Learning Module 8: Yield and Yield Spread Measures for Floating Rate Instruments

LOS 8a: calculate and interpret yield spread measures for floating-rate instruments.

Floating Rate Instruments

Floating-rate instruments, such as floating-rate notes (FRNs) and most loans, differ from fixed-rate bonds in their periodic payment dynamics. Their interest payments fluctuate based on a reference interest rate, ensuring the borrower's base rate remains aligned with prevailing market conditions. For lenders or investors, this means minimized price risk amidst interest rate volatilities. For instance, an FRN issued by a company will adjust its interest payments depending on a prevalent market reference rate (MRR), such as LIBOR. This mechanism ensures that even amidst unstable interest rates, the FRN's price remains steady as its cash flows recalibrate with rate changes.

Market Reference Rate (MRR)

The MRR on an FRN or loan is usually a short-term money market rate. The reference rate is determined at the beginning of the period, and the interest payment is made at the end of the period. This payment structure is called in arrears. For example, if the MRR is based on the 3-month LIBOR, the interest payment for a period will be determined by the LIBOR rate at the start of the period. The most common day-count conventions for calculating accrued interest on floaters are actual/360 and actual/365. To this MRR, a specified spread, called the quoted margin, is either added or subtracted.

Quoted Margin

The quoted margin, a specified spread over or under the reference rate, compensates the investor for the differential in credit risk associated with the issuer relative to the implications of the reference rate. For example, consider Tesla. If it possesses a greater credit risk relative to a government treasury and issues an FRN, the associated quoted margin would surpass that of an FRN put forth by the government. This increased margin acts as a form of compensation, offsetting the increased risk that investors assume when opting for Tesla over a more secure government note.

Required Margin

The required margin (discount margin) is the yield spread over or under the reference rate such that the FRN is priced at par value on a rate reset date. It is determined by the market. Changes in the required margin usually come from changes in the issuer’s credit risk. Changes in liquidity or tax status can also affect the required margin. For example, if the issuer's credit rating is downgraded, the required margin may increase as investors demand a higher return for the increased risk.

Relationship between the Required Margin and Floater's Price at Reset Date

When the required margin is greater than the quoted margin, the floater tends to be priced at a discount. This phenomenon can often be traced back to changes in the issuer's credit risk. Specifically, at the reset date, if the required margin overshadows the quoted margin, it results in the floater making what is termed a "deficient" interest payment. This deficiency, in turn, leads to the floater being priced below its par value, solidifying its position at a discount.

Conversely, when the required margin is exactly equal to the quoted margin, the floater is said to be priced at par. The rationale behind this is that the alignment between the required and quoted margins naturally drives the floater's flat price towards its par value, especially as the next reset date comes into the horizon.

Lastly, in situations where the required margin is less than the quoted margin, the floater enjoys premium pricing. This is indicative of favorable market conditions for that particular floater.

Valuation of Floating-Rate Note

Valuing a floating-rate note (FRN) necessitates the use of a pricing model. For a fixed-rate bond, the price is determined based on a market discount rate, denoted as r, and a coupon payment per period, denoted as PMT. The formula to calculate this price is as follows:

$$PV = \frac{PMT}{(1+r)} + \frac{PMT}{(1+r)^2} + \ldots + \frac{PMT + FV}{(1+r)^N}$$

Where:

- PV = present value, or the price of the bond
- PMT = Coupon payment per period
- r = the market discount rate
- FV = the future value paid at maturity, or the par value of the bond
- N = the number of evenly spaced periods to maturity

In the context of an FRN, PMT is derived from the Market Reference Rate (MRR) and the quoted margin. r is influenced by the MRR and the margin. The price of an FRN is calculated using the formula:

For an FRN, the price is calculated using the following formula:

$$PV = \frac{\frac{(MRR+QM)\times FV}{m}}{\left(1 + \frac{MRR+DM}{m}\right)} + \frac{\frac{(MRR+QM)\times FV}{m}}{\left(1 + \frac{MRR+DM}{m}\right)^2} + \ldots + \frac{\frac{(MRR+QM)\times FV}{m} + FV}{\left(1 + \frac{MRR+DM}{m}\right)^N}$$

Where:

- PV = present value, or the price of the floating-rate note
- MRR = the market reference rate, stated as an annual percentage rate
- QM = the quoted margin, stated as an annual percentage rate

- FV = the future value paid at maturity, or the par value of the bond
- m = the periodicity of the floating-rate note, the number of payment periods per year
- DM = the discount margin = required margin stated as an annual percentage rate
- N = the number of evenly spaced periods to maturity

Example: Calculating the Price of a Floating-Rate Note

Suppose we are pricing a three-year, semi-annual FRN that pays MRR plus 0.75%. Assume MRR is 1.50% and the yield spread required by investors is 50bps. Given:

- MRR = 0.0150
- QM = 0.0075
- FV = 100
- m = 2
- DM = 0.0050
- N = 6

Calculate the price of the floating rate instrument.

Solution

Determine the coupon payment for each period:

$$\text{PMT} = \frac{\text{MRR} + \text{QM}}{\text{m}} \times \text{FV}$$

$$\text{PMT} = \frac{0.0150 + 0.0075}{2} \times 100$$

$$\text{PMT} = \frac{0.0225}{2} \times 100$$

$$\text{PMT} = 1.125$$

Calculate the present value of each cash flow: For i = 1 to N :

$$PV_i = \frac{PMT}{\left(1+\frac{(MRR+DM)}{m}\right)^i}$$

E.g., for i=1

$$PV_1 = \frac{1.125}{\left(1+\frac{0.0150+0.0050}{2}\right)^1} = 1.1139$$

Finally, the price of the FRN is the sum of all present values plus the present value of the face value at maturity:

$$\sim\text{Price}\sim = \sum_{i=1}^{N} PV_i + \frac{FV}{\left(1+\frac{MRR+DM}{m}\right)^N}$$

The price of the FRN has been calculated as: 100.724

Question

A floating-rate note has a quoted margin of +60bps and a required margin of +85bps. On its next reset date, the note is said to be priced at:

A. par
B. A discount
C. A premium

Solution

The correct answer is **B.**

When the required margin is greater than the quoted margin, the floater tends to be priced at a discount. This phenomenon can often be traced back to changes in the issuer's credit risk. Specifically, at the reset date, if the required margin is greater than the quoted margin, it results in the floater making what is termed a "deficient" interest payment. This deficiency, in turn, leads to the floater being priced below its par value, solidifying its position at a discount.

A is incorrect: When the required margin is exactly equal to the quoted margin, the floater is said to be priced at par. The rationale behind this is that the alignment between the required and quoted margins naturally drives the floater's flat price towards its par value, especially as the next reset date comes into the horizon.

C is incorrect:

When the required margin is less than the quoted margin, the floater is said to be priced at a premium. This is indicative of favorable market conditions for that particular floater.

LOS 8b: calculate and interpret yield measures for money market instruments.

Money market instruments are short-term debt securities with original maturities of one year or less. They are a crucial part of the financial market and include a variety of instruments such as overnight sale and repurchase agreements (repos), bank certificates of deposit, commercial paper, Treasury bills, bankers' acceptances, and time deposits based on market reference rates. For instance, a company might issue commercial paper to meet its short-term liquidity needs. Money market mutual funds, which invest solely in eligible money market securities, are sometimes considered as an alternative to bank deposits.

Yield measures for money market instruments differ from those for bonds in several ways. Firstly, bond yields-to-maturity are annualized and compounded, while yield measures in the money market are annualized but not compounded. This means the return on a money market instrument is stated on a simple interest basis. For example, if you invest $1000 in a 90-day Treasury bill with a yield of 1%, you would earn $10 at the end of the period.

Secondly, bond yields-to-maturity are usually stated for a common periodicity for all times-to-maturity, while money market instruments with different times-to-maturity have different periodicities for the annual rate. Lastly, bond yields-to-maturity can be calculated using standard time-value-of-money analysis, while money market instruments are often quoted using non-standard interest rates and require different pricing equations than those used for bonds.

Quoted money market rates are either discount rates or add-on rates. Commercial paper, Treasury bills, and bankers' acceptances are often quoted on a discount rate basis, while bank certificates of deposit, repos, and market reference rate indexes are quoted on an add-on rate basis. In the money market, the discount rate involves an instrument for which interest is included in the face value of the instrument, while an add-on rate involves interest that is added to the principal or investment amount.

The pricing formula for money market instruments quoted on a discount rate basis is:

$$\text{PV} = \text{FV} \times \left(1 - \frac{\text{Days}}{\text{Year}} \times \text{DR}\right)$$

Where:

PV = present value, or the price of the money market instrument

FV = the future value paid at maturity, or the face value of the money market instrument

Days = the number of days between settlement and maturity

Year = the number of days in the year

DR = the discount rate, stated as an annual percentage rate

$$DR = \frac{\text{Year}}{\text{Days}} \times \frac{(FV - PV)}{FV}$$

The pricing formula for money market instruments quoted on an add-on rate basis is:

$$PV = \frac{FV}{1 + \frac{\text{Days}}{\text{Year}} \times AOR}$$

Where:

PV = present value, the principal amount, or the price of the money market instrument

FV = the future value, or the redemption amount paid at maturity, including interest

Days = the number of days between settlement and maturity

Year = the number of days in the year

AOR = the add-on rate, stated as an annual percentage rate

$$AOR = \frac{\text{Year}}{\text{Days}} \times \frac{FV - PV}{PV}$$

Investment analysis is more challenging for money market securities because some instruments are quoted on a discount rate basis while others are on an add-on rate basis, and some assume a 360-day year, and others use a 365-day year. Furthermore, the “amount” of a money market instrument quoted by traders on a discount rate basis typically is the face value paid at maturity, while the “amount” when quoted on an add-on rate basis usually is the price at issuance.

Comparing Money Market Instruments on Bond Equivalent Yield Basis

The bond equivalent yield, often termed the investment yield, quantifies a money market rate using a 365-day add-on rate method.

Step 1:

For money market assets priced with a Discount Rate (DR), compute the Price for every 100 of Par (PV) as:

$$PV = FV \times (1 - \frac{\text{Days}}{\text{Year}} \times DR)$$

Step 2:

From the PV obtained in Step 1, determine the Add-on Rate (AOR) for that specific money market asset:

$$AOR = \frac{\text{Year}}{\text{Days}} \times (\frac{FV - PV}{PV})$$

Step 3:

The Bond Equivalent Yield (BEY) represents a money market rate defined using a 365-day AOR method.

With this, the asset can be evaluated alongside other money market assets that use the Bond Equivalent Yield as their standard.

Example: Determining the Bond Equivalent Yield

Suppose an investor is comparing the following two money market instruments:

A. A 60-day Treasury bill issued by the government, quoted at a discount rate of 0.050% for a 360-day year.
B. A 60-day bank certificate of deposit, quoted at an add-on rate of 0.060% for a 365-day year.

Which one offers the higher expected rate of return, assuming the same credit risk?

Solution

60-day Treasury bill:

- Days = 60
- Year = 360
- DR (Discount Rate)= 0.050% or 0.0005

Using the formula:

$$PV = FV \times (1 - \frac{\text{Days}}{\text{Year}} \times DR)$$

$$PV = 100 \times (1 - \frac{60}{360} \times 0.0005) = 99.99$$

$$AOR = \frac{\text{Year}}{\text{Days}} \times (\frac{FV - PV}{PV})$$

$$AOR = \frac{365}{60} \times (\frac{100 - 99.99}{99.99}) = 0.0608\%$$

The bond equivalent rate is, therefore, 0.0608%

The bond equivalent rate for the 60-day bank certificate of deposit is 0.060% or 0.0006.

The 60-day Treasury bill offers a higher annual return relative to the 60-day bank certificate of deposit.

Question

The bond equivalent yield of a 180-day Treasury bill quoted at a discount rate of 0.75% for a 360 -day year is closest to:

A. 0.750%
B. 0.753%
C. 0.763%

Solution

The correct answer is **C.**

Step 1:

For money market assets priced with a Discount Rate (DR), compute the Price for every 100 of Par (PV) as:

$$PV = FV \times (1 - \frac{\text{Days}}{\text{Year}} \times \text{DR})$$

$$PV = 100 \times (1 - \frac{180}{360} \times 0.75\%) = 99.6250$$

Step 2:

From the PV obtained in Step 1, determine the Add-on Rate (AOR) for that specific money market asset:

$$\text{AOR} = \frac{\text{Year}}{\text{Days}} \times (\frac{FV - PV}{PV})$$

$$\text{AOR} = \frac{365}{180} \times (\frac{100 - 99.6250}{99.6250}) = 0.763\%$$