Floating Rate Notes

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July 12, 2018

1 Introduction

The majority of the Floating Rate Notes traded by MHI are corporate bonds with Bloomberg calculation type 21 [1]. Typically these bonds pay quarterly coupons. The floating coupon rate is referenced to a benchmark index (for example EURIBOR) plus a spread (known as "quoted margin").

The pricing formulas for floating rate notes are designed to facilitate price agreement between counterparties and to avoid a dependency on forecast and discount curves. The MLIB calculations closely follow the description given in chapter 17 of Stignum and Robinson's book [2], with small changes in order to match the Bloomberg YAS screen exactly.

2 Price from Discount Margin

The coupon rate for the next coupon is known in advance. Subsequent projected coupons amounts are assumed to be equal, with equally spaced coupon intervals. For bonds with an ACT/XYZ daycount, a "leap year adjustment factor" is applied to the discount formula and the projected coupon rate. Let:

$$m_d = \text{Discount margin} \quad (1)$$
$$r_{ic} = \text{Reference index rate for the current coupon interval} \quad (2)$$
$$r_{ia} = \text{Assumed average reference index rate for projected coupon intervals} \quad (3)$$
$$m_q = \text{Quoted margin or spread to the reference index} \quad (4)$$
$$r_c = \text{Coupon rate for the first coupon} \quad (5)$$
$$C_0 = \text{Next (first) coupon amount} \quad (6)$$
$$C = \text{Subsequent (projected) coupon amounts} \quad (7)$$
$$w = \text{Number of coupons per year} \quad (8)$$
$$F = \text{Face value of the bond} \quad (9)$$
$$R = \text{Redemption value of the bond} \quad (10)$$
$$T_{sn} = \text{Actual number of days from settlement date to the next coupon} \quad (11)$$
$$T_{pn} = \text{Actual number of days from prior coupon date to the next coupon} \quad (12)$$
$$A_y = \text{Number of days in year for the specified daycount (360, 365)} \quad (13)$$
$$v_{sn} = \text{Discount factor from settlement to first coupon} \quad (14)$$
$$v = \text{Discount factor in subsequent coupon intervals} \quad (15)$$
$$AI = \text{Accrued interest} \quad (16)$$

In particular the quantities m_d, r_c, r_{ic}, r_{ia} are all fixed and known as of settlement date. Therefore:

$$\begin{aligned} L &= \frac{365.25}{A_y} && \text{the leap year adjustment factor} && (17)\\ C_0 &= r_c F(T_{pn}/A_y) && && (18)\\ C &= \left[(r_{ia}+m_q)FL/w\right]^+ && \text{i.e. do not allow negative projected coupons} && (19)\\ v_{sn} &= \left[1+(r_{ic}+m_d)(T_{sn}/A_y)\right]^{-1} && && (20)\\ v &= \left[1+(r_{ia}+m_d)L/w\right]^{-1} && && (21) \end{aligned}$$

Note that the projected coupons C are scaled up by the leap year adjustment factor L, however the Bloomberg CSHF screen shows the unadjusted coupon amounts. The PV of the FRN on settlement date is given by the following expression:

$$PV = v_{sn}\left[C\sum_{n=1}^{N-1} v^n + Rv^{N-1} + C_0\right] \tag{22}$$

and the clean price is:

$$P = (PV - AI)\times 100/F \tag{23}$$

3 Price from Yield

Page 267 of Stignum and Robinson's book [2] describes how to discount the FRN coupons using yield to maturity y_{tm}. However Bloomberg requires that the yield y_{tm}, discount-margin d_m, index level for the current coupon period r_{ic}, and assumed average index r_{ia} should remain consistent at all times. To enforce this consistency, and noting the following relationship on p270 of Stignum and Robinson, the discount margin is implied from the yield as follows:

$$\begin{aligned} m_d &= \text{yield to maturity} - \text{reference index value} && && (24)\\ &= y_{tm} - r_{ic} && \text{if a single coupon remains} && (25)\\ &= y_{tm} - r_{ia} && \text{if more than one coupon remains.} && (26) \end{aligned}$$

Once the discount margin m_d is implied consistently from the yield, the FRN price is calculated from discount margin as before.

References

[1] Bloomberg. *Valid Calculation Types.* The document is downloaded from Bloomberg. We save a local copy in the MLIB repository: `resource/documentation/EN/Bonds/BondCalculationTypes.pdf`

[2] Marcia Stignum, Franklin L. Robinson. *Money Market and Bond Calculations.* IRWIN Professional Publishing, 1996.