

June 26, 2020

Mr. Fred Pietrangeli  
Director, Office of Debt Management  
Office of the Assistant Secretary for Financial Markets  
U.S. Department of the Treasury

Re: TREAS-DO-2020-0007, Development and Potential Issuance of Treasury Floating Rate Notes Indexed to the Secured Overnight Financing Rate

Dear Mr. Pietrangeli,

I appreciate the opportunity to comment on the development and potential issue of Treasury floating rate notes (FRNs) indexed to the Secured Overnight Financing Rate (SOFR). I am an Associate Professor of Finance at MIT Sloan School of Management and a Research Associate of the National Bureau of Economic Research. With a specialty in market structure and design, I have published more than 15 research articles on academic journals and served as an academic expert for the Bank for International Settlements and the U.S. Commodity Futures Trading Commission. In the context of SOFR, I have designed a form of “clock auction” to exchange market participants’ LIBOR exposures to SOFR exposures, at market-determined prices. My auction design and related recommendations are elaborated in a white paper<sup>1</sup> and a recent presentation at the U.S. Securities and Exchange Commission.<sup>2</sup>

**I believe SOFR-indexed FRNs issued by the U.S. Treasury are: (1) likely to receive favorable market pricing and hence benefit U.S. taxpayers; and (2) a significant step toward a successful transition of U.S. benchmark interest rates to SOFR.** In this letter, a SOFR FRN is defined as an FRN whose coupon payments are indexed to SOFR, published daily by the Federal Reserve Bank of New York.

### *Benefits for U.S. Taxpayers*

**Treasury-issued SOFR FRNs are likely to receive strong demand and favorable pricing because of their price stability and effective hedges against funding risk.**

A key feature of an FRN is its price stability. Each coupon payment moves in tandem with the discount rate on that coupon, so the market value of an FRN stays close to its face value.

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<sup>1</sup> See [http://www.mit.edu/~zhuh/HaoxiangZhu\\_IBORAuction.pdf](http://www.mit.edu/~zhuh/HaoxiangZhu_IBORAuction.pdf).

<sup>2</sup> See [http://www.mit.edu/~zhuh/HaoxiangZhu\\_LIBOR\\_SEC.pdf](http://www.mit.edu/~zhuh/HaoxiangZhu_LIBOR_SEC.pdf).

The U.S. Treasury has been issuing FRNs linked to the 13-week Treasury Bills since 2014. A recent publication by Matthias Fleckenstein and Francis Longstaff provides compelling evidence that the 13-week Treasury Bill FRN is priced at a premium.<sup>3</sup> The authors write:

“FRN prices are significantly higher than the value of their replicating portfolios of Treasury bills or notes. This is true across the maturity spectrum as we compare FRN prices with replicating portfolios using fixed rate securities ranging from three-month on-the-run Treasury bills to the most recently auctioned two-year Treasury notes. On average, the premium is 5.97 basis points relative to Treasury bills and 9.73 basis points relative to Treasury notes. These premia vary significantly through time and can exceed 30 basis points (or more than 40 cents per \$100 par amount). Furthermore, these premia are economically large, almost uniformly positive, and orders of magnitude larger than the bid-ask spreads for these actively traded and highly liquid Treasury bills, notes, and FRNs.”

The 6-10 bps premium is substantial in the context of U.S. Treasury markets. Per \$1 trillion outstanding of Treasury Bill FRNs, the savings to U.S. taxpayers is between \$600 million and \$1 billion. This estimate is consistent with the Treasury’s own estimate that the \$1.1 trillion Treasury Bill FRNs issued so far have reduced the Treasury’s interest expense by \$1.3 billion compared to two-year Treasury Notes. Fleckenstein and Longstaff further show that nearly 40% of all Treasury Bill FRNs are held by U.S. money market mutual funds. They also provide evidence that the SEC’s money market mutual fund reform increased the demand for price-stable Treasury securities such as Treasury Bill FRNs.<sup>4</sup>

The evidence documented by Fleckenstein and Longstaff strongly suggests that SOFR FRNs will also receive favorable market pricing for their price stability. Money market investors that have strong demand for Treasury Bill FRNs are likely to demand SOFR FRNs with similar enthusiasm. In addition, money market mutual funds are major investors in the tri-party repo market. According to data from the Federal Reserve Bank of New York, the average SOFR from April 2, 2018 to June 25, 2020 is 1.789%, whereas the average tri-party repo rate in the same period is 1.767%. These rates are comparable, suggesting that money market funds’ demand for SOFR FRN will be as strong as their demand of tri-party repos. Separately, corporate treasurers who wish to invest for a short term for extra yields but dread losing money will also find SOFR FRNs desirable.

A technical caveat of directly drawing from the Treasury Bill FRN experience is that SOFR discount rates are still in development. In particular, there is no term SOFR yet, so one cannot discount SOFR FRN cash flows with a term SOFR rate as one discounts Treasury Bill FRN cash flows with term Treasury rates. That said, if the cash flows of Treasury SOFR FRNs are designed to align with the market convention of discounting, a high degree of price stability will be achieved with SOFR FRNs. For example, if the market uses geometrically compounded daily SOFR rates as the discount rate, then it would make sense for the Treasury to set the SOFR

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<sup>3</sup> See Fleckenstein and Longstaff (2020), “The US Treasury floating rate note puzzle: Is there a premium for market-to-market stability?”, forthcoming in the Journal of Financial Economics.

<sup>4</sup> There are two reasons. First, money market funds that do not have fixed \$1.00 NAVs would want to hold more FRNs to minimize their NAV volatility. Second, in the context of SEC’s regulation of money market funds, the remaining maturity of FRNs is taken to be the time until the next interest rate reset date. The effective short maturity of FRNs relaxes the constraint on the maximum maturity of securities that can be held by money market funds.

FRN’s coupon to be the geometrically compounded daily SOFR rates.<sup>5</sup> Under this convention, asking auction participants to bid an upfront discount or premium to the face value of the SOFR FRN is probably more desirable for achieving price stability than bidding a spread to SOFR.<sup>6</sup>

SOFR FRNs have one additional advantage compared to other Treasury securities. Financial intermediaries such as dealer banks are major participants in Treasury markets because Treasury securities are collateral for financing in the repo market. When purchasing Treasury securities and financing them by repo, an investor receives the coupon rate of the Treasury securities and pays the repo rate. For the vast majority of Treasury notes and bonds, the coupon rate is fixed, but the repo rate is time-varying. During a market stress event such as in September 2019, when SOFR settled above 5%, the repo rate (financing cost) can far exceed the Treasury coupon rate (interest income), making the Treasury security “expensive” to hold (i.e., a “negative carry”). The same risk applies to other leveraged investors of Treasury securities such as hedge funds.

Cash flows from SOFR FRNs are a natural hedge against fluctuations of funding costs. The funding cost of a SOFR FRN is the repo rate that a Treasury investor pays in the repo market. The cash flow from a SOFR FRN is SOFR itself, which is a trimmed median of all repo rates. There is a dispersion of repo rates in the market, so the hedge is imperfect, but it is decent one.

Table 1. Correlation and average difference between SOFR and various percentiles of repo rates  
Source: Federal Reserve Bank of New York (04/02/2018—06/25/2020)

	1st pct	25th pct	75th pct	99th pct
Correlation with SOFR	0.9833	0.9998	0.9989	0.9509
Average spread to SOFR (%)	-0.21	-0.02	0.08	0.17

Table 1 above shows the correlations between SOFR and the 1<sup>st</sup>, 25<sup>th</sup>, 75<sup>th</sup>, and 99<sup>th</sup> percentile of repo rates, using data from the Federal Reserve Bank of New York from April 2, 2018 to June 25, 2020. It also shows the average difference between the 1<sup>st</sup>, 25<sup>th</sup>, 75<sup>th</sup>, and 99<sup>th</sup> percentile of repo rates and SOFR in the same sample period. The lowest correlation in this table is the one between SOFR and the 99<sup>th</sup> percentile of repo rates. Even if there is an “unlucky” investor who consistently pays the 99<sup>th</sup> percentile of repo rates, this investor’s financing cost still has a 0.95 correlation with the cash flow income from a SOFR FRN. All other percentiles have correlations of 0.98 to 1.00 with SOFR. In terms of spread, the 99<sup>th</sup> percentile investor in the repo market

<sup>5</sup> For each coupon period, let’s denote the previous coupon date by day 0 and denote subsequent days up to the next coupon date to be day 1, 2, ...,  $T$ , where  $T$  is the number of days in that coupon period. Denote the SOFR rate on day  $t$  by  $S_t$ . The next coupon is discounted to day 0 by the discount factor  $\left(1 + \frac{S_1}{360}\right) \left(1 + \frac{S_2}{360}\right) \dots \left(1 + \frac{S_T}{360}\right)$ , where the year is simplified to 360 days. If the next SOFR FRN coupon is set to be  $\left(1 + \frac{S_1}{360}\right) \left(1 + \frac{S_2}{360}\right) \dots \left(1 + \frac{S_T}{360}\right) - 1$  of the face value, then the SOFR FRN is priced exactly at par.

<sup>6</sup> To continue the example in the previous footnote, adding a spread  $\Delta$  to SOFR means that the SOFR FRN is not priced exactly at par because the coupon would be  $\left(1 + \frac{S_1+\Delta}{360}\right) \left(1 + \frac{S_2+\Delta}{360}\right) \dots \left(1 + \frac{S_T+\Delta}{360}\right) - 1$  but the discount factor of that coupon (to the previous coupon date) remains  $\left(1 + \frac{S_1}{360}\right) \left(1 + \frac{S_2}{360}\right) \dots \left(1 + \frac{S_T}{360}\right)$ . The fluctuation is likely small, however. The secondary market price would be even more stable if the auction is not on a spread over SOFR, but an upfront discount or premium applied to the face value. This way, the Treasury pays or receives an upfront amount on the auction settlement day, rather than spreading it throughout the life of the SOFR FRN.

pays 17 bps above SOFR on average, while the 1<sup>st</sup> percentile investor pays 21 bps below SOFR on average. A magnitude of 17 bps is nontrivial, but again, the relevant comparison is between a SOFR FRN and other Treasury securities not indexed to repo rates. The high time-series correlation between SOFR and the various percentiles of repo rates suggests that a SOFR FRN is a much better hedge against funding risk than other types of Treasury securities.

Given this hedging property, I believe SOFR FRNs will have strong demands from primary dealers, hedge funds, and other investors that use the repo markets for funding Treasury securities. These investors are thus likely to price SOFR FRNs at a premium, relative to fix-coupon Treasury Bills and Notes. It is true that during market stress, the SOFR FRN may incur a higher interest expense than standard Treasury Bills and Notes, but this temporarily higher interest expense should be more than offset by the lower yield (average cost) on the SOFR FRN. Put differently, by issuing the SOFR FRN, the Treasury can harvest an “insurance premium” by insuring leveraged investors against funding market stress.

Let me add a few observations on the security design. As mentioned, the SOFR FRN has two desirable properties: its price stability and its effective hedge against funding risk. The design of SOFR FRNs should make both properties as salient as possible.

- To maximize price stability, a geometrically compounded SOFR rate is probably a better choice for the coupon than an arithmetic average because the SOFR FRN cash flows are likely discounted by geometrically compounded daily SOFR rates. In comparison, simple arithmetic averages of daily SOFR rates lead to a higher price volatility,<sup>7</sup> and the arrival of a widely accepted “official” term SOFR rate is just too uncertain to wait for.
- In the auction of SOFR FRNs, inviting bidders to submit an upfront discount or premium over the face value, rather than a spread over SOFR, can further enhance price stability.
- To maximize the match to funding costs, the underlying SOFR data for calculating coupons should not involve lags and should be reset daily. That is, the coupon paid for a period including dates 1, 2, ...,  $T$  should be calculated from the realized SOFR rates for dates 1, 2, ...,  $T$ . Quite often, the motive for including a “look back” period or a “lag” is to make each coupon predictable, but most Treasury securities already have this feature. The design of SOFR FRN should focus on dimensions absent in other Treasury securities, such as hedging against funding risk. Investors who have different desire of hedging funding risk and the predictability of coupons can make their own mix of SOFR FRNs and regular Treasury securities.
- It is prudent to set the initial maturities of SOFR FRNs short (e.g., one year or two years) and extend it gradually over time. The interest savings of SOFR FRNs may well be larger at longer maturities. For example, if a 10-year SOFR FRN pays SOFR flat (zero spread) and is priced by the market at par, then the Treasury essentially finances its 10-year debt at an overnight rate. In this scenario, the Treasury saves the term spread between the 10-year yield and the overnight rate, which is usually positive. Note that a longer maturity of SOFR FRNs affects neither its price stability nor its property as a hedge against funding risk. In particular, money market funds can still hold long-term SOFR FRNs because, under SEC rules, their effective maturity is deemed no longer than the interest rate reset period (see footnote 4).

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<sup>7</sup> Arithmetic and geometric averages are generally different, and the difference is larger if the underlying data are more volatile. If coupons were based on arithmetic average of daily SOFR rates, the prices SOFR FRNs would be the least stable precisely when the underlying SOFR rate is the most volatile.

## *Benefits for SOFR Liquidity*

**Besides the benefit to taxpayers, Treasury-issued SOFR FRNs will also speed up the transition away from LIBOR.**

The organic growth in SOFR liquidity has been visible, but it has not reached a level anywhere near the liquidity of LIBOR market that SOFR intends to replace. For example, as of June 2020, the CME SOFR futures are liquid only up to two years, to June 2022.<sup>8</sup> The trading volume of SOFR swaps is also dwarfed by that of LIBOR swaps, according to analysis by Clarus Financial Technology.<sup>9</sup> Private-sector issuance of SOFR FRNs has been of low volume and short maturities, although at least one recent issue has a relatively long maturity of four years.<sup>10</sup>

Compared to occasional issues of SOFR FRNs by the private sector, the U.S. Treasury's issuance can be regular, predictable, and of higher volume and longer maturities. The enhanced supply and liquidity of SOFR FRNs issued by the Treasury will further generate SOFR liquidity in the other cash securities such as consumer mortgages and business loans as well as in derivatives markets such as futures and swaps. Liquidity is a chicken-and-egg problem, and the U.S. Treasury is in a unique position to kick off this virtuous circle.

Equally important, as the largest issuer of U.S. dollar-denominated assets, the U.S. Treasury's decision to finance part of its debt in the SOFR market is, by itself, an extremely strong signal of the official sector's commitment for the LIBOR transition effort. The commitment is particularly important given the heightened economic uncertainty associated with the COVID-19 pandemic that may, in a worst-case scenario, extend into or even beyond 2021.

## *Summary*

In sum, I strongly support the issuance of SOFR-indexed FRNs by the U.S. Treasury. SOFR FRNs have stable market prices, which is desirable for money market investors. SOFR FRNs are also effective hedges against funding risk, which is desirable for primary dealers and other investors who use the repo market for financing. These features are likely to lead to strong market demands for SOFR FRNs and lower interest expenses for U.S. taxpayers.

Sincerely,  
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<sup>8</sup> See [https://www.cmegroup.com/trading/interest-rates/stir/three-month-sofr\\_quotes\\_globex.html](https://www.cmegroup.com/trading/interest-rates/stir/three-month-sofr_quotes_globex.html).

<sup>9</sup> See <https://www.clarusft.com/sofr-swaps-and-sef-venues/>.

<sup>10</sup> On June 16, 2020, CIT announced the issuance of a SOFR FRN of \$500 million, maturing in 2024.