Is There Mispricing In U.S. Treasury Floating Rate Notes?

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Abstract

Since the U.S. Treasury started issuing Floating Rate Notes (FRNs) in January 2014, their pricing relative to other marketable Treasury securities has been relatively understudied. While FRNs may reduce the rollover risk of short-term government debt and expand the overall government debt investor base, using a simple term structure model I show that FRNs have been significantly underpriced. More specifically, the model suggests that Treasury has potentially missed out on hundreds of millions in financing as of the end of 2016. This has several implications for optimal government debt management.

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1 Introduction

The U.S. Treasury began issuing 2-Year Floating Rate Notes (FRNs) in January 2014 the first new debt product issued by the U.S Treasury since TIPS were introduced in 1997.

Similar in structure to floating rate corporate debt, Treasury FRN coupon payments on FRNs are based a reference rate of rolling 13-week Treasury bill rates determined at auction in addition to a fixed spread set at auction.

FRNs are auctioned in par increments of $100 through competitive and noncompetitive bids like other Treasury securities.

With competitive bids, the bidder specifies the highest discount margin they are willing to accept. Their bid will either be accepted in full if the bid is less than the high discount margin determined at auction, accepted in less than the full amount (pro rata) if the bid is equal to the high discount margin, or rejected if the bid is above the high discount margin.

With noncompetitive bids, the bidder agrees to accept the high discount margin determined at auction.

Like other Treasury auctions, a bidder can buy up to $5 million in FRNs by noncompetitive bidding or up to 35

FRNs were in part introduced by the U.S. Treasury to reduce the rollover risk of short-term government debt, namely 3-month Treasury bills which comprised a substantial portion of the U.S. governments overall debt outstanding. In addition, the Treasury believed FRNs could be used expand the overall government debt investor base.

Floating rate note debt can be priced using a simple pricing equation that uses forward rates and zero coupon rates. This paper uses the term structure model of Gurkayanaka, Sack and Wright (2006) to get implied forward rates to price an FRN according to the contemporaneous yield curve.

The paper proceeds as follows. Part 2 reviews the literature. Part 3 introduces the pricing formula of the FRN and the simple term structure model used to derive the implied forward rates used to calculate the expected FRN coupon payments. Part 4 discusses the

magnitude of mispricing between actual debt issuance and the theoretical risk-neutral price according to the Treasury yield curve, arbitrage opportunities and other supply and demand issues impacting FRNs. Part 5 concludes.

2 Literature and Theory

3 Data

3.1 Treasury 2-Year FRN Pricing Formula

Table 1a shows the amount raised by the U.S. Treasury at each 2-Year FRN auction.

While a new 2-Year Treasury FRN is auctioned in the first month of each quarter usually raising $15 billion at the initial auction, each FRN is reopened for 2 additional auctions in the second and third months of the quarter which are FRNs with the same CUSIP and same maturity remaining from the initial issue.

Table 1b shows the U.S. Treasury 2-Year FRN auction allotments by investor class. The most popular awardees of FRNs at auction are investment funds, broker-dealers, and foreign banking entities in that order. In 2015, the Federal Reserve System Open Market Account (SOMA) also began purchasing FRNs.

Table 2 shows the Treasury FRN bid-to-cover ratio versus the treasury high discount margin. While the initial FRN auctions in 2014 were met with high demand and relatively high bid-to-cover ratios along with small discount margins, in 2015 as demand has waned for FRNs, discount margins have risen as well.

One important feature of Treasury FRNs is that unlike traditional FRNs, they accrue interest daily based on that weeks 13-week T-bill rate.

Hence, the FRNs coupon rate will be determined not only by the 13-week T-bill rate when the coupon is paid but instead will be determined by the path of 13-week T-bill rates in between coupon payments.

As a result, the 2-year FRNs pricing formula looks like:

Where K is the highest fixed spread accepted at the FRNs auction, $f_m^1 3$ is the 13-week forward rate at week t=m, r_n is the spot rate at week t=n, and face value is \$100.

This pricing model assumes no term premia at the short-end of the curve and that forward rates fully reflect expected future interest rates. The assumption in recent years has become a stronger one given the recent decline in term premia across longer maturity Treasury securities.

3.2 Term Structure Model of Interest Rates

To obtain a reliable set of forward rates, a term structure model is required. This paper uses the term structure model of Gurkayanaka, Sack and Wright (2006), hereafter GSW, to get implied forward rates to price an FRN according to the contemporaneous yield curve on a given date.

In short, GSW models the entire yield curve with a set of 6 parameters which relate to off-the-run Treasury yield curves and are based on a large set of outstanding Treasury notes and bonds.

The Federal Reserve in their statistical release provides daily estimates of the GSW yield curve parameters from 1961 to present. Using the six parameters β_0, β_1, β_2, β_3, τ_1, and τ_2, we can compute the instantaneous forward rate:

$$f_t(n,0) = \beta_0 + \beta_1 * exp((-n)/\tau_1) + \beta_2 * n/\tau_1 exp((-n)/\tau_1) + \beta_3 * n/\tau_2 exp((-n)/\tau_2) \quad (1)$$

Integrating the instantaneous forward rate obtains a formula for the zero coupon rate:

$$r_t(n,0) = \beta_0 + \beta_1 * 1 - exp((-n)/\tau_1)/(n/\tau_1) + \beta_2 * [n/\tau_1 1 - exp((-n)/\tau_1)/(n/\tau_1) - exp((-n)/\tau_1)] + \beta_3 * [n/\tau_1 1 - e^x \quad (2)$$

4 Results

4.1 Mispricing at issuance

We can determine mispricing and potential loss dollar loss to the Treasury at first issuance by using the GSW yield curve at a given FRN auction date. Table 1 presents the high discount margin of each FRN at auction.

4.2 Mispricing in the secondary market

Table 2 presents the secondary market prices for each Treasury floating rate note. Table 3A and Table 3B

4.3 Arbitrage opportunities

Series of short FRAs (104 to be precise) Diagram of potential arbitrage

5 Conclusion

6 References

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