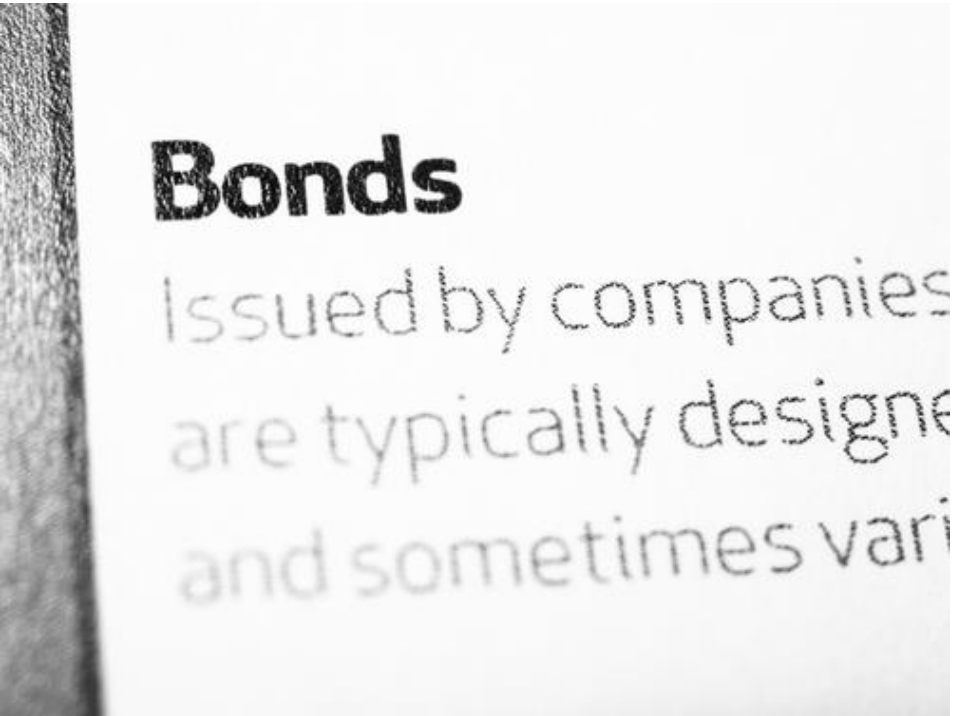
The Yield to Maturity (YTM) of Bonds and How to Calculate It Quickly



This Lesson: Very Important for DCM/LevFin

We're going to start looking at concepts relevant for **Debt Capital Markets (DCM)** and **Leveraged Finance (LevFin)** teams.

This one is also relevant if you're in Restructuring, or you're interviewing for a credit fund or anything else debt-related.

This Lesson: Our Plan

- **Part 1:** The Yield to Maturity (YTM) and What It Means

- **Part 2:** How to Quickly Approximate YTM

- **Part 3:** How to Extend the Formula to Yield to Call and Yield to Put

- **Part 4:** How to Use This Approximation in Real Life

What **Yield to Maturity (YTM)** Means

- **Yield to Maturity:** The internal rate of return (IRR) from buying the bond at its *current market price* and holding it to maturity

- **Assumption #1:** You hold the bond until maturity

- **Assumption #2:** The issuer pays all the coupon and principal payments in full on the scheduled dates

- **Assumption #3:** You reinvest the coupons at the same rate

- **Intuition:** What's the *average* annual interest rate % + capital gain or loss % you earn from the bond?

How to Calculate the **Yield to Maturity (YTM)**

- **YIELD**(Settlement Date, Maturity Date, Coupon Rate, Bond Price % Par Value Out of the Number 100, 100, Coupon Frequency)

- **=YIELD**(“12/31/2014”, “12/31/2024”, 5%, 96.23, 100.00, 1) = 5.500%

- **=YIELD**(“12/31/2017,” “6/30/2021”,6%,101.00,100.00,2) = 5.681%

- **IRR:** This will only work for *annual* coupons – set the initial investment to the bond’s current market price and make the future cash flows equal the interest + principal payments

How to **Quickly Approximate** the YTM

- **Approximate YTM** =

$$\frac{\text{Annual Interest} + (\text{Par Value} - \text{Bond Price}) / \#\text{ Years to Maturity}}{(\text{Par Value} + \text{Bond Price}) / 2}$$

- **Intuition:** Each year, you earn interest PLUS a gain on the bond price if it's purchased at a discount (or a loss if it's purchased at a premium)

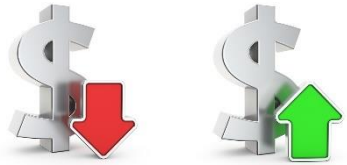
- And you earn that amount on the "average" between the initial bond price and the amount you get back upon maturity

How to **Quickly Approximate** the YTM

- **Example:** 10-year $1,000 bond with a price of $900, coupon of 5%
- **Annual Interest** = 5% * $1,000 = $50
- **Par Value – Bond Price** = $1,000 – $900 = $100
- **(Par Value + Bond Price) / 2** = ($1,000 + $900) / 2 = $950
- **Approximate YTM** = ($50 + $100 / 10) / $950 = $60 / $950 = ~6.3%

Limitations of the Quick Approximation

- **Limitation #1:** Doesn't work as well when the bond trades at a big discount or premium to par value



- **Limitation #2:** Misaligned settlement and maturity dates and semi-annual and quarterly coupons will distort this figure

- **Limitation #3:** Won't work as well with floating interest rates (rare for bonds, but it happens…)

Call and Put Options on Bonds

- **Company:** Interest rates have fallen, or its credit rating has improved, so it wants to refinance at a lower rate

- **Call Options:** Allow companies to redeem (repay) the bond early, usually at a premium to par value

- **In Exchange:** These bonds must offer higher yields to investors because the investors are assuming more risk

- **Early Redemption:** Investors will have to find somewhere else to redeploy their capital, possibly at lower rates

Extending the Formula to Yield to Call and Put

- **Approximate YTC or YTP** =

$$\frac{\text{Annual Interest} + (\text{Redemption Price} - \text{Bond Price}) / \text{\# Years to Maturity}}{(\text{Redemption Price} + \text{Bond Price}) / 2}$$

- **Example:** 10-year $1,000 bond with a price of $900, coupon of 5%, and a call date 3 years from now at a redemption price of 103

- **Approximate YTC** = ($50 + ($1,030 – $900) / 3) / (($1,030 + $900) / 2)

- **Approximate YTC** = ($50 + $43) / $965 = $93 /$965 = *Just under 10%*
- **Approximate YTC** = ~9.7%

How to Use This Approximation in **Real Life**

- **Example:** You're at a **credit fund** that targets a 10% IRR on investments in high-yield debt

- **Potential Investment:** 4-year, 7.950% unsecured bond from JC Penney, currently trading at 91.75 (% of par value)

- **Seems** like an easy "yes": (~8% interest per year + ~8% discount / 4) / Average Price of 96% = Yield of Just Over 10%

- **PROBLEM:** Will a distressed company be able to repay the bond principal upon maturity? What if its financial situation worsens?

How to Use This Approximation in **Real Life**

- You estimate the following **recovery percentages:**

Summary Recovery %	Scenario 1	Scenario 2	Scenario 3
Probability	**High**	**Medium**	**Low**
ABL	100%	100%	100%
Term Loan	100%	100%	100%
Unsecured	65%	47%	13%

- **Scenario 1 Approximate YTM:** (8% – 27% / 4) / 78.5% = 1.6%

- **Scenario 2 Approximate YTM:** (8% – 45% / 4) / 69.5% = -4.7%

- **CONCLUSION:** Probably a "No Invest" decision if these recovery percentages are true – even in the Upside Case, we're far below 10%

Recap and Summary

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