Learning Module 7: Yield and Yield Spread Measures for Fixed-Rate Bonds

Fixed Income

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Future Value Excel

$$= FV(rate, nper, pmt, [pv], [type])$$

Where:

- *rate* is the periodic reinvestment rate
- *nper* is the number of periods in a year

- pmt is the rate per period
- $[pv]$ is the present value
- $[type]$ indicates when payments occur, with 0 designating payment at the end of each period

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Annual Percentage Rate

$$\left(1+\frac{APR_m}{m}\right)^m = \left(1+\frac{APR_n}{n}\right)^n \tag{1}$$

- Equation 1 shows a general formula to convert an annual percentage rate (APR) for m periods per year, denoted APR_m, to an annual percentage rate for n periods per year, APR_n

Where:

- APR = Annual Percentage Rate
- m = periods per year
- n = periods per year

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### Annual Percentage Rate

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Current Yield

$$\text{CY}_t = \frac{\text{Annual coupon}_t}{\text{Bond price}_t} \tag{2}$$

- The current yield is a crude measure of return because it focuses solely on interest income, ignoring the frequency of coupon payments, interest on interest (time value of money), and accrued interest.

- In addition to collecting and reinvesting coupon payments, the investor has a gain if the bond is purchased at a discount and is redeemed at par value.

- The investor has a loss if the bond is purchased at a premium and is redeemed at par value.

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Yield-to-Call

$$PV = \frac{PMT}{(1+r)^1} + \frac{PMT}{(1+r)^2} + \cdots + \frac{PMT + \text{Call price}}{(1+r)^N} \tag{3}$$

Where:

- PV = the price of the bond
- PMT = coupon payment per period
- Call price = price at which a bond can be called on a given date
- r = yield per period or market discount rate
- N = number of evenly spaced periods to the date when a bond can be called at the call price
- Traditional yield-to-maturity measures assume that all cash flows occur as promised and therefore must be modified for callable bonds. Analysts must use alternative return measures that take the bond's call feature into account, such as the yield to the first call date, the second call date, and so on. The yield-to-call is calculated by modifying the general formula for calculating yield-to-maturity.
- The lowest of the sequence of yields-to-call and the yield-to-maturity is known as the yield-to-worst.

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Z-spread

$$PV = \frac{PMT}{(1 + z_1 + Z)^1} + \frac{PMT}{(1 + z_2 + Z)^2} + \dots + \frac{PMT + FV}{(1 + z_N + Z)^N} \tag{4}$$

- The Z-spread over the benchmark spot curve can be calculated with Equation 4:
- $z_1, z_2, \dots, z_N$ are the benchmark spot or zero rate are derived from the government yield curve (or from fixed rates on interest rate swaps)
- Z is the Z-spread per period and is the same for all time periods
- Zero-volatility spread, a constant yield spread over a government (or interest rate swap) spot curve used to derive the term structure of credit spreads for an issuer.

- Sometimes, the Z-spread is called the “static spread” because it is constant (and has zero volatility)

- In practice, the Z-spread is usually calculated in a spreadsheet using a goal seek function or similar solver function.

- The Z-spread is also used to calculate the option-adjusted spread (OAS) on a callable bond.

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Option-Adjusted Spread

$$\text{OAS} = \text{Z-spread} - \text{Option value in basis points per year} \tag{5}$$

- The Z-spread adjusted for the value of an embedded call option.

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