

NO. 1188
MARCH 2026

Intraday Price Pressure and Order Flow Around U.S. Treasury Auctions

Michael Fleming | Weiling Liu | Giang Nguyen

Intraday Price Pressure and Order Flow Around U.S. Treasury Auctions

Michael Fleming, Weiling Liu, and Giang Nguyen

Federal Reserve Bank of New York Staff Reports, no. 1188

March 2026

<https://doi.org/10.59576/sr.1188>

Abstract

Using 33 years of intraday Treasury data, we provide the first high-frequency evidence on auction-day price pressure: yields rise in the hours before auction and reverse afterward. This pressure strengthens when dealers face tighter risk-bearing constraints and weakens when investor demand is stronger or more elastic. More importantly, net order flow dominates in explaining the pressure, providing the first direct evidence that trading transmits dealer constraints into prices. Despite concerns about dealer capacity amid rapid federal debt growth, price pressure has not increased in recent years, partly because non-dealer participants now absorb more auction supply and ease dealers' intermediation burden.

JEL classification: G12, G14, E43, H63

Key words: Treasury auctions, dealer intermediation, order flow, price pressure, supply effects, risk bearing capacity, returns, demand elasticity, liquidity, frictions

Fleming: Federal Reserve Bank of New York (email: michael.fleming@ny.frb.org). Liu: D'Amore-McKim School of Business, Northeastern University (email: w.liu@northeastern.edu). Nguyen: Pennsylvania State University (email: giang.nguyen@psu.edu). This paper was previously circulated under the title "Intraday Pricing and Liquidity Effects of U.S. Treasury Auctions." The authors thank Tobias Adrian, Charles Jones, Wing Wah Tham, and seminar participants at the Bank for International Settlements (Asian Office), Bank of Thailand, Board of Governors of the Federal Reserve System, Centre for Advanced Financial Research and Learning, First International Conference on Sovereign Bond Markets, FTG Summer School, Penn State University, University of New South Wales, University of Zurich, and Wilfrid Laurier University for helpful comments. Henry Dyer and Ron Yang provided excellent research assistance.

This paper presents preliminary findings and is being distributed to economists and other interested readers solely to stimulate discussion and elicit comments. The views expressed in this paper are those of the author(s) and do not necessarily reflect the position of the Federal Reserve Bank of New York or the Federal Reserve System. Any errors or omissions are the responsibility of the author(s).

To view the authors' disclosure statements, visit https://www.newyorkfed.org/research/staff_reports/sr1188.html.

1 Introduction

The U.S. Treasury securities market is one of the largest and most liquid financial markets in the world, with marketable debt outstanding of \$30.3 trillion as of December 31, 2025. Because of their safety, deep secondary market liquidity, and the U.S. dollar’s global reserve currency status, Treasury securities attract strong investor demand, enabling the U.S. Treasury Department to issue debt at favorable rates at regular auctions. With annual interest costs now surpassing \$1 trillion, there is increased interest in understanding the determinants of issuance costs—not only the yields that materialize at auction (direct costs) but also the temporary price pressure surrounding auction (indirect costs).

In a frictionless environment with unlimited capital, auction supply shocks would be absorbed without price impact. In practice, each auction can add billions of dollars to the outstanding supply, while occurring on a regular and predictable schedule, posing recurring challenges for intermediaries whose risk-bearing capacity is limited. The prior literature, most notably [Lou et al. \(2013\)](#), documents that yields on outstanding securities rise in the days before an auction and fall afterward, producing an inverted V-shaped pattern around auction dates despite full anticipation of both timing and amount. Limited dealer balance-sheet capacity and slow-moving capital can lead intermediaries to reduce inventory ahead of auction, thereby temporarily pushing yields away from fundamental values. Related work finds similar auction price pressure in other sovereign and fixed-income markets (e.g., [Beetsma et al., 2016, 2018](#); [Amin and Tedongap, 2023](#); [Albuquerque et al., 2024](#)).

Importantly, auction price pressure is distinct from the well-documented auction underpricing phenomenon and implies that the indirect cost of issuance is higher than what underpricing alone would suggest. The existence of this price pressure is economically important: it indicates that even in the most liquid government bond market, supply shocks are not instantaneously absorbed and impose nontrivial indirect costs on Treasury issuance.

Several developments motivate a reassessment of the auction price pressure effect with more extensive and up-to-date data. First, the U.S. Treasury market has expanded dra-

matically in recent years while dealers’ balance sheet capacity has not kept pace, raising concerns about dealers’ ability to intermediate in both primary and secondary markets (e.g., [Duffie, 2020](#); [Duffie, 2023](#)). Meanwhile, the market has undergone significant structural changes over the past two decades. Regulatory developments such as the introduction of the SLR requirement and tighter internal risk constraints including VaR limits, together with episodes of severe market stress—including the 2007-09 global financial crisis (GFC; e.g., [Adrian et al., 2017](#)) and the COVID-19 crisis (e.g., [Vissing-Jorgensen, 2021](#))—have materially affected dealers’ intermediation capacity ([He et al., 2022](#); [Duffie et al., 2023](#); [Klingler and Sundaresan, 2023](#); [Bräuning and Stein, 2024](#); [Li et al., 2025](#).)

Growing auction sizes, together with evolving regulatory and market-structure conditions, could magnify the auction price pressure documented in earlier work. At the same time, dealers’ share of auction purchases has declined while non-dealer participation has risen (e.g., [Fleming et al., 2024](#)), raising the question of whether shifts in bidder composition alter the dynamics of auction price pressure. Extending the analysis beyond June 2008, the endpoint of [Lou et al. \(2013\)](#), allows us to trace the evolution of auction price pressure through time—from the pre-GFC period through the post-GFC environment, the rollout of major regulatory reforms affecting dealers, the unusually volatile COVID-19 period, and up to the present. This exercise thus offers a long-term perspective that is essential for a more complete understanding of the forces that shape auction price pressure across vastly different economic and regulatory environments.

Second, there are methodological reasons to revisit the auction price pressure effect. Existing studies primarily rely on daily or lower-frequency data to identify auction price pressure effects over the entire auction cycle—often a 20-day window around monthly auctions. Daily data can confound auction-related price effects with unrelated macroeconomic or market developments occurring in the same multi-day window. For instance, major macro announcements such as employment, CPI, and GDP are released on fixed monthly schedules, mostly at 8:30 a.m. or 10:00 a.m., and can produce yield movements that are difficult to dis-

entangle from auction-driven dynamics. Moreover, daily yield changes cannot be precisely aligned with the timing of the auction itself. By contrast, examining yields at intraday frequency permits analysis within a narrow and well-defined window around the auction, abstracting from confounding shocks and producing a cleaner measurement of the causal price effect. Our high-frequency design therefore ensures that the patterns we uncover can be unambiguously attributed to the auction.

Third, the existing literature focuses almost exclusively on yields or returns and provides little evidence on the broader market environment or the mechanics of price formation around auctions. Access to detailed transaction-level and quote data enables us to characterize liquidity, trading activity, and order flow before and after auctions, similar to the approach used in studies of scheduled macroeconomic announcements (e.g., [Fleming and Remolona, 1999](#)). Importantly, the availability of order flow data allows us to examine the mechanism through which price pressure arises, specifically whether limited dealer risk-bearing capacity translates to price pressure through actual trading. Whereas prior studies *infer* pre-auction shorting and post-auction covering from price movements alone, we are able to document these dynamics explicitly in the data.

In this paper, we cleanly identify the auction price pressure effect using a comprehensive dataset of interdealer trades and quotes for on-the-run securities around auctions of the next security in each maturity segment, covering a 33-year sample period (1991–2024). We begin by characterizing yield behavior in a six-hour window around auctions and documenting how the magnitude of the price pressure effect varies across sub-periods. We then analyze market conditions—including liquidity, volatility, and net order flow—to provide economic context for the observed price dynamics. Next, we formally assess whether proxies for dealer risk-bearing capacity and investor demand explain cross-sectional variation in auction price pressure. Finally, exploiting order flow data, we quantify the extent to which actual trading activity encapsulates the effects of dealer constraints and natural buyer demand.

Our first main finding is that the supply-driven price pressure effect manifests cleanly and

systematically at the intraday level, centered precisely around auction closing and results release times. Yields rise steadily in the hours leading up to the auction and reverse in the hours following the release of auction results, producing a sharp and tightly timed inverted V-shaped pattern. On average, the total magnitude of yield movement over this intraday window ranges from 0.5 to 1.3 basis points across maturities. Because this pattern appears in a narrow window that is difficult to attribute to anything other than the auction itself, the intraday evidence provides particularly compelling support for a causal supply effect. Moreover, similar analysis of yield movements around FOMC and employment announcements does not produce the same inverted V-shape, suggesting that the pattern is uniquely a supply effect rather than an information-driven effect.

Second, we show that although the auction price pressure effect is still present, its magnitude has diminished in recent years despite rapid growth in federal debt and heightened concerns about dealer intermediation capacity. The declining explanatory power of traditional dealer constraint proxies, together with the shrinking dealer share of auction purchases and the attenuation of price pressure, suggests that the Treasury market has adapted to a reduced dealer role. Our evidence indicates that non-dealer participants, particularly investment funds, have increasingly absorbed auction supply. By purchasing directly at auction, these investors, many of whom previously relied on dealers to acquire new issues, reduce the demand for dealer intermediation. Investment funds, including hedge funds, also appear to intermediate some flows themselves and exploit arbitrage opportunities around auctions. These developments help mitigate price pressure. Foreign investors exhibit the strongest and most robust mitigating effect in the later part of the sample, likely reflecting their relatively low price sensitivity compared with investment funds.

Third, we find that liquidity is unusually strong on auction days, contrary to the conventional belief that price frictions tend to arise when liquidity is poor. In fact, depth is higher and volatility is lower than usual before the auction; although volatility spikes when results are released, it quickly normalizes. Most importantly, order flow plays a central role

in price dynamics. Ex ante, this is not obvious. On the one hand, the supply shock is fully anticipated and effectively public information, so prices need not rely on order flow to adjust. On the other hand, if dealers actively manage inventories before and after auctions through trading in the secondary market, order flow becomes a natural channel through which limited risk-bearing capacity translates into observed price dynamics. Empirically, we observe significant net selling pressure in the hours before auction and significant net buying pressure afterward, consistent with intermediaries managing inventory around the supply shock through trading in the interdealer market. Decomposing auction price pressure into flow-driven and non-flow-driven components, we find that the flow-driven component is far larger, reinforcing the conclusion that dealer risk-bearing constraints translate into price pressure primarily through trading.

Our paper belongs to the literature that examines the transitory price pressures around Treasury auctions. [Fleming et al. \(2024\)](#) show that secondary market Treasury prices tend to fall during auction weeks and rise in subsequent weeks. [Lou et al. \(2013\)](#) document that prices typically decline in the days leading up to an auction and recover afterwards. Similar V-shaped patterns have been observed in other contexts, including U.S. TIPS ([Amin and Tedongap, 2023](#)), Italian government bonds ([Beetsma et al., 2016](#); [Sigaux, 2024](#)), Portuguese government bonds ([Albuquerque et al., 2024](#)), and across European sovereign bond markets ([Beetsma et al., 2018](#)). Our contribution to this literature is threefold: we provide (i) intraday evidence of price pressure that can be attributed cleanly to the auction event, (ii) a connection between price dynamics and detailed measures of liquidity and order flow, and (iii) the first direct evidence that dealer risk-bearing constraints translate to price pressure through trading in the secondary interdealer market.¹

We also contribute to the literature on dealer balance-sheet constraints (e.g., [Adrian et al., 2014](#); [He et al., 2017](#); [Duffie, 2020](#)) and how such constraints shape price frictions around auctions of Treasury securities as discussed above. To this literature, we bring new

¹Following the first draft of this paper, [Bellia \(2018\)](#) also examines intraday pricing and liquidity around German and Italian government bond auctions.

evidence on how auction price pressure interacts with the changing role of dealers in the primary market, thus offering insight into how the Treasury market adjusts to evolving intermediation capacity and market structure. In this sense, our work complements [Amin and Tedongap \(2023\)](#) and [Fleming et al. \(2024\)](#).

Our paper is also related to the literature on investor demand and auction price pressure. [Duffie \(2010\)](#) posits that inattentive investors cause capital to flow slowly to trading opportunities, temporarily depressing prices before they rebound. [Sigaux \(2024\)](#) argues that uncertainty about natural buyers' demand leads dealers to hedge against a lower-than-expected supply shock. As this uncertainty resolves closer to the auction (e.g., through observing client order flow as in [Boyarchenko et al., 2021](#)), hedging demand diminishes and prices fall toward expected levels. [Amin and Tedongap \(2023\)](#) show that strategic behavior by non-dealers, rather than dealers, explains pre-auction price patterns in TIPS auctions.

Several recent papers specifically focus on demand elasticity. [Albuquerque et al. \(2024\)](#) show that the V-shape is statistically significant only when demand elasticity is low. [Cavaleri et al. \(2025\)](#) similarly find that declining demand elasticity is associated with higher post-auction returns. Using bidding data, [Somogyi et al. \(2026\)](#) document that demand for long-term Treasuries has weakened over time, coinciding with the disappearance of post-auction price appreciation after 2010. We extend this literature by analyzing demand characteristics—both strength and elasticity—and the behavior of two major participant groups in explaining auction price pressure. We further evaluate these demand variables jointly with proxies for dealers' risk-bearing constraints to assess their marginal effects.

Our microstructure-focused analysis also aligns with the literature on Treasury price discovery. Earlier work examines price formation around major events. For example, [Fleming and Remolona \(1999\)](#) show how prices and liquidity respond to scheduled macroeconomic announcements. We provide an analogous characterization for Treasury auctions and show that the inverted V-shaped yield pattern is unique to auction supply shocks—it does not arise around major information releases such as FOMC or monthly employment announcements.

Other studies examine the role of order flow in Treasury price dynamics (e.g., [Brandt and Kavajecz, 2004](#); [Green, 2004](#)). Traditional models distinguish between price moves driven by public information (which can occur without trades) and private information (revealed through trading). Our evidence indicates that even around an anticipated event like an auction, where public information arrives without surprise, order flow still plays an important role. In this case, order flow does not necessarily serve as a conduit for information, but as a mechanism through which dealers adjust their positions around auction supply shocks.

Finally, our paper contributes to the literature studying the relationship between security supply and prices. Early studies such as [Simon \(1991\)](#), [Simon \(1994a\)](#), [Duffee \(1996\)](#), and [Fleming \(2002\)](#) show that the price of a given Treasury security depends on its relative supply. Following the Federal Reserve’s large-scale asset purchases (LSAPs), a broader link between aggregate Treasury supply and yields has also been documented. [Gagnon et al. \(2011\)](#) find that LSAPs produce meaningful and persistent declines in longer-term yields, while [D’Amico and King \(2013\)](#) identify both stock (long-run) and flow (same-day) effects. More generally, [Krishnamurthy and Vissing-Jorgensen \(2012\)](#) show that changes in Treasury supply affect yield spreads, and [Greenwood and Vayanos \(2014\)](#) argue that supply and demand shocks influence the pricing of duration risk and thus bond yields and expected returns. Our analysis adds to this literature by providing evidence on the temporary price effects associated with introducing a large, fully anticipated supply shock into the market—effects that are distinct from the permanent, longer-term supply effects emphasized in this literature.

The remainder of the paper proceeds as follows. Section 2 provides detailed background on the Treasury market and auction effects. Section 3 describe the data sources used in the analysis. Section 4 presents the intraday price pressure estimates and their evolution over time and analyzes market conditions around auction. Section 5 uses regressions to analyze the role of various determinants of price pressure effects around auctions, including order flow. Section 6 concludes.

2 Background on Treasury market and auction effects

The U.S. Treasury market is one of the largest and most liquid financial markets in the world, with marketable debt outstanding of \$30.3 trillion as of December 31, 2025.² Because of their liquidity, Treasuries are commonly used to price and hedge positions in other fixed-income securities and to speculate on the course of interest rates. The securities' creditworthiness and liquidity also make them a key instrument of monetary policy and a key store of value.

2.1 Primary market

Marketable Treasury securities are sold in the primary market via auctions. Each auction is announced one or more days in advance by means of a Treasury Department press release. The announcement provides details of the offering, including the offering amount and the term and type of security being offered. Competitive bids must be made in terms of yield and must typically be submitted by 1:00 p.m. Eastern Time on auction day.³

All noncompetitive bids from the public, up to \$5 million per bidder, are accepted in full. The Treasury then accepts competitive bids starting from the lowest yield (highest price), proceeding upward until the remaining offering amount is fully covered. The highest yield accepted is referred to as the stop-out yield. All successful bids, both competitive and noncompetitive, are awarded at this stop-out yield. There is no maximum acceptable yield, and the Treasury does not adjust the offering size in response to the strength of demand.⁴

Shortly after the competitive bid closing time, the Treasury announces the auction results. Announced results include the stop-out yield, the associated price, and the proportion of

²From Monthly Statement of the Public Debt of the United States: <https://fiscaldata.treasury.gov/datasets/monthly-statement-public-debt/summary-of-treasury-securities-outstanding>.

³Auction closing times are earlier for bills (typically 11:30 a.m.) and sometimes earlier for notes and bonds, usually because of another auction on the same day or because of an early market close. The closing time for noncompetitive bids is 30 or 60 minutes prior to that for competitive bids.

⁴Historically, Treasury securities were sold using multiple-price (discriminatory) auctions. Under this format, winning competitive bidders paid the yields they bid, rather than a uniform stop-out yield. Non-competitive bidders were awarded securities at the weighted-average yield of the accepted competitive bids, not at the stop-out yield. In September 1992, the Treasury started conducting single-price auctions for the 2- and 5-year notes, and since November 1998, the Treasury adopted the single-price method for all auctions.

securities awarded to those investors who bid exactly the stop-out yield. For notes and bonds, the announcement includes the coupon rate of the new security. The coupon rate is set to be the rate (in increments of 1/8 of one percent) that produces the price closest to, but not above, par when evaluated at the yield awarded to successful bidders.

While Treasury auctions are open to all investors, the primary government securities dealers—those with a trading relationship with the Federal Reserve Bank of New York—are required to participate. Historically, primary dealers have purchased the majority of securities sold at auction. In recent years, however, their share has declined, with a growing portion of issuance absorbed by other major bidder categories, most notably investment funds and foreign investors (see [Fleming et al., 2024](#) and Online Appendix Figure A1).

To minimize uncertainty surrounding auctions, and thereby reduce borrowing costs, the Treasury offers securities on a regular, predictable schedule. For example, 2-year notes are announced for auction in the second half of each month, auctioned a few days later, and then issued on the last day of the month. Treasury also tries to maintain a stable issue size for issues of a given maturity over an extended period of time. For example, issue sizes for the 2-year note were a constant \$35 billion between October 2010 and July 2013 and a constant \$26 billion between January 2015 and January 2018.

Upon the announcement of an upcoming auction, a forward “when-issued” market for the soon-to-be auctioned security comes into existence. Trades in the when-issued market are settled on the issuance date of the auctioned security. A security becomes on-the-run the day following auction (while remaining when-issued until issuance date), and ultimately goes off-the-run the day following the auction of the next security in the same maturity.

2.2 Secondary market

Secondary market activity occurs in a multiple-dealer, over-the-counter market. Although trading is conducted nearly around the clock on weekdays, the bulk of activity occurs during New York trading hours, roughly 7:30 a.m. to 5:00 p.m. Eastern Time ([Fleming, 1997](#)).

Primary dealers serve as the main market makers, quoting bid and ask prices and transacting with customers for their own accounts. In the first half of 2024, primary dealers reported average trading volume of nearly \$500 billion per day in coupon Treasury securities, compared with about \$190 billion in the first half of 1998.⁵

In addition to trading with customers, dealers also trade with one another through interdealer brokers (IDBs). A major market structure development was the migration of interdealer activity from voice-assisted brokers to electronic platforms (such as BrokerTec) in the early 2000s (Mizrach and Neely, 2006). Voice-assisted brokers provide dealers with screens displaying the best bid and offer quotes called in by dealers, along with associated quantities (minimums of \$5 million for bills and \$1 million for notes and bonds). Trades are executed by contacting the broker who then disseminates the resulting price and size. Electronic platforms, by contrast, operate as fully automated limit order book (LOB) markets in which bids and offers are matched anonymously without human intervention.⁶ Today, nearly all interdealer trading in on-the-run Treasury securities occurs on these electronic platforms. In addition, access to IDB electronic venues has expanded beyond dealers to include non-dealer participants (e.g., hedge funds and principal trading firms), whose participation has grown substantially since their initial entry in the early 2000s (see Joint Staff Report, 2015).

2.3 Auction price pressure

Several studies using daily or weekly data document that government security prices tend to decline in the days preceding an auction and rise afterward. Lou et al. (2013), examining auctions of 2-, 5-, and 10-year Treasury notes from January 1980 to June 2008, find that yields increase by 2–3 basis points in the days leading up to and including the auction day, and then decline by roughly 2 basis points over the subsequent days. Although their study

⁵Statistics since January 1998 are posted on the Federal Reserve Bank of New York’s website (<https://www.newyorkfed.org/markets/counterparties/primary-dealers-statistics>). Because the data are reported only by primary dealers, trades between two primary dealers are double-counted, while trades not involving a primary dealer are excluded entirely.

⁶See Fleming et al. (2018) for a detailed analysis of the microstructure of BrokerTec, the primary IDB electronic trading platform for on-the-run Treasury notes and bonds.

considers a 20-day window around each auction, most of the rise and subsequent reversal occurs within 3–4 days of the auction. Approximately half of the cumulative yield changes they report are statistically significant, with stronger effects for the 2-year note and weaker effects for the 10-year note. Similar magnitudes of auction-cycle effects are documented in other contexts (e.g., [Beetsma et al., 2016](#) for Italian and German government bond auctions and [Amin and Tedongap, 2023](#) for U.S. TIPS auctions).

In contrast to these studies, which examine price pressure over the entire auction cycle (often a 20-day window around monthly auctions), we adopt a market microstructure approach and analyze price behavior on a minute-by-minute basis within a narrow window around each auction, jointly with a careful assessment of prevailing market conditions. This high-frequency design ensures that any pattern we identify can be cleanly attributed to the auction itself, mitigating several concerns associated with results using lower-frequency data.

First, repo specialness does not affect intraday returns because Treasury settlement is independent of the time of day at which a trade occurs.⁷ Second, complications related to month-end dynamics and trending yields are materially reduced in an intraday setting. Third, intraday data allow us to isolate the interval immediately surrounding the auction and avoid other major information-release times (such as the 8:30 a.m. macroeconomic announcements). Although other information may occasionally be released during the auction window, and although month-end patterns could influence intraday dynamics in a small number of auctions that occur near the month end, it is difficult to conceive of these factors systematically generating the distinct V-shaped price pattern centered on auction time.

Notwithstanding, an important caveat is that if price pressure unfolds over multiple days—as suggested by prior studies using lower-frequency data—our intraday analysis will capture only a portion of the total effect. Accordingly, our contribution is in providing a clean identification of whether auction-related price pressure exists, how it evolves over

⁷A security shorted at 11:00 a.m. and covered at 2:00 p.m. does not need to be borrowed over that interval; settlement for both trades, if not netted, typically occurs the following day by 3:00 p.m. (most Treasury trades settle on a next-day basis).

time, and the role of order flow in driving it rather than a full estimate of the auction effect. In Section 4, we will discuss our multi-day, low-frequency estimates to place the intraday magnitudes in broader perspective.

2.4 Auction underpricing

It is important to distinguish the price pressure effect we study from the well-documented auction underpricing phenomenon. Underpricing refers to Treasury securities being sold in the primary market at prices below the contemporaneous when-issued market price of the same security—an effect estimated by Goldreich (2007) to average roughly 0.3 basis points in yield terms.⁸ This underpricing arises from bid shading driven by winner’s-curse considerations and has been documented extensively; see, among others, Cammack (1991); Spindt and Stolz (1992); Simon (1994b); Simon (1994c); Nyborg and Sundaresan (1996); Goldreich (2007); Hortacsu et al. (2018).

By contrast, the price pressure effect examined in our study pertains to secondary market behavior of the existing on-the-run security in the period leading up to and following the auction of the next security of the same maturity. We explicitly exclude a short interval after the auction result announcement so that our measure of price pressure does not capture the information effect associated with the release of auction outcomes. This approach allows us to isolate transitory price pressure arising from mechanisms distinct from the information channel, including imperfect capital mobility, dealers’ limited risk-bearing capacity, the compensation required for intermediaries to absorb inventory at auction, hedging of uncertain net supply shocks, and strategic trading by non-dealer participants.

⁸Our own calculation of underpricing in auctions of the 2-, 5-, and 10-year notes, using GovPX when-issued indicative pricing data for the 1992–2012 period, shows that underpricing ranges from approximately 0.07 basis points for the 2-year note to about 0.7 basis points for the 10-year note.

3 Data

Our analysis focuses on secondary market behavior of on-the-run nominal coupon Treasury securities (2-, 3-, 5-, 7-, 10-, and 30-year) around auctions of the next security between June 25, 1991 and July 25, 2024.⁹ We focus on the on-the-run securities because of secondary market data availability and because these are the most liquid securities of a given maturity, thus ensuring that the empirical analysis is not contaminated by the lack of liquidity.

3.1 Auction data

Data on Treasury auctions—including auction dates, security characteristics, and auction outcomes—are obtained from the Treasury Department’s TreasuryDirect website. All of the securities we examine are auctioned monthly and have been since at least 2009. New 2-, 3-, 5-, and 7-year notes are issued each month, whereas new 10- and 30-year securities are issued quarterly, with reopenings in each of the subsequent two months. Our auction sample includes these scheduled reopenings as well as the new issues.¹⁰

Figure 1 displays the average auction size and the number of auctions per year by maturity. The figure shows visually the temporary suspensions of issuance of the 3-year note (May 1998–May 2003 and May 2007–November 2008), 7-year note (April 1993–February 2009), and 30-year bond (August 2001–February 2006) and that only the 2-year note is consistently issued on a monthly basis over the entire sample period. Across maturities, auction sizes remain fairly stable over multi-year intervals but increased after September 11, during the GFC, and during the pandemic.

Panel A of Table 1 reports auction characteristics across maturities over the 33-year sample. The number of auctions per maturity ranges from roughly 190 to nearly 400, with

⁹We exclude the 20-year bond because its issuance was suspended between June 1986 and May 2020, covering most of our sample period.

¹⁰We exclude the five unscheduled reopenings of the 10-year note after September 11 and during the GFC in which the Treasury departed from its regular schedule to address specific supply shortages (see [Fleming and Garbade, 2002](#) and [Garbade et al., 2010](#)). We also exclude a small value contingency auction operation of the 10-year note in June 2019.

average offering amounts (excluding the Fed) between \$15 billion and \$33 billion. Dealers purchase a substantial share on average: about 33–51% of the non-Fed issuance amount. Investment funds (largely mutual funds and hedge funds) account for roughly 27–49%, while foreign investors purchase about 11–20%. All remaining investor categories (pension funds, insurance companies, depository institutions, individuals, and other unclassified bidders) collectively account for only 1–3% of purchases, indicating their minimal role in absorbing auction supply.¹¹ Bid-to-cover ratio, which is the quantity of bids relative to offering amount, averages 2.4–2.8, suggesting robust demand across maturities. Finally, bid dispersion—the difference between the stop-out yield and the median accepted yield—is tight (averaging roughly 3–5 bps), suggesting relatively homogeneous valuations among winning bidders.

Critical to our analysis are the auction closing time for competitive bids (which defines the end of the pre-auction period) and the auction results release time (which defines the start of the post-auction period). We collect the auction closing time from the same historical auction database when available, or from individual auction announcements for auctions earlier in our sample period. For auction results release time, we collect the time stamp of the first Bloomberg news article that reports the results following auction close.¹² The time between auction close and release of auction results was typically 30–60 minutes early in our sample, but has been just a few minutes for nearly all auctions since late 2001.

Because some parts of our analysis call for a comparison with non-auction days, we select

¹¹Online Appendix Table A1 and Figure A1 document the evolution of auction purchase shares by investor class from January 2000 (when the investor-class allotment data became available) through the end of the sample period. Both the tabular “start-to-end” comparison and the time-series plot reveal a pronounced secular decline in dealer participation: broker-dealers consistently accounted for roughly 60–80% of awards at the beginning of the sample, but their share falls into the high-teen range by 2024. Investment funds exhibit the mirror image of this pattern, rising steadily to about 70% of awards in recent years. Foreign investor participation is comparatively stable, remaining in the teen range throughout the period, with a modest drift from the high-teens toward the low-teens over time. The residual “Others” category is negligible throughout the sample period.

¹²For instances in which we cannot find a news article with the auction results, we impute the release times using the release times of other securities with the same maturity. The imputed release time for a given auction is defined as the auction’s closing time plus the maximum time interval between the auction closing time and the release time of the six auctions preceding and following that auction. When the surrounding auction release times are also missing at the beginning (end) of our sample, we instead use the maximum time interval between the auction closing time and the release time of the first 12 auctions for which we have release times (last 12 auctions for which we have release times).

these control days as follows. For each auction, we use the same day of week from one week before and one week after the auction so that our comparison is not affected by any day-of-week regularity. Moreover, the use of one control day before and one control day after the auction helps mitigate possible trends in the variables of interest. If a control day coincides with an FOMC announcement, an early market close, or the auction of another note or bond, we replace the “week-before” control day with the nearest preceding trading day without one of the aforementioned events and the “week-after” control day with the nearest subsequent trading day without one of those events. The event times for each control day mirror those of its corresponding auction day; for example, control days for an auction with a 1:00 pm closing time and a 1:03 pm release time have those same event times.

3.2 Secondary market data

To analyze intraday price and liquidity dynamics, we combine tick data from GovPX (June 1991–June 2001) and BrokerTec (July 2001–July 2024), reflecting the market’s transition from voice-assisted to electronic trading platforms in the early 2000s. GovPX consolidates data from voice-assisted IDBs and provides broad coverage early in our sample, while BrokerTec—a fully electronic IDB platform—becomes the dominant venue thereafter. We sample both datasets at the one-minute frequency, applying standard filters to remove outliers and data artifacts (e.g., negative spreads, one-sided quotes, and erroneous prices).

Beyond prices and yields, we construct several measures of market conditions. Net order flow is the difference between buyer-initiated and seller-initiated trading volume, calculated separately over three-hour windows before and after each auction. Market depth is the average quantity quoted at the best bid and ask, expressed in millions of dollars par value. Price impact is the slope coefficient from regressing one-minute changes in the bid-ask midpoint on one-minute net order flow, expressed in basis points per \$1 billion in net order flow. Realized volatility is the annualized square root of the sum of squared one-minute returns. Trading volume is the total par value of trades.

Panel B of Table 1 reports summary statistics for market conditions prevailing before auctions, except for net order flow, which is measured over three-hour windows before and after auction. The statistics reveal a pronounced “V-shaped” pattern in net order flow across all maturities: pre-auction net order flow is consistently negative whereas post-auction net order flow is consistently positive. Excluding the 30-year bond, the pre-auction selling pressure ranges from \$230 million to \$381 million and post-auction buying pressure ranges from \$99 to \$273 million. Price impact increases nearly monotonically with maturity, from 0.046 bps per \$1 billion for the 2-year note to 1.412 bps for the 30-year bond, reflecting both duration differences and differing liquidity as shown by market depth, which averages \$383 million for the 2-year note but just \$8 million for the 30-year bond. Annualized realized volatility scales with duration from 1.3% (2-year) to 12.4% (30-year), while trading volume is highest for intermediate maturities (5- and 10-year) at \$24–26 billion compared to \$13 billion for shorter maturities and \$8 billion for the 30-year bond.

3.3 Other data

To investigate the role of dealers’ willingness to intermediate in explaining price behavior around auctions, we use several proxies and report their summary statistics (based on values available before auctions) in Panel C of Table 1. Specifically, we include the Merrill Lynch Option Volatility Estimate Index (MOVE Index) and the Chicago Board Options Exchange Volatility Index (VIX Index) to capture implied volatility in the bond and equity markets, respectively. These measures proxy for intermediation risk and costs that should negatively affect dealers’ willingness to intermediate. We observe substantial variation in market volatility across auctions in the sample: the VIX ranges from 9.3 to 75.5 (mean 19.1) and the MOVE ranges from 37.2 to 229.9 (mean 87.6), spanning periods of calm and extreme stress including the GFC and COVID-19 pandemic. To facilitate interpretation of our empirical results, we standardize the MOVE and VIX using their time series distributions over the entire sample period, as opposed to just the values observed around auctions.

We also consider more direct proxies of dealers’ intermediation constraints. The first is the growth in broker-dealer leverage from [Adrian et al. \(2014\)](#), calculated as the quarterly percentage change in the ratio of financial assets to equity of broker-dealers from the Financial Accounts of the United States. We interpret this variable similar to [Lou et al. \(2013\)](#), which is that decreased leverage growth implies a higher cost of obtaining leverage and bearing risk, reducing dealers’ willingness to intermediate. An alternative proxy is the intermediary capital ratio growth rate from [He et al. \(2017\)](#), computed as the AR(1) innovation in primary dealers’ capital ratio (aggregate market equity-to-assets) and expressed as a percentage of the lagged capital ratio (we use the monthly series). The interpretation in [He et al. \(2017\)](#) differs from that for the broker-dealer leverage measure: higher growth of intermediary capital indicates a more robust intermediary sector with greater risk-bearing capacity. Panel C reveals substantial variation in these dealer constraint measures: broker-dealer leverage growth averages -0.44%, with a standard deviation of 4.72% and ranging from -28.94% to 11.85%, while intermediary capital ratio growth averages 0.59%, with a standard deviation of 6.73% and ranging from -29.90% to 39.65%. These statistics highlight significant time-series heterogeneity in dealer capacity across our sample period.

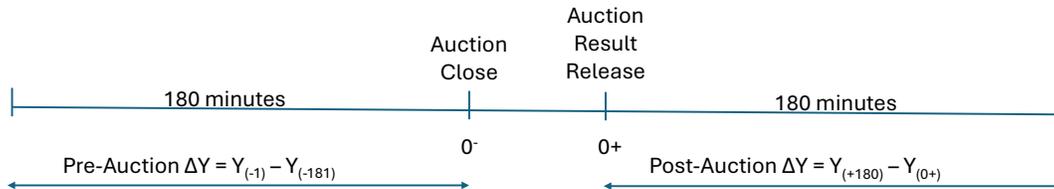
4 Price pressure and market dynamics around auctions

In this section, we provide a detailed analysis of the intraday behavior of yields, order flow, and liquidity in the secondary market for on-the-run Treasury securities around auction of the next security. We also compare these patterns with those observed around other major information releases—most notably FOMC announcements and employment reports—to demonstrate that the dynamics we document are specific to Treasury auctions.

4.1 Yield changes

Our primary variable of interest is the change in yield of an on-the-run security around the auction of the next security with the same original maturity. The pre-auction yield change

is defined as the difference between the yield observed the minute before the auction close time and that 180 minutes earlier. Likewise, the post-auction yield change is defined as the change from the yield observed the minute after the auction results announcement to that 180 minutes later. The diagram below illustrates the event times and the corresponding pre- and post-auction windows used in these calculations:



Similar to [Lou et al. \(2013\)](#), we combine these two components into a single measure of auction price pressure in the yield space, which we refer to as “yield pressure”:

$$\text{Yield Pressure} = \text{Pre-Auction } \Delta Y - \text{Post-Auction } \Delta Y. \quad (1)$$

Yield changes, rather than price changes, serve as our main metric of auction price pressure because they are comparable across maturities. We start the post-auction window from the minute after the release of auction results to ensure that our measure excludes the announcement-time price jump that reflects the information content of the release.¹³

Table 2 provides strong evidence of economically and statistically significant yield pressure around Treasury auctions. Panel A indicates that, over the full 1991–2024 sample, temporary yield deviations in the six-hour window around auctions range from about 0.5 to 1.3 bps across maturities, all statistically significant at the 5% or 1% level. These effects reflect both a pre-auction run-up in yields (0.37–0.65 bps for most maturities) and a post-auction reversal (−0.30 to −0.81 bps for most maturities), with the two components

¹³For the post-auction yield change, we also compute an alternative measure that shifts the start of the post-auction window to 10 minutes after the auction results announcement to account for elevated price volatility immediately following the release of auction information. Our results are robust to the inclusion of this additional time buffer.

broadly similar in magnitude except for the 30-year bond, where the post-auction adjustment is negligible. To place the magnitude of the six-hour yield pressure estimates in broader perspective, we also compute the corresponding 10-day yield pressure using daily yield data following [Lou et al. \(2013\)](#). Over the full sample, the 10-day effect averages roughly 2–5 bps. Thus, the six-hour window we study accounts for approximately 25% of the total 10-day effect (see Online Appendix Table [A2](#)).

Figure [2](#) further illustrates the dynamics at a one-minute resolution, revealing a clear inverted V-shaped pattern: yields rise steadily in the hours leading up to the auction and decline after the announcement of auction results. The pattern holds uniformly across all on-the-run securities. These intraday results complement the multi-day auction-cycle evidence documented by [Lou et al. \(2013\)](#) and confirm that auction price pressure exists in a high-frequency setting that offers the cleanest identification of auction effects. Unreported results show that yield changes over the same intraday windows on control days are not statistically different from zero, alleviating the concern that the effects documented here merely reflect intraday regularities.

Panel B examines how auction price pressures vary across three subsamples defined to align with major structural and regulatory shifts in the U.S. Treasury market. Following [Fleming et al. \(2024\)](#), we define: (i) 1991–2006, the pre-GFC period characterized by relatively unconstrained dealer balance sheets and a stable market structure; (ii) 2007–2014, the crisis period spanning the 2007–09 GFC and the subsequent introduction of major regulatory reforms (including Basel III capital and liquidity requirements, changes in supplementary leverage ratios, and reforms affecting primary dealers); and (iii) 2015–2024, the implementation period in which these reforms were fully implemented and dealer balance sheet constraints became a more persistent feature of the market. This segmentation allows us to assess whether evolving intermediation capacity meaningfully altered auction price pressure.

Across all three periods, yield pressure remains a constant feature, but the magnitudes differ. The 2007–2014 crisis/regulatory-transition period exhibits the strongest pressures—

1.0 to 1.9 bps across most maturities—consistent with impaired dealer intermediation during times of market stress. The 1991–2006 period also shows sizable pressures (0.6–1.6 bps), though generally smaller than during the crisis years. In contrast, the post-2015 period displays markedly weaker yield pressure—roughly half the earlier magnitudes—with statistical significance remaining only for the 3-, 5-, and 10-year notes. Formal F-tests confirm that yield pressure declines significantly after 2014 for the 3- and 10-year notes.

A particularly important implication of these subsample results is that the strong auction-cycle effects documented by [Lou et al. \(2013\)](#), whose sample ends in 2008, do not persist at the same magnitude when the sample is extended through 2024. Their multi-day auction window shows substantial pre- and post-auction yield movements, consistent with our pre- and post-auction intraday effects in the earlier part of our sample. However, the extended sample shows that auction-driven price pressure has moderated substantially in the post-2014 period, even as dealer balance sheet constraints have tightened under post-crisis regulation.

We reach the same conclusion when examining lower-frequency yield dynamics over the 10-day window around auction.¹⁴ This pattern suggests that tighter capital and leverage requirements have not translated into greater auction-related price pressure, contrary to the concern that a more constrained intermediary sector would amplify price pressure and raise issuance costs for the Treasury. The attenuation of auction price pressure in recent years points to the possibility that other market participants—such as investment funds and foreign investors—may have increasingly absorbed auction-related supply shocks or otherwise offset dealers’ reduced intermediation capacity. We explore these possibilities later in the paper using regression analysis designed to isolate the roles of dealer risk-bearing capacity and non-dealer investor participation.

¹⁴Online Appendix Table [A2](#) reports yield pressure estimates using daily yield data over a 10-day auction window using the methodology of [Lou et al. \(2013\)](#). While yield pressure is significant over the full sample, the effect is most pronounced during 2007–2014 and weakens markedly in 2015–2024.

4.2 Price changes

To quantify the magnitude of the auction price effect in dollar terms and obtain a rough estimate of the associated issuance cost due to price pressure, we also compute the auction price effect in return space and report the results in Table 3. The pre-auction return is measured as $\frac{P_{(-1)} - P_{(-181)}}{P_{(-181)}}$ and the post auction return as $\frac{P_{(+180)} - P_{(0+)}}{P_{(0+)}}$. As with our yield-based measure (and as in Lou et al., 2013), we combine the two components into a single measure of price pressure, defined as the post-auction return minus the pre-auction return.

Table 3 shows auction price pressure estimates that mirror the qualitative patterns in yield space. Panel A shows sizeable and highly significant price pressure effects across all maturities, ranging from about 1.3 bps for the 2-year note to over 13 bps for the 30-year bond. Panel B indicates that return-based price pressures are present in all subsample periods, are most pronounced during 2007–2014, and weaken in the post-2014 period.

More importantly, the return-based estimates allow us to gauge the economic significance of auction price pressure in dollar terms. For the 2-year note, applying the average price pressure of 1.299 bps to an average auction size of \$28 billion implies an indirect cost of roughly \$3.6 million per auction, or about \$43 million per year given monthly issuance. The same calculation indicates materially larger costs for longer maturities: roughly \$14 million per auction for the 5-year note, \$22 million per auction for the 10-year note, and nearly \$20 million per auction for the 30-year bond, implying annualized costs in the hundreds of millions of dollars. These amounts represent the savings that would accrue to the Treasury in the absence of intraday price pressure and are conceptually distinct from auction underpricing. Because they measure price pressure within a narrow six-hour window and exclude any longer-horizon effects, these estimates should be viewed as conservative lower bounds on the indirect cost of Treasury issuance attributable to auction-related price pressure.

4.3 Spillover of auction price pressure across the yield curve

The preceding results show that auctions generate meaningful price pressure in the on-the-run security of the auctioned maturity. We now extend this evidence by examining whether this pressure propagates across the yield curve. Although [Lou et al. \(2013\)](#) also study cross-maturity spillovers for the 2-, 5-, and 10-year notes, their multi-day event window makes it difficult to cleanly isolate spillover effects because auctions in different maturities frequently occur within the same window, creating overlapping events that confound identification. Our intraday design overcomes this limitation by focusing on a tight six-hour window around each auction, ensuring that the measurement interval is uncontaminated by auctions in other maturities. This allows us to attribute any spillover effects directly to the supply shock of the given auction. The resulting maturity pattern of spillovers provides insight into how market participants accommodate auction supply shocks, as hedging activity in duration-matched Treasuries can transmit price pressure beyond the auctioned security, with the extent of spillover depending on the availability of close substitutes along the curve.

Table 4 presents estimates of spillover effects and reveals several patterns. Auctions of short-maturity securities generate yield pressure that is largely confined to the short end of the curve. For example, 2-year auctions produce significant yield pressure in the on-the-run 2-year (0.667 bps) and 3-year (0.373 bps) notes, with little evidence of spillovers to longer maturities. Likewise, around 3-year auctions, we observe significant yield pressure in the 2-year (0.729 bps), 3-year (0.813 bps), and 5-year (0.403 bps) notes, with no significant effects from the 7-year maturity onward. This concentration of spillovers at the short end is consistent with the notion that long-maturity securities are not appropriate substitutes for hedging an inventory shock originating from a short-maturity auction without overshooting duration. A similar logic likely explains why 30-year auctions generate significant yield pressure primarily in the 30-year bond (0.66 bps), with negligible effects at shorter maturities.

In contrast, auctions of intermediate maturities exhibit broader cross-maturity spillovers. Auctions of 5- and 10-year notes are associated with significant yield pressure across the

entire curve. Even auctions in the less liquid maturity, the 7-year, spill over to nearby maturities from the 3- to the 10-year. The magnitude and breadth of these effects suggest that when auction supply shocks originate in intermediate maturities, the wider set of available substitutes for hedging auction supply shocks generates more widespread spillovers.

Overall, Table 4 indicates that auction-related price pressure is not confined to the auctioned maturity. Instead, the spillover patterns are descriptively consistent with dealers managing auction-induced inventory shocks in duration space under limited risk-bearing capacity, a mechanism emphasized by [Beetsma et al. \(2018\)](#) in their study of cross-border auction spillovers in euro-area sovereign bond markets.

4.4 Net order flow

A key mechanism proposed in the literature is that dealers use secondary market trading to manage auction-related inventory shocks, especially when they feel constrained (e.g., [Lou et al., 2013](#); [Anderson and Liu, 2024](#)). Existing studies largely infer such behavior indirectly from price dynamics measured over multi-day horizons, conjecturing that dealers sell securities ahead of auctions to hedge anticipated takedowns and unwind these positions afterward. We advance this literature by providing—with the use of intraday data—the first direct evidence that confirms this conjectured mechanism.

Figure 3 plots cumulative net order flow on auction days (solid line) against non-auction control days (dashed line) for the six-hour window surrounding each auction. Across all maturities—from the 2-year to the 30-year—the figure shows a consistent pre-auction buildup of negative net order flow, indicating sustained selling pressure as the auction approaches. Immediately after the auction results are released, the pattern reverses sharply into positive net order flow, indicating post-auction buying pressure. These auction-day patterns are statistically different from those on control days, as indicated by the open and filled diamonds marking significance at the 5% and 1% levels, respectively.

This intraday trading pattern aligns closely with the yield-pressure dynamics documented

earlier. The pre-auction selling coincides with the buildup of yield pressure while the post-auction buying coincides with the subsequent reversal of that pressure. The tight synchronization between order flow and yield dynamics provides direct confirmation that secondary market trading activity is a key microstructural channel through which auction-related inventory shocks translate into observed auction price pressure.

Treasury auctions differ from other major macroeconomic announcement events in two important respects. In addition to revealing information about demand conditions and investors' expectations for future interest rates, auctions also inject a large and predictable quantity of securities into the market, generating a pure supply shock. While the information component is common to other macroeconomic announcements, the supply component is unique to auctions.

To illustrate this distinction, we examine net order flow around two other major scheduled announcements: FOMC announcements and monthly employment reports. As shown in Appendix Figures A2 and A3, neither event exhibits the pronounced pre-event selling and post-event buying pattern observed around auctions. Instead, net order flow remains relatively flat or displays only transitory movements, and in some cases even post-event net selling.¹⁵ This contrast indicates that the trading behavior documented in Figure 3 reflects dealer inventory management around the fully anticipated supply shocks rather than a generic response to information arrival.

We further examine corresponding yield changes around the other announcements in Appendix Figures A4 and A5. In the three hours prior to each announcement, yield changes are not systematically different from zero. Following employment report releases, yield changes remain largely insignificant. FOMC announcements are followed by a significant and persistent decline in yields—on the order of 1-2 bps—consistent with previously documented post-FOMC drift in bond markets (Brooks et al., 2018; Indriawan et al., 2021). If this post-event yield behavior reflects more informed trading after monetary policy announcements, it

¹⁵In unreported analysis, we further condition on the sign of announcement surprises and continue to find no systematic net order flow patterns.

is notable that it is not accompanied by corresponding post-announcement buying pressure, further distinguishing these events from Treasury auctions.

Taken together, these results provide direct evidence from intraday data that dealers engage in pre-auction selling to make room for new supply and subsequently unwind these positions after the auction. The symmetric patterns documented here appear unique to auctions and do not arise around other major macroeconomic announcements. This behavior of net order flow is tightly linked to the yield-pressure dynamics documented earlier and constitutes a key mechanism through which auction supply shocks generate temporary price deviations, which we will examine more formally in Section 5.

4.5 Other secondary market conditions

An alternative explanation for auction-related price pressure is that it reflects deteriorating market liquidity around auctions rather than inventory-related trading pressures. To evaluate this possibility, we examine the behavior of inside market depth and realized volatility in the same six-hour window used for our yield and order-flow analysis. Figures 4 and 5 plot these liquidity conditions on auction days (solid line) and on matched non-auction control days (dashed line), with statistically significant differences indicated by open and filled diamonds at the 5% and 1% levels, respectively.

Across maturities, liquidity conditions are remarkably strong ahead of auctions. Figure 4 shows that inside market depth on auction days rises steadily throughout the pre-auction window and exceeds depth on control days for most of this period, with the largest differences occurring about 10 minutes before the auction. Depth falls immediately before and after the auction but remains significantly above control-day levels for most maturities, converging only toward the end of the post-auction window. The late post-auction decline occurs on both auction and control days, indicating routine intraday liquidity patterns rather than auction-induced illiquidity.

Turning to volatility, Figure 5 shows that realized volatility before auction is consistently

lower on auction days than on control days, in line with the abundant liquidity in this period. Volatility rises immediately after the release of auction results, but the increase is concentrated within the first hour and then subsides to levels comparable to control days for most maturities. Thus, while auctions trigger a brief volatility response as information is incorporated, volatility does not remain elevated and does not impair trading conditions over the remainder of the post-auction window.

Taken together, these results show that liquidity is unusually strong before auctions, characterized by deeper markets and lower volatility relative to comparable non-auction days. Although there is a transitory volatility increase immediately following the auction, both depth and volatility normalize quickly and become indistinguishable from regular intraday patterns for most maturities. These findings rule out the alternative explanation that auction-related price pressure arises from poor liquidity conditions. Instead, they reinforce the interpretation that the observed price pressure reflects dealers actively managing auction-induced inventory shocks in an otherwise liquid and orderly market.

5 Understanding auction price pressure

Having documented robust and systematic price pressure around Treasury auctions, we next examine the mechanisms behind these patterns. A leading explanation is that dealers have limited risk-bearing capacity and must manage their balance sheets around auction supply shocks. To accommodate large incoming issuance, dealers may take short positions in closely related securities ahead of the auction, generating temporary downward price pressure that subsequently reverses. Prior work (e.g., [Lou et al., 2013](#)) tests this hypothesis using only price/yield movements over a multi-day horizon around auction dates. Such an approach makes it difficult to isolate auction-driven effects from broader market forces and offers limited visibility into the underlying price-formation process.

Our setting permits a sharper test. Leveraging a clean intraday identification window and detailed data on trades and market liquidity, we provide direct evidence on how deal-

ers' limited risk-bearing capacity manifests in trading behavior and price dynamics around auctions. We first assess the explanatory power of standard proxies for dealers' risk-bearing capacity. We then examine auction demand characteristics that may influence dealers' inventory adjustments and the resulting price pressure. Next, we incorporate measures of non-dealer participation, which has grown in importance amid declining dealer participation and may have altered how auction supply shocks are intermediated. Finally, we analyze net order flow to assess whether the observed price patterns are transmitted through trading activity around these fully anticipated supply events.

To explore these questions, we estimate cross-sectional regressions of the form:

$$YieldPressure_{m,t} = \alpha_m + \sum_i \beta^i X_t^i + \sum_j \gamma_j Z_{m,t}^j + \epsilon_{m,t}, \quad (2)$$

where $YieldPressure_{m,t}$ is our measure of temporary yield deviation around auction for maturity m on auction date t . It captures the magnitude of the inverted V-shaped yield movement by taking the pre-auction yield change minus the post-auction yield change, so that larger values indicate stronger price pressure. We focus on yield changes rather than price changes to reduce cross-security variation due to differences in duration. Maturity fixed effects α_m absorb level differences across maturities. The vector X_t contains macro-level explanatory variables while $Z_{m,t}$ includes maturity-specific explanatory variables. Unless otherwise noted, maturity-specific explanatory variables are standardized using maturity-specific means and standard deviations.

5.1 Dealers' limited risk bearing capacity

The descriptive evidence presented thus far points to the central role of intermediation frictions in generating the systematic auction-related price pressure. We now formally investigate this connection by examining a set of proxies that capture dealers' willingness and ability to take positions around auction supply shocks.

Following [Lou et al. \(2013\)](#), we consider three market-wide proxies for intermediaries’ risk-bearing capacity: bond-market implied volatility (MOVE), equity-market implied volatility (VIX), and broker-dealer leverage growth. Higher MOVE or VIX indicates more volatile market conditions and faster depletion of dealers’ risk-bearing capacity. In such conditions, dealers may adjust inventory more aggressively ahead of auctions and demand greater compensation for absorbing supply shocks, resulting in stronger auction price pressure. Accordingly, we expect positive coefficients on MOVE and VIX. By contrast, stronger broker-dealer leverage growth implies cheaper access to leverage and greater balance-sheet capacity, which should mitigate price pressure and yield a negative coefficient. We also include the intermediary capital ratio growth from [He et al. \(2017\)](#), which captures the soundness of the intermediary sector. An improvement in this ratio signals enhanced risk-bearing capacity and should weaken price pressure, implying a negative coefficient.

Beyond these macro-level proxies, we also consider a set of maturity-specific measures that may influence dealers’ willingness to intermediate. First, realized volatility reflects the price risk of the auctioned maturity, with higher price risk increasing the cost of holding inventory and making dealers more constrained. Thus, it should be positively correlated with auction price pressure. Second, price impact—our measure of secondary market liquidity—captures the ease with which dealers can adjust positions for inventory management.¹⁶ Higher price impact indicates greater difficulty in (or higher cost of) trading, reducing dealers’ willingness to intermediate and thereby increasing auction price pressure. We therefore expect a positive coefficient. Finally, the offering amount scales the intermediation burden: larger auctions should generate more price pressure by pushing dealers closer to their risk-bearing limits.

¹⁶We also examine alternative liquidity measures such as depth and bid–ask spreads. Depth, however, is not comparable across the GovPX and BrokerTec eras because of substantial market structure changes, making it unsuitable for explaining variation in auction price pressure over time. This limitation does not affect our earlier descriptive analysis in Section 4, where depth is compared only across auction and control days within the same market environment. The bid–ask spread, by contrast, offers little meaningful variation for explaining auction price pressure because it is typically constrained to a single tick (see [Fleming et al., 2023](#)). Over a long sample period, price impact is thus the most reliable and internally consistent liquidity measure available. For comparability, we adjust price-impact estimates for inflation using December 1999 as the base period.

However, because offering amounts are known well in advance and have little variation over short periods of time, their ability to explain auction price pressure may be limited.

Because these proxies are likely correlated, we first estimate regressions separately for each determinant to assess individual explanatory power and then estimate a joint specification to evaluate which proxies dominate when examined concurrently. Table 5 reports the results and reveals several key findings. First, columns (1)–(2) show that both MOVE and VIX are strongly and positively associated with auction price pressure. The MOVE coefficient implies that a one-standard-deviation increase in Treasury market volatility amplifies yield pressure by roughly 0.38 bps, a sizable effect given the average magnitude of auction price pressure reported in Table 2. The significance of these coefficients (1% level) supports the interpretation that heightened volatility tightens intermediaries’ risk-bearing capacity, induces greater pre-auction inventory liquidation and hedging, and produces a more pronounced inverted V-shaped yield pattern.

Second, the direct proxies of intermediary risk-bearing capacity offer additional support for this interpretation, especially the intermediary capital ratio growth. Column (4) shows that increases in intermediary capital—indicating a stronger, better-capitalized intermediary sector—are associated with weaker auction price pressure, as predicted. By contrast, broker-dealer leverage growth (measured at the quarterly frequency) is insignificant, likely because such low-frequency variation does not have enough power to explain price pressure measured over an intraday window.

Third, the maturity-specific measures generally also explain auction price pressure as expected. Realized volatility and illiquidity in the auctioned maturity are both positively associated with price pressure (Columns 5-6), indicating that higher local price risk and poorer liquidity increase the cost of intermediating the impending supply shock and therefore intensify price pressure around the auction. In contrast, offering amount (Column 7) does not explain variation in price pressure, consistent with the view that auction sizes are stable and well known in advance and therefore should not meaningfully affect price dynamics in

the tight window around auctions.

Finally, when all significant proxies are included jointly in Column (8), the MOVE remains the only significant determinant of auction price pressure. This finding indicates that it is the forward-looking volatility of the overall Treasury market that drives other proxies of dealers’ willingness to intermediate and captures the most relevant variation underlying auction price pressure. Taken together, Table 5 supports the conclusion that limited dealer risk-bearing capacity contributes to auction price pressure and identifies bond market implied volatility as the strongest and most reliable proxy for dealers’ risk-bearing capacity.

5.2 Demand-side determinants

We next examine the role of investor demand in shaping auction price pressure. Dealer risk-bearing constraints generate substantial price pressure only when dealers must absorb a sizable share of auction supply. When demand for the auctioned maturity is strong, more of the supply is purchased directly by non-dealers, leaving a smaller inventory burden for intermediaries and making it easier for dealers to subsequently sell any positions acquired at auction. In this sense, stronger demand should alleviate auction price pressure by relaxing the effective constraint on the intermediary sector.

Although actual auction demand is not known until results are released, dealers can anticipate the strength of demand ahead of time. As documented by [Boyarchenko et al. \(2021\)](#), dealers acquire market intelligence through direct client interactions and order flow, allowing them to assess buy-side interest before the auction. When demand is expected to be weak or inelastic, dealers adjust their inventories preemptively—consistent with the pre-auction selling and post-auction reversal patterns documented earlier.

We consider several proxies that capture distinct features of investor demand. The bid-to-cover ratio measures the quantity of bids relative to supply; stronger aggregate demand should reduce price pressure, implying a negative coefficient. Bid dispersion, the difference between the stop-out yield and the median accepted yield, captures the elasticity of demand.

Higher bid dispersion indicates that the marginal bidder requires a larger yield concession, implying less elastic (more inelastic) demand. As shown in [Albuquerque et al. \(2024\)](#) and [Cavaleri et al. \(2025\)](#), inelastic demand increases intermediaries' difficulty in offloading inventory, thereby raising intermediation risk and intensifying the price pressure around auctions. Thus, we expect a positive coefficient on bid dispersion.

To capture the role of non-dealer participants, we also include the shares of auction purchases by investment funds and foreign investors. When these investors purchase Treasuries directly at auction rather than sourcing them from dealers afterward, they reduce the amount of inventory dealers must warehouse. Moreover, the investment-fund category includes hedge funds, which often buy at auction with the intention of reselling later to exploit short-term price movements, effectively acting as non-dealer intermediaries. Both the reduced intermediation burden on dealers and the presence of alternative (non-dealer) intermediaries should mitigate auction price pressure, implying negative coefficients for these variables.

Table 6 reports the results. In the univariate regressions (Columns 1–4), each demand proxy enters significantly with the expected sign. A one-standard-deviation increase in bid-to-cover reduces auction yield pressure by about 0.27 bps, while a comparable increase in bid dispersion raises price pressure by 0.28 bps, consistent with the interpretation that inelastic demand amplifies auction price effects. Similarly, a one-standard-deviation increase in investment fund participation reduces price pressure by roughly 0.32 bps, while foreign participation lowers it by roughly 0.16 bps. These groups constitute deep pockets of stable demand; when they absorb more supply, dealers' intermediation burden falls and auction price pressure subsides.

When all variables are included simultaneously (Columns 5–6), bid dispersion, investment fund share, and foreign investor share remain highly significant, while the explanatory power of bid-to-cover disappears. The joint model explains substantially more variation in auction price pressure (R-squared of 3.7–3.8%) than any of the univariate regressions (R-squared below 1.1%). This pattern suggests that bid dispersion and buyer composition capture

distinct, incremental dimensions of demand—namely, demand elasticity and the depth of non-dealer buying—that jointly determine how much inventory dealers must absorb and, in turn, how strong the auction price pressure is.

Overall, the evidence shows that price pressure effects are mitigated by strong and elastic investor demand. When non-dealer buyers absorb more supply and when the demand curve is more elastic, dealers face a smaller inventory shock and can offload positions more easily. These findings reinforce the central mechanism: auction price pressure arises when dealers’ risk-bearing capacity is limited and investor capital is insufficient to absorb auction supply.

5.3 The role of order flow around auctions

One striking pattern documented in Section 4 is the close alignment between net order flow and yield movements around auctions. Whereas dealer capacity constraints and investor demand help explain why auction price pressure arises, order flow clarifies how these pressures manifest in real time. Ex ante, however, it is not obvious that order flow should play a central explanatory role. On the one hand, the auction-induced supply shock is fully anticipated, effectively public information, so order flow need not be essential for price pressure to occur. That is, prices can move without trades, so the existence of auction price pressure does not mechanically imply an order-flow mechanism. On the other hand, if dealers actively manage inventories before and after auction through trading in the secondary market, then order flow becomes a natural channel through which limited risk-bearing capacity translates into observed price dynamics. Whether order flow plays a role in shaping auction price pressure is ultimately an empirical question.

To investigate this link, we regress our auction price pressure measure on pre- and post-auction net order flow variables. Because overall trading activity has changed substantially over time, a given dollar amount of net order flow may have different implications depending on the level of trading volume; e.g., a \$1 million imbalance may be more consequential when daily volume is \$10 million than when it is \$100 million. To account for this, we examine

both dollar net order flow (inflation-adjusted to ensure comparability over time) and net order flow scaled by trade volume over the same interval. For ease of interpretation, we flip the sign of pre-auction net order flow variables so that positive values indicate net selling pressure and standardize all explanatory variables by maturity-specific means and standard deviations. We also separately analyze how pre-auction net selling (post-auction net buying) relates to pre-auction (post-auction) yield changes.¹⁷ The results are reported in Table 7.

Corroborating the descriptive evidence, the regression estimates show a tight and economically meaningful relationship between order flow and auction price pressure. A one-standard deviation increase in pre-auction net selling increases the yield pressure by 0.77 bps, while a comparable increase in post-auction net buying increases it by 1.07 bps. The effects are similar (0.64 bps and 0.73 bps) if we use the scaled net order flow variables. All coefficients are significant at the 1% level. Examining the two windows separately yields the same conclusions: pre-auction net selling is significantly associated with the pre-auction yield increase and post-auction net buying is significantly associated with the post-auction yield decline. Also striking is the high explanatory power of net order flow variables compared to other determinants. The regressions explain roughly 5–13% of the variation in auction price pressure—substantially more than dealer capacity or demand-side proxies.

Overall, the results in Table 7 show that the effects of net order flow on auction price pressure are large, statistically strong, and account for more variation in the inverted V-shaped yield pattern than any other determinants we examine.

5.4 Horse race analysis of key variables

Having established the individual roles of dealer risk-bearing capacity, investor demand, and secondary market trading activity in shaping auction price pressure, we now examine their joint explanatory power. If our conjecture is correct—that the effects of dealer constraints

¹⁷We expect a positive coefficient when regressing pre-auction yield changes on pre-auction net selling (net selling associated with rising yields) and a negative coefficient when regressing post-auction yield changes on post-auction net buying (net buying associated with falling yields).

and auction demand ultimately manifest through inventory adjustment in the secondary market—then net order flow should dominate once all determinants are jointly evaluated.

To test this, we combine the significant determinants uncovered in prior analyses (Tables 5–7) and run a horse race.¹⁸ Columns (1) and (2) of Table 8 compare a specification excluding the two order-flow variables with one that includes them. Without order flow variables, nearly all key determinants are significant with the expected signs, indicating that demand elasticity and non-dealer participation each captures meaningful variation in auction price pressure. However, adding order flow variables increases the adjusted R^2 from 3.8% to nearly 19%, underscoring the outsized explanatory power of order flow. The other coefficients are still economically and statistically meaningful, but their incremental effects are generally smaller in magnitude. The one exception is the MOVE coefficient, which is insignificant when order flow is excluded, but more positive and significant when order flow is included.

We next estimate the same comprehensive model within two subsamples (2007–2014 and 2015–2024), since investor participation, dealer balance-sheet conditions, and market structure change substantially over these periods.¹⁹ In the 2007–2014 period, which spans the financial crisis and the subsequent development of regulations, bond market volatility and demand elasticity play especially prominent roles alongside order flow. Purchases by foreign investors also significantly explain auction price pressure, although their explanatory power largely disappears once order flow is included. By contrast, investment funds do not meaningfully explain auction price pressure during this period.

These results align with the broader market context. Dealers purchased a substantial share of issuance during this period (see Online Appendix Figure A1), while investment funds had not yet become major buyers at auction. The elevated volatility during the GFC further discourages their willingness to participate. Because investment funds are not

¹⁸As shown in Table 7, the dollar net order flow variables exhibit stronger explanatory power than their scaled counterparts for auction price pressure, so we use them in this horse-race analysis.

¹⁹We do not estimate the model for 1991–2006 because investor-class allotment data begin only in 2000, and the limited number of auctions between 2000 and 2006—driven by less frequent issuance of the 5- and 10-year notes and issuance suspensions of the 3-, 7-, and 30-year securities—precludes reliable estimation.

obligated to bid at auction, their reduced willingness does not generate price pressure in the same way as dealer constraints do, except indirectly by increasing the intermediation burden on dealers—a channel already captured by the significant effect of MOVE, which proxies for dealers’ risk-bearing capacity. Taken together, these results underscore the central role of dealers in this period: their risk-bearing constraints materially affect auction price pressure, while non-dealer intermediaries—who face no bidding obligations—are less likely to step in when intermediation is most risky.

In the more recent 2015–2024 period when the post-crisis regulations are implemented, the pattern changes. With regulations increasing balance-sheet costs for dealers, non-dealer buyers play a more important stabilizing role with investment fund and foreign investor participation significantly attenuating auction price pressure. This non-dealer participation helps offset concerns that post-crisis regulatory constraints on dealers would amplify auction price pressure. At the same time, the MOVE no longer significantly explains price pressure, consistent with the belief that dealer risk bearing capacity now has less bearing on primary market intermediation. Online Appendix Table [A1](#) shows that dealers’ share of purchases has declined sharply—from around 60–80% in 2000 to roughly 17% by 2024—consistent with the reduced relevance of dealer constraints in driving auction-day yield movements.

Across the subsamples, demand elasticity (bid dispersion) and net order flow remain highly significant determinants of auction price pressure. That said, order flow variables consistently have markedly higher explanatory power, especially in the 2007–2014 subsample period when their inclusion increases the adjusted R^2 from 6% to 27%.

In summary, these results provide a nuanced interpretation of yield dynamics around Treasury auctions. Volatility, demand elasticity, and non-dealer participation all contribute to explaining auction price pressure, but net order flow consistently absorbs much of their influence and accounts for the largest share of variation across specifications and periods. The evidence provides the first direct confirmation that the effect of dealers’ limited risk-bearing capacity on auction price pressure operates through trading activity.

5.5 Quantifying the role of trading on auction price pressure

The preceding results establish that auction price pressure is transmitted primarily through actual trading activity, with net order flow absorbing much of the influence of volatility, demand elasticity, and investor participation. However, the continued significance of several non-order-flow determinants suggests that trading is not the only channel through which auction price effects arise. This raises the question of the relative importance of inventory-driven trading versus price adjustments that occur even in the absence of trades.

To answer this question, we decompose each auction’s price pressure into a flow-driven and a non-flow-driven component. The flow-driven component is based on a simple structural logic: given the realized pre- and post-auction net order flow and given the typical price impact estimated from comparable non-auction days (to avoid contamination from the auction itself), how much should yields move purely due to trading? Specifically, the flow-driven price pressure is computed as net order flow \times typical price impact, separately for the pre- and post-auction windows and then aggregated in the same way as the overall price-pressure measure. This counterfactual isolates the price pressure effect attributable to trading activity alone. The non-flow-driven price pressure is simply the difference between the actual price pressure and the flow-driven component.

Table 9 presents the results across maturities for the full sample and subsample periods. Panel A shows that a substantial portion of auction price pressure is directly attributable to trading activity. The flow-driven component is positive and significant across nearly all maturities, especially during 2007–2014 when dealer balance-sheet constraints were most binding, necessitating more secondary market trading to manage the absorption of auction supply shocks. In contrast, it is markedly smaller in the regulation implementation period (2015–2024), consistent with the sharp decline in dealer take-downs and the rise of non-dealer participation at auctions. Panel B shows that the non-flow-driven component is generally modest and far less systematic. Overall, the analysis indicates that most auction price pressure operates through trade-based inventory adjustment rather than non-trade channels,

corroborating our earlier regression results that trading explains most of the inverted V-shaped yield pattern around auctions.

6 Conclusion

Using intraday data over a 33-year sample period (1991–2024), we analyze U.S. Treasury security yield movements within a tight window around auctions and document a clear and robust inverted V-shaped pattern: yields rise in the hours leading up to auction and decline thereafter. While prior studies have documented similar dynamics over multi-day windows, our intraday approach allows for cleaner identification by limiting confounding influences from macroeconomic or policy developments. The persistence and clarity of the intraday pattern provide compelling evidence that significant, though temporary, price pressure exists around auctions and that the auction supply effects are causal.

Equally important, our detailed data enables us to observe actual trading activity as the price pattern unfolds and allows us to examine directly, rather than infer indirectly, whether auction price pressure arises through trading. Ours is the first study to use granular, high-frequency transaction data in conjunction with precisely identified auction events to study the mechanism behind auction price pressure. Our analysis of more extensive and up-to-date data also allow us to assess how auction price pressure effects have evolved given the market’s rapidly growing size and concerns about dealers’ balance sheet capacity and ability to intermediate in both primary and secondary markets.

We show that the magnitude of auction price pressure varies systematically with two fundamental forces: dealer intermediation capacity and the availability of investor capital at auction time. When market volatility is high or dealer balance-sheet constraints are tight, price pressure is amplified. When demand from non-dealer buyers is strong—particularly from investment funds and foreign investors—or more elastic, price pressure is mitigated.

More importantly, the explanatory power of these determinants is dominated by that of net order flow in the interdealer market. Pre-auction net selling is tightly linked to the run-up

in yields and post-auction net buying drives the reversal—patterns that hold across maturities, specifications, and time periods. Decomposing auction price pressure into flow-driven and non-flow-driven components further shows that a substantial portion of price pressure arises directly from trading, even though dealer constraints and investor demand determine the underlying economic pressures that motivate that trading. These results support the idea that order flow encapsulates how market participants absorb information, manage inventory risk, and respond to the evolving supply–demand landscape. These findings provide the first direct evidence that dealer risk bearing constraint gives rise to auction price pressure through trading, a mechanism that was only inferred in prior work.

Finally, our results highlight the structural evolution of the Treasury market. In recent years, participation by dealers at auctions has declined sharply—from around 70% in the early 2000s to around 17% by 2024—while participation by non-dealers (primarily investment funds and foreign investors) has increased. Meanwhile, the secondary interdealer market has witnessed rapidly growing participation of non-dealer liquidity providers (e.g., principal trading firms). These shifts help explain why auction price pressure has moderated despite more stringent dealer balance-sheet requirements in the post-crisis period. A deeper and more diversified buyer base, together with increased presence of non-dealer intermediaries, appears to reduce the intermediation burden on dealers while greater liquidity provision in the IDB market helps dealers manage inventory fluctuations more efficiently. These factors contribute to mitigate temporary pricing frictions associated with Treasury issuance.

Overall, our findings advance the understanding of auction price pressure and the mechanisms through which it arises. By combining high-frequency data with a comprehensive analysis of intermediation capacity, investor demand, and trading behavior, we provide new insight into the microstructure of the world’s most important fixed-income market. The results also underscore the importance of a liquid secondary IDB market and suggest that broad, diversified participation in auctions can help mitigate price pressure and ultimately reduce the indirect costs of Treasury issuance.

References

- ADRIAN, T., E. ETULA, AND T. MUIR (2014): “Financial intermediaries and the cross-section of asset returns,” *Journal of Finance*, 69, 2557–2596.
- ADRIAN, T., M. J. FLEMING, O. SHACHAR, AND E. VOGT (2017): “Market liquidity after the financial crisis,” *Annual Review of Financial Economics*, 9, 43–83.
- ALBUQUERQUE, R., J. M. CARDOSO-COSTA, AND J. A. FAIAS (2024): “Price elasticity of demand and risk-bearing capacity in sovereign bond auctions,” *Review of Financial Studies*, 37, 3149–3187.
- AMIN, S. AND R. TEDONGAP (2023): “The changing landscape of Treasury auctions,” *Journal of Banking & Finance*, 148, 106714.
- ANDERSON, C. AND W. LIU (2024): “Inferring intermediary risk exposure from trade,” *Management Science*, 70, 6966–6982.
- BEETSMA, R., M. GIULIODORI, F. DE JONG, AND D. WIDIJANTO (2016): “Price effects of sovereign debt auctions in the euro-zone: The role of the crisis,” *Journal of Financial Intermediation*, 25, 30–53.
- BEETSMA, R., M. GIULIODORI, J. HANSON, AND F. DE JONG (2018): “Cross-Border Auction Cycle Effects of Sovereign Bond Issuance in the Euro Area,” *Journal of Money, Credit and Banking*, 50, 1401–1440.
- BELLIA, M. (2018): “Intraday pricing and liquidity of Italian and German Treasury auctions,” *Available at SSRN 3718948*.
- BOYARCHENKO, N., D. O. LUCCA, AND L. VELDKAMP (2021): “Taking Orders and Taking Notes: Dealer Information Sharing in Treasury Auctions,” *Journal of Political Economy*, 129, 607–645.
- BRANDT, M. W. AND K. A. KAVAJECZ (2004): “Price Discovery in the U.S. Treasury Market: The Impact of Orderflow and Liquidity on the Yield Curve,” *Journal of Finance*, 59, 2623–2654.
- BRÄUNING, F. AND H. STEIN (2024): “The effect of primary dealer constraints on intermediation in the Treasury market,” *Available at SSRN 4862212*.
- BROOKS, J., M. KATZ, AND H. LUSTIG (2018): “Post-FOMC announcement drift in US bond markets,” National Bureau of Economic Research.
- CAMMACK, E. (1991): “Evidence on bidding strategies and the information in Treasury bill auctions,” *Journal of Political Economy*, 99, 100–130.
- CAVALERI, F., A. RANALDO, AND E. ROSSI (2025): “The demand for safe assets,” Swiss Finance Institute Research Paper No. 24-110, Swiss National Bank Working Paper No. 03/2025.

- D'AMICO, S. AND T. B. KING (2013): "Flow and stock effects of large-scale Treasury purchases: Evidence on the importance of local supply," *Journal of Financial Economics*, 108, 425–88.
- DUFFEE, G. R. (1996): "Idiosyncratic variation of Treasury bill yields," *Journal of Finance*, 51, 527–551.
- DUFFIE, D. (2010): "Presidential Address: Asset Price Dynamics with Slow-Moving Capital," *Journal of Finance*, 65, 1237–1267.
- (2020): "Still the World's Safe Haven? Redesigning the U.S. Treasury Market After the COVID-19 Crisis," *Brookings Papers on Economic Activity*.
- (2023): "Resilience Redux in the U.S. Treasury Market," Jackson Hole Symposium, Federal Reserve Bank of Kansas City, August.
- DUFFIE, D., M. J. FLEMING, F. M. KEANE, C. NELSON, O. SHACHAR, AND P. VAN TASSEL (2023): "Dealer capacity and US Treasury market functionality," *Federal Reserve Bank of New York Staff Report*.
- FLEMING, M., G. NGUYEN, AND F. RUELA (2023): "Tick Size, Competition for Liquidity Provision, and Price Discovery: Evidence from the U.S. Treasury Market," *Management Science*, 70, 332–354.
- FLEMING, M. J. (1997): "The Round-the-Clock Market for U.S. Treasury Securities," *Federal Reserve Bank of New York Economic Policy Review*, 3, 9–32.
- (2002): "Are larger Treasury issues more liquid? Evidence from bill reopenings," *Journal of Money, Credit, and Banking*, 34, 707–735.
- FLEMING, M. J. AND K. D. GARBADE (2002): "When the Back Office Moved to the Front Burner: Settlement Fails in the Treasury Market after September 11," *Federal Reserve Bank of New York Economic Policy Review*, 8, 35–57.
- FLEMING, M. J., B. MIZRACH, AND G. NGUYEN (2018): "The microstructure of a U.S. Treasury ECN: The BrokerTec Platform," *Journal of Financial Markets*, 40, 2–22.
- FLEMING, M. J., G. NGUYEN, AND J. ROSENBERG (2024): "How do Treasury dealers manage their positions?" *Journal of Financial Economics*, 158, 103885.
- FLEMING, M. J. AND E. M. REMOLONA (1999): "Price formation and liquidity in the U.S. Treasury market: The response to public information," *Journal of Finance*, 54, 1901–15.
- GAGNON, J., M. RASKIN, J. REMACHE, AND B. SACK (2011): "Large-scale asset purchases by the Federal Reserve: Did they work?" *Federal Reserve Bank of New York Economic Policy Review*, 17, 41–59.
- GARBADE, K. D., F. M. KEANE, L. LOGAN, A. STOKES, AND J. WOLGEMUTH (2010): "The Introduction of the TMPG Fails Charge for U.S. Treasury Securities," *Federal Reserve Bank of New York Economic Policy Review*, 16, 45–71.

- GOLDREICH, D. (2007): “Underpricing in discriminatory and uniform-price Treasury auctions,” *Journal of Financial and Quantitative Analysis*, 42, 443–466.
- GREEN, T. C. (2004): “Economic News and the Impact of Trading on Bond Prices,” *Journal of Finance*, 59, 1201–1233.
- GREENWOOD, R. AND D. VAYANOS (2014): “Bond Supply and Excess Bond Returns,” *Review of Financial Studies*, 27, 663–713.
- HE, Z., B. KELLY, AND A. MANELA (2017): “Intermediary asset pricing: New evidence from many asset classes,” *Journal of Financial Economics*, 126, 1–35.
- HE, Z., S. NAGEL, AND Z. SONG (2022): “Treasury inconvenience yields during the COVID-19 crisis,” *Journal of Financial Economics*, 143, 57–79.
- HORTACSU, A., J. KASTL, AND A. ZHANG (2018): “Bid Shading and Bidder Surplus in U.S. Treasury Auctions,” *American Economic Review*, 108, 147–69.
- INDRIAWAN, I., F. JIAO, AND Y. TSE (2021): “The FOMC announcement returns on long-term US and German bond futures,” *Journal of Banking & Finance*, 123, 106027.
- JOINT STAFF REPORT (2015): “The U.S. Treasury Market on October 15, 2014,” U.S. Department of the Treasury, Board of Governors of the Federal Reserve System, Federal Reserve Bank of New York, U.S. Securities and Exchange Commission, and U.S. Commodity Futures Trading Commission.
- KLINGLER, S. AND S. SUNDARESAN (2023): “Diminishing Treasury convenience premiums: Effects of dealers’ excess demand and balance sheet constraints,” *Journal of Monetary Economics*, 135, 55–69.
- KRISHNAMURTHY, A. AND A. VISSING-JORGENSEN (2012): “The Aggregate Demand for Treasury Debt,” *Journal of Political Economy*, 120, 233–267.
- LI, D., L. PETRASEK, AND M. H. TIAN (2025): “Risk-averse Dealers in a Risk-free Market—The Role of Trading Desk Risk Limits,” *Available at SSRN 5304908*.
- LOU, D., H. YAN, AND J. ZHANG (2013): “Anticipated and Repeated Shocks in Liquid Markets,” *Review of Financial Studies*, 26, 1891–1912.
- MIZRACH, B. AND C. NEELY (2006): “The Transition to Electronic Communications Networks in the Secondary Treasury Market,” *Federal Reserve Bank of St. Louis Review*, 88, 527–541.
- NYBORG, K. G. AND S. SUNDARESAN (1996): “Discriminatory versus Uniform Treasury Auctions: Evidence from When-Issued Transactions,” *Journal of Financial Economics*, 42, 63–104.
- SIGAUX, J.-D. (2024): “Trading ahead of Treasury auctions,” *Journal of Banking & Finance*, 158, 107032.

- SIMON, D. P. (1991): “Segmentation in the Treasury bill market: Evidence from Cash Management Bills,” *Journal of Financial and Quantitative Analysis*, 26, 97–108.
- (1994a): “Further evidence on segmentation in the Treasury bill market,” *Journal of Banking & Finance*, 18, 139–51.
- (1994b): “Markups, Quantity Risk, and Bidding Strategies at Treasury Coupon Auctions,” *Journal of Financial Economics*, 35, 43–62.
- (1994c): “The Treasury’s experiment with single-price auctions in the mid-1970s: Winner’s or taxpayer’s curse?” *Review of Economics and Statistics*, 76, 754–60.
- SOMOGYI, F., J. WALLEN, AND L. XU (2026): “What Treasury auctions reveal about investor demand,” Northeastern University and Harvard University Working Paper.
- SPINDT, P. A. AND R. W. STOLZ (1992): “Are US Treasury Bills Underpriced in the Primary Market?” *Journal of Banking & Finance*, 16, 891–908.
- VISSING-JORGENSEN, A. (2021): “The Treasury Market in Spring 2020 and the Response of the Federal Reserve,” *Journal of Monetary Economics*, 124, 19–47.

Table 1. Summary Statistics of Sample

This table reports summary statistics for the sample of auctions of nominal coupon Treasury securities between June 25, 1991 and July 24, 2024. Auction data for panel A are from TreasuryDirect (with data on auction allotment by investor class available from January 2000). Panel B shows the average net order flow (NOF) in the six-hour window around auctions as well as price impact, inside market depth, realized volatility, and trading volume on the day before auctions. Data for panel B are from GovPX (June 1991–June 2001) and BrokerTec (July 2001–July 2024). Panel C reports summary statistics for dealer risk bearing capacity proxies used in the paper.

Panel A: Auction Statistics						
	2-Year	3-Year	5-Year	7-Year	10-Year	30-Year
Number of Auctions	398	232	358	192	282	223
Offering Amount (\$B)	28.24	32.47	27.78	33.00	21.18	15.20
Auction Yield (%)	3.04	2.22	3.46	2.44	3.43	3.69
Bid Dispersion (High – Mid) (bps)	2.95	3.44	3.97	5.07	4.32	5.26
Bid-to-Cover Ratio	2.62	2.75	2.46	2.54	2.50	2.39
Dealer Share (%)	50.79	45.36	45.60	32.50	44.24	38.30
Investment Fund Share (%)	26.56	34.81	34.46	47.81	36.04	49.33
Foreign Investor Share (%)	19.52	19.02	18.33	18.74	18.67	11.24
Other Investor Share (%)	3.14	0.80	1.61	0.95	1.06	1.13

Panel B: Secondary Market Activity						
	2-Year	3-Year	5-Year	7-Year	10-Year	30-Year
Pre-auction NOF (\$M)	-298.5	-287.6	-381.4	-232.9	-229.8	-20.2
Post-auction NOF (\$M)	273.2	142.5	143.2	99.1	108.9	68.1
Price Impact (bps per \$B)	0.046	0.074	0.132	0.282	0.251	1.412
Market Depth (\$M)	382.5	186.0	77.7	74.9	72.3	8.3
Realized Volatility (% , ann.)	1.3	1.7	3.2	5.1	5.9	12.4
Trade Volume (\$B)	13.3	12.7	24.4	11.8	26.1	8.0

Panel C: Dealer Risk Bearing Capacity Proxies					
	Mean	StDev	Min	Median	Max
MOVE	87.6	28.6	37.2	84.1	229.9
VIX	19.1	7.8	9.3	17.0	75.5
BD Leverage Growth (%)	-0.44	4.72	-28.94	-0.17	11.85
Intermediary Capital Growth (%)	0.59	6.73	-29.90	0.84	39.65

Table 2. Are There Significant Yield Pressures Around Auctions?

This table presents analysis of yield pressures around auctions of nominal coupon Treasury securities between June 25, 1991 and July 24, 2024. Yield pressure reflects the total magnitude of the inverted V-shape yield pattern in the six-hour window around auction, expressed in bps. It is equal to the pre-auction yield increase ($\Delta Y^{(pre)}$) minus the post-auction yield decrease ($\Delta Y^{(post)}$), where $\Delta Y^{(pre)} = Y_{0-} - Y_{-180}$ and $\Delta Y^{(post)} = Y_{180} - Y_{0+}$. Auction data are from TreasuryDirect and secondary market data are from GovPX (June 1991–June 2001) and BrokerTec (July 2001–July 2024). * $p < .1$; ** $p < .05$; *** $p < .01$.

	2-Year	3-Year	5-Year	7-Year	10-Year	30-Year
Panel A: Full Sample Analysis (1991–2024)						
Yield Pressure (bps)	0.667***	0.813***	1.097***	0.529**	1.291***	0.660**
$\Delta Y^{(pre)}$	0.366***	0.403***	0.562***	0.202	0.485***	0.646***
$\Delta Y^{(post)}$	-0.301**	-0.410***	-0.535***	-0.327**	-0.806***	-0.015
t-stat $H_0 : \Delta Y^{(pre)} = -\Delta Y^{(post)}$	0.332	-0.042	0.105	-0.527	-1.441	2.299**
Panel B: Subsample Analysis						
Yield Pressure (bps):						
S1: 1991-2006	0.606**	1.003**	1.045***	1.379	1.610***	0.101
S2: 2007-2014	0.980***	1.259***	1.340***	0.770**	1.888***	1.268***
S3: 2015-2024	0.503	0.456*	0.960**	0.315	0.639*	0.389
F-test Statistic:						
$H_0 : S2 = S1$	0.709	0.206	0.313	0.313	0.251	1.845
$H_0 : S3 = S1$	0.059	1.074	0.029	0.996	3.443*	0.123
$H_0 : S3 = S2$	0.951	3.534*	0.467	1.025	6.232**	2.301

Table 3. Are There Significant Price Pressures Around Auctions?

This table presents analysis of price pressure around auctions of nominal coupon Treasury securities between June 25, 1991 and July 24, 2024. Price pressure reflects the total magnitude of the V-shape price pattern in the six-hour window around auction, expressed in bps. It is equal to post-auction return minus pre-auction return, where pre-auction (post-auction) returns are computed as the change in the log of the best bid-ask midpoint over the 180-minute window before (after) auction close (release). Auction data are from TreasuryDirect and secondary market data are from GovPX (June 1991–June 2001) and BrokerTec (July 2001–July 2024). * $p < .1$; ** $p < .05$; *** $p < .01$.

	2-Year	3-Year	5-Year	7-Year	10-Year	30-Year
Panel A: Full Sample Analysis (1991–2024)						
Price Pressure (bps)	1.299***	2.329***	4.813***	3.754***	10.488***	13.240***
Pre-auction Return (bps)	-0.712***	-1.167***	-2.522***	-1.351	-3.858***	-11.614***
Post-auction Return (bps)	0.580**	1.183***	2.291***	2.445**	6.662***	1.626
Panel B: Subsample Analysis						
Price Pressure (bps):						
S1: 1991-2006	1.218**	2.957**	4.179***	7.544	12.158***	0.300
S2: 2007-2014	1.871***	3.671***	6.215***	4.875**	15.833***	20.370**
S3: 2015-2024	0.951	1.230*	4.455***	2.811	5.373*	11.779*
F-test Statistic:						
$H_0 : S2 = S1$	0.628	0.218	0.769	0.153	0.638	1.638
$H_0 : S3 = S1$	0.117	1.455	0.016	0.502	2.470	0.588
$H_0 : S3 = S2$	1.025	4.366**	0.518	0.543	6.263**	0.644

Table 4. Auction Effect Spillovers Across the Yield Curve

This table reports the average yield pressure of on-the-run nominal coupon securities within the six-hour window around auctions of each given maturity between June 25, 1991 to July 24, 2024. Yield pressure reflects the total magnitude of the inverted V-shape yield pattern in the six-hour window around auction, expressed in bps. It is equal to the pre-auction yield increase ($\Delta Y^{(pre)}$) minus the post-auction yield decrease ($\Delta Y^{(post)}$), where $\Delta Y^{(pre)} = Y_{0-} - Y_{-180}$ and $\Delta Y^{(post)} = Y_{180} - Y_{0+}$. Auction data are from TreasuryDirect and secondary market data are from GovPX (June 1991–June 2001) and BrokerTec (July 2001–July 2024). * $p < .1$; ** $p < .05$; *** $p < .01$.

Auctioned	Secondary Market Yield Pressure (bps)					
Maturity	2-Year	3-Year	5-Year	7-Year	10-Year	30-Year
2-Year	0.667***	0.373**	0.271	-0.068	0.146	0.088
3-Year	0.729***	0.813***	0.403*	0.117	-0.000	-0.155
5-Year	0.954***	0.911***	1.097***	0.554**	0.753***	0.655***
7-Year	0.257	0.425**	0.606***	0.529**	0.392*	0.257
10-Year	1.127***	1.168***	1.293***	0.842***	1.291***	1.355***
30-Year	-0.052	-0.030	0.173	0.278	0.337	0.660***

Table 5. Limited Dealer Risk Bearing Capacity and Auction Price Pressure

The table reports regressions of auction price pressure on dealer risk bearing capacity proxies around auctions of nominal coupon Treasury securities between June 25, 1991 and July 24, 2024. The *MOVE* and *VIX* variables have been standardized to have zero mean and unit standard deviation. *BD Leverage Growth* is the percentage change in broker-dealers' leverage in the preceding quarter. Intermediary Capital Growth is the AR(1) innovation of monthly intermediary capital ratio, scaled by lagged intermediary capital ratio (He et al., 2017). *Realized Volatility*, *Liquidity*, and *Offering Amount* (inflation-adjusted) are standardized using security-specific means and standard deviations. Liquidity is measured as the midpoint price impact per \$1 billion of net order flow, adjusted for inflation using December 1999 as the base period. Auction data are from TreasuryDirect and secondary market data are from GovPX (June 1991–June 2001) and BrokerTec (July 2001–July 2024). * $p < .1$; ** $p < .05$; *** $p < .01$.

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
MOVE	0.380*** (0.087)							0.378*** (0.122)
VIX		0.268*** (0.089)						0.074 (0.105)
BD Leverage Growth			0.001 (0.018)					
Intermediary Capital Growth				-0.023* (0.013)				-0.017 (0.013)
Realized Volatility					0.204** (0.087)			0.055 (0.102)
Liquidity						0.148* (0.088)		-0.129 (0.110)
Offering Amount							0.008 (0.087)	
Adjusted R^2 (%)	1.328	0.735	0.186	0.376	0.509	0.346	-0.060	1.287
# Observations	1663	1663	1663	1663	1658	1654	1663	1654
Security Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 6. Demand-side Explanations of Auction Price Pressure

The table reports regressions of auction price pressure on demand-side determinants around auctions of nominal coupon Treasury securities between June 25, 1991 and July 24, 2024. *Bid-to-Cover* is the ratio of total bids submitted to the auction’s offering amount. *Bid Dispersion* is measured as the difference between the auction stop-out yield and the median yield of accepted bids. *Investment Fund Share* and *Foreign Investor Share* denote the percentage of the auction purchased by investment funds and foreign investors, respectively. All explanatory variables are standardized using maturity-specific means and standard deviations. CPI-adjusted and standardized auction size control is included where indicated. Auction data are from TreasuryDirect and secondary market data are from GovPX (June 1991–June 2001) and BrokerTec (July 2001–July 2024). * $p < .1$; ** $p < .05$; *** $p < .01$.

	[1]	[2]	[3]	[4]	[5]	[6]
Bid-to-Cover	-0.276*** (0.087)				-0.044 (0.104)	-0.047 (0.104)
Bid Dispersion		0.280*** (0.087)			0.540*** (0.108)	0.495*** (0.111)
Investment Fund Share (%)			-0.324*** (0.091)		-0.575*** (0.100)	-0.657*** (0.110)
Foreign Investor Share (%)				-0.161* (0.091)	-0.353*** (0.098)	-0.397*** (0.101)
Adjusted R^2 (%)	0.790	0.804	1.066	0.373	3.685	3.832
# Observations	1663	1663	1378	1378	1378	1378
Security Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Offering Amount	No	No	No	No	No	Yes

Table 7. Can Net Order Flow Explain Auction Price Pressure?

The table reports regressions of auction price pressure on net order flow measures around auctions of nominal coupon Treasury securities between June 25, 1991 and July 24, 2024. *Pre-auction Net Sell* is defined as the negative of the cumulative net order flow over the three hours before auction close, while *Post-auction Net Buy* is the cumulative net order flow over the three hours following the auction result release. Net order flow variables are in CPI-adjusted billion of dollars (base: December 1999). *Scaled Pre-auction Net Sell* and *Scaled Post-auction Net Buy* divide the corresponding net order flow measures by trading volume over the same interval. All explanatory variables are standardized using maturity-specific means and standard deviations. Auction data are from TreasuryDirect and secondary market data are from GovPX (June 1991–June 2001) and BrokerTec (July 2001–July 2024). * $p < .1$; ** $p < .05$; *** $p < .01$.

	Aggregated Yield Changes			Pre-Auction ΔY		Post-Auction ΔY	
	[1]	[2]	[3]	[4]	[5]	[6]	
Pre-auction Net Sell	0.772*** (0.082)		0.639*** (0.057)				
Post-auction Net Buy	1.074*** (0.082)				-0.870*** (0.063)		
Scaled Pre-auction Net Sell		0.641*** (0.086)		0.517*** (0.058)			
Scaled Post-auction Net Buy		0.733*** (0.086)				-0.609*** (0.065)	
Adjusted R^2 (%)	12.867	6.419	6.981	4.565	10.521	5.361	
# Observations	1663	1653	1663	1655	1663	1653	
Security Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	

Table 8. Horse Race of Determinants of Auction Price Pressure

The table reports regressions of auction price pressure on dealer risk bearing capacity, auction demand, and net order flow around auctions of nominal coupon Treasury securities between June 25, 1991 and July 24, 2024. Explanatory variables are as explained in Tables 5–7. Results for the first subperiod (S1: 1991–2006) are not available due to insufficient data on auction purchase share by investor class. Auction data are from TreasuryDirect and secondary market data are from GovPX (June 1991–June 2001) and BrokerTec (July 2001–July 2024). * $p < .1$; ** $p < .05$; *** $p < .01$.

	Full Sample		S2: 2007–2014		S3: 2015–2024	
	[1]	[2]	[3]	[4]	[5]	[6]
MOVE	0.142 (0.101)	0.269*** (0.094)	0.371** (0.176)	0.418*** (0.155)	−0.061 (0.153)	0.083 (0.146)
Investment Fund Share (%)	−0.534*** (0.104)	−0.299*** (0.099)	−0.097 (0.337)	0.023 (0.297)	−0.633** (0.282)	−0.448 (0.278)
Foreign Investors Share (%)	−0.364*** (0.095)	−0.306*** (0.087)	−0.317** (0.148)	−0.211 (0.130)	−0.428** (0.168)	−0.355** (0.160)
Bid Dispersion	0.472*** (0.117)	0.344*** (0.108)	0.712*** (0.198)	0.548*** (0.175)	0.533*** (0.172)	0.366** (0.163)
Pre-auction Net Sell		0.785*** (0.081)		0.860*** (0.122)		0.569*** (0.114)
Post-auction Net Buy		1.030*** (0.076)		1.186*** (0.118)		0.834*** (0.103)
Adjusted R^2 (%)	3.811	18.978	6.252	27.408	1.979	12.419
# Observations	1378	1378	499	499	682	682
Security Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Table 9. Flow-Driven and Non-Flow-Driven Yield Changes

This table reports the decomposition of auction-related yield pressure into two components: (A) flow-driven price pressure, defined as the yield change attributable to net order flow and the prevailing price impact estimated from control days; and (B) non-flow-driven price pressure, defined as the residual yield change not explained by trading activity. The sample includes auctions of nominal coupon Treasury securities (excluding the 20-year bond) from June 25, 1991 to July 24, 2024. Auction data are from TreasuryDirect and secondary market data are from GovPX (June 1991–June 2001) and BrokerTec (July 2001–July 2024). * $p < .1$; ** $p < .05$; *** $p < .01$.

	2-Year	3-Year	5-Year	7-Year	10-Year	30-Year
Panel A: Flow-Driven Price Pressure						
Full sample	0.461***	0.402***	0.688***	0.557***	0.666***	0.546***
S1: 1991-2006	0.440***	0.579**	0.469***	0.174	0.527**	0.279
S2: 2007-2014	1.062***	0.732***	1.403***	1.231***	1.157***	1.413***
S3: 2015-2024	-0.011	0.124	0.370**	0.187	0.390**	0.026
F-Stat $H_0 : S2 = S1$	6.854***	0.257	14.801***	1.997	3.573*	3.834*
F-Stat $H_0 : S3 = S1$	4.006**	2.572	0.183	0.000	0.191	0.209
F-Stat $H_0 : S3 = S2$	16.858***	7.034***	16.300***	11.339***	6.452**	12.841***
Panel B: Non-Flow-Driven Price Pressure						
Full sample	0.215	0.387**	0.419**	-0.041	0.613***	0.131
S1: 1991-2006	0.185	0.288	0.583**	1.205	1.048***	-0.123
S2: 2007-2014	-0.084	0.525*	-0.063	-0.438	0.731**	-0.129
S3: 2015-2024	0.513*	0.331	0.612*	0.109	0.248	0.367
F-Stat $H_0 : S2 = S1$	0.474	0.195	1.993	2.566	0.359	0.000
F-Stat $H_0 : S3 = S1$	0.783	0.008	0.004	1.193	2.588	0.367
F-Stat $H_0 : S3 = S2$	1.937	0.229	1.951	1.630	1.039	0.792

Figure 1. Average Issuance Amounts by Year

This figure shows the average offering amount per auction by year for auctions of nominal coupon Treasury securities between June 25, 1991 and July 24, 2024. The total number of auctions per year (within our sample) is shown above each bar. Auction data are from TreasuryDirect.

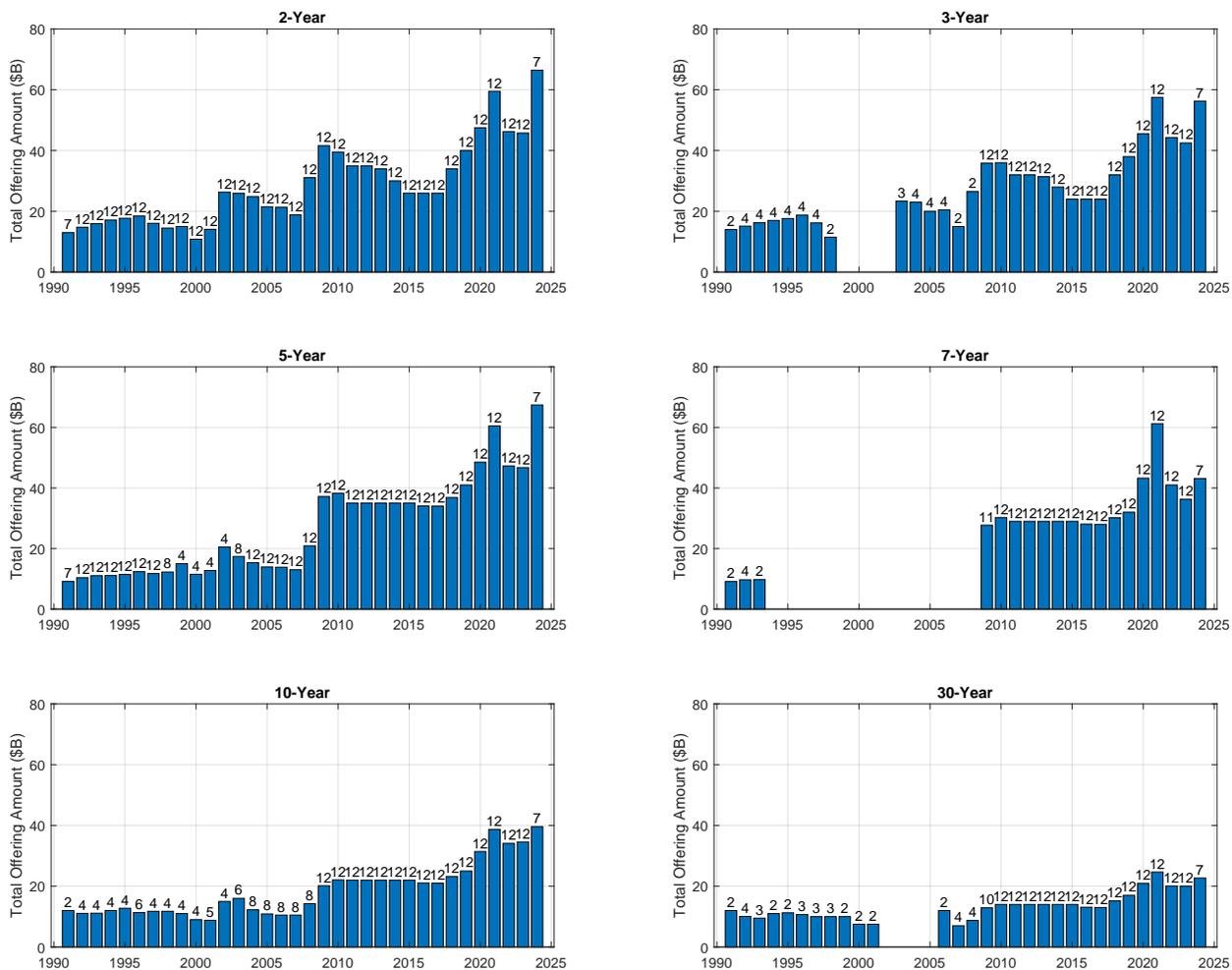


Figure 2. Secondary Market Yield Changes Around Auctions

This figure plots the average change in yield between the indicated time and auction time for auctions of nominal coupon Treasury securities between June 25, 1991 and July 24, 2024. Pre-auction yield changes are computed relative to the auction closing time and post-auction yield changes are computed relative to the auction result release time. The shaded area indicates the 95% confidence interval around the sample mean. Secondary market data are from GovPX (June 1991–June 2001) and BrokerTec (July 2001–July 2024).

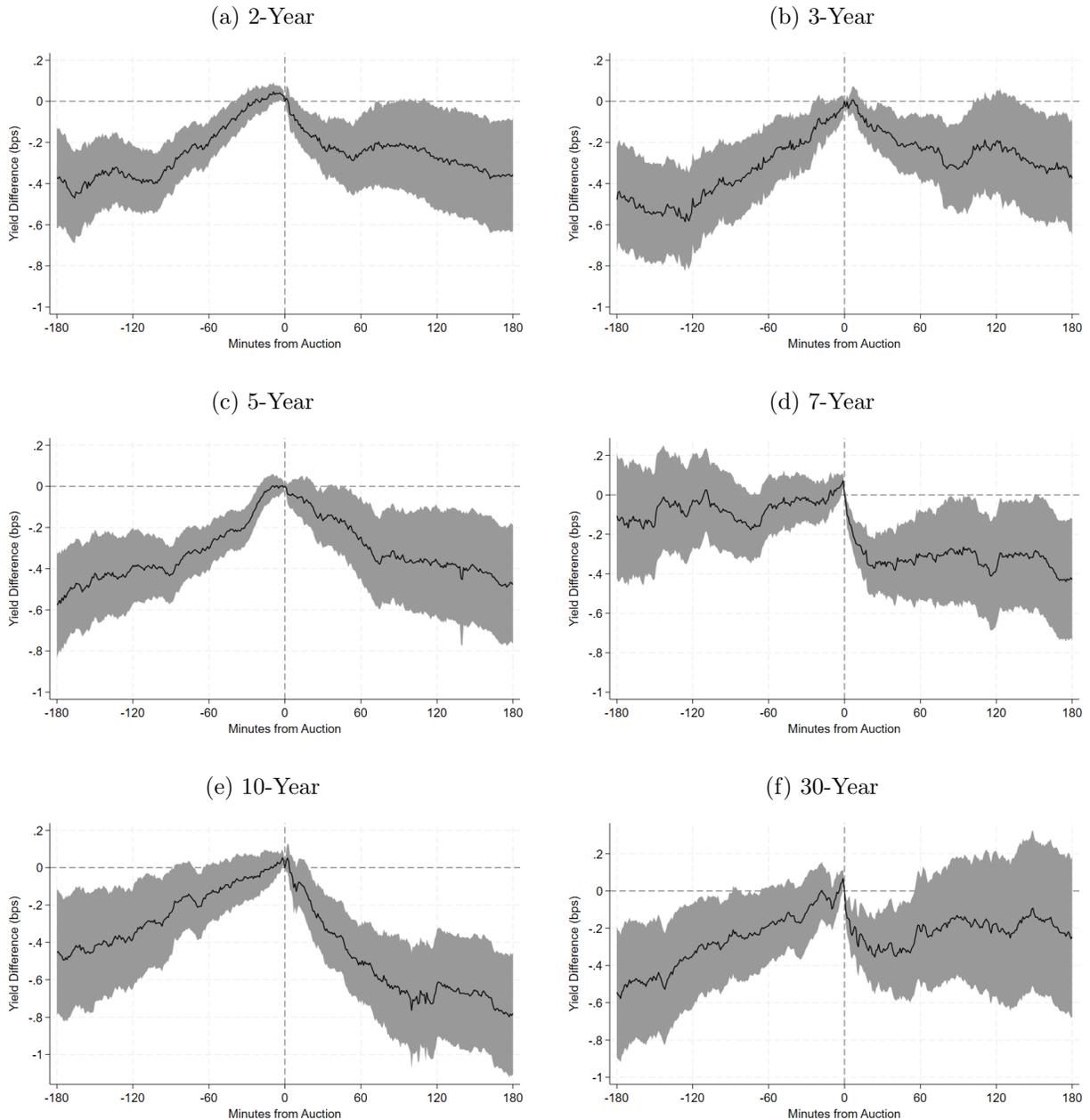


Figure 3. Cumulative Net Order Flow Around Auctions

This figure plots the average cumulative net order flow and compares it with the corresponding pattern on control days around auctions of nominal coupon Treasury securities between June 25, 1991 and July 24, 2024. Cumulative net order flow is computed as buyer-initiated minus seller-initiated volume, accumulated separately for the pre- and post-auction periods. Each auction is matched to two control days, defined as the same weekday one week before and one week after the auction. Pre-auction time marks are relative to the auction closing time and post-auction time marks are relative to the auction result release time. Open (filled) diamonds indicate that the auction-day value is significantly different from control-day value at the 5% (1%) significance level based on the t-test. Secondary market data are from GovPX (June 1991–June 2001) and BrokerTec (July 2001–July 2024).

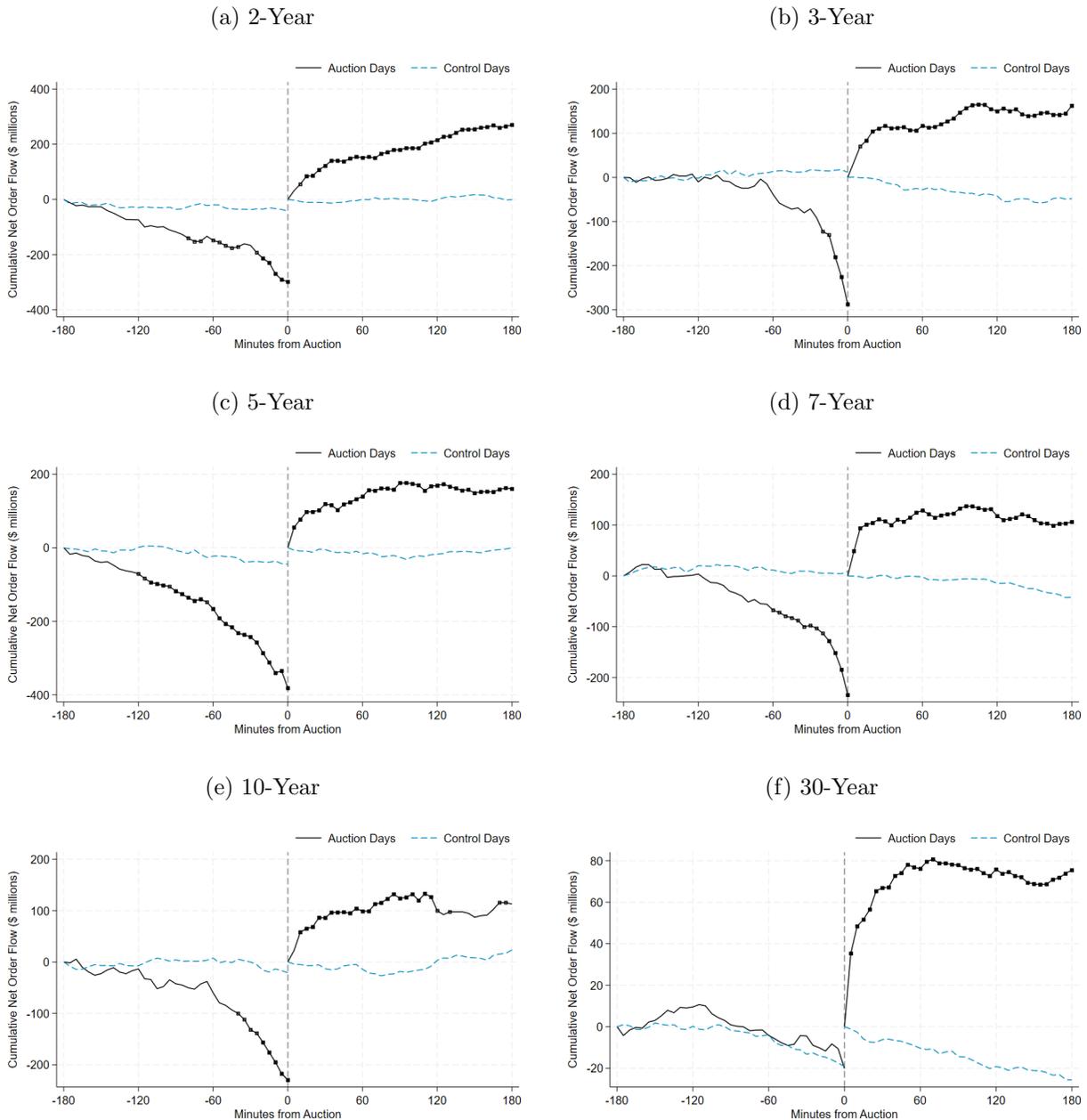


Figure 4. Market Depth Around Auctions

This figure plots the average market depth at the best bid and offer and compares it with the corresponding pattern on control days around auctions of nominal coupon Treasury securities between June 25, 1991 and July 24, 2024. Each auction is matched to two control days, defined as the same weekday one week before and one week after the auction. Pre-auction time marks are relative to the auction closing time and post-auction time marks are relative to the auction result release time. Open (filled) diamonds indicate that the auction-day value is significantly different from control-day value at the 5% (1%) significance level based on the t-test. Secondary market data are from GovPX (June 1991–June 2001) and BrokerTec (July 2001–July 2024).

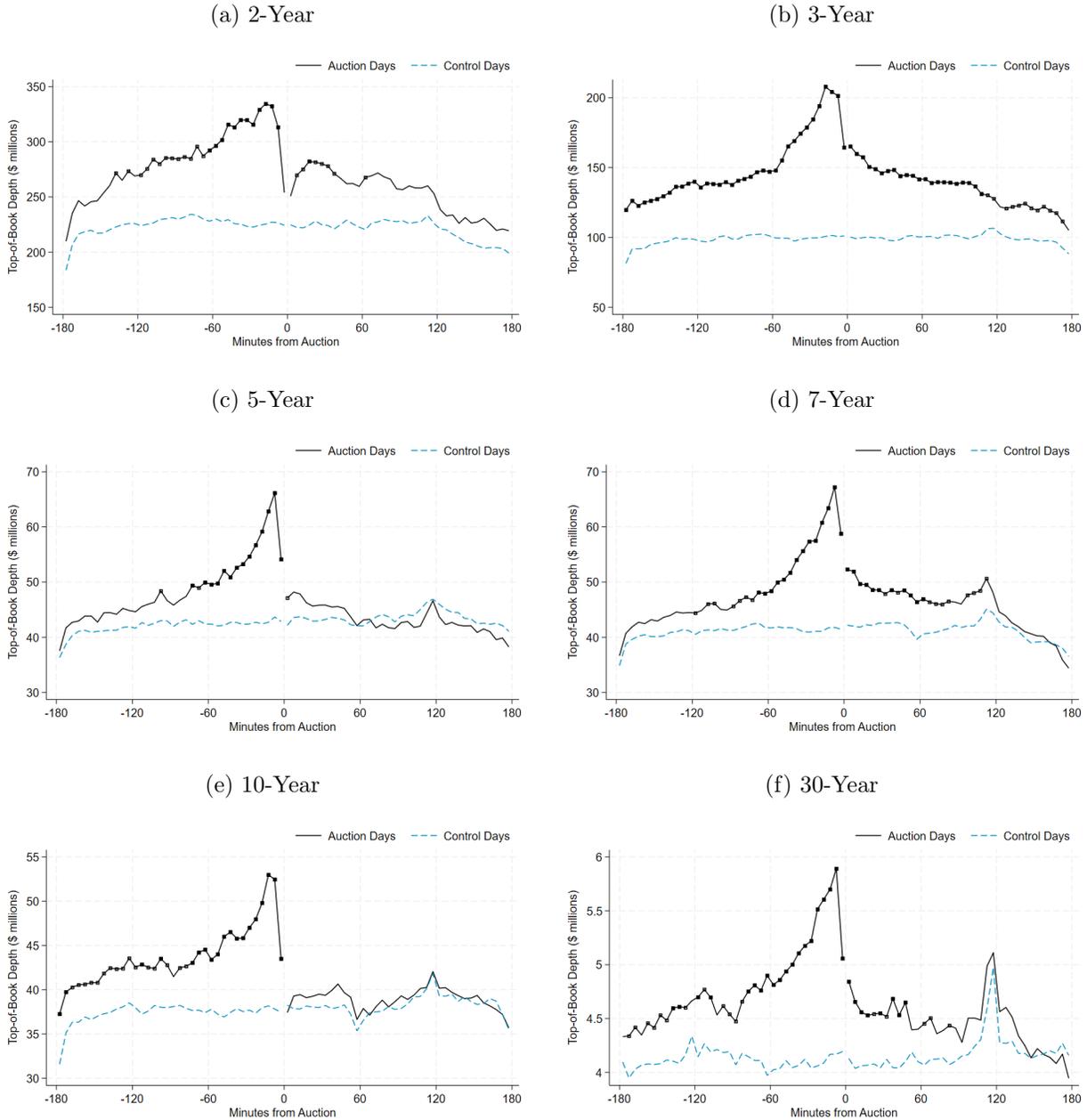
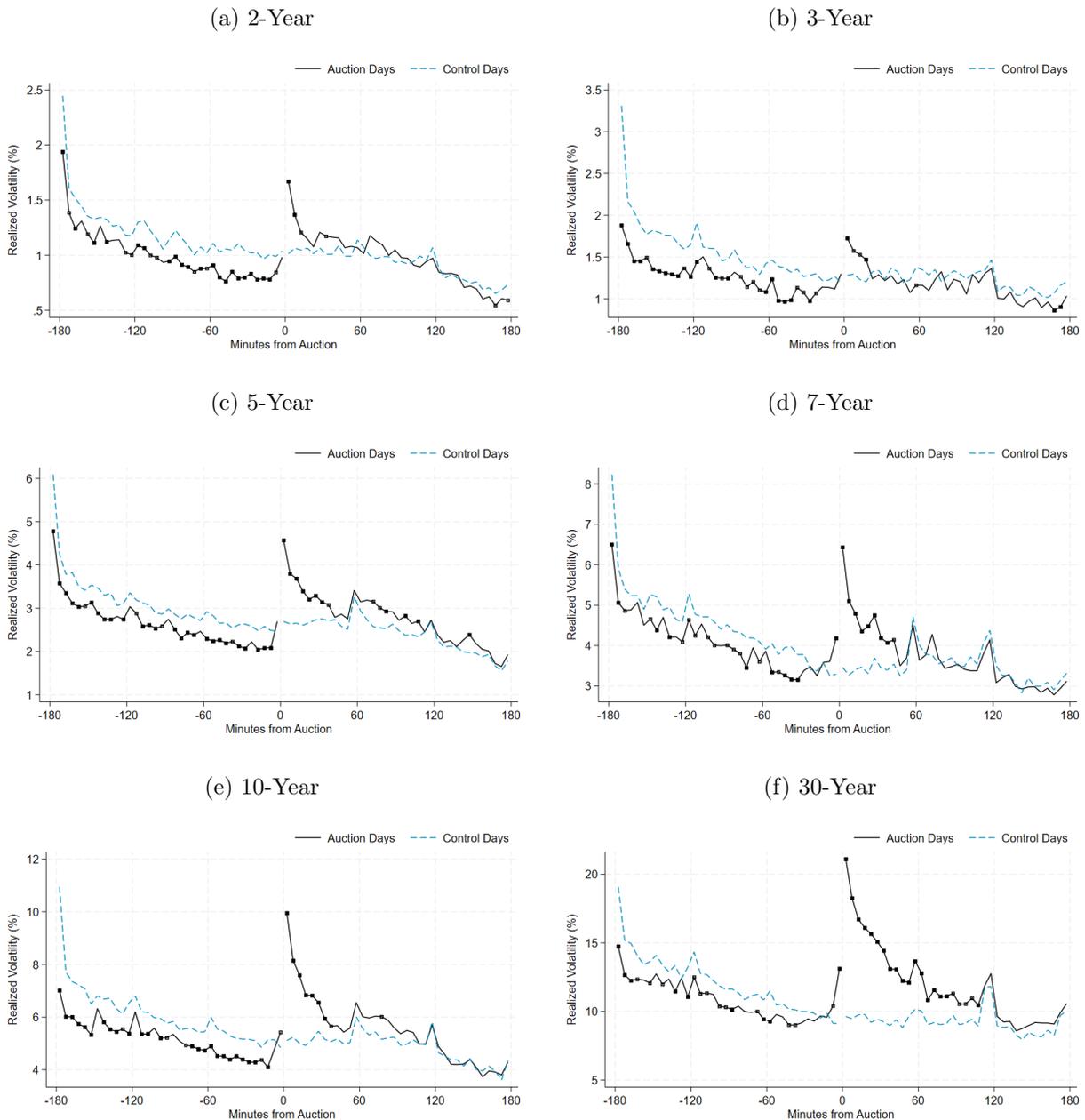


Figure 5. Realized Volatility Around Auctions

This figure plots the average annualized realized volatility (based on the best bid-ask midpoint returns) and compares it with the corresponding pattern on control days around auctions of nominal coupon Treasury securities between June 25, 1991 and July 24, 2024. Each auction is matched to two control days, defined as the same weekday one week before and one week after the auction. Pre-auction time marks are relative to the auction closing time and post-auction time marks are relative to the auction result release time. Open (filled) diamonds indicate that the auction-day value is significantly different from control-day value at the 5% (1%) significance level based on the t-test. Secondary market data are from GovPX (June 1991–June 2001) and BrokerTec (July 2001–July 2024).



INTERNET APPENDIX

Table A1. Auction Purchase Share by Investor Class

This table reports the percentage of Treasury auction awards allocated to broker-dealers, investment funds, and foreign investors at the beginning and end of the sample period. Shares are calculated as a fraction of total issuance excluding amounts purchased by the Federal Reserve. For each maturity, the “Start” value is the average share across all auctions of that maturity in the first year for which investor-class allotment data are available (2000 for the 2-, 5-, 10-, and 30-year securities; 2003 for the 3-year note; and 2009 for the 7-year note). The “End” value is the average share across all auctions of that maturity in 2024. Intermediate years are omitted for brevity. Investor-class allotment data are available from the U.S. Department of the Treasury beginning in January 2000.

Maturity	Broker Dealers		Investment Funds		Foreign Investors	
	Start	End	Start	End	Start	End
2-Year	64.27	15.02	4.48	70.90	18.18	12.46
3-Year	72.16	18.05	7.25	69.21	18.11	11.62
5-Year	78.28	16.19	1.55	71.20	13.49	12.04
7-Year	49.16	13.91	14.12	69.82	36.06	14.75
10-Year	82.15	17.70	3.86	67.12	10.30	13.79
30-Year	69.36	17.17	23.08	71.20	1.85	10.61

Figure A1. Auction Purchase Share by Investor Class by Year

This figure plots the yearly average share of Treasury auction purchase by investor class from the first year of available investor-class data through 2024. Shares are calculated as a fraction of total issuance excluding amounts purchased by the Federal Reserve. Investor-class allotment data are available from the U.S. Department of the Treasury beginning in January 2000.

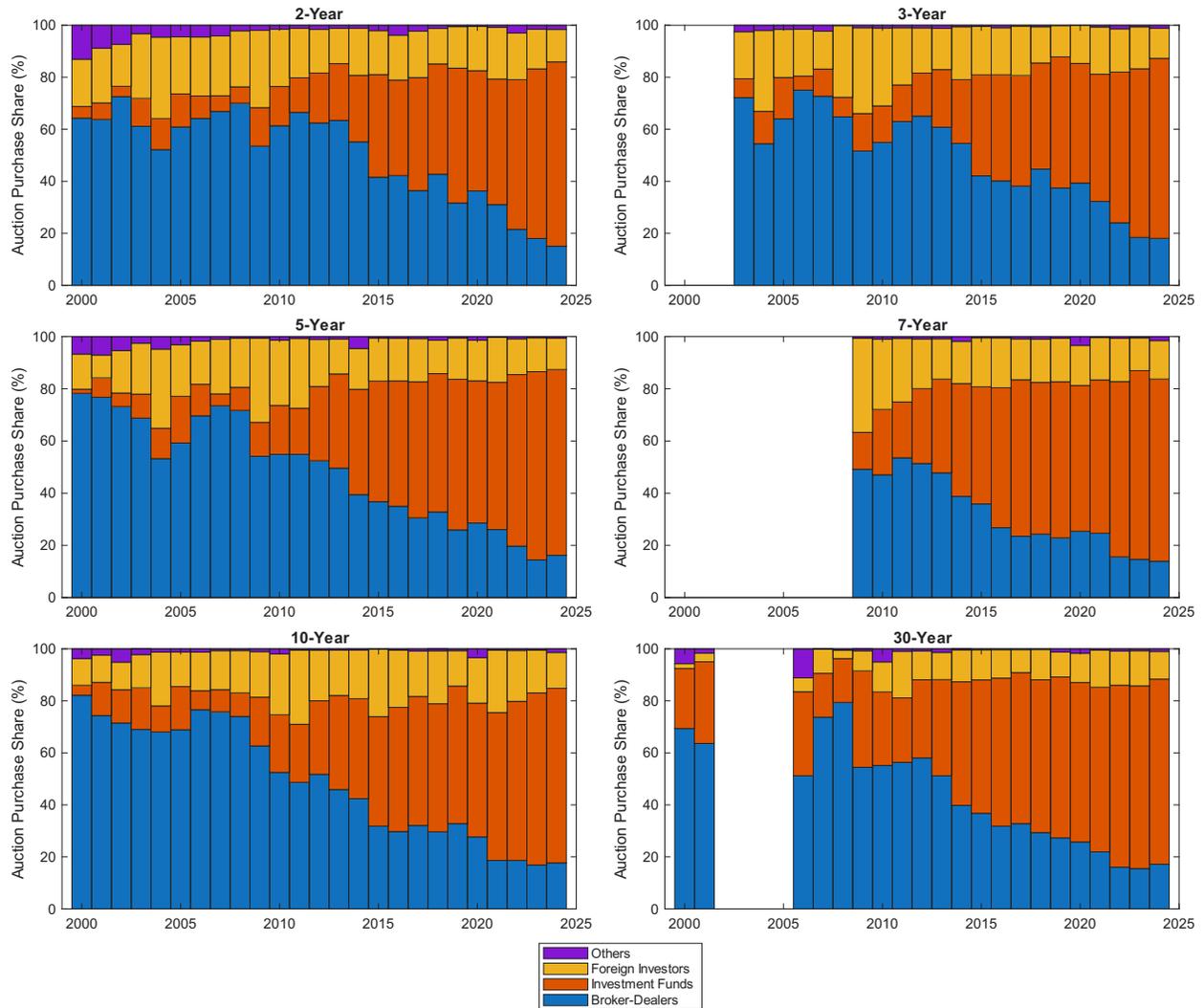


Table A2. Yield Pressure over 10-Day Window Around Auctions

This table presents analysis of yield pressure around auctions of nominal coupon Treasury securities between June 25, 1991 and July 24, 2024. Yield pressure reflects the total magnitude of the inverted V-shape yield pattern in the 10 days around auction, expressed in bps. It is equal to the pre-auction yield increase ($\Delta Y^{(pre)}$) minus the post-auction yield decrease ($\Delta Y^{(post)}$), where $\Delta Y^{(pre)} = Y_0 - Y_{-5}$ and $\Delta Y^{(post)} = Y_5 - Y_0$. Auction data are from TreasuryDirect and secondary market daily yield data are from CRSP. * $p < .1$; ** $p < .05$; *** $p < .01$.

	2-Year	3-Year	5-Year	7-Year	10-Year	30-Year
Panel A: Full Sample Analysis (1991–2024)						
Yield pressure (bps)	4.421***	1.900*	5.032***	1.539	2.299**	3.794***
$\Delta Y^{(pre)}$	1.585***	1.871**	1.891***	-0.362	1.655**	2.753***
$\Delta Y^{(post)}$	-2.836***	-0.029	-3.141***	-1.902*	-0.644	-1.041
t-stat $H_0 : \Delta Y^{(pre)} = -\Delta Y^{(post)}$	-1.549	1.679*	-1.382	-1.800*	0.946	1.568
Panel B: Subsample Analysis						
Yield pressure (bps):						
S1: 1991-2006	5.592***	3.133	4.850***	-2.924	1.545	5.678*
S2: 2007-2014	5.609***	4.237**	8.197***	2.163	4.446**	6.314***
S3: 2015-2024	1.525	-0.064	2.621	1.470	1.174	1.609
F-test statistic:						
$H_0 : S2 = S1$	0.000	0.122	2.056	0.589	1.031	0.033
$H_0 : S3 = S1$	5.038**	1.167	1.013	0.457	0.019	1.495
$H_0 : S3 = S2$	3.733*	3.173*	5.142**	0.066	1.570	4.012**

Figure A2. Cumulative Net Order Flow Around FOMC Announcements

This figure plots the average cumulative net order flow around FOMC announcements for the period from 1997 to July 24, 2024. Cumulative net order flow is computed as buyer-initiated minus seller-initiated volume, accumulated separately for the pre- and post-announcement periods. Announcement times are from Bloomberg. Secondary market data are from GovPX (June 1991–June 2001) and BrokerTec (July 2001–July 2024).

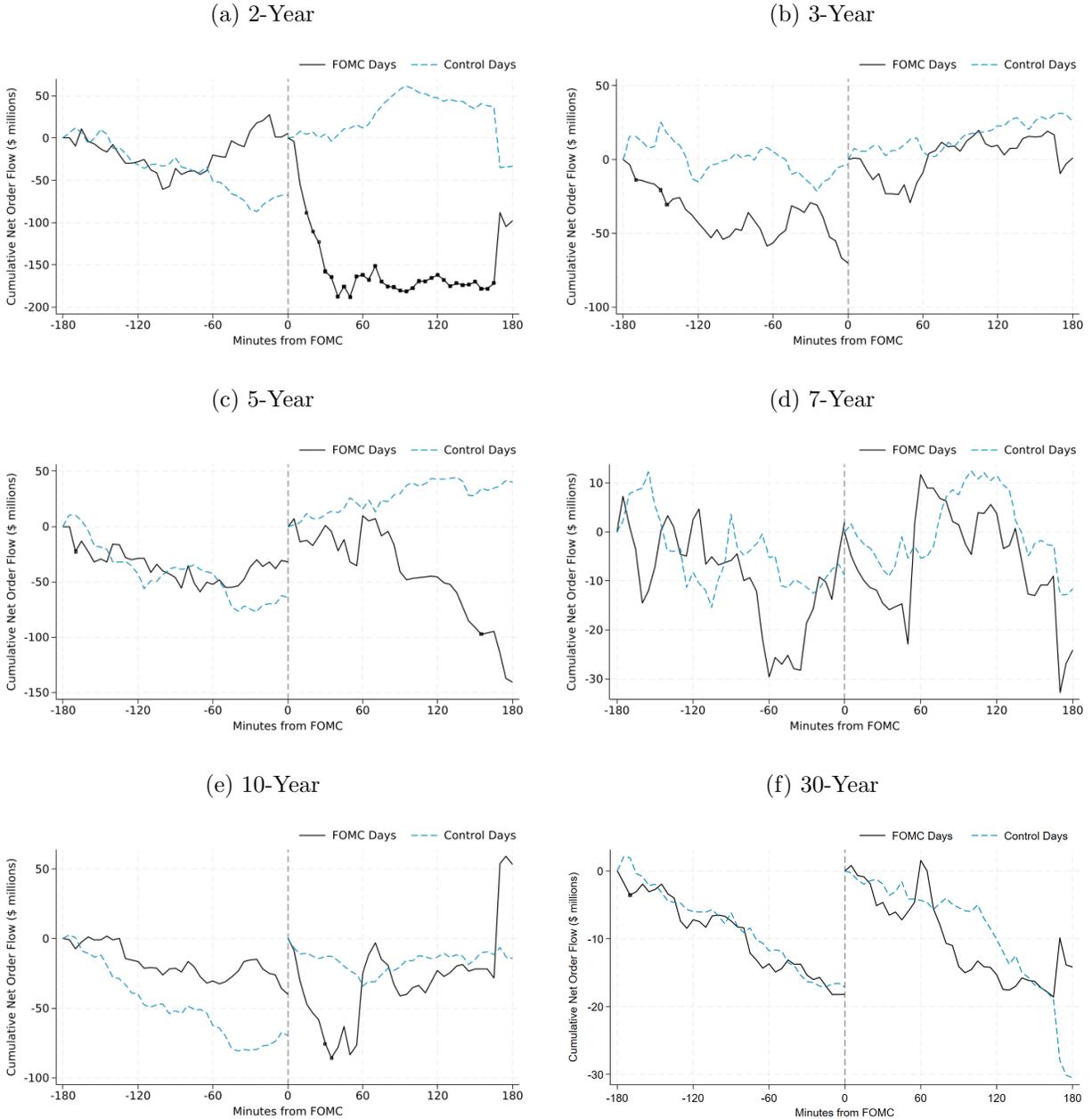


Figure A3. Cumulative Net Order Flow Around Employment Report Announcements

This figure plots the average cumulative net order flow around announcements of employment reports for the period from 1997 to July 24, 2024. Cumulative net order flow is computed as buyer-initiated minus seller-initiated volume, accumulated separately for the pre- and post-announcement periods. Announcement times are from Bloomberg. Secondary market data are from GovPX (June 1991–June 2001) and BrokerTec (July 2001–July 2024).

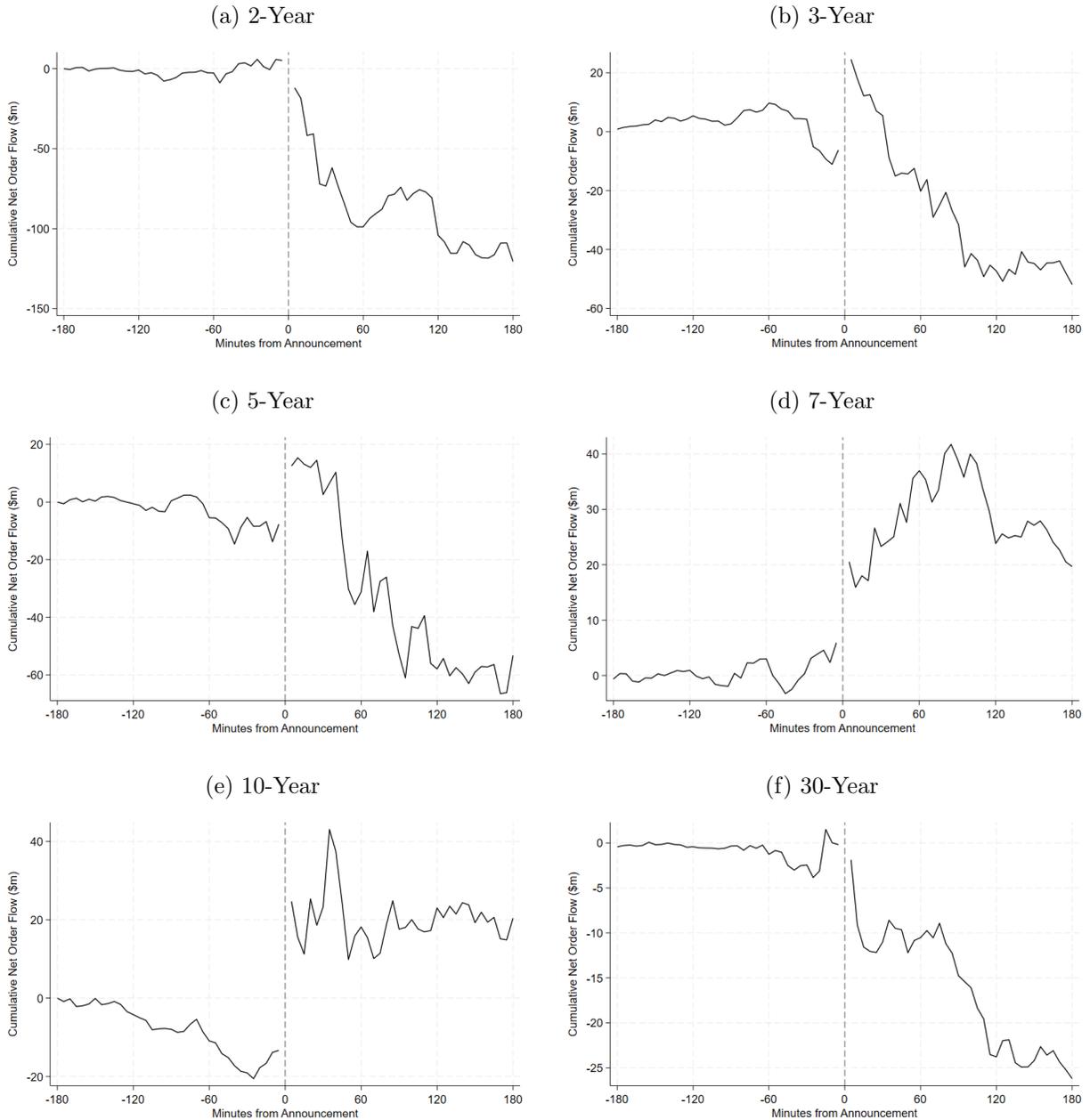


Figure A4. Yield Changes Around FOMC Announcements

This figure plots the average yield changes around FOMC announcements for the period from 1997 to July 24, 2024. Yield changes are computed relative to the yield at announcement time. Announcement times are from Bloomberg. Secondary market data are from GovPX (June 1991–June 2001) and BrokerTec (July 2001–July 2024).

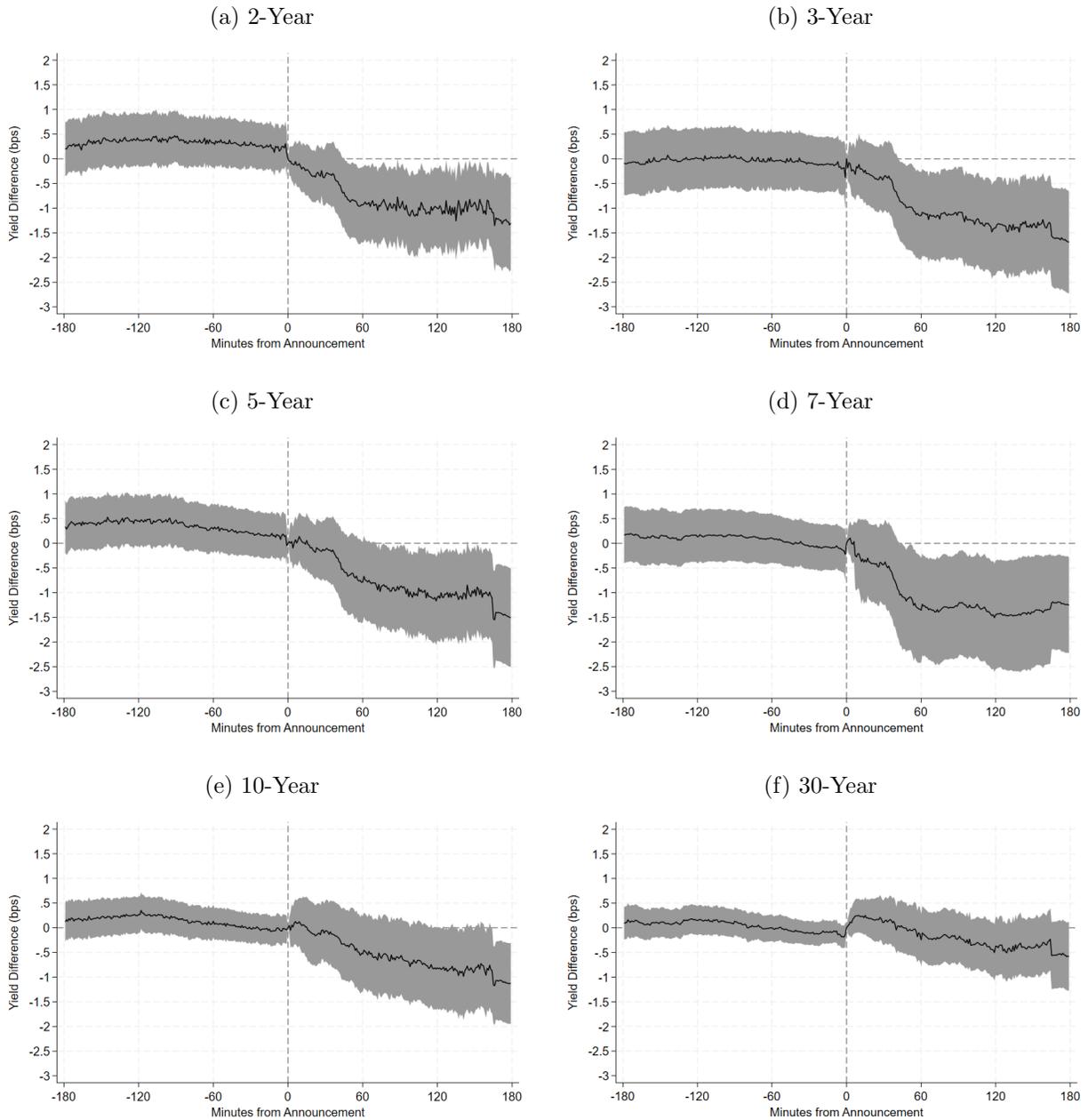


Figure A5. Yield Changes Around Employment Report Announcements

This figure plots the average yield changes around announcements of employment reports for the period from 1997 to July 24, 2024. Yield changes are computed relative to the yield at announcement time. Announcement times are from Bloomberg. Secondary market data are from GovPX (June 1991–June 2001) and BrokerTec (July 2001–July 2024).

