}$ is half of the auctioned quantity (i.e., offering amount) of Treasuries for tenor bucket τ and auction a, $Q_{a,\tau}$ is the total outstanding Treasuries in tenor bucket τ prior to auction a, and $\Delta y_{a,\tau}$ is the spread between the high yield and the median yield. Hence, more precisely, we measure a semi-elasticity since we do not scale the yield spread by the level of yields.[8] This avoids the issue of near-zero 10-year yields from December 2008 to December 2015 during the Great Recession and March 2020 at the onset of the Covid-19 pandemic. For simplicity we will refer to our measure as the yield elasticity of demand.[9]

The recent literature on demand elasticities (Gabaix and Koijen, 2020; Li and Lin, 2022; Haddad, He, Huebner, Kondor, and Loualiche, 2025a) distinguishes between three types of elasticities: First, micro-elasticities describe how much the relative price of a given Treasury security S changes if investors substitute one dollar out of another Treasury T to buy security S. Second, meso-elasticities capture, for instance, relative changes in the price of short- vs long-duration Treasuries conditional on all other observable characteristics. Third, macro-elasticities evaluate the impact of substitution across asset classes (e.g., investors buying Treasuries with cash). Given that we directly observe parts of the aggregate demand curve for Treasuries at auction, we are able to estimate macro-elasticities. In addition, we also estimate the maturity structure of macro elasticities by splitting our universe of Treasury auctions into

[7] We focus on single-price auctions because in multi-price auctions the incentives for bid shading are high and hence, the observed aggregate demand curve is likely different from bidders' true willingness to pay.

[8] In Section 4 we discuss alternative ways of defining both the numerator and the denominator of Eq. (1).

[9] There are two reasons why we use yields rather than prices. First, yields summarize in a single measure the heterogeneity of features between different debt securities (e.g., maturity, coupon rate). Second, median and low prices are only available for multi- but not single-price auctions, which are the main auction format since 1992.

three tenor buckets: 5 to 7 years, 8 to 10 years, and beyond 11 years.

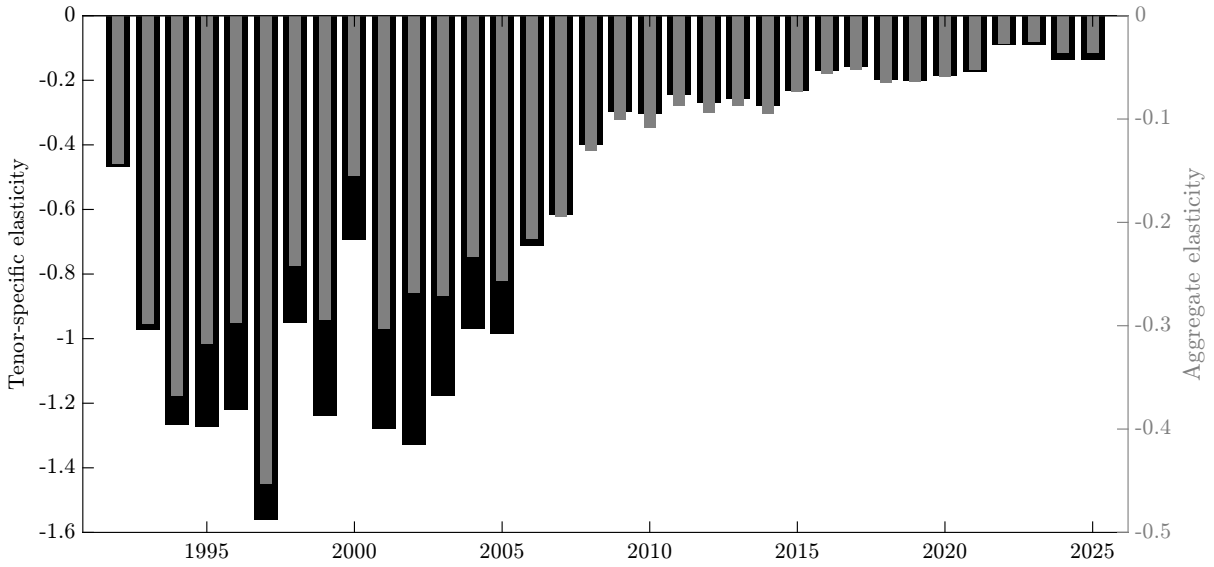
To estimate the yield elasticity of demand, we use the difference between the high-yield and the median-yield (rather than the low-yield) because the median-yield is closest to the market clearing yield and more likely represents bids that may be marginal. Our choice is consistent with Albuquerque et al. (2024) and corresponds most closely to what they label as *subscribed* elasticities using four subscribed price points to the left of the cut-off price. The average spread between the high-yield and the median-yield is just about 5 bps. As a comparison, the standard deviation of daily yield changes is 6 bps. Hence, the median yield is well within the range of typical day-to-day yield variation. Moreover, when using the previous day's yield as a bidding benchmark, we find that the forecast error relative to the median yield is statistically indistinguishable from the forecast error relative to the high yield. This suggests that conditional on pre-auction information, bidding at the median yield constitutes a rational bidding strategy. In contrast, the low-yield corresponds to the 5% lowest yield bids in the auction, and these extremely low bids may stem from inelastic bidders who "free ride" on other bidders in the single-price auction. Recall that in a single-price auction, all accepted bids receive the same market clearing yield.

Elasticity estimates. Figure 2 plots the time variation of investors' yield elasticity of demand at US Treasury auctions from 1992 to 2025. Specifically, we plot the yearly average of elasticities for all auctions (across all maturity buckets) within a given year. While aggregate and tenor-specific elasticities show strong commonality in time-variation (correlation coefficient of 94%), their economic magnitude is markedly different: the aggregate elasticities (right axis) are on average one-third the magnitude of the tenor-specific elasticities (left axis). The average investor elasticity of demand has been decreasing over time. From 1992 to 2010, the average elasticity of demand was -0.8. From 2011 to 2025, the average elasticity of demand was -0.2. The core focus of our analysis is the time series variation in elasticities and hence, we present our main findings based on the tenor-specific elasticities and relegate robustness checks using the aggregate macro elasticities to the Online Appendix.

The recent literature finds a range of elasticity estimates for the US Treasury market. Plante, Richter, and Zubairy (2025) and Furceri, Goncalves, and Li (2025) extend the earlier work by Laubach (2009) and find that a 1 percentage point increase in the debt-to-GDP ratio

raises the 5-year-ahead, 5-year Treasury rate by 2 to 3 bps. Chaudhary et al. (2024), Jansen et al. (2024), and Fang et al. (2025) apply a demand system approach to the US Treasury market and provide structural estimates of demand elasticities that range from 5 to 10 basis points for long-term yields. Indeed, our elasticity estimates correspond on average to a yield multiplier of 8 bps, which is similar to the estimates in these more recent papers. Although there is variation, likely because of data and methodological differences (e.g., instruments and model specifications), it is noteworthy that the estimates generally fall within a similar range, yet they differ substantially from those predicted by the methodology introduced in Laubach (2009). A possible reason for this difference is that the approach in Laubach (2009) estimates the elasticity of the Treasury market as a whole, whereas more recent approaches, including ours, allow researchers to distinguish elasticities across maturities. Thus, a possible conclusion is that while the demand for Treasury bills, which dominate the Treasury market in terms of trading volume and new issuances, has been relatively robust, the demand for notes and bonds has become more fragile since 2010.

Figure 2: Average Yearly Elasticity of Demand at Treasury Auctions



Note: This figure plots the average yearly yield elasticity of demand at Treasury auctions. We measure the elasticity of demand at every Treasury auction following Eq. (1) and we distinguish between aggregate (black bars) and tenor-specific elasticities (gray bars). The sample is yearly and spans from 1992 to 2025.

In Figure 3 Panel A we present more granular estimates of our tenor-specific elasticity for each auction, distinguishing between three maturity buckets. We observe a sharp decline in

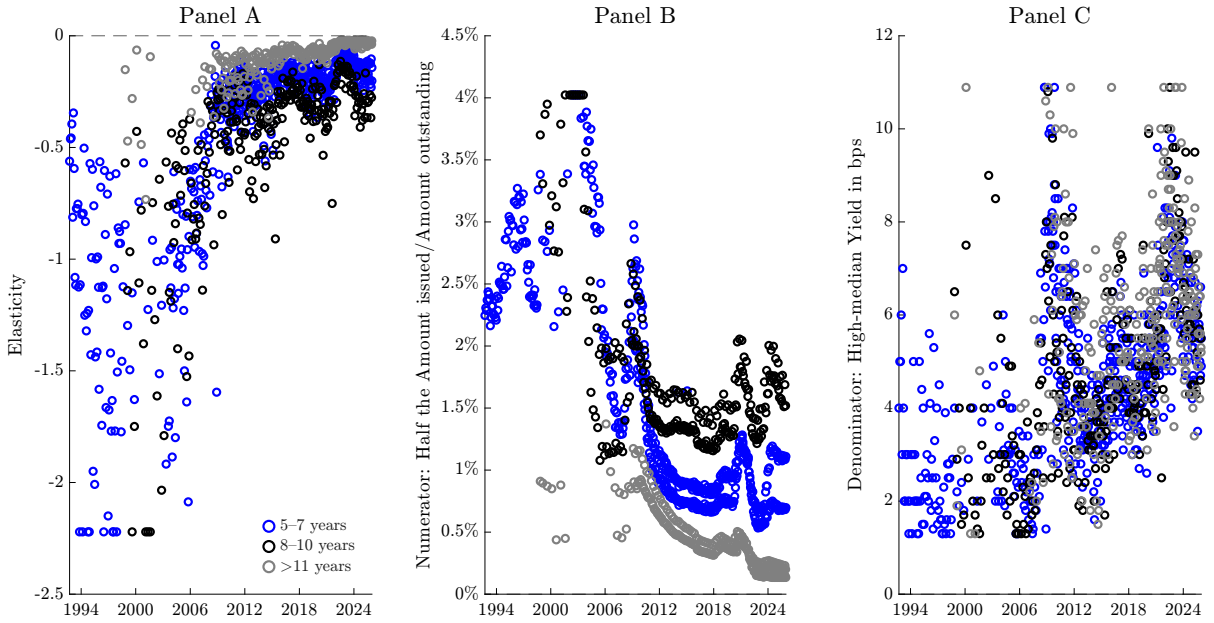
yield elasticities across all three maturity buckets, with 20- and 30-year bonds experiencing the strongest decline. This decline in the elasticity of demand for Treasuries is driven by both changes in quantities and yields. We discuss the impact of these two components in turn.

From the numerator of Eq. (1), we see that the elasticity depends on the size of Treasury auctions relative to the outstanding supply of Treasuries. Figure 3 Panel B shows that the relative size of Treasury auctions has decreased compared to the outstanding stock of Treasuries for each of our three tenor buckets. From 1992 to 2010, a long-term Treasury auction issued on average 2.2% of the total supply of Treasuries within the same tenor bucket. Over 2011 to 2025, this has decreased to on average 0.9%. This decline is not due to Treasury auctions issuing fewer dollars of Treasuries; indeed, over these two periods the size of auctions has roughly doubled. However, the outstanding stock of Treasuries has outpaced this growth, increasing nearly fivefold, and the frequency of auctions has also doubled.

From the denominator of Eq. (1), we also see that the yield elasticity at auction depends on the change in yields along the aggregate demand curve. Figure 3 Panel C shows that the spread between the high-yield and the median-yield has widened over time. From 1992 to 2010, the median spread was 3.2 bps, while over 2011 to 2025 the median spread increased to 5.1 bps. This increase in the spread is especially noteworthy because the level of interest rates has also declined over this period. In sum, the decline in the elasticity of demand for Treasuries is not entirely due to an increase in the total supply of Treasuries (Panel B) because yields have also become more sensitive to auctions (Panel C).

Potential explanations. It is natural to ask *why* the demand for Treasuries has become more inelastic since 2010. Conceptually, there are at least three potential channels at play: First, holding the composition of investors at auction constant over time, some investor groups have become more inelastic. For instance, falling Treasury convenience yields (Krishnamurthy and Vissing-Jorgensen, 2012; Du et al., 2025), fiscal concerns related to the expansion of Treasury supply (Chen et al., 2025), and increased illiquidity in the secondary market (Duffie et al., 2023) may all have played a role. Second, the elasticity of individual investor groups has stayed constant over time but the composition of investors has shifted toward more inelastic bidders (Fang et al., 2025). Lastly, individual bidders' market power and hence, their ability to shade their bids (Hortaçsu et al., 2018) has increased over the years since GFC.

Figure 3: Decomposing the Elasticity of Demand at Treasury Auctions



Note: Panel A plots the yield elasticity of demand at every Treasury auction following Eq. (1) broken down by three maturity buckets. Panel B shows the numerator, that is, half of the amount issued at a given Treasury auction relative to the amount of debt outstanding within a given maturity bucket. Panel C displays the denominator, that is, the spread between the market clearing high-yield and the median-yield (at which 50% of the accepted competitive tenders is reached). We winsorize all variables at the 1% level. The sample is in event time and spans from January 1992 to December 2025.

Isolating any of these effects is challenging empirically due to the endogenous nature of investor participation at auction. In Section 3.3, we overcome this challenge and use an instrumental variable approach to show that foreign investor participation has been a pivotal determinant of auction demand elasticity. Specifically, we find that if foreign and international investors buy 10% less at auction this is associated with a 13 bps decline in the auction demand elasticity, which is about 38% of the average elasticity.

Concerning the first two channels, it is worth noting that the deterioration of auction demand elasticity around the global financial crisis also coincides with dealers participating *less* at Treasury auctions (see Figure B.10) and quantitative easing conducted by the Fed. Is it possible that these shifts in the composition of market participants at auction and in the secondary market have contributed to the negative trend in the elasticity?

Over the past two decades, investment funds have shifted from indirect bidding to direct bidding at auction. In contrast, dealer participation at auction has declined due to tighter reg-

ulatory constraints that reduced the flexibility of dealer balance sheets (Duffie et al., 2023).[10] In sum, both trends may have contributed to a decline in the aggregate demand elasticity since the asset demand of investment funds is generally inelastic due to investment mandates (Koijen and Yogo, 2019), benchmark tracking (Pavlova and Sikorskaya, 2022), and flow induced trading (Gabaix and Koijen, 2020), whereas intermediaries have become relatively more inelastic due to balance sheet constraints (Fleming et al., 2024).

To quantitatively address the role of investor composition at auction and, in particular, the declining dealer share at auction, we compute two boundary cases for which we assume that either dealers or investors (i.e., foreign, direct, and indirect bidders) are perfectly inelastic (i.e., they have an elasticity of zero). Specifically, we rescale our elasticity in Eq. (1) by the inverse of the share of Treasuries purchased by dealers and non-dealers, respectively, at auction. Figure B.9 in the Online Appendix shows that the deterioration of auction demand elasticity in Panel A of Figure 3 has been primarily driven by investors (i.e., investment funds), rather than dealers becoming more inelastic over time.

To assess the impact of the Fed's quantitative easing (QE) and, in recent years, quantitative tightening (QT) policies, we perform a back of the envelope calculation. The argument is that QE has effectively reduced the (net) supply increase of long-term bonds over the period from 2008 to 2014 (and during the Covid-19 pandemic in 2020). Taken at face value, our elasticity estimates imply that after 2010, a 1% increase in the supply of Treasuries relative to the amount outstanding corresponded to a 10 basis point increase in long-term yields. From 2010 to 2025, US debt-to-GDP has increased by about 40 percentage points. Holding demand constant, this supply shift implies a 400 bps increase in long-term yields. In contrast, over the same period, long-term yields only increased by about 210 bps. If we account for the fact that over the same period the Fed has purchased more than 5.6 trillion dollars worth of Treasuries, we find that the net supply increase is only about 20 percentage points, which is associated with a 200 bps increase in long-term yields.[11] In other words, our elasticity estimates are consistent with the Fed buying large quantities of outstanding Treasuries and thereby reducing the size of the (long-term) Treasury supply "shock."

[10] From 2000 to 2025, the primary dealer share of auctioned long-term Treasuries has steadily decreased from 71% to 12%. Allen, Hortaçsu, Richert, and Wittwer (2025a) find similar trends for Canadian Treasury auctions, where the dealer share has declined from around 80% in the early 2000s to about 50% in the early 2020s.

[11] See `https://fred.stlouisfed.org/series/TREAST` for the amount US Treasury securities held by the Fed.

Concerning the third channel, one might wonder whether the negative trend in our auction elasticity estimates may stem from changes in bidders' ability to shade their true willingness to pay. It is worth noting that unlike for most other markets (e.g., Canada or Portugal), bidding at Treasury auction is not restricted to a handful of dealer banks but is open to a broad and relatively large investor base.[12] Thus, in the context of single-price auctions, where each awarded bidder pays the same price, the incentive to shade individual bids is relatively small because individual bidders have a low probability of being marginal (Friedman, 1992). For the US Treasury market, Hortaçsu et al. (2018) provide empirical evidence in favor of this notion. Specifically, they leverage granular Treasury auction level bidding data to show that primary dealers bid on average 1 (4) bps higher yields for Treasury notes than direct (indirect) participants due to their ability to bid-shade. Put differently, primary dealers are able to shade their bids more relative to any other group of market participants. Hence, related to the previous point, a reduction in dealer participation at auction should have resulted in a tighter (rather than wider) median- to high-yield spread. Recent work by Wittwer and Allen (2026) further supports this conclusion by showing theoretically that for single-price auctions tighter intermediary constraints decrease dealers' ability to bid shade. Lastly, motivated by Albuquerque et al. (2024), we show that our results in Section 3.3 are robust to controlling for common empirical proxies of bid-shading (i.e., auction "underpricing" or "tail").

In sum, the negative trend in the elasticity of demand over Treasury auctions corroborates the notion that global investors' demand for Treasuries in the primary market has eroded since 2010. In the following section, we study whether similar trends have been at play in the secondary market following Treasury auctions.

3.2. Changes in the Level of Yields at Auction

For our second empirical fact, we examine changes in the level of secondary market yields over Treasury auctions. Auctions do not reveal any (new) information about supply, but they potentially reveal information about investor demand. Our hypothesis is that if the market is positively surprised by strong auction demand, we expect higher Treasury prices and lower yields. The reverse should hold if the market is negatively surprised. We proceed in two

[12] On April 22, 2004, Under Secretary for Domestic Finance Brian C. Roseboro stated that there were 825 investors making use of the auction system that allows direct bidding.

steps: First, we employ an event study approach to measure changes in long-term yields in a narrow four day window over Treasury auctions. Second, we use regressions to show that yields fall more conditional on unexpected shifts in the demand for long-term bonds, which we proxy using innovations in the bid-to-cover ratio.

3.2.1. Event Study of Yield Changes at Auction

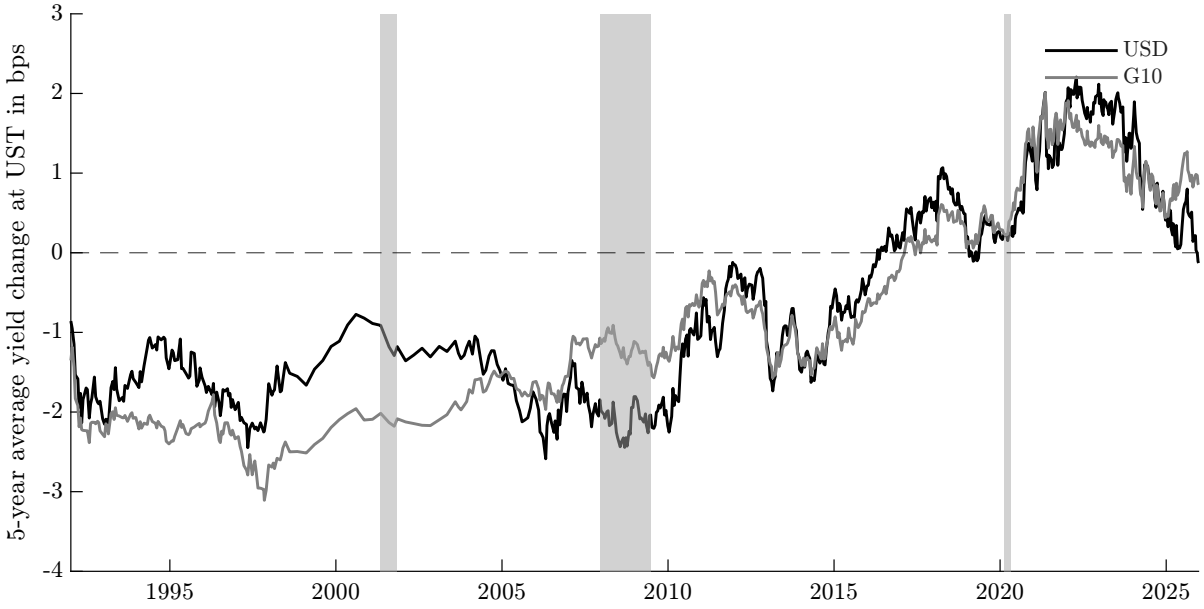
We examine changes in both US and G10 foreign 10-year sovereign bond yields in a 4-day window over US Treasury auctions. Foreign yields provide an ideal placebo setting for US yields: if Treasury auctions reflect global investor demand for long-term sovereign bonds of developed economies, we would expect to see similar post-auction price appreciations across G10 yields. In particular, the 4-day window is symmetric and includes two days before (including the day of the auction) and after the Treasury auction. The reason we look at this particular 4-day window is because we are interested in studying how yields respond after auction demand has materialized. Moreover, our goal is *not* to identify any high-frequency demand shocks but to observe the slow-moving impact of Treasury auctions on long-term yields. Specifically, Ray, Droste, and Gorodnichenko (2024) and Krohn et al. (2025) show that such high-frequency demand shocks are on average zero. One possible explanation is that the majority of foreign bond markets are closed at the time of the Treasury auction, which usually takes place at 1 pm New York time.

For cases where we have overlapping 4-day windows over long-term Treasury auctions, we keep the first 4-day window and exclude the latter from our sample. Such overlapping windows are relatively rare for foreign G10 countries, where we drop on average 29% of long-term auctions, whereas for the US we exclude 40% because of overlaps. Our main sample contains 682 long-term Treasury auctions (that is, with maturities beyond 5 years) because, starting from 1177 auctions in Table 1 (sum the number of issues in the row labeled "USD"), we consolidate 4 auctions that occur on the same day and lose another 491 auctions that occur one day before and one or two days after the Treasury auction. In sum, our 682 long-term US Treasury auction 4-day windows span 32% of all trading days in our sample period from January 1992 to December 2025.

Figure 4 shows a time series plot of changes in long-term bond yields (USD in black and G10 in gray) over Treasury auctions from 1992 to 2025. Specifically, we plot a 5-year moving

average of cumulative changes in long-term yields over our 4-day Treasury auction windows. It is visually apparent that, up until the global financial crisis, both USD and G10 yields have almost always declined over our 4-day window. Specifically, from 1992 to 2010, the yearly average change in long-term bond yields at auction was a negative 1.6 bps for US yields and negative 1.8 for the average G10 yield. In contrast, starting around 2010, this average change switched sign from negative to on average zero from 2011 to 2025. This result is driven by the fact that in several years, the yield change at auction was often positive and economically large. For instance, in 2024 yields on average rose by about 2.5 bps at each Treasury auction.[13]

Figure 4: Long-Term Yield Changes over Treasury Auctions



Note: This figure plots the 5-year average yield change at US Treasury auctions for 10-year USD and G10 yields. Yield changes are cumulated over our 4-day event window that includes two days before (including the day of the auction) and after each Treasury auction. The sample is daily and spans from January 1992 to December 2025.

We interpret our result in Figure 4 through the prism of a quantity-based portfolio choice model with global bond investors and preferred habitat investors (Gourinchas et al., 2022; Greenwood et al., 2023; Zou, 2024). A standard prediction of these models is that a positive bond demand shock lowers bond yields through both the *risk premium* and *convenience yield* channels. The risk premium channel reduces global bond arbitrageurs' exposure to interest rate risk because with rising demand the quantity of bonds that intermediaries must bear to

[13]In Section 4 we consider two alternative measures of yield changes at auctions: when-issued yields and Treasury futures prices.

clear the market decreases. In turn, this reduces intermediaries' risk exposure and lowers the required risk premium on domestic bonds, leading to lower yields in equilibrium. In contrast, the convenience yield channel enhances the value of domestic safe assets. Specifically, an increase in bond demand raises the "convenience yield," capturing a bond's liquidity benefits. This rise in convenience yield further lowers bond yields. It is beyond the scope of the paper to disentangle these two channels and hence, we leave this question for future research.

To better illustrate the difference between these two periods (1992 to 2010 and 2011 to 2025) on an auction by auction basis, we estimate an event-study regression for both periods:

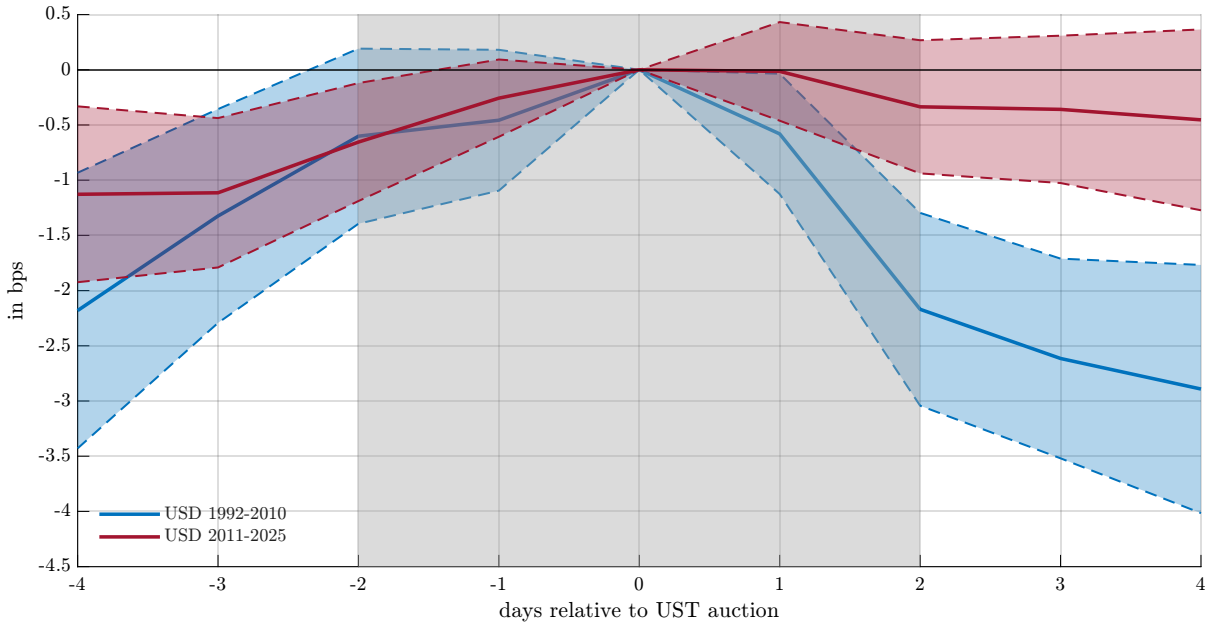
$$\Delta Y_{t,c} = \alpha_c + \sum_{m=M^-}^{M^+} \beta_{c,m} D_{t,m} + \epsilon_{t,c}, \tag{2}$$

where the dependent variable is the change in the 10-year government bond yield of currency c over time interval t. The main regressor is $D_{t,m}$, which is an indicator variable equal to 1 m units of time before and after a long-term Treasury auction at time t and is 0 otherwise. Specifically, time 0 denotes the end of the day of the Treasury auction. The key parameters of interest (the $\beta_{c,m}$'s) are identified from how long-term yields change before and after auctions.

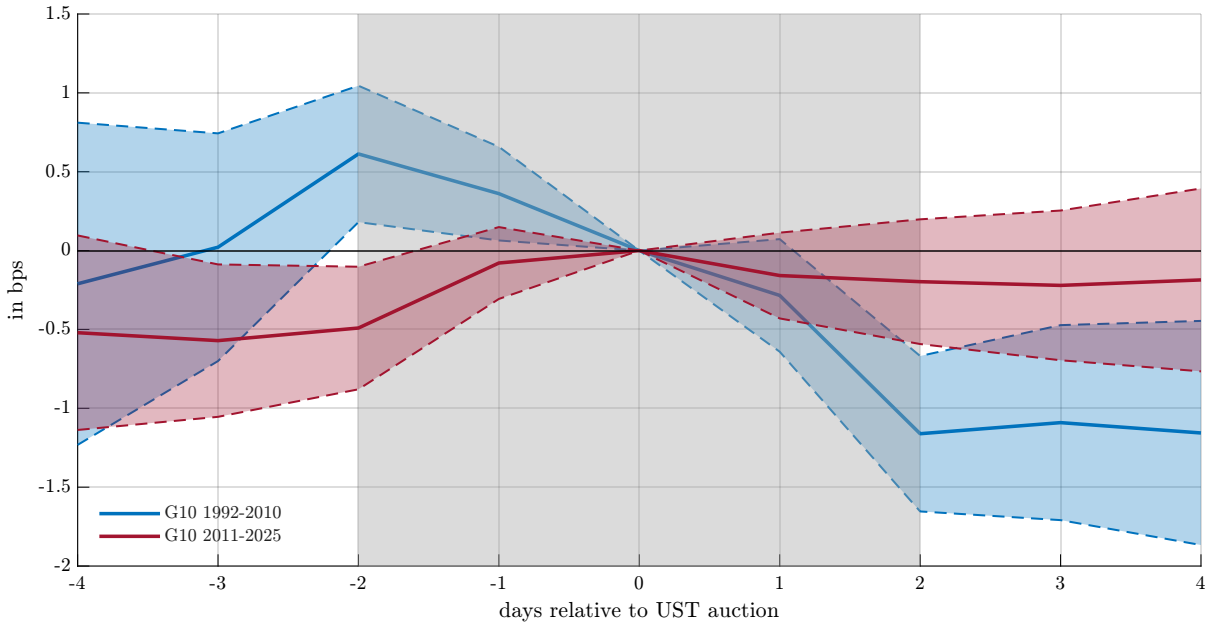
In Figure 5, Panel A plots the event study estimates for the 10-year USD rate across our two sample periods (1992 to 2010 and 2011 to 2025). From 1992 to 2010, USD yields rise by about 0.6 bps in the two days ahead of Treasury auctions (including the day of the auction), and fall by about 2.2 bps the two days after, resulting in a net decline of 1.6 bps per 4-day auction window. This finding is consistent with Lou et al. (2013) whose sample ends in 2008. In contrast, from 2010 to 2025, US long-term yields no longer decline *after* Treasury auctions. Focusing on foreign G10 yields in Panel B, we find no evidence of foreign G10 yields exhibiting any systematic changes before auctions. This result is not surprising given that the rise in yields before Treasury auctions has been associated with the limited risk-bearing capacity of primary dealers (see Fleming et al. (2016) for recent evidence) and is therefore specific to the US market, which heavily relies on the flexibility of dealer balance sheets (Duffie, 2023). Moreover, the decline in yields at auctions also extends to G10 yields, which fall by about 1.8 bps over our 4-day window. However, from 2010 to 2025, G10 long-term yields no longer decline at Treasury auctions.

In sum, the evidence in Figure 5 corroborates our narrative that up until the global fi-

Figure 5: Event Study: USD and G10 Long-Term Rates over Treasury Auctions



Panel A: USD Long-Term Yields



Panel B: G10 Long-Term Yields

Note: Panel A (*Panel B*) plots the cumulative yield changes for 10-year USD (*G10*) interest rates 4 days before and after long-term US Treasury auctions from January 1992 to December 2010 and from January 2011 to December 2025, respectively. The gray shaded area marks our 4-day event window that includes for every long-term Treasury auction two days before and after the auction. Time zero indicates the end of the auction day. The red and blue solid lines indicate the actual cumulative yield change, whereas the red and blue dotted lines indicate 90% confidence bands that are based on Newey and West (1987) standard errors.

nancial crisis, the market has been on average positively surprised by global demand for long-term sovereign debt at Treasury auctions.[14] These positive surprises have been associated with both US and G10 yields falling at auction. In contrast, after the crisis, demand for Treasuries has softened and yields do not fall at auction. Next, we explore whether Treasury auctions have served a special role in revealing information about global investor demand for long-term bonds or whether this is a common feature of sovereign bond auctions.

Table 2: Decline of Long-Term Yields Around Auctions

		UST auctions			Local auctions			
	All days	Prior GFC	After GFC	No auction	Prior GFC	After GFC	No auction	Share in %
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
USD	−0.11	−1.57**	0.32	0.04	−1.57**	0.32	0.04	32.08
	[0.46]	[2.06]	[0.63]	[0.11]	[2.06]	[0.63]	[0.11]	
G10	−0.23	−1.77***	0.29	−0.09	0.09	−0.26	−0.49*	22.21
	[1.35]	[3.98]	[0.82]	[0.43]	[0.32]	[0.79]	[1.88]	
EUR	−0.27	−1.82***	0.56	−0.21	0.25	−0.20	−0.34	23.97
	[1.34]	[3.49]	[1.24]	[0.87]	[0.38]	[0.39]	[1.51]	
AUD	−0.23	−1.66**	−0.08	−0.01	0.84	−0.11	−0.36	19.13
	[0.85]	[2.03]	[0.14]	[0.03]	[0.80]	[0.15]	[1.17]	
CAD	−0.20	−1.60**	0.39	−0.10	1.07	1.15	−0.39	12.49
	[0.84]	[2.34]	[0.78]	[0.35]	[0.98]	[1.44]	[1.52]	
CHF	−0.19	−1.23**	0.30	−0.16	1.03	−2.13	−0.23	6.12
	[0.97]	[2.56]	[0.89]	[0.64]	[1.60]	[1.59]	[1.14]	
GBP	−0.26	−2.51***	0.47	−0.05	1.25	−0.14	−0.37	16.37
	[1.06]	[3.36]	[0.87]	[0.16]	[1.13]	[0.20]	[1.38]	
JPY	−0.16	−1.39***	0.20	−0.04	0.06	0.25	−0.30*	30.10
	[1.17]	[3.02]	[1.08]	[0.21]	[0.16]	[0.94]	[1.78]	
NOK	−0.07	−2.62***	0.58	0.16	1.28	0.59	−0.15	6.89
	[0.32]	[3.78]	[1.26]	[0.56]	[1.01]	[0.66]	[0.61]	
NZD	−0.28	−1.25*	0.09	−0.24	−0.24	−1.04	−0.15	22.89
	[1.15]	[1.67]	[0.17]	[0.79]	[0.28]	[1.62]	[0.53]	
SEK	−0.26	−1.68***	0.05	−0.17	0.01	0.33	−0.36	15.81
	[1.26]	[2.75]	[0.14]	[0.65]	[0.02]	[0.46]	[1.57]	

Note: This table reports the average change in 10-year US and foreign yields in basis points around long-term auctions. *All days* shows the average 4-day change over the entire sample. *UST auctions* shows the average cumulative change during a 4-day window around US Treasury auctions both prior and after the global financial crisis (GFC). We split the sample at the end of 2010. This 4-day window includes two days before and after every long-term Treasury auction. *Local auctions* is defined analogously to *UST auctions* but is based on the long-term auctions of each foreign country and excludes any days that overlap with the 4-day window for US Treasury auctions. For the euro (EUR) we consider both French and German auctions. The column *Share in %* displays the fraction of 4-day windows for both UST and local auctions. The numbers inside the brackets are the corresponding test statistics based on robust standard errors (Newey and West, 1987). Asterisks *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels. The sample is daily and spans from January 1992 to December 2025.

We extend our analysis for US Treasury auctions to foreign sovereign bond auctions. For

[14] In Section 4 we consider alternative sample splits for both yield changes and elasticities at auction based on Treasury implied volatility as well as the level of short-term rates.

each G10 currency, we estimate the change in long-term yields when there is a local sovereign bond auction. For example, for the GBP we measure changes in 10-year GBP yields for long-term Gilt auctions.[15] Table 2 shows the decline in long-term yields over Treasury auctions vs local auctions for each currency both before and after the global financial crisis. Columns 2 and 3 of Table 2 show that the decline in long-term yields over Treasury auctions from 1992 to 2010 occurred for each currency.[16] However, for local currency auctions shown in columns 5 and 6, we find that local auctions are not associated with statistically or economically significant changes in long-term rates.[17] This difference is unlikely to be due to variation in the frequency of foreign auctions (shown in column 8). For instance, 4-day windows around Japanese debt auctions span around 30 percent of our sample period, whereas US Treasury auction windows correspond to 32 percent of all days.

To shed some light on why US Treasury auctions may be special, we examine the differentiating features of US Treasury auctions. Table 1 shows that US Treasury auctions tend to be an order of magnitude larger in size than other sovereign bond auctions of G10 currencies. Similar to how size may be an important feature of US Treasuries in their role as the global reserve asset (He, Krishnamurthy, and Milbradt, 2019), the size of Treasury auctions may also contribute to their informativeness about global investor demand.

To empirically test this hypothesis, we match foreign and US Treasury auctions by size. In particular, within each quarter, we identify days for which multiple foreign countries have auctions for sovereign bonds that are cumulatively similar in size to Treasury auctions. Specifically, we define large foreign auctions as follows: First, we sum up the offering amount across foreign sovereign debt auctions for every given day in our sample. Second, within each quarter, we identify days for which we can find a US auction (within the same quarter) that is no more than $100 million larger than the cumulative foreign offering amount. The average offering amount for these large foreign auctions is $25.3 billion and we are able to match around 24 percent of US Treasury auctions with similar-sized foreign auctions.

[15] For the EUR, we measure changes in 10-year German government bond yields and use German and French sovereign bond auctions. Our results are robust to using French government bond yields instead.

[16] See Figure B.8 in the Online Appendix for event studies akin to Figure 5 but for each G10 currency.

[17] The notable exception is the USD, for which we have already shown that US Treasury auctions matter locally and globally. Note that from the foreign 4-day auction windows, we exclude any days that overlap with the 4-day window for US Treasury auctions. However, even when we include these overlapping days we tend not to find significant changes in foreign yields on foreign auction days.

Figure 6 shows the same event study as in Eq. (2) but conditional on days with large foreign auctions (upper panel) and the matching US auctions (lower panel). Again, we show cumulative yield changes for both 10-year USD and G10 rates four days before and after large foreign sovereign bond auctions and the matching US auctions, respectively. Unlike for the matching sample of US auctions (lower panel), where we find an average decline in both USD and G10 10-year yields of around 1.3 and 0.5 bps, respectively, per 4-day auction window, we find no such consistent pattern for large foreign auctions. G10 yields are on average unchanged over large foreign auctions, while US yields exhibit increases, rather than decreases, of about 1.5 bps. This suggests that it is not the case that large foreign sovereign bond auctions have been particularly informative about positive shifts in global demand for long-term sovereign debt. Moreover, we note that the confidence bands are somewhat wider for the large foreign auctions than the matching US auctions, suggesting that integration of long-term yields tends to be weaker in the presence of foreign auctions.

3.2.2. Comparisons with the Bid-to-Cover Ratio

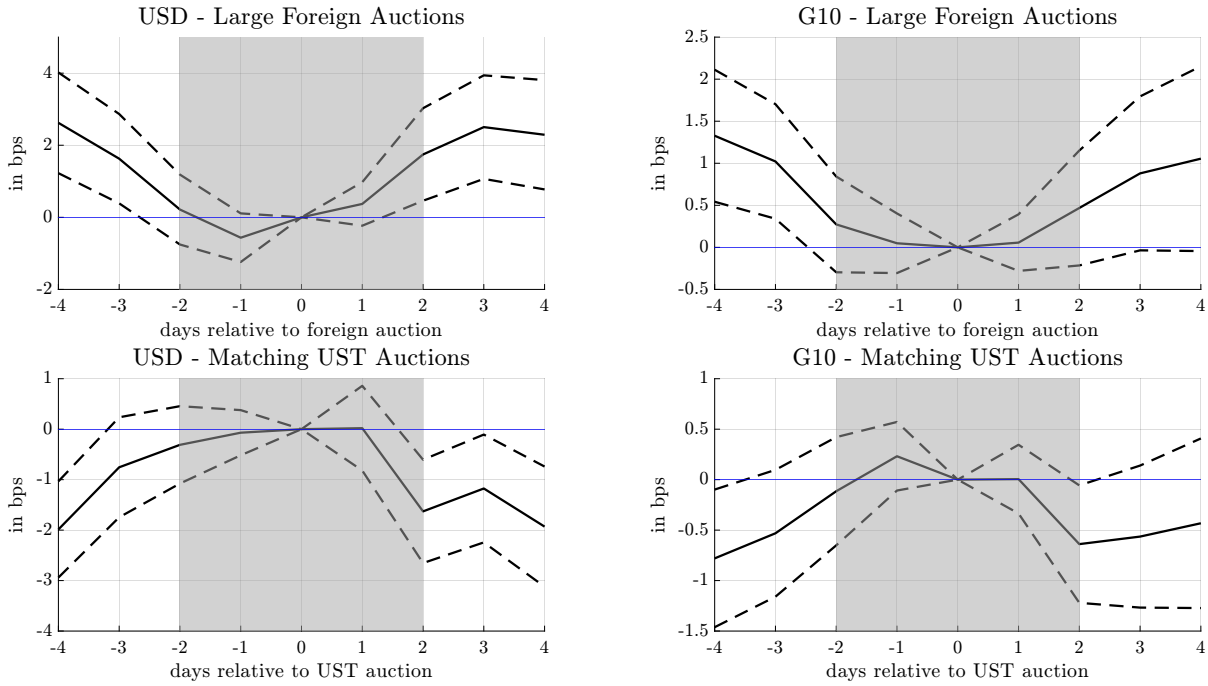
Both changes in the level of yields and the elasticity of demand suggest that there has been a gradual erosion of investor demand for Treasuries at auction since 2010. However, these trends are not apparent in a commonly referenced measure of Treasury market demand, the bid-to-cover ratio. The bid-to-cover ratio is total bids divided by offered amount (these two quantities are depicted in Figure 1).

Figure 7 shows the time series plot of the bid-to-cover ratio at US Treasury auctions from 1992 to 2025. The bid-to-cover ratio has averaged around 2.5 over the sample and does not exhibit a statistically significant time-trend. This may be because primary dealers are required to bid at auction and the Treasury uses the bid-to-cover ratio as the primary indicator of demand for Treasuries.[18] In quarterly meetings with primary dealers, the Treasury Borrowing Advisory Committee regularly seeks input about market demand for Treasuries of various maturities. The Treasury adjusts the maturity structure of its issuance in response to market input, in particular the composition of Treasury bills, notes, and bonds.

Due to Treasury issuance being endogenous to bid-to-cover and requirements of dealers

[18] In the 2024 annual Treasury presentation to the Treasury Borrowing Advisory Committee the level of bid-to-cover is listed as the first demand metric and plotted for various tenor buckets; https://home.treasury.gov/system/files/221/TreasuryPresentationToTBACQ22024.pdf.

Figure 6: Event Study: US and G10 Long-Term Rates at Large Foreign Auctions



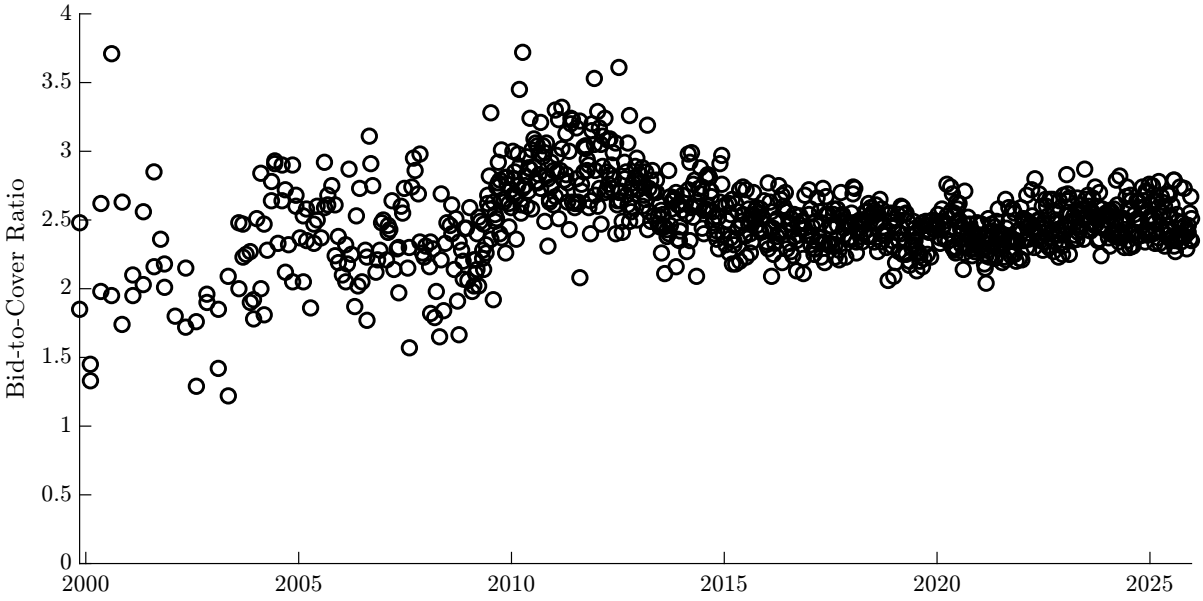
Note: The upper panel labeled *USD - Large Foreign Auctions* plots the cumulative yield change for 10-year USD government bond yields 4 days before and after a large foreign auction. Large foreign auctions are defined as any foreign auction that occurs within the same quarter as the US auction and is not more than $100 million smaller than the closest matching US auction. The gray area marks the 4-day event window that includes for every long-term Treasury auction two days before and after. The panel labeled *G10 - Large Foreign Auctions* is based on foreign G10 government bond yields. The panels labeled *USD - Matching UST Auctions* and *G10 - Matching UST Auctions* are defined analogously based on the closest matching US auctions. Time zero indicates the end of the auction day. The black solid lines indicate the actual cumulative yield change, whereas the black dotted lines indicate 90% confidence bands that are based on Newey and West (1994) standard errors. The sample is daily and spans from January 1992 to December 2025.

to bid at auction, the bid-to-cover ratio may not capture long-term trends in demand for Treasuries. However, Ray et al. (2024) show that high-frequency changes in the bid-to-cover ratio are informative about demand shocks at US Treasury auctions. Thus, we can use this measure to empirically test whether the changes in the level of US and G10 yields over Treasury auctions are associated with demand shocks. Specifically, we use the bid-to-cover ratio to measure demand shocks by using the innovations to an autoregressive model with 3 lags:

$$B2C_{a,\tau} = \alpha + \sum_{t=1}^{3} \beta_t B2C_{a-t,\tau} + \epsilon_{a,\tau}, \tag{3}$$

where $B2C_{a,\tau}$ is Treasury auction a for tenor bucket τ and is regressed on the three previous

Figure 7: Bid-to-Cover Ratio



Note: This figure plots the time series of the bid-to-cover ratio at Treasury auctions. The sample is in event time and spans from November 1999 to December 2025. Note that we remove one outlier on September 28, 1994, which is the only data point that we have from the Treasury prior to November 1999.

Treasury auctions for the same tenor bucket.[19]

Table 3 summarizes the relations across our key variables in both levels and changes (i.e., AR(3) residual): 4-day yield changes around auctions, the bid-to-cover ratio, and the elasticity of demand. There are three main observations: First, the correlation between yield changes and surprises in yield changes is close to one, which is in line with interest rates following a first order autoregressive process. Second, in line with our prior, the association between yield changes and the bid-to-cover ratio is negative, whereas yield changes and demand elasticity are positively correlated. Put differently, stronger demand at auctions is associated with a larger decline in yields, whereas a more inelastic market is associated with rising rather than falling yields. It is worth noting that the correlations are somewhat larger in changes than in levels. Lastly, the correlation between the elasticity of demand and the bid-to-cover is close to zero in levels but strongly negative in changes. We interpret this as evidence that high-frequency changes to the bid-to-cover ratio capture demand shocks, whereas low-frequency

[19]We choose 3 lags because the autocorrelation function of the bid-to-cover ratio flattens out beyond 3 lags. The autocorrelation of the estimated residualized bid-to-cover ratio is statistically indistinguishable from zero across all maturity buckets. Our core findings are qualitatively similar when using only 1 lag or up to 6 lags.

Table 3: Yield Changes, Bid-to-cover Ratio, and Elasticity at Treasury Auctions

	Yield change	Bid-to-cover	Elasticity	Yield change AR(3)	Bid-to-cover AR(3)	Elasticity AR(3)
Yield change	100.00					
Bid-to-cover	−7.45	100.00				
Elasticity	11.87	−1.15	100.00			
Yield change AR(3)	98.33	−6.78	11.24	100.00		
Bid-to-cover AR(3)	−9.82	76.30	−11.55	−9.82	100.00	
Elasticity AR(3)	13.91	−16.58	52.76	14.56	−34.53	100.00

Note: This table shows the correlation between changes in the 10-year US Treasury yield measured over our 4-day window (two days before and after a Treasury auction), the bid-to-cover ratio, and the yield elasticity. We also report correlations for AR(3) innovations (computed maturity bucket by bucket) in yield changes, bid-to-cover ratio, and elasticity. The sample is in event time and spans all long-term Treasury auctions (not just the ones occurring at least two business days apart) over the period from November 1999 to December 2025.

trends do not capture the erosion in Treasury demand.

Next, we estimate the association between changes in long-term yields over US Treasury auctions and surprise demand at auctions for each currency c:

$$\Delta y_{a,c} = \alpha_c + \beta_i B2C_a^s + \epsilon_{a,c}, \tag{4}$$

where $\Delta y_{a,c}$ is the 4-day window change in 10-year yields for currency c over US Treasury auction a and the primary explanatory variable of interest is the innovation in the bid-to-cover ratio of US Treasury auction a, that is, $B2C_a^s$.

The first column of Table 4 reports the β_i estimates for each currency. We find a negative relationship between surprise demand at auction and changes in long-term yields for all currencies and a significantly negative relationship for the USD, AUD, CHF, JPY, NOK, and SEK. When demand at auction is surprisingly strong, long-term yields tend to decline even more. To show the economic magnitude of the effect, we split the sample into high-demand and low-demand auctions. High-demand auctions have above median bid-to-cover surprise, while low-demand auctions have below median bid-to-cover surprise. We find that the declines in long-term yields for the USD and G10 tend to be concentrated in auctions with surprisingly high demand (column labeled *High* $B2C^s$). Over high demand auctions, long-term yields on average fall by 1.61 bps for the USD and 1.1 bps for the G10, while for low demand auctions, long-term yields on average do not significantly decrease or increase.

As a placebo test, we consider the predictable component of Treasury auction demand for

Table 4: Decline of Long-Term Yields Around Auctions — Bid-to-Cover Ratio

	$B2C^s$	High $B2C^s$	Low $B2C^s$	High−Low $B2C^s$	$\widehat{B2C}$	High−Low $\widehat{B2C}$
USD	−1.72***	−1.61**	1.18*	−2.80***	0.76	1.04
	[3.68]	[2.56]	[1.84]	[3.20]	[1.41]	[1.15]
G10	−0.66**	−1.10***	0.24	−1.34**	0.75***	0.50
	[2.34]	[2.92]	[0.64]	[2.53]	[2.85]	[0.95]
EUR	−0.82	−1.20*	0.24	−1.43	−0.03	−1.08
	[1.55]	[1.65]	[0.35]	[1.48]	[0.05]	[1.09]
AUD	−1.06***	−1.01*	1.05*	−2.06***	0.54	0.92
	[2.85]	[1.81]	[1.88]	[2.62]	[1.23]	[1.09]
CAD	−0.20	−0.36	0.20	−0.56	0.61*	0.76
	[0.69]	[0.88]	[0.47]	[1.02]	[1.83]	[1.29]
CHF	−0.92**	−1.55***	0.89	−2.44***	0.54	0.80
	[2.19]	[2.71]	[1.42]	[3.10]	[1.14]	[0.98]
GBP	−0.21	−0.24	0.17	−0.41	0.02	−0.39
	[0.97]	[0.95]	[0.61]	[1.05]	[0.09]	[1.12]
JPY	−1.18***	−1.26**	0.79	−2.05**	0.81*	0.95
	[2.58]	[2.11]	[1.41]	[2.57]	[1.68]	[1.12]
NOK	−0.78*	−0.79	0.44	−1.24	0.15	0.26
	[1.68]	[1.26]	[0.71]	[1.40]	[0.33]	[0.27]
NZD	−0.43	−0.96*	0.35	−1.30*	0.34	−0.11
	[1.23]	[1.91]	[0.63]	[1.87]	[0.86]	[0.16]
SEK	−0.71**	−0.91**	0.57	−1.48**	0.41	0.34
	[2.30]	[2.14]	[1.31]	[2.57]	[1.22]	[0.54]

Note: This table reports the average change in 10-year US and foreign yields in basis points conditional on various sample splits and regressions. *Bid-to-cover*^{s} *(*$B2C^s$*)* shows the standardized point estimate of a univariate regression of the cumulative 4-day change in the 10-year yield (two days before and after an auction) on AR(3) surprises in the bid-to-cover (B2C) ratio. *High* $B2C^s$ and *Low* $B2C^s$ show the average cumulative yield change conditional on high and low B2C 3-day auction windows, respectively. The cutoff values are based on the median surprise. *High*−*Low* $B2C^s$ computes the difference between the columns *High* $B2C^s$ and *Low* $B2C^s$. $\widehat{B2C}$ and *High*−*Low* $\widehat{B2C}$ are analogous to columns *Bid-to-cover (*$B2C^s$*)* and *High*−*Low* $B2C$ but the difference is that the $\widehat{B2C^s}$ designates the AR(3) fitted value rather than residual. The numbers inside the brackets are the corresponding test statistics based on robust standard errors (Newey and West, 1987). The row G10 is estimated from a panel regression of 9 foreign rates and the test statistics are based on Driscoll and Kraay (1998) standard errors. Asterisks *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels. The sample is daily and spans from November 1999 to December 2025.

which we find no significant *negative* association with changes in long-term yields at auctions (column labeled $\widehat{B2C}$). Moreover, the difference between high and low residual bid-to-cover auctions is either insignificant or positive for both the USD and G10 currencies (column labeled *High*−*Low* $\widehat{B2C}$). Overall, the evidence in Table 4 is in line with the notion that asset prices respond to news that is unanticipated and unpredictable using past information.

Figure 8 visualizes the event study estimates Eq. (2) for the USD and G10 10-year yields for high-demand and low-demand Treasury auctions, which we identify based on median

surprise.[20] We show the four days before and after the Treasury auction (time zero). For high-demand Treasury auctions, we find no evidence of any pre-trends; long-term yields decline over the auction window and subsequently level off. In other words, high auction demand mitigates the need for intermediaries to absorb excess supply, alleviating pre-auction downward pressure while fueling post-auction price appreciation (Fleming et al., 2016). Notably, much of the decline in USD and G10 yields occurs on the second trading day after the auction, not immediately at the auction. This is consistent with two institutional details about US Treasury auctions that may contribute to more gradual adjustments. First, primary dealers gradually offload their inventory after auctions to investors (Fleming et al., 2024), resulting in elevated levels of secondary market trading volume during our four day event window (see Figure A.1 in the Online Appendix). Such intermediation may pose a friction to Treasury yields responding to investor demand immediately after the auction. Second, the auctions occur at 1 pm New York time, when European and Asian bond markets are closed. As we discuss in the next section, foreign demand is important for explaining the specialness of Treasury auctions. This suggests that taking too narrow of a window around the Treasury auction may miss much of the economic effect of the auction on yields. Indeed, Ray et al. (2024) find no average change in US yields for a narrow 10-minute window before and after Treasury auctions.

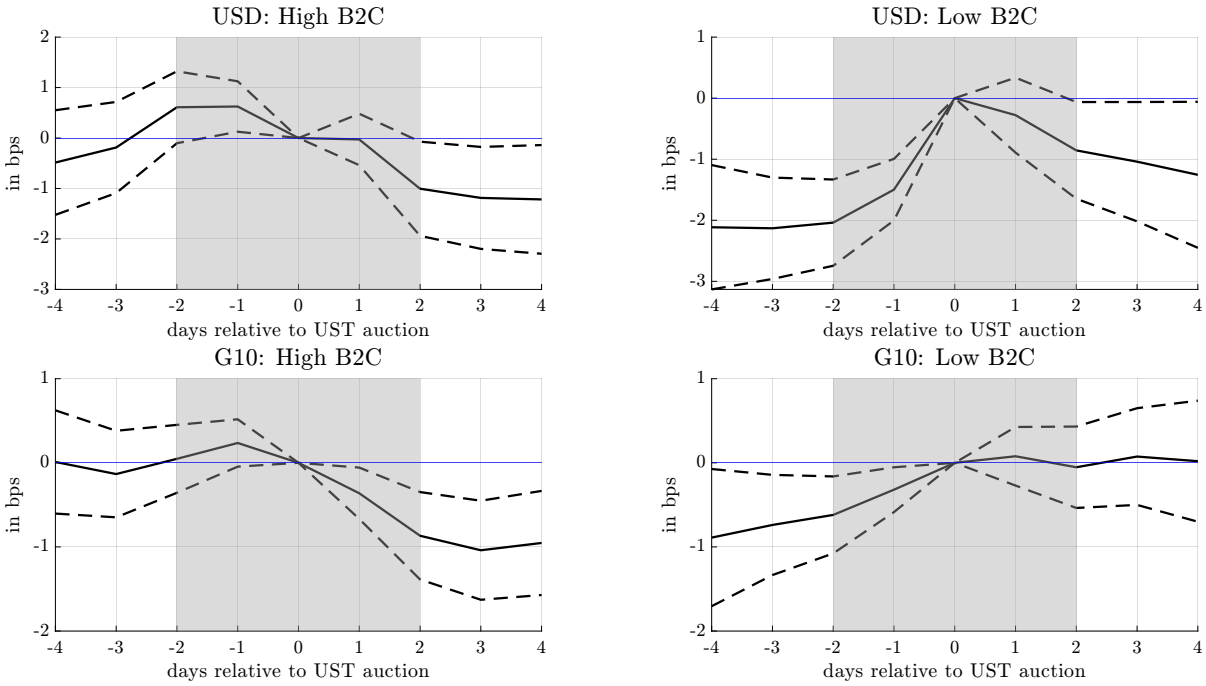
The right two panels in Figure 8 show that for low-demand auctions, USD long-term yields exhibit a hump shape and G10 yields are flat. The hump shape in US long-term yields likely reflects intermediation spreads (Lou et al., 2013), especially since primary dealers make up a larger share of bids for low-demand auctions.[21] Meanwhile, for G10 yields where there is no need for primary market intermediation, we find no hump shape and on average no change in the 10-year yield. In Figure B.7 in the Online Appendix we repeat the exercise in Figure 8 but exclude foreign auctions that overlap with Treasury auctions and find qualitatively similar results.

In sum, we have shown that high-frequency changes to the bid-to-cover ratio suggest that the US and G10 yield declines over Treasury auctions are driven by investor demand

[20] In Section 4 we also consider alternative sample splits based on AR(3) innovations of the observed yield elasticity as well as the high-median yield spread realized at each Treasury auction.

[21] Primary dealer share is around 1.75 percentage points higher at auctions with above median surprise bid-to-cover ratios. The difference corresponds to about 9 percent of the standard deviation of primary dealer share.

Figure 8: Event Study: US and G10 Long-Term Rates at Treasury Auctions



Note: The panels labeled *USD* plot the cumulative yield change for 10-year USD government bond yields 4 days before and after a long-term US Treasury auction. The gray area marks the 4-day event window that includes two days before and after every long-term Treasury auction. The panels labeled *G10* are based on foreign G10 government bond yields. Time zero indicates the end of the auction day. "High B2C" and "Low B2C" periods are defined based on the AR(3) surprise component in the bid-to-cover ratio and cutoff values are based on the median surprise. The black solid lines indicate the actual cumulative yield change, whereas the black dotted lines indicate 90% confidence bands that are based on Newey and West (1994) standard errors. The sample is daily and spans from January 1999 to December 2025.

at auction. However, the bid-to-cover ratio does *not* capture the gradual erosion of demand for Treasury at auction. This may be because the bid-to-cover ratio is closely monitored by the Treasury and that primary dealers are required to bid at auction. Specifically, while the overall bid-to-cover ratio at auction has been close to 2.5 over the full sample period the ratio of tendered-to-accepted bids by primary dealers has increased from 3.8 before the global financial crisis to 7.4 after.

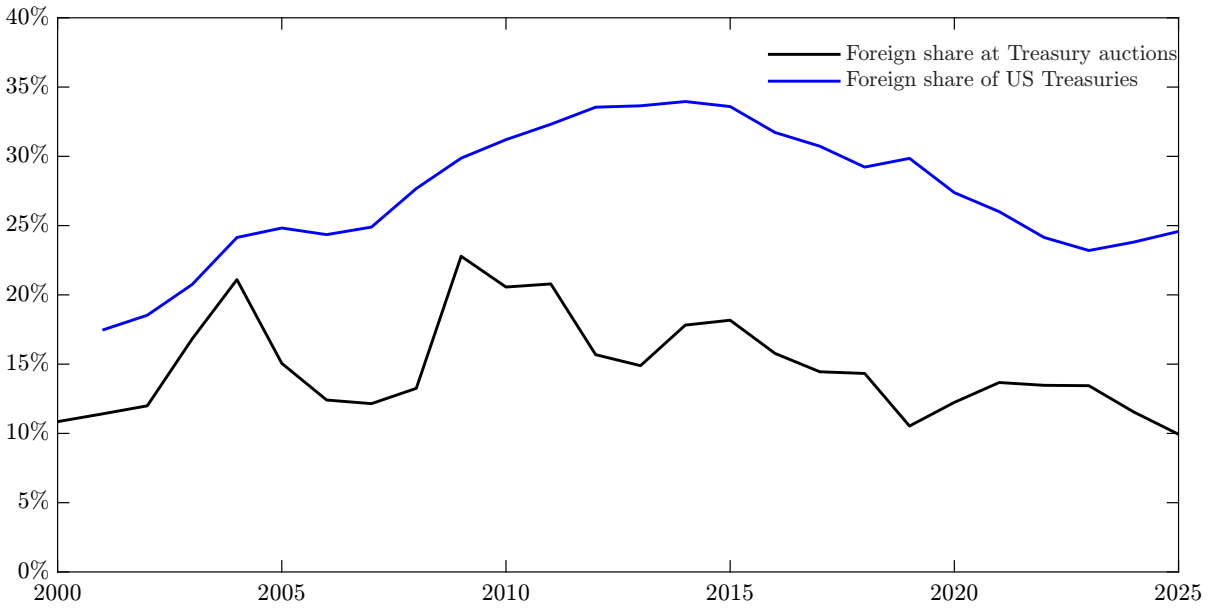
3.3. Foreign Demand for Treasuries

So far, we have shown that changes in the level of yields over auctions and the elasticity of investor demand suggest a gradual erosion of the demand for Treasuries since 2010. As outlined in Section 3.1 there are many plausible reasons why the demand for Treasuries at

auction has deteriorated over the past one and a half decades. In this section, we provide suggestive evidence in favor of the notion that foreign investor demand for Treasuries has been a pivotal determinant of this negative trend in auction elasticities.

Figure 9 shows the trend in the foreign share of outstanding Treasuries (including intergovernmental holdings) and auctioned Treasuries. The foreign share of outstanding Treasuries peaked at 34% in 2015 and has since declined to 24% as of 2025. This peak occurred even earlier for the largest two foreign investors in US Treasuries, China and Japan, which peaked at 15% in 2011 and their share has since more than halved. Similarly, the foreign share of long-term Treasuries at auction peaked at 23% in 2009 and has more than halved by 2025.[22] Although these two contemporaneous trends, declining foreign ownership and weaker aggregate demand at auction, are suggestive of a relationship, they are far from causal.

Figure 9: Foreign Investor Participation at Auctions and Foreign US Treasury Holdings



Note: This figure plots the yearly average share of Treasuries purchased by foreign and international investors at any US Treasury auction (not just long-term auctions) and the yearly average share of US Treasuries held by foreigners. The underlying data stem from the Treasury International Capital (TIC) System and the US Treasury, respectively. The sample is yearly and spans from 2000 to 2025.

To examine whether foreign investor participation at Treasury auctions is important for demand, we instrument for their participation using plausibly exogenous variation in auc-

[22]Note that Figure 9 plots the foreign share of Treasuries outstanding, which includes short-term Treasuries. We find similar trends when we only focus on long-term Treasuries, for which we can only distinguish foreign ownership in Treasury bills, notes, and bonds for a shorter sample, starting in 2011.

tion schedules. For some US Treasury auctions, there is an overlapping foreign sovereign bond auction that occurs on the same day. Due to home-bias, we expect foreign investors to participate less at US Treasury auctions when there is a contemporaneous foreign sovereign bond auction. Maggiori, Neiman, and Schreger (2020) document such home-bias in the portfolios of global bond investors: they tend to hold a portfolio of local currency bonds and US Treasuries. We measure the overlap of foreign sovereign bond auctions as

$$Overlap_{a(t)} = \frac{\sum_c q_{a(t),c}}{q_{a(t)}}, \tag{5}$$

where $q_{a(t),c}$ is the dollar quantity of foreign sovereign bonds auctioned on date t for currency c, and $q_{a(t)}$ is the dollar quantity of US Treasuries auctioned on the same date t. For example, on April 24, 2025, the Treasury auctioned $44 billion of a 7-year Treasury note, while Canada, UK, and New Zealand also had long-term sovereign bond auctions for $3.8, $2.9, and $0.3 billion, respectively. This yields an overlap of 13.7%, that is, the US Treasury auction accounted for the bulk of the issuance on that day. For 26.9% of US Treasury auction days, there is no overlap. A one standard deviation increase in $Overlap_{a(t)}$ is 12.8%.

For each Treasury auction, there are four main groups of investors: dealers and brokers, investment funds, foreign and international, and other participants.[23] For each investor group, we estimate the following regression:

$$Share_{a(t),i} = \alpha_{y(t),i} + \beta_i Overlap_{a(t)} + \epsilon_{a(t),i}, \tag{6}$$

where the dependent variable is the share of long-term Treasuries bought at auction $a(t)$ on a given date t by investor group i, $\alpha_{y(t)}$ is a year-fixed effect, and $\text{Overlap}_{a(t)}$ is the dollar-weighted overlap defined in Eq. (5).

Table 5 shows how investor group shares at auction respond to overlapping foreign auctions. For a one standard deviation increase in $Overlap_{a(t)}$, foreign investor share decreases by 1.3 percentage points, which is 8.1% of their average share. The instrument is strongly relevant: the F-stat is 20, which is above the conventional threshold of 10. This decrease in foreign investor participation is primarily offset by a greater share for dealers and brokers and

[23]Other participants include System Open Market Account (SOMA) banks, depository institutions, private individuals, and non-bank financials.

investment funds. The changes in shares (the β_i coefficients) sum to zero by market clearing.

Table 5: Overlapping Long-Term Auctions and Treasury Auction Participation

	Foreign and international	Dealers and brokers	Investment funds	Others
$\text{Overlap}_{a(t)}$	-1.258^{***}	1.251^{***}	0.193	-0.019^{**}
	[4.674]	[2.874]	[0.626]	[2.148]
Overall R^2 in %	30.92	84.84	86.63	20.18
Year FE	yes	yes	yes	yes
#Obs	1010	1010	1010	1010

Note: This table reports estimates from a regression of the form $Share_{a(t),i} = \alpha_{y(t),i} + \beta_i Overlap_{a(t)} + \epsilon_{a(t),i}$, where the dependent variable is the share (in percentage points) of long-term Treasuries bought at auction $a(t)$ on a given date t by investor group i, $\alpha_{y(t)}$ is a year-fixed effect, and $\text{Overlap}_{a(t)}$ is the dollar-weighted overlap defined in Eq. (5). The investor groups are listed in the column header and include dealers and brokers, investment funds, foreign and international, and other participants (i.e., SOMA banks, depository institutions, private individuals, and non-banks financials). All regressors are measured in units of standard deviations. The numbers inside the brackets are the corresponding test statistics based on heteroskedasticity robust standard errors that are clustered by year. Asterisks *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels. The sample is in event time and spans the period from January 2000 to December 2025.

Next, we estimate how foreign investor demand for Treasuries at auction impacts yields and the elasticity of demand:

$$Y_{a(t)} = \alpha_{y(t)} + \beta Share_{a(t),f} + \epsilon_{a(t)}, \tag{7}$$

where $Y_{a(t)}$ is the change in the 10-year Treasury yield measured over our 4-day window (two days before and after a Treasury auction), or the elasticity of demand at auction or the bid-to-cover ratio at auction $a(t)$. $Share_{a(t),f}$ is the share of long-term Treasuries bought by foreigners at auction. Panel A in Table 6 shows the OLS estimates and the IV estimates, for which we use overlapping foreign auctions to instrument for foreign investor share. Panel B adds the difference between the market clearing high yield and the prevailing yield in the when-issued market (i.e., "auction tail") one day prior to the auction as a control variable for bid-shading (Hortaçsu et al., 2018; Albuquerque et al., 2024). Our results remain both qualitatively and quantitatively similar to the baseline specification in Panel A.

The primary endogeneity concern with the simple OLS estimate is demand shocks of other investor groups. For example, if domestic investors have a positive demand shock for US Treasuries, then the foreign share decreases and yields fall. More generally, since shares

Table 6: Foreign Investor Share and Treasury Auction Demand

Panel a)	(1)	(2) OLS	(3) IV	(4) OLS	(5) IV	(6) OLS	(7) IV
	$Share_{a(t),f}$	Yield change	Yield change	Elasticity	Elasticity	Bid-to-cover	Bid-to-cover
$Overlap_{a(t)}$	−1.258***						
	[4.674]						
$Share_{a(t),f}$		−0.088	−0.426*	−0.762***	−1.278**	0.917***	0.446
		[0.952]	[1.847]	[4.404]	[1.981]	[6.654]	[0.789]
Overall R^2 in %	30.92	3.39	N/A	70.32	N/A	47.12	N/A
Year FE	yes	yes	yes	yes	yes	yes	yes
#Obs	1010	1010	1010	1010	1010	1010	1010
Panel b)	(1)	(2) OLS	(3) IV	(4) OLS	(5) IV	(6) OLS	(7) IV
$Overlap_{a(t)}$	−1.290***						
	[4.791]						
$Share_{a(t),f}$		0.047	−0.574**	−0.681***	−1.398**	0.783***	0.610
		[0.539]	[2.507]	[3.800]	[2.111]	[6.116]	[1.129]
$Tail_{a(t)}$	0.966***	−0.879***	−0.876***	−0.603***	−0.741***	1.161***	1.311***
	[3.413]	[12.018]	[10.379]	[3.353]	[3.834]	[6.895]	[7.447]
Overall R^2 in %	32.70	20.47	N/A	71.21	N/A	51.07	N/A
Year FE	yes	yes	yes	yes	yes	yes	yes
#Obs	1000	1000	1000	1000	1000	1000	1000

Note: This table reports estimates from a regression of the form $Y_{a(t)} = \alpha_{y(t)} + \beta Share_{a(t),f} + \gamma Tail_{a(t)} + \epsilon_{a(t)}$, where $Y_{a(t)}$ is the change in the 10-year Treasury yield measured over our 4-day window (two days before and after an auction), the elasticity of demand at auction (see Eq. (1)) or the bid-to-cover ratio at auction $a(t)$. $Share_{a(t),f}$ is the share of long-term Treasuries bought by foreigners at auction. $Tail_{a(t)}$ is the difference between the market clearing high yield and the prevailing yield in the when-issued market the day prior to the auction. $\alpha_{y(t)}$ is a year-fixed effect and $Overlap_{a(t)}$ is the dollar-weighted overlap defined in Eq. (5). The regressor in column 1 is measured in units of standard deviations. The numbers inside the brackets are the corresponding test statistics based on heteroskedasticity robust standard errors that are clustered by year. Asterisks *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels. The sample is in event time and spans the period from January 2000 to December 2025.

sum up to one, the demand shocks of other investor groups would positively bias the OLS estimates to zero. The calendar schedules of US and foreign sovereign bond auctions are set far in advance of the auction and therefore, not endogenous to such investor demand shocks.

For changes in the level of long-term yields over Treasury auctions, the OLS estimates show a negative but insignificant association between foreign share and yield changes. Table 6 column 2 shows that for a one percentage point increase in foreign share, yields tend to fall by −0.088 bps. When we instrument for foreign share using variation in overlapping auctions in column 3, we find a more negative relationship between foreign share and yield changes. This positive bias to the OLS estimate is consistent with the endogeneity of foreign share to other investor demand shifts. For a one percentage point increase in foreign share due to

exogenous variation in auction schedules, yields on average fall by an additional -0.426 bps. This effect is statistically only weakly significant but economically large: a standard deviation of foreign share is 7.3%, corresponding to a 3.1 bps effect on yields, which is roughly seven times the average change in yields over auctions and around half of their standard deviation. Put differently, if foreigners were to buy all of the issuance at auction, corresponding to 1% of the amount outstanding, long-term yields would decrease by around 9 bps, which is in line with the average yield multiplier of 8 bps that we measure at auction.[24]

For the elasticity of demand, we similarly find that foreign demand at auction causes a more elastic aggregate demand curve. From the IV estimates, we show that a one percentage point increase in foreign share from our demand shift instrument is associated with a demand elasticity that is 1.278 bps more negative. Recall that a more negative elasticity means that the slope of the demand curve is flatter, that is, yields are less sensitive to issuance quantity. This effect is roughly twice as large as that of the OLS estimates, which is consistent with positive bias due to endogenous demand shocks to other investors. This effect is also economically large, where a one standard deviation of foreign share corresponds to a 9.3 bps effect on the elasticity, which is about 51% of the average elasticity from 2011 to 2025.

For comparison, we also estimate the effect of foreign demand on bid-to-cover. We find a positive association between foreign share and the bid-to-cover ratio, meaning that there is more bidding when foreign demand is relatively high. Furthermore, the OLS estimated coefficient is close to 1, suggesting that for a \$1 increase in the foreign share of accepted bids, total bidding also increased by \$1. This ratio is much lower than the average bid-to-cover ratio of 2.5, suggesting that there may be a negative correlation between foreign and domestic investor demand shocks. This negative correlation is consistent with a "home flight" effect of uncertainty shocks. Giannetti and Laeven (2012) document that global investors tend to retrench to home markets in response to financial crises. Perhaps surprisingly, there is a positive bias to the OLS estimates. In contrast, the IV estimates show a smaller and insignificant positive association between bid-to-cover and foreign demand. This further highlights the potential endogeneity of the aggregate quantity of bidding, which may be explained by broker

[24] Yields fall by an additional 0.426 bps over our four day window if foreigners buy 1% more at auction, corresponding to a 0.107 bps decline per day. The average auction issuance size (over the full sample) relative to the amount of long-term debt outstanding is around 1.2% (see Figure 3). Hence, if foreigners buy the entire issuance amount at auction, yields fall by an additional $0.107/1.2 \times 100 = 9$ bps.

dealers being required to submit bids for auctions that experience low demand.

As mentioned above, there are several other factors that may have also contributed to the decline in investor demand for Treasuries. Our goal is not to rule out any of these alternative explanations, as we believe that the elasticities that we observe at auction are an equilibrium outcome that is jointly determined by various micro- and macro-level drivers of demand. Instead, we ask how large the correlations between our elasticity measure and empirical proxies of alternative explanations are once we control for common time-trends. In the Online Appendix (Table B.1), we revisit the OLS estimates from Table 6 and find that measures of Treasury convenience yields and secondary market liquidity are only weakly correlated with auction elasticities after controlling for unobservable common factors at yearly frequency.

In light of our two motivating empirical facts in Figures 2 and 5, one might wonder whether the deterioration in Treasury auction demand is mainly driven by the decline in foreign investor participation at auction or by a shift in the marginal effect of foreign participation on yields and demand elasticities, respectively. To explore these two possibilities, we split our sample at the end of 2010 and repeat our analysis in Table 6 (see Tables B.6 and B.7 in the Online Appendix for details). Three key findings emerge: First, the instrument ($\text{Overlap}_{a(t)}$) in column 1 is statistically significant across both periods but economically larger in the early sample. Second, for changes in the level of long-term yields, the IV estimates are similar across the two samples, suggesting that our results in Figure 5 are driven by foreigners participating less at auction. In other words, the marginal effect of foreign participation on yields has been stable over time. Lastly, for the elasticity of demand, the IV estimates are almost eight times as large in the later period, which is in line with the fact that Treasury demand has become more inelastic since the global financial crisis (see Figure 2). Thus, one may conclude that in the later sample period, foreign investors are possibly even more important for maintaining and restoring Treasury market elasticity.

3.4. Implications for Treasury Market Fragility

So far, we have shown that the demand for US Treasuries seems to have gradually eroded since 2010: yields no longer tend to fall over Treasury auctions and demand has become more inelastic, meaning that yields are now more sensitive to the auctioned quantity. In this

section, we examine how these changes in the primary market can help explain the increased fragility of Treasuries in the secondary market.

We measure fragility in the Treasury market using option-implied volatility and yield curve noise. These two measures capture different dimensions of the Treasury market. We use the MOVE Index, which is similar to the VIX but for US Treasuries, to measure the riskiness of term premia at a short horizon of one month.[25] We use the yield curve noise measure of Hu et al. (2013) that measures deviations from the Svensson (1994) yield curve model. This measure captures illiquidity in the Treasury market, where frictions to arbitrage cause local deviations in the yield curve that appear to be law of one price violations.[26] We choose these measures of Treasury market conditions because they are based on traded prices, which are commonly studied in the literature, and cover our long sample period.[27]

Figure 10 plots the time series of Treasury option implied volatility and yield curve noise. The series are strongly correlated in levels (73%) and in monthly changes (39%), which is in line with the existing literature (see, e.g., Fleming, Mizrach, and Nguyen, 2018; Nguyen, Engle, Fleming, and Ghysels, 2020). Both measures show worsening Treasury market conditions since 2012. This trend coincides with the more inelastic investor demand for Treasuries at auctions since 2010. In levels, Treasury demand elasticity is strongly positively correlated with Treasury market conditions.

In addition to the relationship in levels, we also measure whether monthly changes in the elasticity of investor demand at auctions are associated with changes in Treasury market conditions. We estimate the following regression model:

$$\Delta \log Y_t = \alpha + \beta \Delta \epsilon_t + \eta \text{Inelastic}_t \times \Delta \epsilon_t + \gamma \text{Inelastic}_t + \varepsilon_t, \tag{8}$$

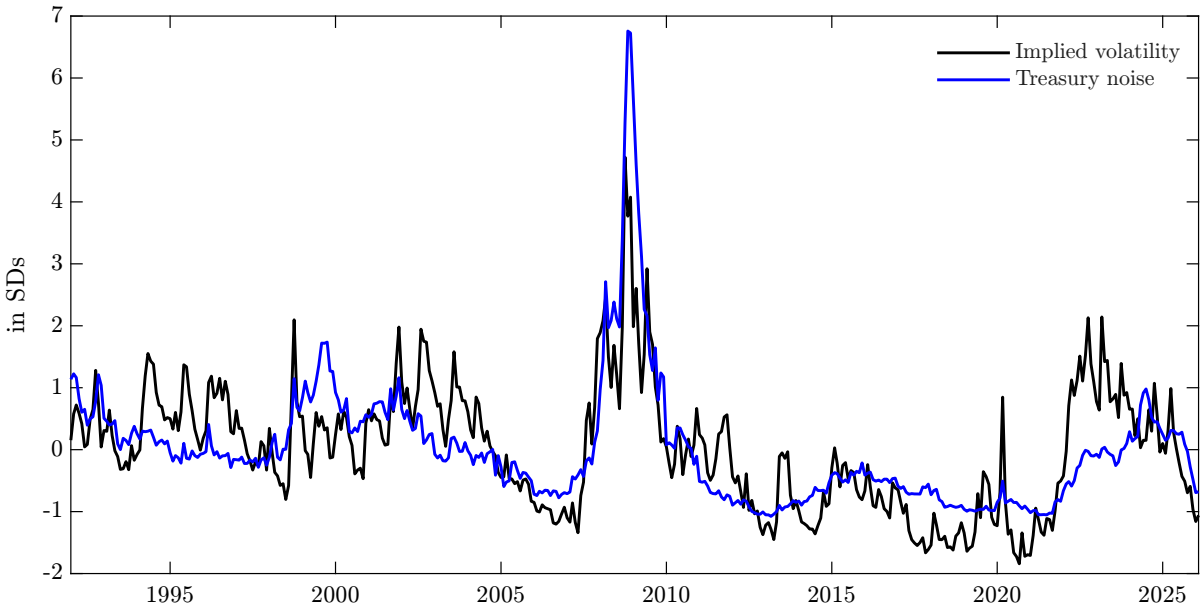
where $\Delta \log Y_t$ is either the monthly log change in the Treasury implied volatility (MOVE index) or the Treasury noise measure (Hu et al., 2013). $\Delta \epsilon_t$ is the monthly average AR(3) surprise (computed maturity bucket by bucket) in the elasticity of demand at auction, $Inelastic_t$

[25] The MOVE Index is the average of 1-month option implied volatility on Treasury futures for the tenors of 2, 5, 10, and 30 years.

[26] From January 1, 1992 to August 7, 2007, we use the Hu et al. (2013) data and from August 8, 2007 to December 31, 2025, the Bloomberg illiquidity measure that follows a similar methodology, while using best bid and ask quotes.

[27] Duffie et al. (2023) show that the Treasury yield curve noise measure is highly correlated with other measures of Treasury market illiquidity that rely on confidential regulatory data.

Figure 10: Treasury Market Conditions



Note: This figure plots the monthly time series of Treasury option implied volatility (1-month MOVE Index) and yield curve noise (Hu et al., 2013). Observations have been standardized by subtracting the sample mean and dividing by the standard deviation of every variable. The sample is monthly and spans from January 1992 to December 2025.

is an indicator variable equal to 1 for the inelastic period of demand (2011–2025) and 0 otherwise (1992–2010). We interact changes in the elasticity of demand with an indicator variable for inelastic demand to account for non-linear effects on market conditions. Duffie et al. (2023) motivates this interaction by showing that there are important non-linear relationships between volatility and liquidity in the Treasury market.

Table 7 shows that more inelastic investor demand at auction tends to be negatively associated with Treasury market conditions. Furthermore, the effect is significantly larger for the more recent period from 2011 to 2025, when demand has been more inelastic. For implied volatility, a one standard deviation decrease in elasticity (that is, an increase in ϵ_t) is associated with a 0.92 percentage point increase in implied volatility. This effect more than triples during the inelastic period, amounting to 3.1 percentage points. This effect is statistically significant and economically large, corresponding to about 3.4 percent of the average implied volatility over the sample period. For Treasury yield curve noise, we find no significant relationship during the elastic period from 1992 to 2010, but a significant and negative association during the inelastic period from 2011 to 2025. The evidence here complements Duffie et al. (2023)

by highlighting the importance of non-linear effects in the relation between Treasury demand elasticities and market conditions.

Table 7: Demand Elasticity at Auction and Treasury Market Conditions

	Implied volatility	Implied volatility	Treasury noise	Treasury noise
Intercept (α)	−0.41	−0.53	−0.28	−0.42
	[0.79]	[0.71]	[0.41]	[0.38]
$\Delta\epsilon_t$	0.92*	0.71	−0.27	−0.40
	[1.95]	[1.46]	[0.51]	[0.73]
$\Delta\epsilon_t \times \text{Inelastic}_t$		2.39**		1.45**
		[2.53]		[2.47]
Inelastic_t		−0.50		−0.24
		[0.88]		[0.35]
$\bar{R}^2$ in %	0.33	3.66	−0.24	0.57
#Obs	345	345	345	345

Note: This table reports estimates from a regression of the form $\Delta \log Y_t = \alpha + \beta\Delta\epsilon_t + \eta\text{Inelastic}_t \times \Delta\epsilon_t + \gamma\text{Inelastic}_t + \varepsilon_t$, where $\Delta \log Y_t$ is either the monthly log change in the Treasury implied volatility (MOVE index) or the Treasury noise measure from Hu et al. (2013) (see header row). The regressors are the monthly average AR(3) surprise (computed maturity bucket by bucket) in the elasticity of demand ϵ_t at auction (see Eq. (1)), a dummy variable $Inelastic_t$ that is equal to unity after January 1, 2011, and their interaction. All regressors are measured in units of standard deviations. The numbers inside the brackets are the corresponding test statistics based on heteroskedasticity and autocorrelation robust standard errors (Newey and West, 1987). Asterisks *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels. The sample is monthly and spans the period from January 1992 to December 2025.

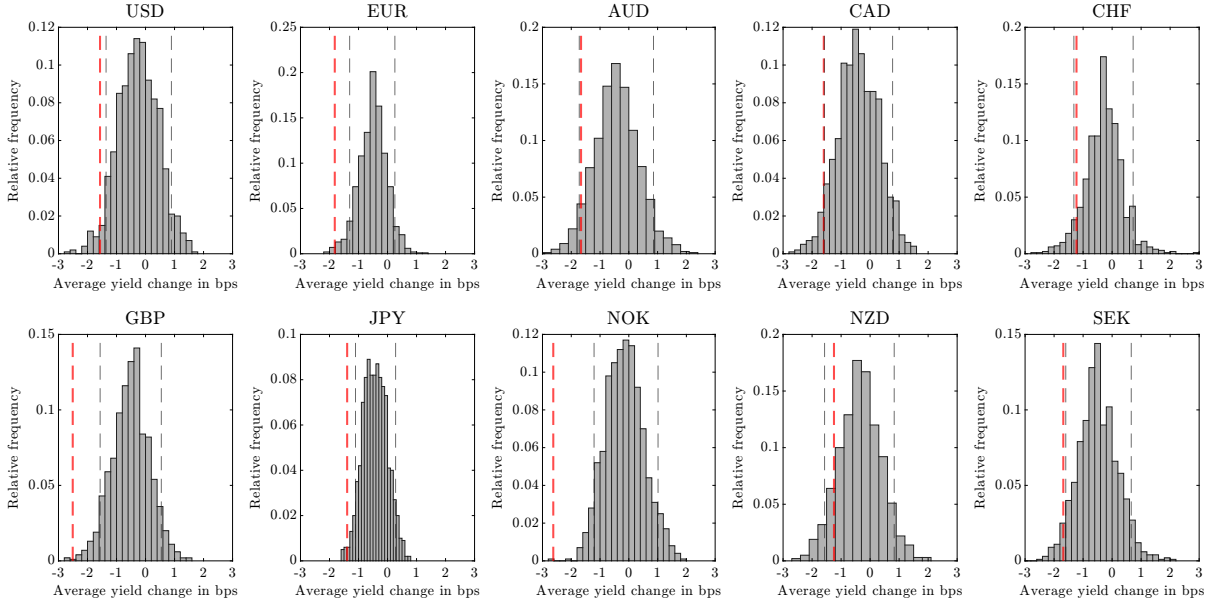
4. Robustness and Alternative Explanations

Here we summarize robustness checks and additional analyses supporting our main findings. Specifically, we i) ask if it is possible that the empirical pattern in Table 2 arose by coincidence, ii) compute the information ratio of a trading strategy that is long 10-year Treasuries around long-term auctions, iii) consider alternative ways to split our sample, iv) employ different data sources to measure yield changes at auction, and v) explore alternative ways to measure demand elasticities. For the first two of these additional tests we focus on the period prior to the global financial crisis up until December 2010.

4.1. *Simulation Exercise*

It is natural to ask whether the pattern in Table 2 column 2 is systematic or simply a coincidence. For instance, assuming that all days up until December 2010 contained the same information about the global demand for long-term bonds, how likely would it be that we would observe such a pattern? To answer this question, we conduct a simulation exercise where we randomly draw a number of days equal to the actual number of long-term Treasury auctions within a given quarter. These days represent "placebo auctions." We repeat this procedure for all quarters in our sub-sample, which yields a simulated path for auction days. Analogous to Table 2, we then compute the cumulative yield change over a 4-day window around these placebo Treasury auction days. In Figure 11 we show the outcome of 1,000 simulated paths. Overall, our results are in line with the asymptotic test statistics in Table 2.

Figure 11: Simulation Exercise with Random Treasury Auction Days



Note: Each of these figures plots the distribution of 1,000 simulated paths of placebo Treasury auctions. Each of the placebo auction paths is obtained by sampling the number of days within a quarter equal to the actual number of long-term Treasury auction days. The red dotted line indicates the actual cumulative yield change in a 4-day window around Treasury auctions. The gray dotted lines designate the top and bottom 5 percentiles of the simulated distribution. The sample spans the period from January 1992 to December 2010.

4.2. *Market Efficiency*

A potential concern about our empirical finding is that these predictable decreases in long-term yields over Treasury auctions are inconsistent with forward looking, efficient markets. Simply put, does our empirical fact suggest that there are implausibly large trading profits that could have been earned over nearly three decades of Treasury auctions? To empirically evaluate this concern, we estimate the information ratios of a strategy that buys and holds long-term bonds over the 4-day auction windows.

Table 8 shows that such a trading strategy earns an information ratio of 1.18 for US Treasuries and 2.23 for a portfolio of G10 sovereign bonds. Such information ratios are large, but they constitute an upper bound because they do not account for trading costs, such as bid-ask spreads and price impact. Moreover, the information ratios are similar to what could have been earned over other macroeconomic event days, such as FOMC announcements.

4.3. *Alternative Sample Splits*

We consider various alternative sample splits for each of our two empirical facts. First, for the elasticity of demand, we consider splitting our sample into two parts based on the following conditioning variables: implied volatility (MOVE index) and the level of short-term yields (Federal funds rate). Table 9 shows that the yield elasticity of Treasury auction demand is in fact higher (i.e., more negative), rather than lower during times when Treasuries are more risky (i.e., higher implied volatility) and interest rates are higher (i.e., higher short-term rate).

Second, for our event study analysis in Figure 8 we consider three alternative sample splits based on demand shocks that we retrieve from Ray et al. (2024), our yield elasticity of demand, and the spread between the market clearing yield and the median yield (i.e., the denominator in Eq. (1)). We collect these results in Figures B.11 to B.13, which we relegate to the Online Appendix for conciseness. Across all these sample splits, a consistent picture arises: Treasury yields fall after auctions that experience unexpectedly strong demand.

Table 8: Information Ratios of Long-Term Yields over Auctions and Macroeconomic News

	All days	Treasury auctions	Local auctions	FOMC	Local MP news	US macro news	Local macro news
USD	−0.17	−1.18**	−1.18**	−1.34*	−1.34*	−0.35	−0.35
	[0.75]	[2.05]	[2.05]	[1.82]	[1.82]	[0.72]	[0.72]
G10	−0.44*	−2.23***	0.51	−1.63**	−0.24	−0.18	−0.18
	[1.91]	[3.92]	[1.20]	[2.17]	[0.56]	[0.37]	[0.24]
EUR	−0.42*	−2.02***	0.25	−1.27*	0.22	−0.31	−0.31
	[1.81]	[3.61]	[0.39]	[1.72]	[0.31]	[0.64]	[0.57]
AUD	−0.18	−1.16**	0.52	−1.66**	0.19	0.33	−0.41
	[0.79]	[2.05]	[0.84]	[2.32]	[0.31]	[0.69]	[0.70]
CAD	−0.27	−1.32**	0.85	−2.01***	0.14	−0.39	−0.12
	[1.18]	[2.30]	[1.03]	[2.69]	[0.14]	[0.80]	[0.26]
CHF	−0.11	−1.35**	1.15	−0.62	−1.34	−0.33	0.06
	[0.42]	[2.42]	[1.51]	[0.84]	[1.43]	[0.67]	[0.10]
GBP	−0.35	−1.90***	0.99	−1.31**	−0.24	−0.30	0.57
	[1.52]	[3.44]	[1.25]	[2.00]	[0.34]	[0.61]	[1.06]
JPY	−0.39	−1.68***	0.07	−0.35	−0.69	−0.24	−0.08
	[1.64]	[3.01]	[0.16]	[0.47]	[0.85]	[0.49]	[0.12]
NOK	−0.12	−1.99***	1.11	−1.55*	−1.25	−0.02	0.30
	[0.50]	[3.34]	[0.99]	[1.88]	[1.54]	[0.04]	[0.57]
NZD	−0.24	−0.93*	−0.15	0.29	0.68	0.03	−0.37
	[0.95]	[1.65]	[0.26]	[0.40]	[0.70]	[0.07]	[0.46]
SEK	−0.41	−1.41**	0.01	−1.34*	−0.39	−0.25	−0.56
	[1.41]	[2.53]	[0.02]	[1.92]	[0.34]	[0.52]	[1.00]

Note: This table reports the annualized information ratio of a long position in 10-year US and G10 interest rates around long-term debt auctions and macroeconomic events. *All days* is based on the entire sample. *Treasury auctions* is computed based on a 4-day window around US Treasury auctions. This 4-day window includes two days before and after every long-term Treasury auction. *Local auctions* is defined analogously to *Treasury auctions* but is based on the long-term auctions of each foreign country and excludes any days that overlap with the 4-day window for US Treasury auctions. For each of the macro-economic announcement events (i.e., FOMC, local monetary policy (MP) news, US macro news, and local macro news) we consider a 3-day window that we define in line with Hillenbrand (2025) to include the day prior to the event, the day of the event, and the day after the event. Macro news include information about GDP, unemployment, and CPI. For *US macro news* we exclude any days that overlap with our 4-day window for US Treasury auctions. The row G10 is based on the average across 9 foreign yields excluding the USD. The numbers inside the brackets are the corresponding test statistics based on robust standard errors (Newey and West, 1987). Asterisks *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels. The sample is daily and spans from January 1992 to to December 2010.

4.4. *Alternative Measures of Yield Changes*

We consider two alternative measures of yield changes at Treasury auctions. First, we use when-issued yields instead of on-the-run yields around auctions. Figure B.2 shows that our findings in Figure 5 are virtually unchanged. Note that we winsorize the when-issued yields at the 0.05% level based on the spread between when-issued yields and on-the-run yields. Second, we measure changes in Treasury futures prices instead of on-the-run yields and find consistent results. Interestingly, the V-shaped intermediation spread is less pronounced

Table 9: Alternative Sample Splits for Demand Elasticity

	(1)	(2)	(3)	(4)
Intercept (α)	-0.84^{***}	-0.31^{***}	-0.27^{***}	-0.87^{***}
	[13.57]	[12.43]	[12.76]	[14.07]
Post GFC Dummy	0.65^{***}			0.67^{***}
	[10.44]			[10.98]
Volatility dummy		-0.11^{**}		0.10^{***}
		[2.04]		[3.01]
Policy rate dummy			-0.22^{***}	-0.07
			[3.36]	[1.63]
$\bar{R}^2$ in %	47.41	1.54	6.65	48.87
#Obs	1110	1110	1110	1110

Note: This table reports estimates from a regression of the form $\epsilon_t = \alpha + \beta \Delta D_t + \varepsilon_t$, where ϵ_t is the yield elasticity of demand and D_t is a dummy variable that is either defined based on above median realization of implied volatility (i.e., *volatility dummy*) and Federal funds rate (i.e., *policy rate dummy*) or is simply equal to unity after January 1, 2011 (i.e., *post GFC dummy*). The numbers inside the brackets are the corresponding test statistics based on heteroskedasticity and autocorrelation robust standard errors (Newey and West, 1987). Asterisks *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels. The sample encompasses every single-price auction with a maturity of more than 5 years during the period from January 1992 to December 2025.

when approximating yield changes with movements in derivatives prices. For more details, see Figure B.14 in the Online Appendix.

4.5. Alternative Measures of Elasticity

For our analysis in Sections 3.3 and 3.4 we consider two alternative measures of yield elasticities of demand: First, we scale half of the auctioned quantity of Treasuries $\Delta q_{a,\tau}$ in Eq. (1) by the sample average of $Q_{a,\tau}$ (see Tables B.2 and B.3 in the Online Appendix). Second, instead of computing an elasticity we only focus on the denominator in Eq. (1) (see Tables B.4 and B.5 in the Online Appendix). The advantage of these two alternative approaches is that they mitigate issues related to the mechanical decline of the numerator in Figure 3 Panel B. In both cases, we find i) that demand for Treasuries is more inelastic if foreign investors participate less and ii) that after the financial crisis periods of inelastic auctions are also associated with elevated Treasury market fragility.

5. Conclusion

In this paper, we document a gradual decline in investor demand for US Treasuries at auction from 2011 to 2025. We measure investor demand at auction by the change in long-term yields and the elasticity of investor demand. From 1992 to 2010, we show evidence of persistently positive demand shocks: US and global long-term yields have declined over Treasury auctions and demand has been highly elastic. By contrast, from 2011 to 2025, yields have been on average unchanged over Treasury auctions and the elasticity of demand has declined nearly fivefold in magnitude. We find that this decline in investor demand at auction has coincided with less foreign demand for Treasuries and a more illiquid secondary market.

Treasury auctions are especially convenient for studying investor demand because we can directly measure the elasticity of demand from the slope of the aggregate demand curve. This clean measurement is helpful for identifying changes in investor demand over time. A growing literature on demand based asset pricing uses instruments for supply to estimate demand elasticity in the Treasury market. A challenge with this approach is that it is difficult to find instruments with large variation in supply, that do not also contain information that is relevant for term premia. We hope that demand curves from sovereign bond auctions may be a helpful direct measure of investor demand elasticity.

Our findings suggest that the erosion of the dollar's "exorbitant privilege" may have been gradually occurring for longer than expected. A growing literature documents a decline in Treasury convenience yields (see, e.g., Du et al., 2018; Jiang et al., 2025b; Du et al., 2025). During the March 2020 "dash for cash" episode, Treasuries exhibited illiquidity and yields rose (He et al., 2022). During the tariff shock of 2025, Treasury yields increased while the dollar depreciated, which tends to be a characteristic of emerging market economies (Jiang, Krishnamurthy, Lustig, Richmond, and Xu, 2025a). The decline in investor demand for Treasuries at auction may have foretold some of these more salient events.

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Online Appendix

"Treasury Auctions and Long-Term Bond Yields"

Appendix A. Additional Information on Data

The Treasury used to engage in two main auction mechanisms: single-price and multi-price. Under both auction designs, the clearing price is identified by equating the aggregate demand submitted by competitive bidders to the total issue amount minus the total demand from non-competitive bidders. The difference between the two mechanisms is that in the multiple-price auctions, competitive bidders pay for their allocated shares at their submitted prices, whereas in the single-price auctions all winning bidders pay the same price. However, since September 1992, the Treasury started conducting single-price auctions for the 2- and 5-year notes, and in November 1998, the Treasury adopted the single-price method for all auctions. To ensure consistency, we drop all multi-price auctions and only focus on single-price auctions when computing elasticities. This leaves us with a total of 1,111 single-price auctions with maturities of beyond 5 years.

Appendix A.1. Sovereign Bond Auctions

From the US Treasury website, we collect detailed information regarding auctions for Treasury notes and bonds (e.g., we exclude TIPS, CMB, FRN Notes, and Bills), with maturities ranging from 2 to 30 years. Such information includes the auction date, issue date, bids submitted, total tender amount received, total tender amount accepted, lowest and highest winning rates, etc. In recent years, 2-, 3-, 5- and 7-year notes are auctioned each month, whereas 10-year notes and 30-year bonds are auctioned in February, May, August, and November with reopenings in the other 8 months. Our sample also includes these reopened issues. The frequency of auctions has changed over time. For example, 30-year bonds were not issued between 1999 and 2006 and were issued only twice a year between 1993 and 1999. Moreover, 20-year bonds were auctioned in May 2020, for the first time since 1986.

For the remaining G10 currencies, we collect data on auction date, issue date, maturity date, amount offered (in local currency), total amount issued (in local currency), and bid-to-

cover ratio. Australia's government bond auction data is sourced from the Australian Office of Financial Management. Canada's data come from the Bank of Canada. Data for France are published by Agence France Trésor, Germany by the Finanzagentur, Japan by the Ministry of Finance Japan, New Zealand by New Zealand Debt Management (a division of the New Zealand Treasury), Norway by Norges Bank, Sweden by the Swedish National Debt Office, Switzerland by the Swiss National Bank, and the UK by the UK Debt Management Office.

Appendix A.2. Volume Dynamics around Auctions

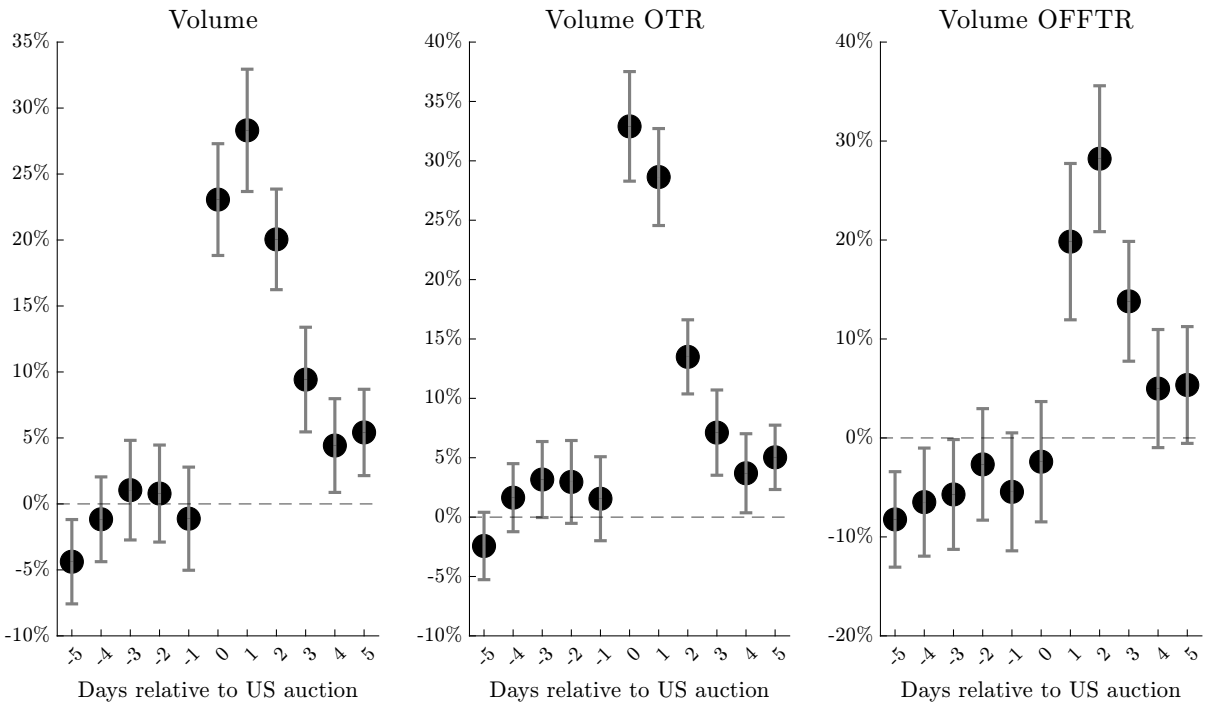
We obtain information on secondary market trading activity at US Treasury auctions from Treasury Daily Aggregate Statistics[28] for the period from February 2023 to December 2025. Figure A.1 shows the relative change in secondary market trading volume five days before and after a Treasury auction. Specifically, we estimate the following regression.

$$\log V_{t,\tau} = \alpha_t + \mu_\tau + \sum_{m=M^-}^{M^+} \beta D_{t,\tau} + \epsilon_{t,\tau}, \tag{A.1}$$

where the dependent variable is the natural logarithm of secondary Treasury market trading volume. The key regressor is $D_{t,\tau}$, which is an indicator variable equal to 1 m days before and after a long-term Treasury auction at time t. We also include time-fixed effects α_t and maturity bucket-fixed μ_τ effects to control for unobservable variation in global factors and maturity specific characteristics. We distinguish between total trading volume, on-the-run, and off-the-run trading volume, respectively. Across all three measures of trading activity we find that *secondary* market trading volume surges by around 30–35 percent on the day of the auction and then mean-reverts after four to five days on average.

[28] https://www.finra.org/finra-data/browse-catalog/about-treasury/daily-data

Figure A.1: Secondary Market Trading Volume around US Treasury Auctions



Note: This figure plots the β regression coefficients of a fixed effects panel regression of the form $\log V_{t,\tau} = \alpha_t + \mu_\tau + \sum_{m=M^-}^{M^+} \beta D_{t,\tau} + \epsilon_{t,\tau}$ where the dependent variable is the natural logarithm of secondary Treasury market trading volume from Treasury Daily Aggregate Statistics. We distinguish between total, on-the-run (OTR), and off-the-run (OFFTR) trading volume, respectively. The main regressor is $D_{t,\tau}$, which is an indicator variable equal to 1 m days before and after a long-term Treasury auction at time t. α_t and μ_τ are time- and maturity bucket-fixed effects. The maturity buckets are from 5–7 years, 8–10 years, 11–20 years, and >20 years. The sample is daily and spans from February 2023 to December 2025.

Table A.1: Overview of Auction Mechanism

Country	Mechanism	Description
Australia	Multi-price auction	Acceptance of bids will be made in ascending order of Yield bid, that is, from the lowest Yield bid to the highest Yield accepted. Allotments will be made at the Yields bid.
Canada	Multi-price auction	Subject to the bidding limits set out in the summary tables in Section 5 of the Terms of Participation, Government securities distributors may submit competitive tenders or non-competitive tenders, or both. Subject to the conditions set out in (a) and (b) below, non-competitive bids for Government of Canada securities will be accepted in full, and then competitive bids will be accepted in rising order of yield (or in the case of Real Return Bonds, real yield), until the full amount of the issue (or tranche, in the case of treasury bills) is allotted. In the case of nominal bonds and treasury bills, non-competitive bids will be allotted at the average yield of the accepted competitive bids. In the case of Real Return Bonds, all non-competitive and successful competitive bids will be allotted at the highest real yield of accepted competitive bids.
France	Multi-price auction	Participants compete in the auction on an equal footing through a transparent system of open bidding according to a planned issuance program. The bid price system consists of supplying securities at the bid price or the effective bid rate as opposed to the marginal price or rate. This type of auction is known as an "auction with several prices and sealed prices." The highest bids are served first, followed by lower bids and so on, up to AFT's target amount. Participants pay different prices that are equal to their different bid prices.
Germany	Multi-price auction	The Federal government uses a multi-price auction process, that is, bids accepted by the Federal government are allocated at the price quoted in the respective bid and are not settled at a single price. Bids that are above the lowest accepted rate will be fully allocated, while bids that are below the lowest accepted rate will not receive an allocation. Bids without a price indication will be allocated at the weighted average price of the accepted price bids. The Federal government reserves the right to reject all bids as well as to repair both the bids at the lowest accepted price and the bids without price indication, i.e. to allocate only a certain percentage.
Japan	Multi-price auction	Price-competitive & multi-price auction methods are used in Japan, except for the auctions for 40-year bonds (yield-competitive & single-price auction), Inflation-indexed bonds (price-competitive & single-price auctions) and Liquidity Enhancement Auctions (yield-spread-competitive & multi-price auctions).
New Zealand	Multi-price auction	For the issuance of all Government Securities by way of tender, allocations for each maturity will be made in ascending order of yields bid and (except as described below) the issue yield for each allocation will be equal to: for Nominal Bonds and Treasury Bills, the relevant yield bid; and for Inflation-Indexed Bonds, the highest yield bid and accepted for the relevant maturity in the tender.
Norway	Multi-price auction	F-loans are the instrument primarily used to supply liquidity to the banking system. F-loans are issued at a floating rate and specified maturity against collateral in the form of securities. The maturity of F-loans is determined by Norges Bank and varies depending on liquidity in the banking system. The interest rates on F-loans are normally determined by multi-price auctions. In a multi-price auction, also referred to as an American auction or an ordinary auction, banks submit bids for a desired amount and interest rate. For F-loans, the interest rate bids that banks' submit must be equal to or greater than the sight deposit rate on the auction date. Norges Bank decides the aggregate amount of the allotment. The banks' interest rate bids are ranked in descending order. Banks that place bids within the aggregate amount will be awarded an amount at the interest rate submitted. If a bank receives an allotment for more than one bid, the interest rate will be a volume-weighted average of the interest rates submitted. If the sight deposit rate changes during the operation's time to maturity, the banks' allotment yield will be adjusted accordingly, from the same date that the sight deposit rate changes.
Sweden	Multi-price auction	The allotted yield is determined using the multi-price method. This means that the bidders offering the highest price – i.e., the lowest yield – are allotted securities at the yield that they bid. Bidders receiving allotment thereby pay the prices they offered.
Switzerland	Single-price auction	Almost all of our debt (bills as well as bonds, both new issues and reopenings) is issued under an auction system with a Dutch tender (the one exception are our "own tranches", see below). The reopening of already issued bonds (implemented by auction) is comparable with the auctioning of new bonds. To support market liquidity, we aim to have only one outstanding bond per year with a volume of around 4 billion CHF at maturity. Because of our limited financial needs and limited market demand, we do not auction the entire volume at once but reopen individual bonds several times over their entire lifetime until they reach our target volume.
UK	Multi-price auction	Conventional gilt auctions are generally held on a bid or multi-price basis (i.e., successful bidders pay the price that they bid), with non-competitive bids allocated at the weighted average accepted price.
US	Single-price auction	US Treasury Bills, Notes, Bonds, TIPS, and FRNs are sold at single-price auctions. In a single-price auction, all successful competitive bidders and all noncompetitive bidders are awarded securities at the price based on the highest rate, yield, or discount margin of awarded competitive tenders.

Appendix B. Additional Empirical Results

Table B.1: Determinants of Treasury Auction Demand

Panel A	Yield change	Yield change	Yield change	Yield change
Foreign Share$_{a(t)}$	−0.088			
	[0.952]			
10-year CIP basis$_{a(t)}$		0.000		
		[0.511]		
10-year Aaa-Treasury spread$_{a(t)}$			0.077***	
			[2.904]	
Treasury illiquidity$_{a(t)}$				0.006
				[0.705]
Overall R^2 in %	3.39	3.49	4.60	4.63
#Obs	1010	984	1148	1010
Panel B	Elasticity	Elasticity	Elasticity	Elasticity
Foreign Share$_{a(t)}$	−0.762***			
	[4.404]			
10-year CIP basis$_{a(t)}$		−0.002**		
		[2.448]		
10-year Aaa-Treasury spread$_{a(t)}$			0.065	
			[1.303]	
Treasury illiquidity$_{a(t)}$				−0.004
				[0.892]
Overall R^2 in %	70.32	67.10	70.95	72.29
#Obs	1010	984	1030	888
Panel C	Bid-to-cover	Bid-to-cover	Bid-to-cover	Bid-to-cover
Foreign Share$_{a(t)}$	0.917***			
	[6.654]			
10-year CIP basis$_{a(t)}$		0.000		
		[0.175]		
10-year Aaa-Treasury spread$_{a(t)}$			−0.085	
			[0.971]	
Treasury illiquidity$_{a(t)}$				−0.010
				[0.605]
Overall R^2 in %	47.12	42.45	42.50	44.81
#Obs	1010	984	1030	888
Year FE	yes	yes	yes	yes

Note: This table reports estimates from regressions of the form $Y_{a(t)} = \alpha_{y(t)} + \beta X_{a(t),f} + \epsilon_{a(t)}$, where $Y_{a(t)}$ is the change in the 10-year Treasury yield (Panel A) measured over our 4-day window (two days before and after an auction), the elasticity of demand (Panel B) at auction (see Eq. (1)) or the bid-to-cover ratio (Panel C) at auction $a(t)$. The regressors are various determinants of Treasury auction demand (e.g., share of long-term Treasuries bought by foreigners at auction). $\alpha_{y(t)}$ is a year-fixed effect. The numbers inside the brackets are the corresponding test statistics based on heteroskedasticity robust standard errors that are clustered by year. Asterisks *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels. The sample is in event time and spans the period from January 2000 to December 2025.

Table B.2: Foreign Investor Share and Treasury Auction Demand

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		OLS	IV	OLS	IV	OLS	IV
	$Share_{a(t),f}$	Yield change	Yield change	Multiplier	Multiplier	Bid-to-cover	Bid-to-cover
$\text{Overlap}_{a(t)}$	−1.258***						
	[4.674]						
$\text{Share}_{a(t),f}$		−0.088	−0.426*	−0.336***	−1.738***	0.917***	0.446
		[0.952]	[1.847]	[8.505]	[4.040]	[6.654]	[0.789]
Overall R^2 in %	30.92	3.39	N/A	22.38	N/A	47.12	N/A
Year FE	yes	yes	yes	yes	yes	yes	yes
#Obs	1010	1010	1010	1010	1010	1010	1010

Note: This table reports estimates from a regression of the form $Y_{a(t)} = \alpha_{y(t)} + \beta Share_{a(t),f} + \epsilon_{a(t)}$, where $Y_{a(t)}$ is the change in the 10-year Treasury yield measured over our 4-day window (two days before and after an auction), the yield multiplier defined as the median yield spread times the ratio of the average Treasury auction offering amount divided by half the offering amount or the bid-to-cover ratio at auction $a(t)$. $Share_{a(t),f}$ is the share of long-term Treasuries bought by foreigners at auction. $\alpha_{y(t)}$ is a year-fixed effect and $\text{Overlap}_{a(t)}$ is the dollar-weighted overlap defined in Eq. (5). The regressor in column 1 is measured in units of standard deviations. The numbers inside the brackets are the corresponding test statistics based on heteroskedasticity robust standard errors that are clustered by year. Asterisks *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels. The sample is in event time and spans the period from January 2000 to December 2025.

Table B.3: Demand Elasticity at Auction and Treasury Market Conditions

	Implied volatility	Implied volatility	Treasury noise	Treasury noise
Intercept (α)	−0.70	−1.12*	−0.40	−0.52
	[1.41]	[1.87]	[0.61]	[0.53]
$\Delta\mu_t$	2.04**	1.19	0.42	−0.11
	[2.51]	[1.56]	[0.62]	[0.16]
$\Delta\mu_t \times \text{Inelastic}_t$		2.59***		1.56***
		[3.27]		[2.63]
Inelastic_t		0.80		0.37
		[1.59]		[0.56]
$\bar{R}^2$ in %	2.78	6.72	−0.16	0.78
#Obs	353	353	353	353

Note: This table reports estimates from a regression of the form $\Delta \log Y_t = \alpha + \beta \Delta\mu_t + \eta \text{Inelastic}_t \times \Delta\mu_t + \gamma \text{Inelastic}_t + \varepsilon_t$, where $\Delta \log Y_t$ is either the monthly log change in the Treasury implied volatility (MOVE index) or the Treasury noise measure from Hu et al. (2013) (see header row). The regressors are the monthly average AR(3) surprise (computed maturity bucket by bucket) in the yield multiplier of demand μ_t at auction defined as the median yield spread times the ratio of the average Treasury auction offering amount divided by half the offering amount at auction, a dummy variable $Inelastic_t$ that is equal to unity after January 1, 2011, and their interaction. All regressors are measured in units of standard deviations. The numbers inside the brackets are the corresponding test statistics based on heteroskedasticity and autocorrelation robust standard errors (Newey and West, 1987). Asterisks *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels. The sample is monthly and spans the period from January 1992 to December 2025.

Table B.4: Foreign Investor Share and Treasury Auction Demand

	(1)	(2) OLS	(3) IV	(4) OLS	(5) IV	(6) OLS	(7) IV
	$Share_{a(t),f}$	Yield change	Yield change	Multiplier	Multiplier	Bid-to-cover	Bid-to-cover
$\text{Overlap}_{a(t)}$	−1.258***						
	[4.674]						
$\text{Share}_{a(t),f}$		−0.088	−0.426*	5.905***	38.431***	0.917***	0.446
		[0.952]	[1.847]	[5.585]	[3.612]	[6.654]	[0.789]
Overall R^2 in %	30.92	3.39	N/A	19.06	N/A	47.12	N/A
Avg. #Time periods	337	337	337	337	337	337	337
#Obs	1010	1010	1010	1010	1010	1010	1010

Note: This table reports estimates from a regression of the form $Y_{a(t)} = \alpha_{y(t)} + \beta Share_{a(t),f} + \epsilon_{a(t)}$, where $Y_{a(t)}$ is the change in the 10-year Treasury yield measured over our 4-day window (two days before and after an auction), the dollar multiplier defined as the ratio of half the offering amount relative to the median yield spread in units of billion dollars per bps or the bid-to-cover ratio at auction $a(t)$. $Share_{a(t),f}$ is the share of long-term Treasuries bought by foreigners at auction. $\alpha_{y(t)}$ is a year-fixed effect and $\text{Overlap}_{a(t)}$ is the dollar-weighted overlap defined in Eq. (5). The regressor in column 1 is measured in units of standard deviations. The numbers inside the brackets are the corresponding test statistics based on heteroskedasticity robust standard errors that are clustered by year. Asterisks *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels. The sample is in event time and spans the period from January 2000 to December 2025.

Table B.5: Demand Elasticity at Auction and Treasury Market Conditions

	Implied volatility	Implied volatility	Treasury noise	Treasury noise
Intercept (α)	−0.70	−1.12*	−0.40	−0.52
	[1.41]	[1.87]	[0.61]	[0.53]
$\Delta\xi_t$	2.04**	1.19	0.42	−0.11
	[2.51]	[1.56]	[0.62]	[0.16]
$\Delta\xi_t \times \text{Inelastic}_t$		2.59***		1.56***
		[3.27]		[2.63]
Inelastic_t		0.80		0.37
		[1.59]		[0.56]
$\bar{R}^2$ in %	2.78	6.72	−0.16	0.78
#Obs	353	353	353	353

Note: This table reports estimates from a regression of the form $\Delta \log Y_t = \alpha + \beta \Delta\xi_t + \eta \text{Inelastic}_t \times \Delta\xi_t + \gamma \text{Inelastic}_t + \varepsilon_t$, where $\Delta \log Y_t$ is either the monthly log change in the Treasury implied volatility (MOVE index) or the Treasury noise measure from Hu et al. (2013) (see header row). The regressors are the monthly average AR(3) surprise (computed maturity bucket by bucket) in the dollar multiplier of demand ξ_t at auction defined as the ratio of half the offering amount relative to the median yield spread, a dummy variable $Inelastic_t$ that is equal to unity after January 1, 2011, and their interaction. All regressors are measured in units of standard deviations. The numbers inside the brackets are the corresponding test statistics based on heteroskedasticity and autocorrelation robust standard errors (Newey and West, 1987). Asterisks *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels. The sample is monthly and spans the period from January 1992 to December 2025.

Table B.6: Foreign Investor Share and Treasury Auction Demand (2000 – 2010)

	(1)	(2) OLS	(3) IV	(4) OLS	(5) IV	(6) OLS	(7) IV
	$Share_{a(t),f}$	Yield change	Yield change	Elasticity	Elasticity	Bid-to-cover	Bid-to-cover
$Overlap_{a(t)}$	−2.167***						
	[2.909]						
$Share_{a(t),f}$		−0.230	−0.315*	−0.527**	−0.280	0.590***	0.058
		[1.566]	[1.764]	[2.188]	[0.204]	[4.077]	[0.093]
Overall R^2 in %	28.60	7.32	N/A	55.33	N/A	36.88	N/A
Year FE	yes	yes	no	yes	no	yes	no
#Obs	225	225	225	225	225	225	225

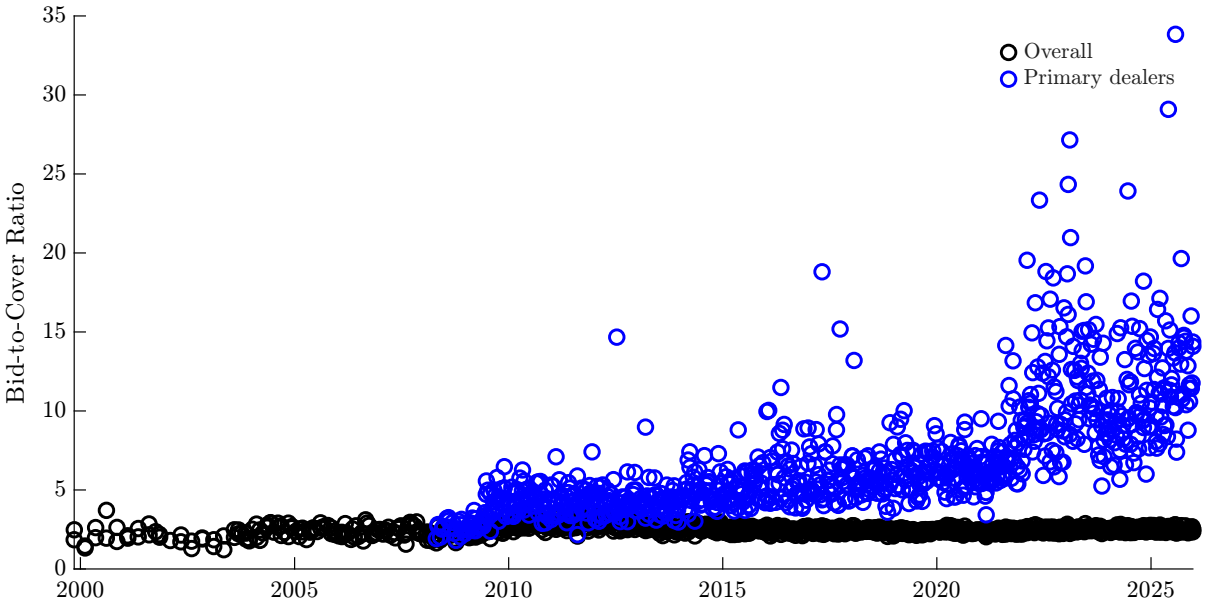
Note: This table reports estimates from a regression of the form $Y_{a(t)} = \alpha_{y(t)} + \beta Share_{a(t),f} + \epsilon_{a(t)}$, where $Y_{a(t)}$ is the change in the 10-year Treasury yield measured over our 4-day window (two days before and after an auction), the elasticity of demand at auction (see Eq. (1)) or the bid-to-cover ratio at auction $a(t)$. $Share_{a(t),f}$ is the share of long-term Treasuries bought by foreigners at auction. $\alpha_{y(t)}$ is a year-fixed effect and $Overlap_{a(t)}$ is the dollar-weighted overlap defined in Eq. (5). The regressor in column 1 is measured in units of standard deviations. The numbers inside the brackets are the corresponding test statistics based on heteroskedasticity robust standard errors that are clustered by year. Asterisks *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels. The sample is in event time and spans the period from January 2000 to December 2010.

Table B.7: Foreign Investor Share and Treasury Auction Demand (2011 – 2025)

	(1)	(2) OLS	(3) IV	(4) OLS	(5) IV	(6) OLS	(7) IV
	$Share_{a(t),f}$	Yield change	Yield change	Elasticity	Elasticity	Bid-to-cover	Bid-to-cover
$Overlap_{a(t)}$	−0.888***						
	[4.797]						
$Share_{a(t),f}$		0.051	−0.529	−0.992***	−2.206***	1.238***	0.807
		[0.574]	[1.204]	[7.969]	[3.609]	[7.360]	[0.828]
Overall R^2 in %	25.93	1.93	N/A	38.49	N/A	49.85	N/A
Year FE	yes	yes	no	yes	no	yes	no
#Obs	785	785	785	785	785	785	785

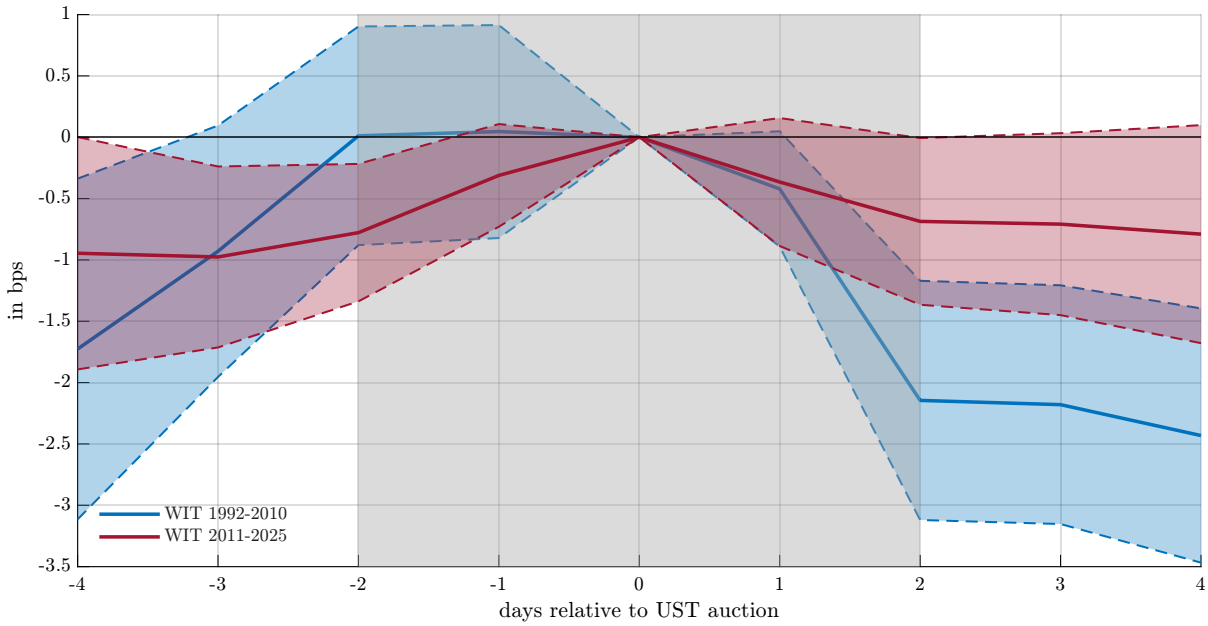
Note: This table reports estimates from a regression of the form $Y_{a(t)} = \alpha_{y(t)} + \beta Share_{a(t),f} + \epsilon_{a(t)}$, where $Y_{a(t)}$ is the change in the 10-year Treasury yield measured over our 4-day window (two days before and after an auction), the elasticity of demand at auction (see Eq. (1)) or the bid-to-cover ratio at auction $a(t)$. $Share_{a(t),f}$ is the share of long-term Treasuries bought by foreigners at auction. $\alpha_{y(t)}$ is a year-fixed effect and $Overlap_{a(t)}$ is the dollar-weighted overlap defined in Eq. (5). The regressor in column 1 is measured in units of standard deviations. The numbers inside the brackets are the corresponding test statistics based on heteroskedasticity robust standard errors that are clustered by year. Asterisks *, **, and *** denote significance at the 90%, 95%, and 99% confidence levels. The sample is in event time and spans the period from January 2011 to December 2025.

Figure B.1: Bid-to-Cover Ratio



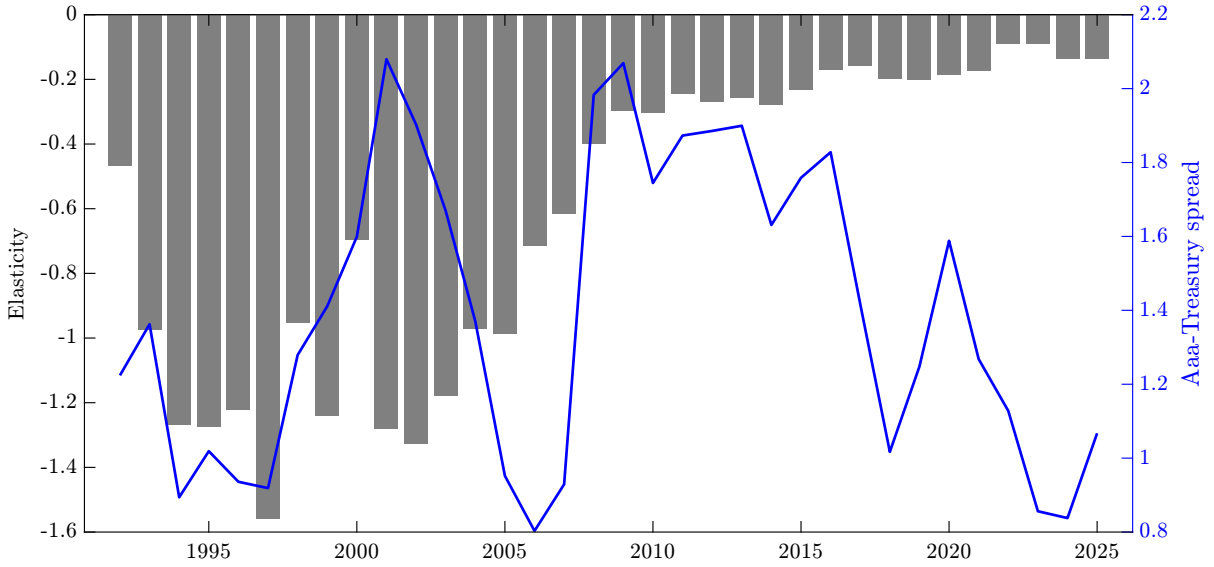
Note: This figure plots the time-series of the aggregate bid-to-cover ratio (across all tendered bids) and the ratio of tendered-to-accepted bids for primary dealers (blue circles) at Treasury auctions. The sample is in event time and spans from November 1999 to December 2025. Note that we remove one outlier on September 28, 1994, which is the only data point that we have from the Treasury prior to November 1999.

Figure B.2: Event Study: US Long-Term When-Issued Yields over Treasury Auctions



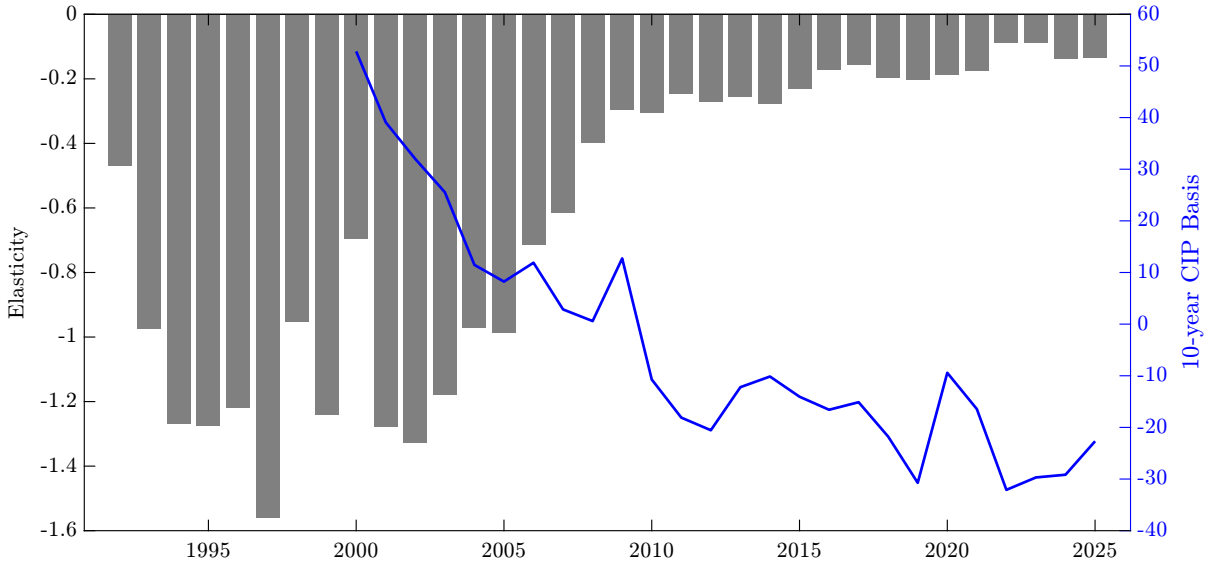
Note: This figure plots the cumulative yield changes for 10-year USD when-issued yields 4 days before and after long-term US Treasury auctions from January 1992 to December 2010 and from January 2011 to December 2025, respectively. The gray shaded area marks our 4-day event window that includes for every long-term Treasury auction two days before and after the auction. Time zero indicates the end of the auction day. The red and blue solid lines indicate the actual cumulative yield change, whereas the red and blue dotted lines indicate 90% confidence bands that are based on Newey and West (1987) standard errors.

Figure B.3: Treasury Demand Elasticity and Convenience Yields



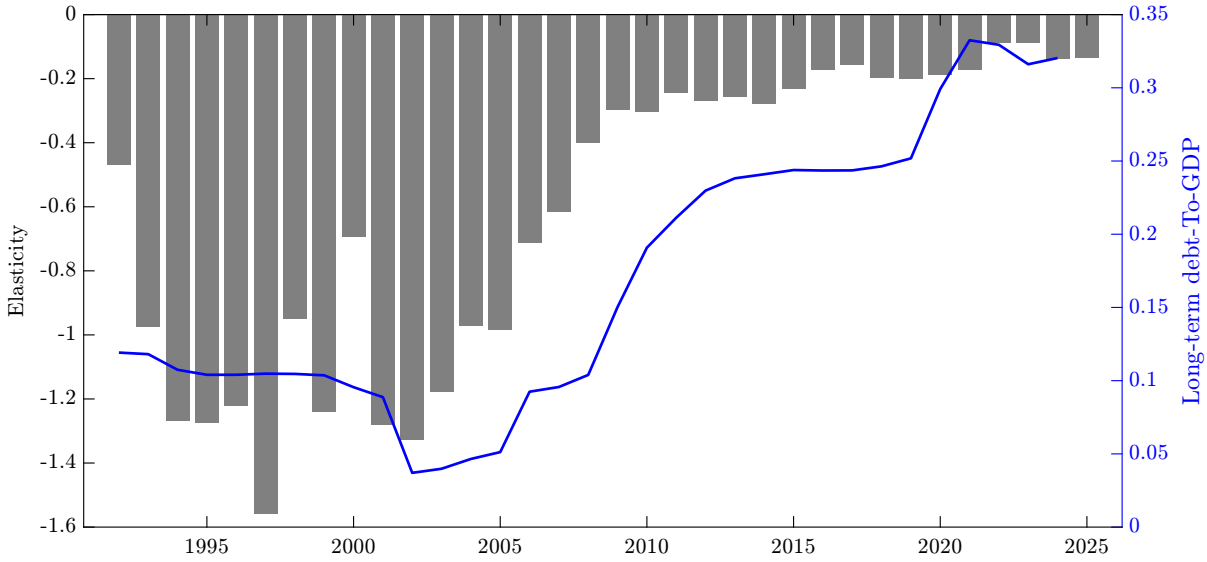
Note: This figure plots the yield elasticity of demand at Treasury auctions and the 10-year Aaa-Treasury spread. We measure the elasticity of demand at every Treasury auction following Eq. (1) (gray bars). We measure the 10-year Aaa-Treasury spread (Krishnamurthy and Vissing-Jorgensen, 2012) as the difference between the 10-year Treasury and Aaa-rated corporate bond yield (blue line). The sample is yearly and spans from 1992 to 2025.

Figure B.4: Treasury Demand Elasticity and Cross-Currency Basis



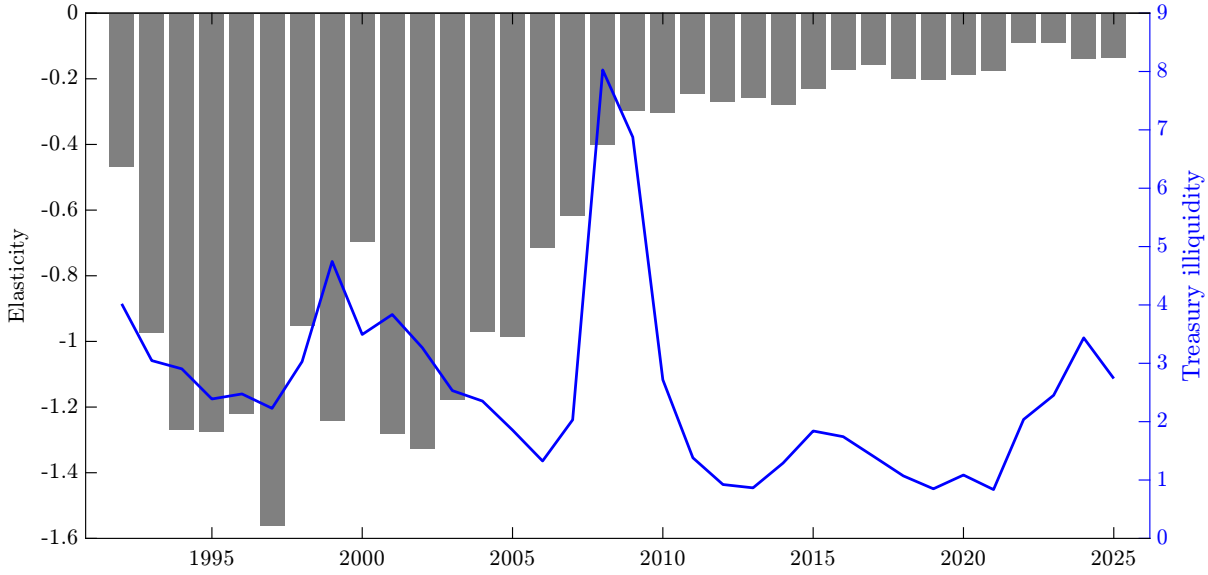
Note: This figure plots the yield elasticity of demand at Treasury auctions and the 10-year CIP basis. We measure the elasticity of demand at every Treasury auction following Eq. (1) (gray bars). We compute the cross-sectional average CIP basis across G10 currencies at every Treasury auction (blue line). The sample is yearly and spans from 1992 to 2025.

Figure B.5: Treasury Demand Elasticity and Fiscal Capacity



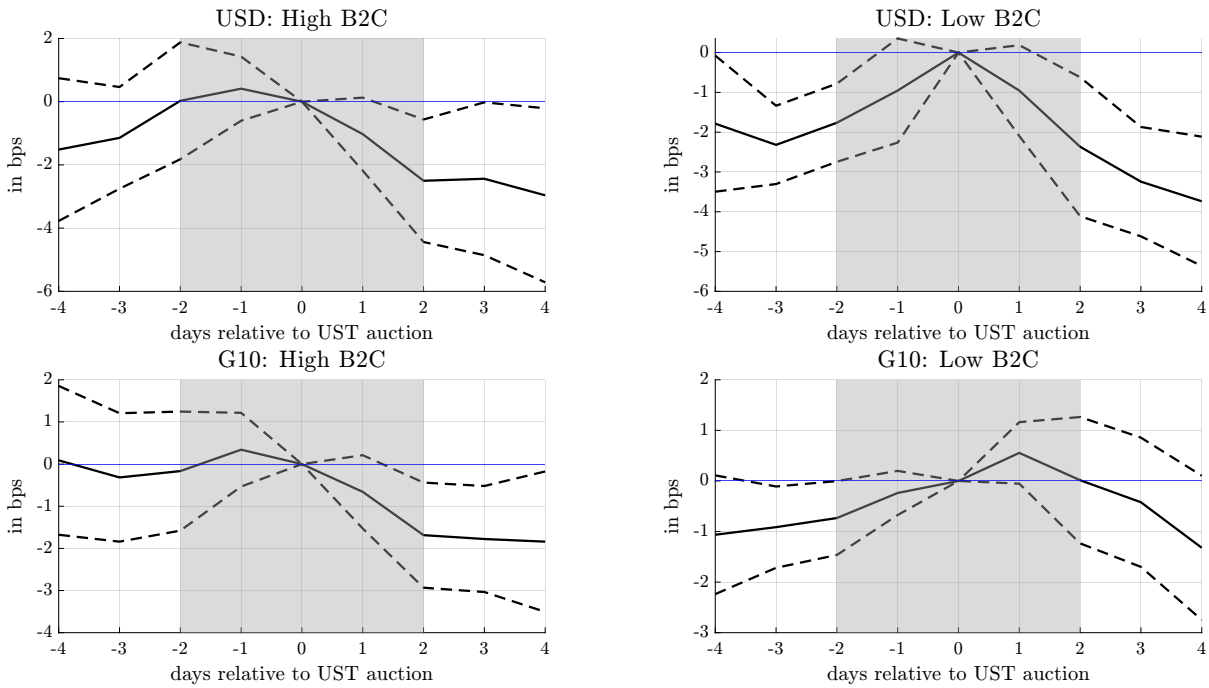
Note: This figure plots the yield elasticity of demand at Treasury auctions and long-term US debt-to-GDP (blue line) as proxy for fiscal capacity. We measure the elasticity of demand at every Treasury auction following Eq. (1) (black line). The sample is yearly and spans from 1992 to 2025.

Figure B.6: Treasury Demand Elasticity and Secondary Market Illiquidity



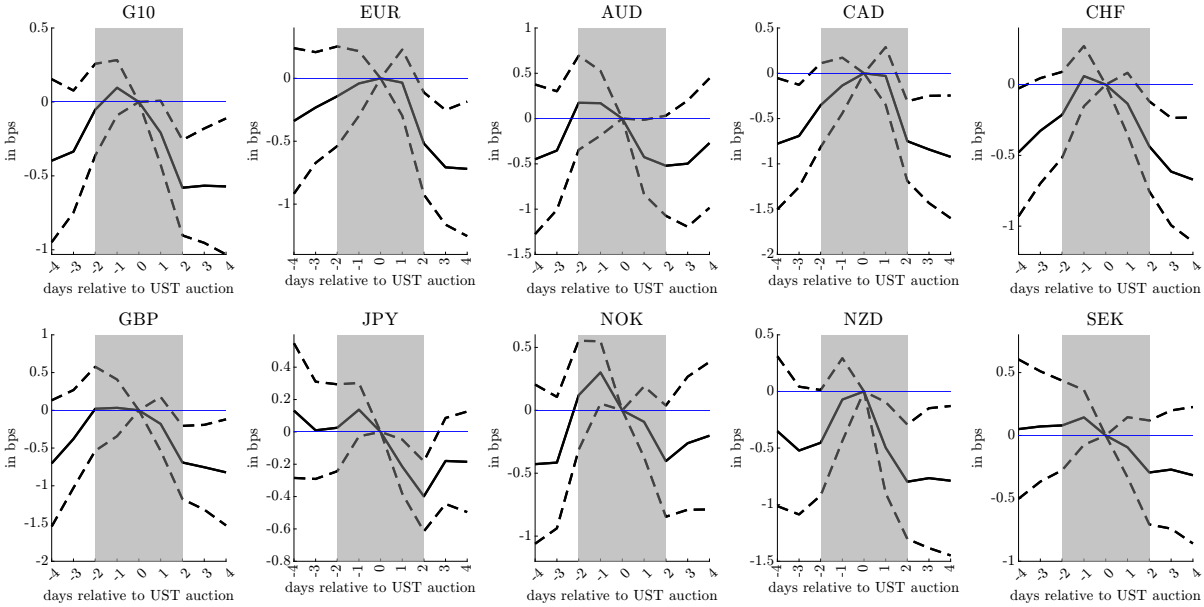
Note: This figure plots the yield elasticity of demand at Treasury auctions and secondary market illiquidity. We measure the elasticity of demand at every Treasury auction following Eq. (1) (black line). We measure Treasury illiquidity as deviations (in bps) from the Svensson (1994) yield curve model (Hu et al., 2013) (blue line). The sample is yearly and spans from 1992 to 2025.

Figure B.7: Event Study: US and G10 10-Year Rates at Non-Overlapping Treasury Auctions



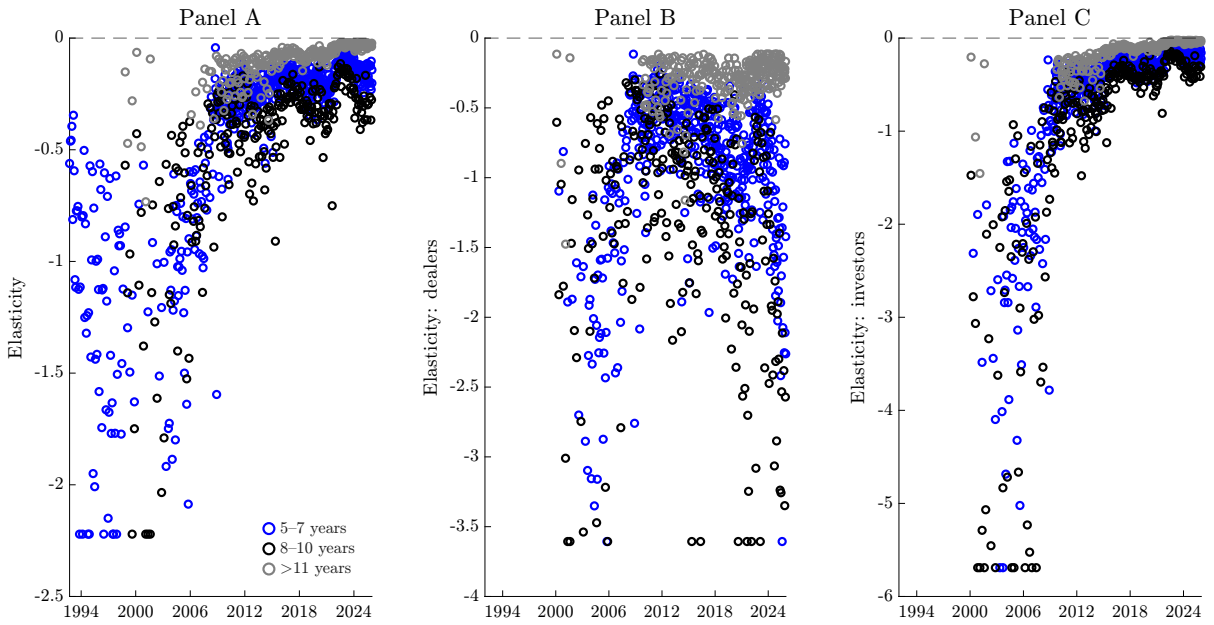
Note: The panels labeled *USD* plot the cumulative yield change for 10-year USD government bond yields 4 days before and after a long-term US Treasury auction. The gray area marks the 4-day event window that includes two days before and after every long-term Treasury auction. The panels labeled *G10* are based on foreign G10 government bond yields. Time zero indicates the end of the auction day. "High B2C" and "Low B2C" periods are defined based on the AR(3) surprise component in the bid-to-cover ratio and cutoff values are based on the median surprise. We exclude Treasury auction days that overlap with any other foreign sovereign bond auction. The black solid lines indicate the actual cumulative yield change, whereas the black dotted lines indicate 90% confidence bands that are based on Newey and West (1994) standard errors. The sample is daily and spans from January 1999 to December 2025.

Figure B.8: Event Study: Long-Term Yield Changes at Treasury Auctions



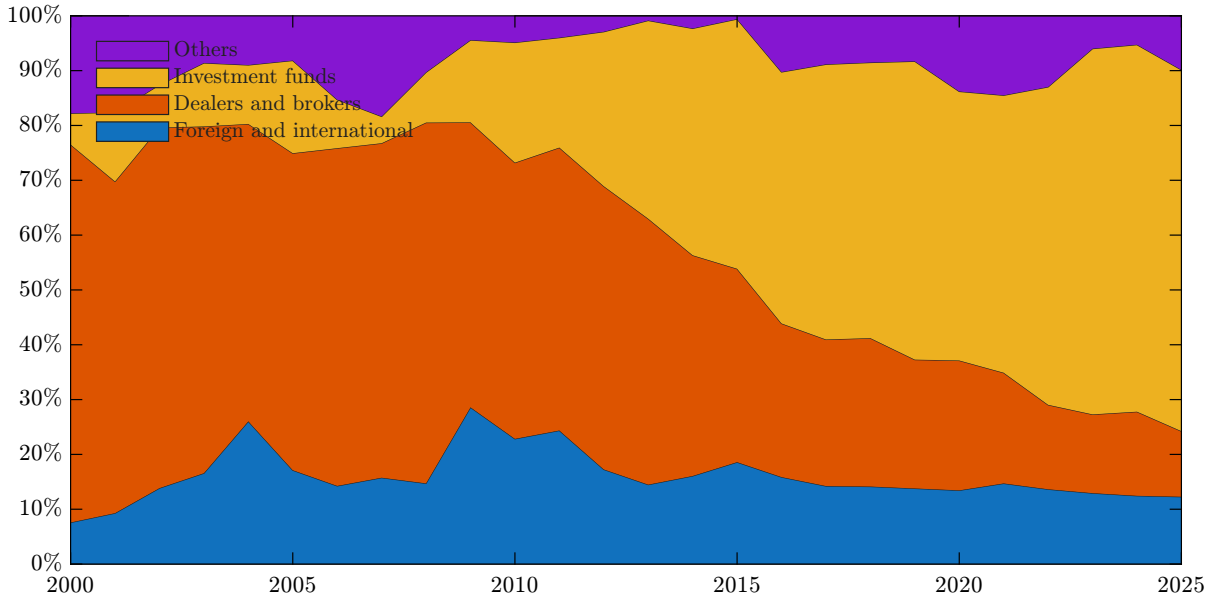
Note: This figure plots the cumulative yield change for 10-year sovereign government bond yields 4 days before and after a long-term US Treasury auction. Countries are abbreviated by their domestic currency (e.g., GBP stands for the UK). The gray area marks the 4-day event window that includes two days before and after every long-term Treasury auction. Time zero indicates the end of the auction day. The black and blue solid lines indicate the actual cumulative yield change, whereas the black and blue dotted lines indicate 90% confidence bands that are based on Newey and West (1994) standard errors. The sample is daily and spans from January 1992 to December 2025.

Figure B.9: Decomposing the Elasticity of Demand at Treasury Auctions



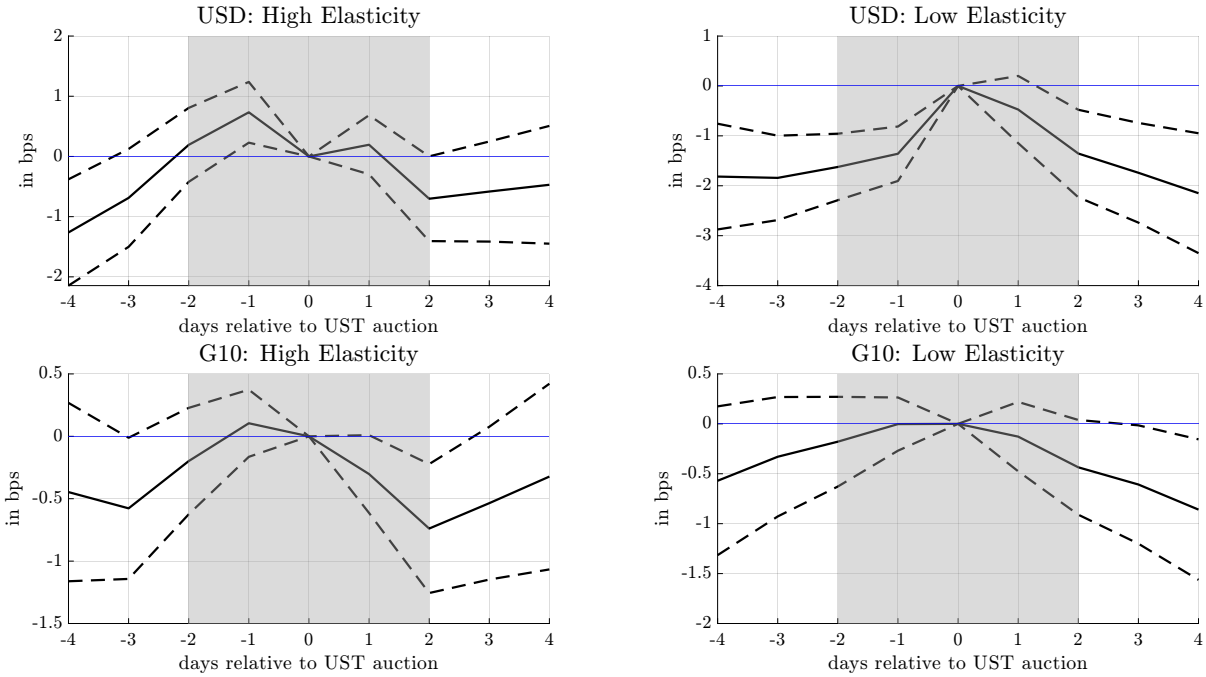
Note: Panel A plots the elasticity of demand at every Treasury auction following Eq. (1) broken down by three maturity buckets. Panel B and C rescale our elasticity in Eq. (1) by the inverse of the share of Treasuries purchased by dealers and non-dealers, respectively, at auction. We winsorize all variables at the 1% level. The sample is in event time and spans from January 1992 to December 2025.

Figure B.10: Foreign Investor Participation at US Treasury Auctions



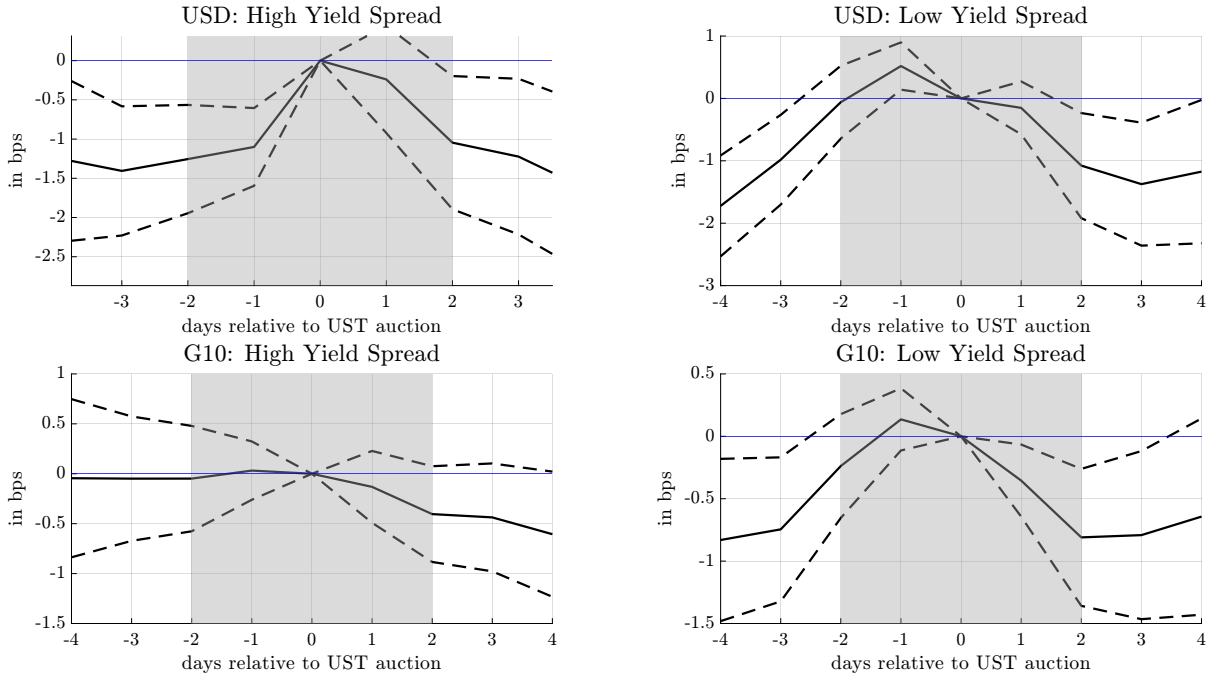
Note: This figure plots the yearly average share of Treasuries purchased by four key groups of market participants: dealers and brokers, investment funds, foreign and international, and other participants (i.e., SOMA banks, depository institutions, private individuals, and non-bank financials). Within each year, auctions are weighted by issuance size. The sample is yearly and spans from January 2000 to December 2025.

Figure B.11: Event Study Sample Split — Demand Elasticity



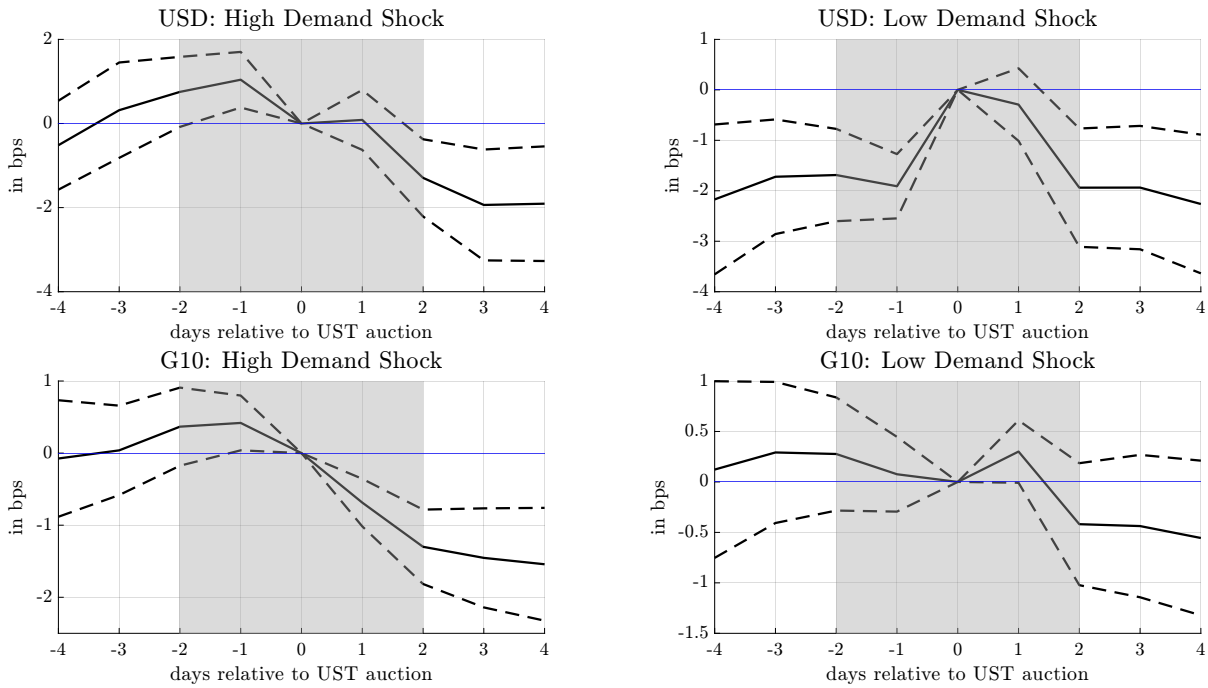
Note: The panels labeled *USD* plot the cumulative yield change for 10-year USD government bond yields 4 days before and after a long-term US Treasury auction. The gray area marks the 4-day event window that includes two days before and after every long-term Treasury auction. The panels labeled *G10* are based on foreign G10 government bond yields. Time zero indicates the end of the auction day. "High Elasticity" and "Low Elasticity" periods are defined based on the AR(3) surprise component in the yield elasticity of demand (see Eq. (1)) and cutoff values are based on the median surprise. The black solid lines indicate the actual cumulative yield change, whereas the black dotted lines indicate 90% confidence bands that are based on Newey and West (1994) standard errors. The sample is daily and spans from January 1992 to December 2025.

Figure B.12: Event Study Sample Split — Yield Spread



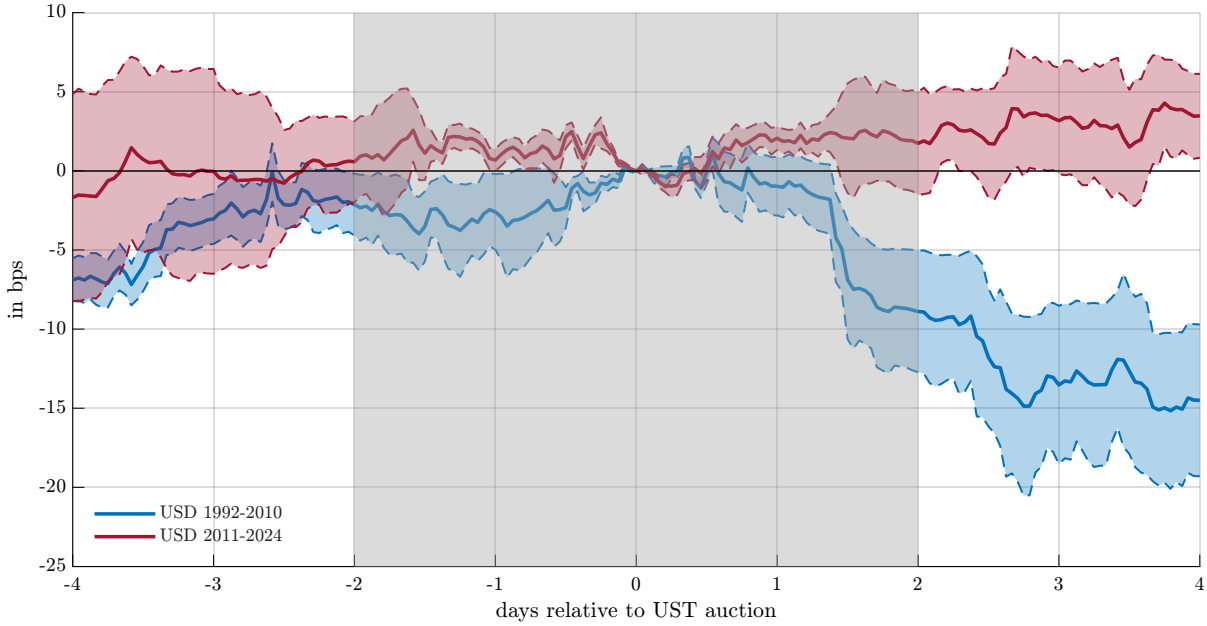
Note: The panels labeled *USD* plot the cumulative yield change for 10-year USD government bond yields 4 days before and after a long-term US Treasury auction. The gray area marks the 4-day event window that includes two days before and after every long-term Treasury auction. The panels labeled *G10* are based on foreign G10 government bond yields. Time zero indicates the end of the auction day. "High Yield Spread" and "Low Yield Spread" periods are defined based on the AR(3) surprise component in the high-median yield spread (see denominator in Eq. (1)) and cutoff values are based on the median surprise. The black solid lines indicate the actual cumulative yield change, whereas the black dotted lines indicate 90% confidence bands that are based on Newey and West (1994) standard errors. The sample is daily and spans from January 1992 to December 2025.

Figure B.13: Event Study Sample Split — Demand Shocks

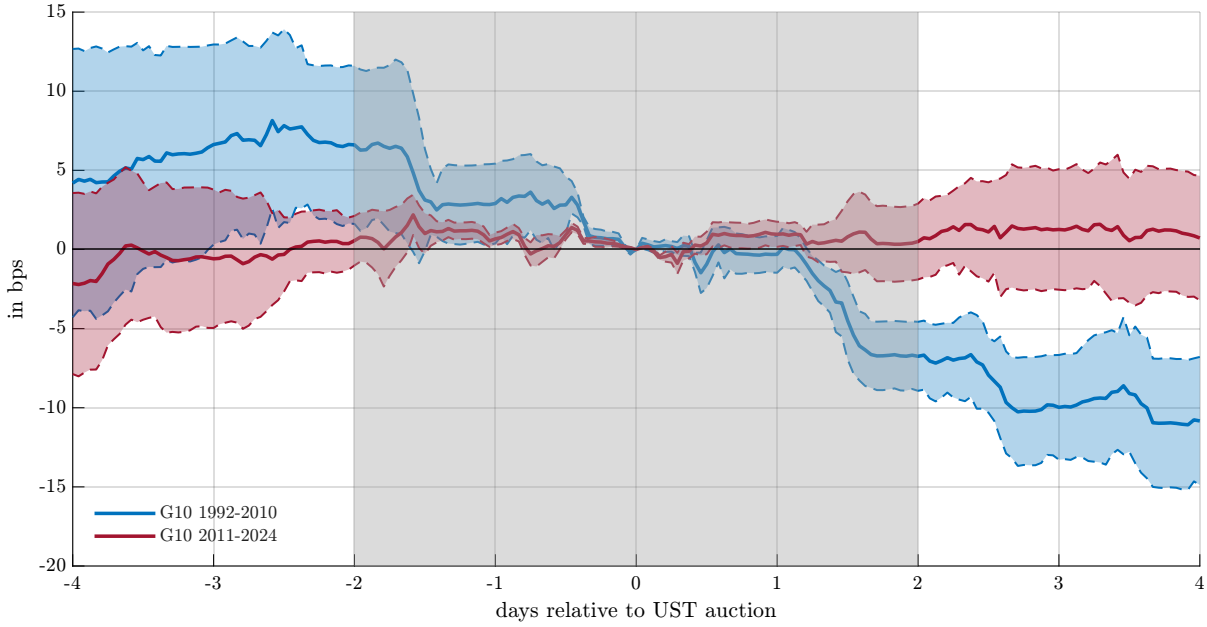


Note: The panels labeled *USD* plot the cumulative yield change for 10-year USD government bond yields 4 days before and after a long-term US Treasury auction. The gray area marks the 4-day event window that includes two days before and after every long-term Treasury auction. The panels labeled *G10* are based on foreign G10 government bond yields. Time zero indicates the end of the auction day. "High Demand Shock" and "Low Demand Shock" periods are defined based on the AR(3) surprise component of the demand shock series from Ray et al. (2024) and cutoff values are based on the median surprise. The black solid lines indicate the actual cumulative yield change, whereas the black dotted lines indicate 90% confidence bands that are based on Newey and West (1994) standard errors. The sample is daily and spans from January 1995 to December 2017.

Figure B.14: Event Study: USD and G10 Long-Term Rates over Treasury Auctions



Panel A: USD Long-Term Yields



Panel B: G10 Long-Term Yields

Note: Panel A (*Panel B*) plots the cumulative futures price changes for 10-year USD (*G10*) Treasury futures 4 days before and after long-term US Treasury auctions from January 1992 to December 2010 and from January 2011 to March 2024, respectively. We access futures prices from TickData.com (https://www.tickdata.com/product/historical-futures-data/) and aggregate them to the hourly frequency. For the G10 we use futures prices for Australian, Canadian, German, UK, and Japanese long-term Treasury securities. The gray shaded area marks our 4-day event window that includes for every long-term Treasury auction two days before and after the auction. Time zero indicates the end of the auction day. The red and blue solid lines indicate the actual cumulative yield change, whereas the red and blue dotted lines indicate 90% confidence bands that are based on Newey and West (1987) standard errors.