Computing the Cost of Debt

The cost of debt affects the weighted average cost of capital (WACC) which in turn affects the intrinsic value of Company. From company’s perspective the pre tax cost of debt is the required returns from the debt holders. Hence the pre tax cost of debt is the yield to maturity or the yields to call (if a call is likely). Below I explain the terminology for bond securities and then show how to compute the yield to maturity and yield to call.

Bond is a security that obligates the issuer to make specified payment to the bondholders. It is an interest-only loan. The borrower will pay the interest every period, but none of the principal will be repaid until the end of the loan.

Example:

Bond Prices

Issuer (Borrower) ---|---|--- Bondholder (Lender)

Interest Payment

Payment (Face Value) at maturity

**Coupon Payment:** The interest payments paid to the bondholders (PMT)

**Face Value:** The principal amount of a bond that is repaid at the end of the maturity called bond’s face value, par value or maturity value. Unless stated, most of U.S. bonds have a face value of bond $1,000 (FV)

**Coupon Rate:** The annual interest payment as a percentage of face value

**Coupon Rate:**

\[
\text{Coupon Rate} = \frac{\text{Coupon Payment}}{\text{Face Value}}
\]

**Maturity:** Specified date at which the principal amount of a bond is paid (N).

**Yield to Maturity:** The rate required in the market on the bond (%I)

It is the interest rate for which the present value of the bonds’ payment equals the price.

**Price of bonds (PV) = \frac{\text{cpn}}{(1+r)^1} + \frac{\text{cpn}}{(1+r)^2} + \frac{\text{cpn}}{(1+r)^3} + \ldots + \frac{\text{(cpn+ par)}}{(1+r)^T}**

Where:
- \text{cpn} represents periodic coupon payments or (PMT)
- \text{R} represents the yield to maturity of the bonds or(%I)
- \text{T} represents the maturity (N)
- \text{Par} represents the face value of bonds (FV)
**Bond Yields**
1. Current Yield = \(\frac{\text{Annual Coupon Payment}}{\text{Bond Price}}\)
2. Yield to maturity: Interest rate for which the present value of the bond’s payment equals the price.

**Finding the Yield to Maturity:** If you are given the price of a bond and coupon rate, you can find the yield to maturity by solving for \(r\).

**Example 1:** What is the yield to maturity of a 10% annual coupon bond which matures in 12 years and the price of the bond is $935.08?

1. Annual Coupon Payment = \(10\% \times 1,000 = 100\)
2. \[\begin{align*}
\text{Payment} &= 100 \\
\text{PV} &= 935.08 \\
\text{N} &= 12 \\
\text{FV} &= 1,000 \\
\text{CPT} &= 11.00\% \\
\end{align*}\]
3. \[
935.08 = \frac{100}{1+r} + \frac{100}{(1+r)^2} + \frac{100}{(1+r)^3} + \ldots + \frac{100}{(1+r)^{12}} + \frac{1,000}{(1+r)^{12}}
\]

**Example 2:** What is the yield to maturity of a 6.125 \% annual coupon rate which matures in 4 years if the coupon payment is paid semi-annually and the price of a bond is $983.76?

Annual coupon = 6.125 \% of Face value
\[
= \frac{6.125}{100} \times 1,000 = 61.25
\]
The coupon is paid semi annually
Hence payment each six month = \(61.25/2 = 30.625\)
Bond matures in 4 years, hence number of payments = 4 \times 2 = 8

To calculate YTM use BA II plus calculator
\[
\begin{align*}
\text{FV} &= 1,000 \\
\text{Payment} &= 30.625 \\
\text{N} &= 8 \\
\text{PV} &= -983.76 \\
\end{align*}
\]
Compute I/Y
You will get I/Y = 3.297
YTM is an APR hence multiply I/Y by 2 to get YTM = 6.594%

**Finding The Current Yield**

**Example 3:** Using information in example 1, what is the annual current yield of the bond?

Current Yield = \(\frac{\text{Annual Coupon Payment}}{\text{Bond Price}}\) = \(\frac{100}{935.08} = 10.69\%\)
**Yield to Call:** YTM is calculated under the assumption that the bond will be held until maturity. In a callable bond, it may be retired prior to the maturity date.

**Example 4:** Suppose an 8% coupon, 30-year maturity bond sells for $1150 and is callable in 10 years at a call price of $1100. Calculate the bonds Yield to Call and the YTM.

Solution:

For YTM:

- Pmt = 80
- N = 30
- PV = -1150
- FV = 1000
- CPT % = 6.81%

Hence YTM = 6.81%

For YTC:

- Pmt = 80
- N = 10
- PV = -1150
- FV = 1100
- CPT % = 6.64%

Hence YTC = 6.64%