The resilience of the US Treasury market

SUERF Webinar
May, 2024

Drawing from “Dealer Capacity and US Treasury Market Functionality”
Federal Reserve Bank of New York Staff Report 1070, 2023, co-authored with Michael Fleming,
Frank Keane, Claire Nelson, Or Shachar, and Peter Van Tassel, and “Resilience Redux in the US
Market structure: Dealer balance sheets are used for all investor trades
Covid caused an explosion of dealer-to-customer bid-offer spreads


Interdealer market depth virtually disappeared

Figure: Treasury market depth on Brokertec, in millions of dollars. The market depth shown is the average of the largest three amounts bid or offered on Brokertec’s interdealer central limit order book market (New York, London, and Tokyo, respectively) for on-the-run 10-year U.S. treasuries between 8:30am and 10:30am EST. The figure was obtained from JP Morgan, US Fixed Income Strategy, Joshua Younger and Henry St. John, April 2, 2020.
Liquidity is limited by dealer balance-sheet capacity

Ratio of Treasuries outstanding to total primary-dealer assets
The Fed had to quickly remove Treasuries from dealer balance sheets

Figure: Total weekly purchases of Treasuries from primary dealers by the Fed in the weeks of March 16 through May 25, 2020. Data: Federal Reserve. Source: Duffie (2020).
UST illiquidity is normally well explained by yield volatility, but in March 2020 something broke this relationship.

**Figure:** Predicted $z$-score of PC1 of Illiquidity: $y = -1.64 + 0.021x + 0.000037x^2$. Yield volatility $x$ is in basis points. $N = 1,331; \ R^2 = 79.5\%$. 
Something similar happened in the European sovereign bond market

**Figure:** Source: Ferrara, Hudepohl, Karl, Linzert, Nguyen, Cruz (ECB, March, 2024).
(a) Dealer bid and ask quotes. 
(b) Mean time rate of dealer purchases from customers, transactions per year.

Figure: Demand elasticity 400, supply elasticity 300, discount rate $r = 0.1$, implying a perfect-markets price of 100. Central-bank market-function purchase program is active whenever the inventory level $x$ is at or above 45. Central bank purchases are at mean rate $\lambda(x) = B(b_x)/10$ and price $(a_x + b_x)/2$. 
The component of UST illiquidity not explained by yield volatility is high whenever utilization of dealer intermediation capacity is high.

**Figure:** Predicted illiquidity $z$-score not explained by volatility is $y = 0.432 - 0.048x + 0.0011x^2$, with $R^2 = 43.6\%$. All three coefficient estimates have $p$-values of less than 1% (Newey-West).
Broad central clearing reduces settlement commitments

The graph illustrates the comparison between the current structure and market-wide central clearing of settlement obligations in billions of dollars. The blue line represents the current structure, while the yellow line shows market-wide central clearing. The data is sourced from Fleming and Keane, Federal Reserve Bank of New York, April 2021.

Figure: Source: Fleming and Keane, Federal Reserve Bank of New York, April 2021.
Policies for enhancing Treasury market resilience


2. Central bank financing facilities (SRF and FIMA, 2020).

3. Augmenting dealer intermediated trade with all-to-all trade.

4. Post-trade transactions reporting (TRACE, in progress).

5. Lifting exemptions to fair-access regulation of trade platforms (SEC proposal).

6. Reducing the leverage-ratio capital requirement relative to risk-based capital requirements, without lowering system-wide capital.

7. Treasury buybacks, beginning May 2024.
COVID induced record foreign sales of Treasuries to US dealers

Since the GFC, Treasuries are growing faster than dealers
Estimating dealer capacity utilization

- Dealer level net and gross positions in UST, agency MBS, and corporate bonds, from FR2004.

- Dealer purchases and sales from customers over the past three business days, from TRACE.

- Risk adjustment is based on maturity-level swaption-implied volatilities and security-level DV01s.

- The capacity of a dealer for a given activity is estimated, based on revealed preference, as the sample maximum (implying a downward bias).

- The capacity utilization of a dealer is the ratio of its current activity metric normalized by its estimated maximum.

- The collective capacity utilization of dealers is the weighted average of utilization across dealers, using capacity weights.
Illiquidity tracks volatility except when dealer balance sheets are loaded.
99th percentile illiquidity explained by volatility and capacity utilization

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total capacity: gross position</td>
<td>1.245</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.038)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total capacity: net Position</td>
<td></td>
<td>1.074</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.141)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total capacity: gross DTC buys</td>
<td></td>
<td></td>
<td>0.924</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.057)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average 1M Swaption-implied vol</td>
<td>2.077</td>
<td></td>
<td>0.883</td>
<td></td>
<td>1.270</td>
<td></td>
<td>1.270</td>
</tr>
<tr>
<td></td>
<td>(0.317)</td>
<td></td>
<td>(0.315)</td>
<td></td>
<td>(0.243)</td>
<td></td>
<td>(0.091)</td>
</tr>
<tr>
<td>Residuals, gross position</td>
<td></td>
<td></td>
<td></td>
<td>0.775</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.076)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residuals, net position</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.651</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.047)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residuals, Gross DTC Buys</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.505</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.027)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>1.260</td>
<td>2.366</td>
<td>2.076</td>
<td>1.742</td>
<td>1.085</td>
<td>1.265</td>
<td>1.082</td>
</tr>
<tr>
<td></td>
<td>(0.039)</td>
<td>(0.338)</td>
<td>(0.158)</td>
<td>(0.305)</td>
<td>(0.098)</td>
<td>(0.097)</td>
<td>(0.073)</td>
</tr>
<tr>
<td>N</td>
<td>1331</td>
<td>1331</td>
<td>1331</td>
<td>1331</td>
<td>1331</td>
<td>1331</td>
<td>1331</td>
</tr>
<tr>
<td>Pseudo $R^2$</td>
<td>0.688</td>
<td>0.391</td>
<td>0.441</td>
<td>0.533</td>
<td>0.697</td>
<td>0.666</td>
<td>0.707</td>
</tr>
</tbody>
</table>
Revisiting market design and regulation
Broad central clearing
The first principal component of US Treasury market illiquidity

![Bar chart showing PC1 loadings for various measures: Price impact, Bid-ask spread, -Log(depth), YC RMSE, Price dispersion, OTR premium. Measures are differentiated by color: 2-year in brown, 5-year in green, and 10-year in blue.](image)
Estimated US Treasury market dealer capacity utilization

Figure: Dealer capacity utilization is the ratio of the current level of the intermediation measure to the sample record high measure. The capacity utilization of primary dealers as a group is the weighted average of the dealers' utilizations.
Pricing and trade under balance-sheet constraints with a monopolist dealer

Figure: Dealer inventory is a controlled Markov chain. At the current inventory level $x$ the mean dealer purchase speed $A(a_x)$ and sale speed $B(b_x)$ are determined by the dealer’s optimal ask price $a_x$ and bid price $b_x$, respectively, obtained by solving the HJB equation for optimal dealer value $V(x)$. 