COURSE: INVESTMENTS | CHAPTER 10

BOND PRICES AND YIELDS

Dr Abenet Yohannes, Ph.D.

Chapter Purpose

This chapter explains the full life of a bond — from its contract terms to how markets price it and how investors measure return and risk.

The Instrument
Bond characteristics
Cash flows
Coupon bonds
Zero-coupon bonds

The Price
Bond valuation
Premium, par, discount
Price–yield relationship

The Return
Current yield
Yield to maturity
Yield to call
Holding-period return

The Risk
Interest-rate risk
Reinvestment risk
Credit/default risk
Yield curves

Learning Objectives

By the end of this chapter, students should be able to:

1. Explain how bonds work.
2. Identify bond cash flows.
3. Calculate coupon payments.
4. Value a bond using present value.
5. Explain premium, par and discount bonds.
6. Explain why prices and yields move inversely.
7. Value zero-coupon bonds.
8. Calculate current yield.
9. Explain yield to maturity.
10. Explain yield to call.
11. Calculate holding-period return.
12. Explain interest-rate risk.
13. Explain reinvestment risk.
14. Explain credit/default risk.
15. Interpret basic yield curves.

What Is a Bond?

A bond is a debt security. The investor lends money to the issuer, and the issuer promises contractual payments in return.

INVESTOR
provides money

→

ISSUER
receives financing

→

ISSUER
promises payments

A bond is an IOU: interest along the way, principal at maturity.

A Bond Is an IOU

Suppose a company says:

> *"Lend me ETB 10,000 today. I will pay you ETB 1,000 every year and return the ETB 10,000 after five years."*

YOU

The Lender — you receive interest and principal

THE COMPANY

The Borrower — it receives financing today

Who Issues Bonds?

Governments
Sovereign and agency debt

Municipalities
Regional authorities

Corporations
Companies and banks

International
Multilateral institutions

Different issuers carry different levels of:

- Credit risk — the chance that promised payments are not made
- Liquidity — how easily the bond can be traded
- Yield — the return investors require for holding it

Face Value

The face value, or par value, is the principal amount specified by the bond contract.

Face Value = ETB 1,000

The reference amount for coupons and repayment

This is generally the amount repaid at maturity, subject to the issuer meeting its obligations. Coupon payments are also calculated from this amount.

Coupon Rate

The coupon rate determines the bond's contractual interest payment.

$$\text{Annual Coupon} = \text{Coupon Rate} \times \text{Face Value}$$

Example: Face value = ETB 1,000, Coupon rate = 8%

$$1{,}000 \times 8\% = \text{ETB } 80 \text{ per year}$$

Coupon Payment

If the ETB 1,000 bond pays an 8% annual coupon:

ETB 80

Annual payment — once each year

ETB 40

Semiannual payment — every six months

Maturity

Maturity is the date on which the bond's principal becomes due.

1 year	**5 years**	**10 years**	**30 years**

Important: longer maturity normally means greater exposure to interest-rate movements.

Bond Terminology Summary

Term	Meaning
Face Value	Principal amount
Coupon Rate	Contractual interest rate
Coupon	Periodic interest payment
Maturity	Final repayment date
Market Price	Current trading price
Yield	Measure of investment return

Bond Cash Flows

A conventional coupon bond normally provides two streams of cash to the investor.

Coupon Payments
Periodic contractual interest

Principal Repayment
Face value returned at maturity

If sold before maturity, the investor may also realize a capital gain or loss.

Cash-Flow Example

Face value = ETB 1,000 | Coupon = ETB 100 | Maturity = 5 years

Year	Cash Flow (ETB)
1	100
2	100
3	100
4	100
5	1,100

The final year combines the last coupon with repayment of the ETB 1,000 principal.

— Two Main Promises

A traditional bond makes two basic promises:

Promise 1

"I will pay you interest."

Promise 2

"I will return the principal."

Therefore bond value depends on BOTH the coupons and the principal repayment.

Basic Valuation Principle

A bond's value is the present value of its expected contractual cash flows, discounted using the market-required yield appropriate for its risk and maturity.

FUTURE CASH FLOWS → **DISCOUNT TO PRESENT** → **BOND PRICE**

Value flows backward in time: tomorrow's promised money is translated into today's money.

Bond Valuation Formula

$$P = \sum_{t=1 \ldots T} C / (1 + r)^t + F / (1 + r)^T$$

- P = bond price
- C = coupon payment per period
- F = face value
- r = required yield per period
- T = number of periods

Why Discount Future Cash Flows?

ETB 1,000 today is generally worth more than ETB 1,000 received several years later, because money held today can:

Be invested

Earn a return

Be used immediately

Therefore future cash flows must be converted into present value.

Worked Example — The Inputs

ETB 1,000
Face value

10%
Coupon rate

ETB 100
Annual coupon

3 years
Maturity

8%
Required yield

Worked Example — Cash Flows

Year 1	Year 2	Year 3
ETB 100	ETB 100	ETB 1,100

Now discount each cash flow at the required yield of 8%.

Year 1 Present Value

$$PV_1 = 100 / 1.08$$
$$PV_1 = \text{ETB } 92.59$$

The first coupon arrives in one year, so it is discounted for one period.

Year 2 Present Value

$$PV_2 = 100 / (1.08)^2$$
$$PV_2 \approx \text{ETB } 85.73$$

Two years of discounting makes the same ETB 100 worth less today.

Year 3 Present Value

$$PV_3 = 1{,}100 / (1.08)^3$$
$$PV_3 \approx \text{ETB } 873.21$$

Year 3 combines the final coupon of ETB 100 with the ETB 1,000 principal.

Bond Price

$$P = 92.59 + 85.73 + 873.21$$
$$P \approx \text{ETB } 1{,}051.53$$

Why above ETB 1,000?

Coupon Rate (10%) > Required Yield (8%) → the bond pays a relatively attractive coupon.

Three Possible Bond Prices

Relative to face value, a conventional bond can trade in one of three states.

PREMIUM	PAR	DISCOUNT
Above face value	At face value	Below face value

Which state applies depends entirely on the coupon rate compared with the required yield.

Bond at Par

```
Coupon Rate  =  Required Yield  →  Price ≈ Face Value
```

Example: Coupon = 8%, Required yield = 8%

Price ≈ ETB 1,000

The bond pays exactly what the market requires

Premium Bond

Coupon Rate > Required Yield → Price > Face Value

Why? The bond pays a coupon that is more attractive than current required market returns, so investors compete for it and bid the price up.

An above-market coupon must be paid for through a higher price.

— Premium Bond

10%
Old bond coupon

7%
New comparable bonds

Investors may pay more for the old bond because its coupon is better.

Therefore its price rises above par.

Discount Bond

```
Coupon Rate  <  Required Yield  →  Price  <
                 Face Value
```

The bond's coupon is less attractive than current required market returns. To compete, the bond must be offered at a lower price.

A below-market coupon is compensated by buying the bond cheaply.

— Discount Bond

5%
Old bond coupon

10%
New comparable bonds

The old bond cannot remain equally attractive at the same price.

Therefore its price generally falls.

Important Bond Rule

Coupon vs Required Yield	Resulting Price
Coupon = Yield	Par
Coupon > Yield	Premium
Coupon < Yield	Discount

Memorize this relationship — every later topic builds on it.

The Most Important Relationship

YIELD ↑ → PRICE ↓

Rates rise, existing bonds cheapen

YIELD ↓ → PRICE ↑

Rates fall, existing bonds richen

Bond prices and market yields move in OPPOSITE directions — like a seesaw.

Why Prices Fall When Rates Rise

6%
Existing bond coupon

10%
New comparable bond yield

Investors prefer the newer, higher-return alternative. The existing bond can only compete if it becomes cheaper.

The existing bond's price must FALL to offer a competitive yield.

Why Prices Rise When Rates Fall

10%
Existing bond coupon

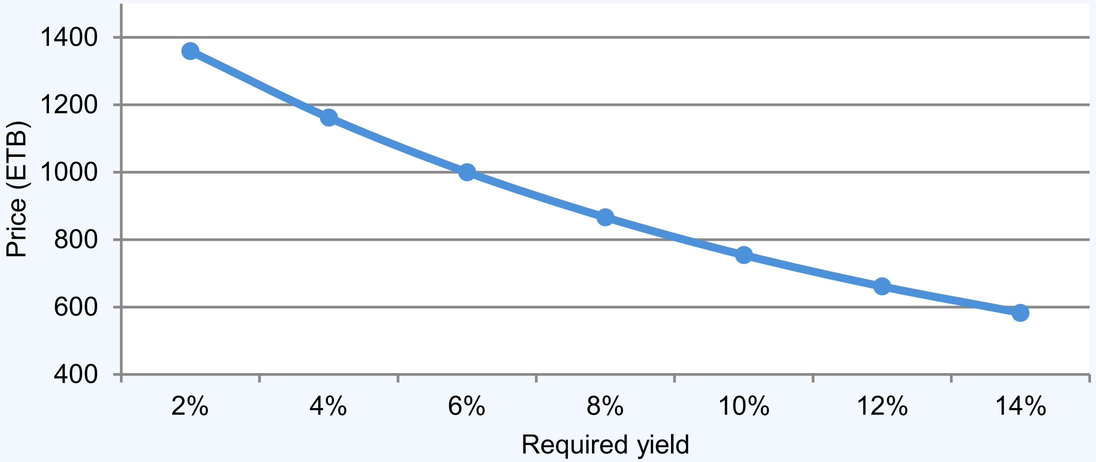
6%
New comparable bond yield

The existing bond's coupon becomes more attractive than anything newly available.

Investors may pay a premium for it.

Price–Yield Curve

The bond price–yield relationship is inverse, nonlinear and convex: price falls as yield rises, but at a decreasing rate.



What Is a Zero-Coupon Bond?

A zero-coupon bond pays no periodic coupons at all.

BUY BELOW FACE VALUE → **HOLD** → **RECEIVE FACE VALUE AT MATURITY**

ETB 600 → ETB 1,000

All return comes from the price rising toward face value

Zero-Coupon Bond Formula

$$P = F / (1 + r)^T$$

- P = current price
- F = face value
- r = required yield
- T = maturity in periods

Zero-Coupon Example

ETB 1,000
Face value

5 years
Maturity

10%
Required yield

$$P = 1{,}000 / (1.10)^5$$
$$P \approx \text{ETB } 620.92$$

Where Does the Return Come From?

ETB 620.92
Investor pays today

ETB 1,000
Received at maturity

This assumes the issuer meets its obligation. There is no coupon income at any point in between.

The return comes mainly from price accretion toward face value.

What Is Current Yield?

Current yield measures annual coupon income relative to the bond's market price.

$$\text{Current Yield} = \text{Annual Coupon} / \text{Current Price}$$

It is a simple income measure — quick to compute, but incomplete as a measure of total return.

Current Yield Example

ETB 80
Annual coupon

ETB 900
Market price

$$\text{Current Yield} = 80 / 900 = 8.89\%$$

Current Yield ≈ 8.89%

What Current Yield Ignores

Current yield does not fully incorporate:

- Capital gain or loss between purchase and sale
- Maturity value repaid at the end
- Timing of the cash flows
- Reinvestment of coupon income
- The time value of money

Current yield is NOT the same as total return.

What Is Yield to Maturity?

Yield to Maturity (YTM) is the discount rate that makes the present value of a bond's promised cash flows equal to its current price.

CURRENT PRICE → **PV OF COUPONS + PRINCIPAL** → **DISCOUNTED AT YTM**

YTM is the market's single summary measure of a bond's promised return.

— Yield to Maturity

YTM answers one question:

> *"If I buy the bond at today's price and hold it to maturity, what single discount rate makes today's price equal to all the promised future cash flows?"*

One rate. All the cash flows. Today's price.

YTM Formula

$$P = \sum_{t=1}^{T} C / (1 + YTM)^t + F / (1 + YTM)^T$$

YTM cannot be solved algebraically for most bonds. It is usually found using:

- A financial calculator
- A spreadsheet function
- Numerical (trial-and-error) methods

YTM Assumptions

Interpreting YTM generally assumes:

- The bond is held to maturity
- Coupons and principal are paid as promised
- Intermediate coupons can be reinvested at rates consistent with the YTM assumption

Actual realized return may differ from the quoted YTM.

Discount Bond and YTM

ETB 1,000
Face value

6%
Coupon rate

ETB 900
Market price

The investor receives coupon income plus a potential gain toward ETB 1,000 at maturity.

Therefore: YTM > Coupon Rate

Premium Bond and YTM

ETB 1,000
Face value

12%
Coupon rate

ETB 1,100
Market price

The investor receives high coupons but pays more than the principal that will be repaid at maturity.

Therefore: YTM < Coupon Rate

Yield Relationships

Discount Bond
YTM > Current Yield > Coupon Rate

Premium Bond
Coupon Rate > Current Yield > YTM

Par Bond
Coupon Rate = Current Yield = YTM

These orderings hold under standard assumptions about timing and payment.

Callable Bonds

Some bonds allow the issuer to repay the bond before its scheduled maturity date. This is a callable bond.

CALLABLE BOND

The issuer holds the right to redeem early

The issuer may exercise this right when doing so is financially advantageous.

— Why Call a Bond?

12%
Rate on debt originally issued

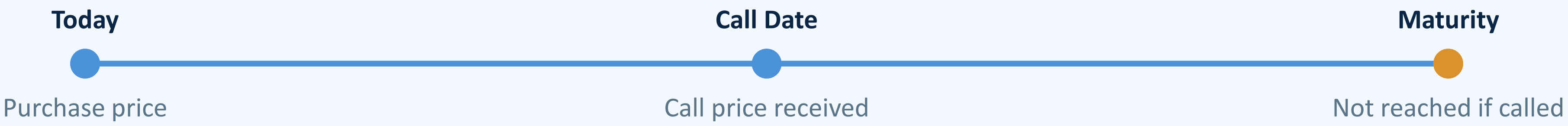
7%
Market borrowing rate later

1. Repay the expensive 12% bond.
2. Borrow again at 7%.

This resembles refinancing a loan.

Yield to Call

Yield to Call (YTC) estimates the yield assuming the bond is called at a specified call date rather than held to maturity.



- Current price
- Coupons received until the call date
- The call price
- Time remaining to the call

Selling Before Maturity

If the investor sells a bond before maturity, the realized return no longer equals YTM. It depends on two components:

Coupon Income
Interest received while holding

Price Change
Gain or loss on the sale

Holding-Period Return Formula

For a simple one-period case:

$$HPR = (C + P_1 - P_0) / P_0$$

- C = coupon income received
- P_0 = purchase price
- P_1 = selling price

HPR Example

ETB 1,000
Purchase price

ETB 80
Coupon

ETB 1,050
Sale price

$$HPR = (80 + 1{,}050 - 1{,}000) / 1{,}000 = 13\%$$

Holding-Period Return = 13%

What Is Interest-Rate Risk?

Interest-rate risk is the risk that changing market rates cause bond prices to change.

Rates Rise → Prices Fall

Rates Fall → Prices Rise

This matters particularly if the investor may sell before maturity.

Which Bonds Are More Sensitive?

Other things equal, greater interest-rate sensitivity is generally associated with:

Longer Maturity

Cash flows sit farther in the future

Lower Coupon Rate

Less value returned early

A long-term, low-coupon bond moves the most when rates change.

— Long-Term Bonds

Bond A

Matures next year

Bond B

Matures in 25 years

If market rates suddenly increase, Bond B generally experiences a much larger percentage price change.

Why? Its cash flows are much farther in the future, so discounting affects them far more.

What Is Reinvestment Risk?

Coupon-paying investors receive cash before maturity and must reinvest it. The future interest rate available for reinvestment is uncertain.

COUPON RECEIVED → **REINVEST AT UNKNOWN RATE** → **REINVESTMENT RISK**

That uncertainty about future reinvestment rates is reinvestment risk.

Reinvestment Risk Example

ETB 100
Coupon received

10%
Expected reinvestment rate

4%
Actual market rate

Accumulated wealth will be lower than originally expected.

Price Risk vs Reinvestment Risk

Rates Rise

Prices fall, but coupons are reinvested at higher rates

Rates Fall

Prices rise, but coupons are reinvested at lower rates

Important: these two effects move in opposite directions and partly offset each other.

What Is Default Risk?

Default risk is the possibility that an issuer fails to make required payments in full and on time.

Interest
Coupons may be missed or delayed

Principal
Face value may not be repaid in full

A promised payment is only as good as the issuer's ability to make it.

Credit Risk and Yield

CREDIT RISK ↑ → **REQUIRED YIELD ↑** → **BOND PRICE ↓**

Investors demand greater expected compensation for bearing greater credit risk, so riskier issuers must offer higher yields — which means lower prices for the same promised cash flows.

Credit Spread

A credit spread is the yield difference between a risky bond and a comparable benchmark.

11%
Corporate bond yield

7%
Benchmark yield

```
Credit Spread  =  11% – 7%  =  4 percentage points
```

Basis Points

Bond markets often quote yield differences in basis points.

```
1 basis point  =  0.01%
```

Basis Points	Percentage
50 bp	0.50%
100 bp	1.00%
250 bp	2.50%
400 bp	4.00%

Clean Price and Dirty Price

A bond can trade between coupon-payment dates, so quoted and settled prices differ.

Clean Price
Excludes accrued interest

Dirty Price
Includes accrued interest

```
Dirty Price  =  Clean Price  +  Accrued Interest
```

What Is Accrued Interest?

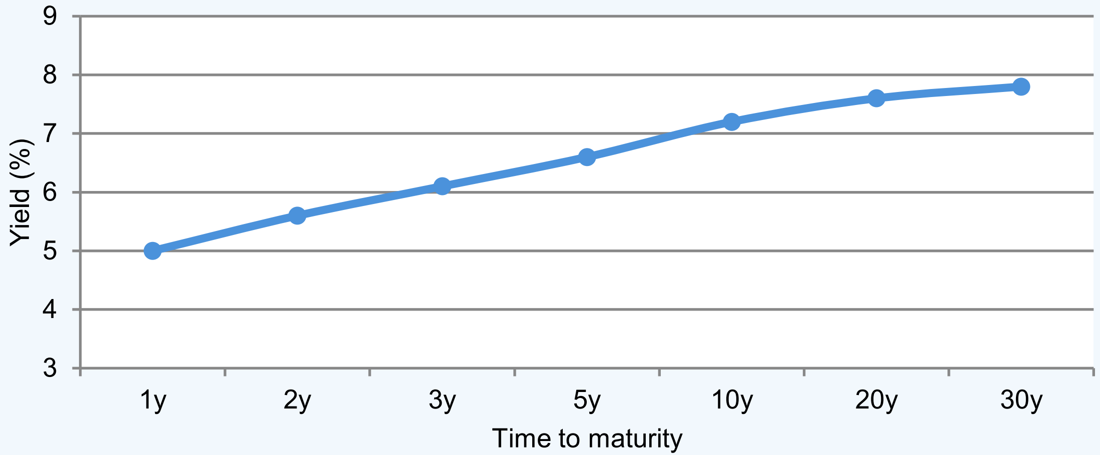
Suppose part of the current coupon period belongs to the seller, but the next coupon has not yet been paid. The buyer compensates the seller for interest earned since the last coupon date.

Last Coupon	Trade Date	Next Coupon
Interest starts accruing	Buyer pays accrued interest	Buyer receives full coupon

That compensation amount is accrued interest.

What Is a Yield Curve?

A yield curve shows the relationship between yield and time to maturity for bonds with comparable credit characteristics.



Normal Yield Curve

A normal yield curve slopes upward: short-term yields are lower and long-term yields are higher.

Short-Term Yield
Lower

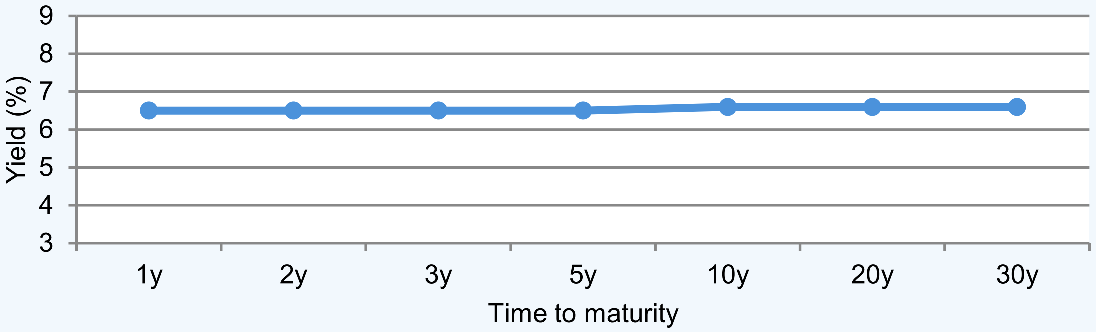
Long-Term Yield
Higher

Possible reasons include:

- Expectations of future interest rates
- Inflation expectations
- Maturity-related risk premiums

Flat Yield Curve

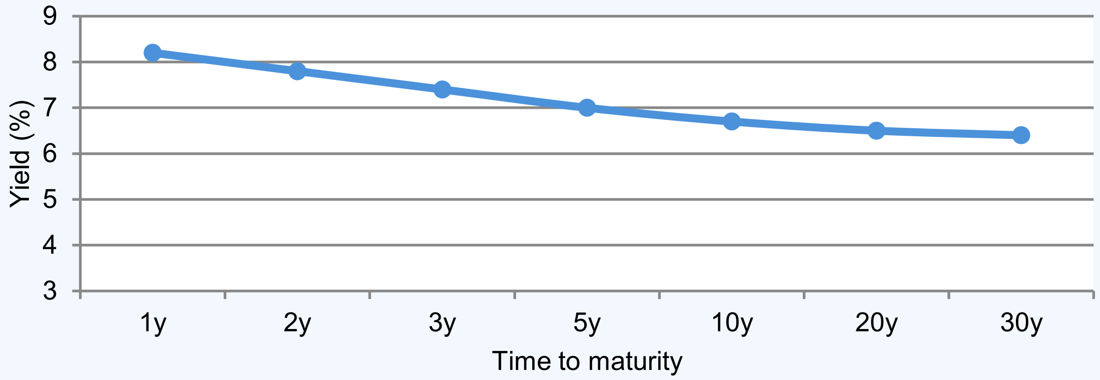
A flat yield curve means short- and long-term yields are similar.



- Transition in economic expectations
- Changing monetary-policy expectations
- Uncertainty about future growth and inflation

Inverted Yield Curve

An inverted yield curve occurs when short-term yields exceed long-term yields.



This may reflect expectations of future rate declines or slower growth, and should be interpreted with broader economic evidence rather than as a guaranteed forecast.

Practical Exercise

Face value ETB 1,000 | Coupon 8% | Price ETB 920 | Maturity 5 years | Market yield 10%

1. Calculate the annual coupon.
2. Par, premium or discount?
3. Calculate the current yield.
4. Why is price below face value?
5. What if market yields rise?
6. What if market yields fall?
7. Identify the interest-rate risk.
8. Identify the reinvestment risk.
9. Effect of greater default risk?
10. Why does current yield differ from YTM?

Key Takeaways

- Bonds are debt securities paying coupons and principal.
- Face value is the principal amount specified.
- Coupon rate determines contractual payments.
- Bond value = present value of future cash flows.
- Coupon = yield → par; > yield → premium; < yield → discount.
- Bond prices and yields move inversely.
- Zero-coupon bonds pay no periodic coupons.
- Current yield measures income relative to price.
- YTM incorporates price and all promised cash flows.
- YTC applies when a bond may be called early.
- Holding-period return depends on income and price change.
- Longer maturity and lower coupon → more rate sensitivity.
- Reinvestment risk arises from uncertain future rates.
- Higher credit risk normally requires higher yield.
- Credit spreads show extra yield over a benchmark.
- Yield curves relate yield to time to maturity.

Remember: prices and yields behave like a seesaw — when one rises, the other generally falls.

Next Chapter — Chapter 11: Managing Bond Portfolios

- Interest-rate risk
- Bond-price sensitivity
- Macaulay duration
- Modified duration
- Portfolio duration
- Convexity

- Immunization
- Duration matching
- Cash-flow matching
- Bond laddering
- Bullet portfolios
- Barbell portfolios

- Passive bond management
- Active bond management
- Yield-curve strategies
- Bond swaps
- Credit strategies
- Contingent immunization

THANK YOU

Questions and Discussion

Dr Abenet Yohannes, Ph.D.
abenetyohannes@gmail.com | abenetyohannes.com