CHARTA LEARNING · LESSON NOTES

Corporate Bonds

FRM Part I

1 A story: a company borrows from many people

- A company sells many small IOU pieces: bonds
- It promises a coupon and its face value (par) back
- Corporate bond = a company's IOU to investors
- Key questions: trading, promises, risks, real return

IN THE LESSON

- Imagine a company that wants to build a new factory and needs far more money than any one bank wants to lend.
- So it writes an I O U, splits it into many small pieces, and sells the pieces to investors.
- Each piece is a bond.
- The company promises to pay interest, called the coupon, on a schedule, and to hand back the face value, also called par, on a final date.
- A corporate bond is simply that I O U from a company.
- The questions for the rest of this lesson are practical ones.
- How do you buy and sell such a bond?
- What exactly is promised?
- What can go wrong?
- And what return can you honestly expect?

2 How corporate bonds trade

- Over the counter: dealers quote a bid and an ask
- Thinner liquidity, wider costs than listed shares
- Quote = clean price; invoice = clean + accrued = dirty
- Price and yield move inversely
- Price is pulled toward par as maturity nears

IN THE LESSON

- Unlike shares, which mostly trade on an exchange, corporate bonds trade mainly over the counter.
- That means a dealer, usually a bank, quotes two prices.
- The bid is the price at which the dealer will buy from you.
- The ask is the higher price at which the dealer will sell to you.
- The gap between them is the dealer's pay and your transaction cost.
- Dealers hold inventory and negotiate, so liquidity is thinner and costs are wider than in listed shares, especially for small or old issues.
- Quotes are clean prices, which leave out interest earned so far.
- The buyer also pays accrued interest, and the total is the dirty price, or invoice price.
- Finally, price and yield move in opposite directions, and as maturity nears the price is pulled toward par.

3 Example 1: from clean price to dirty price

Illustration: $1,000 face, 6% coupon twice a year, clean price 98.5

Semiannual coupon	6% × 1,000 ÷ 2	**$30**
Days since coupon	3 months × 30 days	**90 days**
Accrued interest	30 × 90 ÷ 180	**$15**
Clean price quoted	98.5% × 1,000	**$985**
Dirty (invoice) price	985 + 15	**$1,000**

IN THE LESSON

- Example one, an illustration.
- A bond has a face value of one thousand dollars and a six per cent coupon paid twice a year.
- Each payment is therefore thirty dollars.
- U S corporate bonds count accrued interest on the thirty three sixty day count, where each month has thirty days.
- Suppose the last coupon was three months ago, so ninety days have passed out of a one hundred eighty day period.
- Accrued interest is thirty times ninety over one hundred eighty, which is fifteen dollars.
- The quoted clean price is ninety eight point five per cent of face, or nine hundred eighty five dollars.
- The buyer pays the clean price plus the accrued interest, so the invoice or dirty price is one thousand dollars.

4 Where a corporate yield comes from

Yield = Benchmark Treasury yield + Spread

Corporate bond yield	What the corporate bond offers
Benchmark Treasury yield	Safe benchmark of similar maturity
Credit spread	Credit and liquidity reward
Price	Moves opposite to the yield

IN THE LESSON

- In its simplest form, a corporate bond's yield is built in two layers.
- The first layer is the benchmark Treasury yield, the return on a government bond of similar maturity, with no meaningful credit risk.
- The second layer is the spread, the extra yield investors demand for the company's credit risk and for the bond being harder to trade.
- So the yield equals the benchmark plus the spread.
- The yield can therefore move for two separate reasons: Treasury yields move, or the spread moves with credit and liquidity conditions.
- And whichever way the yield goes, the price goes the other way.
- The usual error is to watch only the Treasury yield and forget the spread.

5 Example 2: Treasury yields fall, bond drops

Illustration: modified duration of 6

Starting yield	4.00% + 1.50%	**5.50%**
Treasury yield falls	4.00% − 0.25%	**3.75%**
Spread widens	1.50% + 0.50%	**2.00%**
New yield	3.75% + 2.00%	**5.75%**
Price move	−6 × 0.25%	**−1.5%**

IN THE LESSON

- Example two, an illustration.
- A corporate bond yields five point five per cent, made of a Treasury yield of four per cent and a spread of one point five per cent.
- Now Treasury yields fall by a quarter of a point to three point seven five per cent.
- That sounds good for the price.
- But worries about the company push the spread out by half a point, to two per cent.
- The new yield is three point seven five plus two, which is five point seven five per cent, a quarter point higher than before.
- If the bond has a modified duration of six, the price change is roughly minus six times a quarter of a point, minus one point five per cent.
- Treasuries rallied and the bond still lost value, because the spread drove it.

6 The bond indenture

- The indenture is the legal contract: issuer and holders
- It sets principal, coupon and maturity
- It sets security, call and sinking fund terms
- It also sets the covenants: promises and limits

IN THE LESSON

- Every bond is backed by a contract, and that contract is the bond indenture.
- It is the legal agreement between the issuer and the bondholders.
- It sets out the terms of the issue: the principal, the coupon, the maturity, any security pledged, the call and sinking fund provisions, and the covenants.
- Think of it as the rule book that every holder of the issue shares, so the rights of a small investor are the same as those of a large one.
- Because the rules are written down in advance, nobody needs to negotiate them each time the bond changes hands.
- The most interesting part of the rule book, and the part that protects investors, is the set of covenants, which we look at next.

7 Covenants: what to do and what not to do

Two kinds of promise inside the indenture

Type of covenant	Examples / purpose
Affirmative: must do	Pay on time, insure, report
Negative: must not do	Limits on debt, liens, payouts
Negative: asset sales	Limits on selling key assets
Why it matters	Stops leakage to shareholders

IN THE LESSON

- Covenants come in two kinds.
- Affirmative covenants say what the issuer must do.
- Typical examples are paying interest and principal on time, keeping its assets insured, and delivering financial statements to the trustee and holders.
- They are mostly routine.
- Negative covenants are the restrictions, and they matter more to credit quality.
- They limit what the issuer may do, for example taking on additional debt, granting liens on its assets, paying dividends, or selling assets.
- The idea is to stop management from moving value away from the bondholders and towards shareholders.
- A breach of a covenant can be an event of default, which gives holders and the trustee the right to act.

8 The corporate trustee

- A bank or trust company acts for all holders as a group
- It holds the indenture, monitors and enforces it
- Before default: only the duties written in the indenture
- After default: the care of a prudent person
- Paid by the issuer, owes duties to holders, no guarantee

IN THE LESSON

- A bond may have thousands of holders, and they cannot all police the issuer.
- So the indenture names a corporate trustee, usually a bank or trust company, to act for the bondholders as a group.
- The trustee holds the indenture, monitors whether the issuer complies, and enforces the terms.
- Its duties differ over time.
- Before default, its duties are limited to those written in the indenture.
- After an event of default, it must act with the care of a prudent person.
- Two points are easy to get wrong.
- The trustee is paid by the issuer, yet it owes its duties to the holders.
- And the trustee does not guarantee payment: if the company cannot pay, the trustee cannot make up the shortfall.

9 What counts as high yield

The line between investment grade and high yield

Agency	Investment grade / high yield
S&P and Fitch	BBB− and up / BB+ and below
Moody's	Baa3 and up / Ba1 and below
Other name for high yield	Junk bonds

IN THE LESSON

- Now to the risky end of the market.
- High yield bonds, also called junk bonds, are bonds rated below investment grade.
- The rating agencies draw the line in slightly different places.
- At Standard and Poor's and Fitch, investment grade runs down to triple B minus, so anything rated double B plus or lower is high yield.
- At Moody's, investment grade runs down to Baa three, so Ba one or lower is high yield.
- The name junk sounds harsh, but it just means a higher chance of default, which is why these bonds pay a higher yield.
- Remember the cut off exactly: the lowest investment grade rating is triple B minus, or Baa three, and the next step down is high yield.

10 Who issues high yield bonds

- Young or fast-growing firms with a short record
- Highly leveraged firms, such as buyout targets
- Firms in or just out of restructuring
- Fallen angels: IG at issue, then cut (not rising stars)

IN THE LESSON

- Who sells high yield bonds?
- There are four typical groups.
- First, young or fast growing companies that have no long record, so investors cannot yet be sure of their strength.
- Second, highly leveraged firms, such as the targets of leveraged buyouts, where a purchase is financed mostly with debt.
- Third, firms that are in restructuring or emerging from it.
- Fourth, fallen angels.
- A fallen angel was investment grade when its bonds were issued and was later downgraded below the line.
- Do not confuse it with its opposite, a rising star, which moves up into investment grade.
- The first three groups are junk from the start, while the fallen angel became junk along the way.

11 Payment features unique to high yield

Three ways to ease the early cash burden

Feature	How the coupon works
Deferred coupon	No cash at first, then full
Step-up	Coupon rises on a schedule
Payment in kind (PIK)	Paid in extra bonds, not cash

IN THE LESSON

- High yield issuers often have weak cash flow early in life, so the sector has payment features that investment grade bonds rarely use.
- A deferred coupon bond pays no cash coupon for an initial period, then pays the full coupon afterwards.
- A step up bond has a coupon that rises on a schedule, so the cash burden comes later, when the business should be stronger.
- And a payment in kind bond, or P I K, pays its coupon in additional bonds instead of cash.
- All three push the cash cost into the future.
- For the investor, the price of that flexibility is more risk, because the debt does not shrink while the company waits to grow into it.

12 Example 3: a PIK bond grows its debt

Illustration: $100 face, 8% PIK coupon, no cash paid

Start balance	face value	**$100.00**
Year 1 PIK coupon	8% × 100	**8.00 bonds**
Balance after year 1	100 + 8	**$108.00**
Balance after year 2	108 × 1.08	**$116.64**
Balance after year 3	116.64 × 1.08	**$125.97**

IN THE LESSON

- Example three, an illustration.
- A company issues a payment in kind bond with a face value of one hundred and an eight per cent coupon.
- The balance starts at one hundred dollars.
- At the end of year one, the coupon is eight per cent of one hundred, which is eight dollars, paid in new bonds, not cash.
- The balance is now one hundred eight.
- In year two the coupon is eight per cent of the bigger balance, so the balance becomes one hundred eight times one point oh eight, which is one hundred sixteen point six four.
- After year three it reaches one hundred twenty five point nine seven.
- The debt grew by about a quarter without a cent of cash leaving the company, and that larger balance must be repaid at maturity.

13 Credit default risk and expected loss

EL = PD × LGD × Exposure

Probability of default	How likely the failure is
Loss given default	Share lost: 1 − recovery rate
Exposure	Amount at risk
Expected loss	Average loss over many outcomes

IN THE LESSON

- Now two credit risks that people often blur together.
- Credit default risk is the risk that the issuer fails to make a promised payment of interest or principal, so the investor loses part or all of what is owed.
- We measure it with expected loss.
- Expected loss equals the probability of default, times the loss given default, times the exposure.
- The probability of default is how likely the failure is over the period.
- The loss given default is the share of the exposure that is lost if it happens, which is one minus the recovery rate.
- And the exposure is the amount at risk.
- Notice that expected loss is an average over many possible outcomes, not a prediction of any single bond.

14 Example 4: expected loss from default

Illustration: $10m position, PD 2% a year, recovery 40%

Probability of default	one year	**2%**
Loss given default	1 − 40% recovery	**60%**
Loss rate	2% × 60%	**1.2%**
Exposure	bond position	**$10m**
Expected loss	1.2% × 10m	**$120,000**

IN THE LESSON

- Example four, an illustration.
- An investor holds ten million dollars of a corporate bond.
- The annual probability of default is two per cent.
- If the company defaults, bondholders recover forty per cent of the face value.
- So the loss given default is one minus forty per cent, which is sixty per cent.
- The loss rate is two per cent times sixty per cent, which is one point two per cent.
- Applied to the exposure of ten million dollars, expected loss is one hundred twenty thousand dollars a year.
- Most years the bond does not default and the loss is zero.
- In the rare year it does, the loss is six million dollars.
- The expected loss of one hundred twenty thousand is the average of those two very different outcomes.

15 Example 5: spread risk with no default

Illustration: $10m position, modified duration of 5

Position	corporate bond	**$10m**
Modified duration	given	**5**
Spread widens	1.20% → 2.00%	**+0.80%**
Price change	−5 × 0.80%	**−4.0%**
Mark-to-market loss	4.0% × 10m	**$400,000**

IN THE LESSON

- Example five shows the other risk, credit spread risk.
- This is the risk that the bond's price falls because the spread over the benchmark widens, even though the issuer is still paying every coupon.
- Spreads widen after a downgrade, when the market sees weaker credit, or when liquidity or risk appetite gets worse.
- The price effect is roughly minus modified duration times the change in spread.
- Take a ten million dollar position with a modified duration of five.
- The spread widens from one point two to two per cent, a rise of eight tenths of a point.
- The price change is minus five times zero point eight per cent, which is minus four per cent.
- On ten million that is a mark to market loss of four hundred thousand dollars, with no default at all.

16 Default risk against spread risk

Same worry about credit, two different losses

Point	Default vs spread
Default risk	Issuer fails to pay: loss realized
Spread risk	Spread widens: price falls
Issuer still paying?	Yes (spread), no (default)
Biggest spread losers	Long-duration bonds

IN THE LESSON

- Now put the two side by side.
- Default risk is a failure to pay, and when it happens the loss is realized: the money is gone.
- Spread risk is a price decline caused by a wider spread while the issuer keeps paying.
- It is a mark to market loss, and it matters if the position is marked each day, financed with borrowed money, or sold.
- If the investor holds to maturity and the company pays, the price recovers toward par and the paper loss disappears.
- Long duration bonds suffer most from spread widening.
- The trap to avoid is calling every price decline caused by credit worries a default loss.
- Most of the time, a falling price means a wider spread, not a default.

17 Event risk: the sudden shock

- A sudden shock to credit quality, whatever the past rating
- Debt-funded buyout, recap, big buyback or dividend
- Merger or spin-off moving assets from holders
- Disaster, accident, accounting scandal, legal change
- Spread widens at once, price drops, downgrade follows

IN THE LESSON

- A third credit danger is event risk.
- This is the risk that a sudden and unexpected event sharply lowers the issuer's credit quality, and so the value of its bonds, whatever its earlier rating or history.
- Typical triggers are a leveraged buyout or takeover paid for with debt, a leveraged recapitalization, and a large debt financed share buyback or special dividend.
- Others are a merger or spin off that moves assets away from the bondholders, a natural disaster or industrial accident, an accounting scandal, or an adverse regulatory or legal change.
- The spread widens at once, the price drops, and a downgrade often follows.
- It is a discrete shock, not a gradual drift in rates or the ordinary cycle of spreads.

18 Example 6: a poison put saves the day

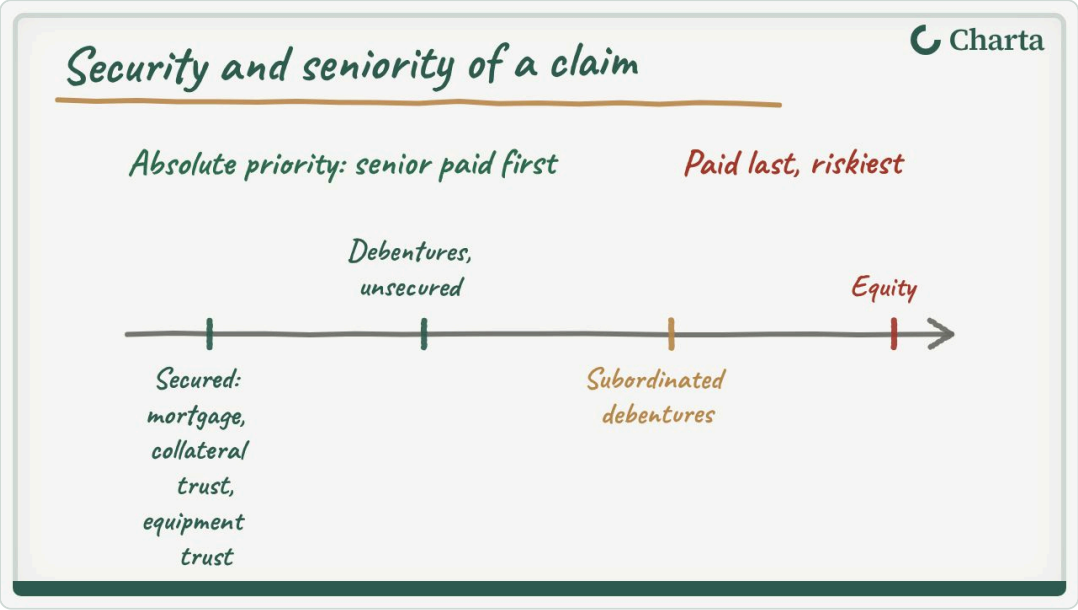
Illustration: debt-funded takeover, put at par

Price before the news	par	**$100**
Price after, no protection	spread jumps	**$82**
Loss without the put	100 − 82	**$18**
Price using the put	sell back at par	**$100**
Loss with the put	100 − 100	**$0**

IN THE LESSON

- Investors protect themselves with covenants, and the best known is the change of control put, or poison put.
- It lets holders sell the bonds back to the issuer, usually at par or slightly above, if control of the company changes hands.
- Example six, an illustration.
- A bond trades at one hundred.
- Then the company announces a takeover financed with a great deal of debt.
- The market fears for the credit and the price falls to eighty two.
- Without protection, a holder has lost eighteen points.
- With a poison put at par, the holder can sell back at one hundred, and the loss is zero.
- On a ten million position the protection is worth one point eight million dollars.
- In real life such bonds usually trade near the put price.

19 Security and seniority of a claim



IN THE LESSON

- Now the features of a bond, starting with collateral, which sets security and seniority.
- Here is a line from the safest claim on the left to the riskiest on the right.
- At the far left are secured bonds: mortgage bonds, collateral trust bonds and equipment trust certificates, each backed by specific assets.
- Next come debentures, which are unsecured claims on the issuer's general credit.
- Further right are subordinated debentures, which rank below senior debt in liquidation.
- At the far right sits equity, the owners' stake, which is paid last and often not at all.
- In a liquidation, absolute priority applies.
- Senior claims are paid in full before junior claims receive anything, and that ranking drives how much each class recovers.

20 Example 7: absolute priority in liquidation

Illustration: $60m raised; claims 40 secured, 50 senior, 30 junior

Assets available	liquidation	**$60m**
Secured paid in full	40 of 40	**$40m**
Left for senior unsecured	60 − 40	**$20m**
Senior unsecured recovery	20 ÷ 50	**40%**
Subordinated recovery	nothing left	**0%**

IN THE LESSON

- Example seven, an illustration of absolute priority.
- A company is liquidated and its assets raise sixty million dollars.
- It owes forty million to secured bondholders, fifty million to senior unsecured bondholders, and thirty million to subordinated holders.
- We simplify by assuming the collateral covers the secured claim.
- The secured bondholders are paid forty million, in full.
- That leaves twenty million.
- The senior unsecured holders are owed fifty million, so they receive twenty over fifty, which is forty per cent.
- Nothing is left for the subordinated holders, whose recovery is zero.
- Same company, same event, yet recoveries of one hundred, forty and zero per cent.
- This is why the rank of a bond matters as much as the rating of the issuer.

21 Interest, maturity and issuer

Features that shape cash flows and risk

Feature	What to remember
Fixed coupon	Same amount each period
Floating coupon	Reference rate + quoted spread
Zero coupon	Discount issue; pays par only
Longer maturity	More rate and credit exposure
Issuer type	Types differ in risk and terms

IN THE LESSON

- Three more features.
- First, the interest.
- A fixed coupon pays the same amount each period.
- A floating rate coupon equals a reference rate plus a quoted spread, and it is reset periodically, so the coupon follows market rates.
- A zero coupon bond is issued at a discount and pays only its face value at maturity.
- Second, maturity, the date the principal is repaid.
- Longer maturity generally means greater interest rate risk and greater credit exposure, because more can go wrong over a longer time.
- Third, the issuer type, such as industrials, utilities or financials.
- The type of issuer affects the covenants, the structure and the risk of the bond, so a utility and a start up bond are not alike.

22 Example 8: a floating coupon and a zero

Illustration: floating spread fixed at 1.20%; zero priced at 5%

Reference rate today	given	**3.00%**
Quoted spread	fixed in contract	**1.20%**
Coupon before reset	3.00% + 1.20%	**4.20%**
Coupon after reset	3.50% + 1.20%	**4.70%**
5-year zero, 5% yield	100 ÷ 1.05^5	**$78.35**

IN THE LESSON

- Example eight, an illustration with two bonds.
- First a floating rate bond.
- The reference rate today is three per cent and the quoted spread, fixed in the contract, is one point two per cent.
- The coupon is three plus one point two, which is four point two per cent.
- At the next reset the reference rate has risen to three point five per cent.
- The spread stays the same, so the new coupon is three point five plus one point two, which is four point seven per cent.
- Now a zero coupon bond with five years to maturity, priced to yield five per cent a year.
- Its price is one hundred divided by one point oh five to the fifth power, which is seventy eight dollars and thirty five cents.

23 Ways a bond can end before maturity

Five routes; calls cost investors reinvestment risk

Route	How it works
Call provision	Issuer redeems at a stated price
Make-whole call	PV at Treasury yield + spread
Sinking fund	Retire part on a schedule
Tender or open market	Issuer buys bonds back
Asset-sale redemption	Paid from asset-sale proceeds

IN THE LESSON

- A corporate bond need not run to its final date.
- There are several ways it can be retired early.
- A call provision lets the issuer redeem at a stated call price, often after a call protection period.
- A make whole call sets the price at the present value of the remaining cash flows, discounted at a Treasury yield plus a small spread, so it is costly for the issuer to use.
- A sinking fund requires the issuer to retire part of the issue on a schedule.
- The issuer can also repurchase bonds through a tender offer or in the open market, and some bonds are redeemed early with asset sale proceeds.
- Calls favor the issuer, so investors face reinvestment risk and price compression.

24 Example 9: how a sinking fund picks its route

Illustration: $1.0m face to retire; lottery calls are at par

Face to retire	sinking fund this year	**$1.00m**
At 95: buy in market	95% × 1.0m	**$0.95m**
At 95: call at par	100% × 1.0m	**$1.00m**
At 104: buy in market	104% × 1.0m	**$1.04m**
At 104: call at par	100% × 1.0m	**$1.00m**

IN THE LESSON

- Example nine, an illustration.
- A sinking fund requires the issuer to retire one million dollars of face value this year.
- It has two options.
- It can buy the bonds in the open market, or call them at par by lottery.
- The cheaper route depends on the market price.
- Suppose the bonds trade at ninety five.
- Buying in the market costs ninety five per cent of one million, which is nine hundred fifty thousand.
- Calling at par costs one million.
- The market is cheaper.
- Now suppose the price is one hundred four.
- Buying in the market costs one million forty thousand, while calling at par still costs one million.
- The call is cheaper.
- Below par, buy; above par, call.

25 Default rate and recovery rate

- Default rate: how often issuers fail
- Recovery rate: value recovered as % of par after default
- Loss = 1 − recovery rate
- Issue default rate = defaulted issues ÷ issues outstanding
- Dollar default rate = defaulted par ÷ par outstanding

IN THE LESSON

- Two numbers describe credit losses in the whole market.
- The default rate measures how often issuers fail.
- The recovery rate measures how much of the claim is recovered afterwards.
- It is the value recovered as a percentage of par, typically measured by the market price shortly after default.
- The loss is one minus the recovery rate.
- There are two ways to count defaults.
- The issue default rate is the number of issues that defaulted divided by the number of issues outstanding at the start of the period.
- The dollar default rate is the par value of defaulted debt divided by the par value outstanding, so it weights large issues more heavily.
- The two differ whenever defaulting issues are larger or smaller than the average issue.

26 Example 10: issue rate against dollar rate

Illustration: 200 issues, $40bn par; 5 issues default, $2bn par

Issue default rate	5 ÷ 200 issues	**2.5%**
Average issue outstanding	40bn ÷ 200	**$200m**
Par defaulted	5 issues	**$2bn**
Dollar default rate	2 ÷ 40	**5.0%**
Average defaulted issue	2bn ÷ 5	**$400m**

IN THE LESSON

- Example ten, an illustration.
- At the start of the year, two hundred issues are outstanding, with forty billion dollars of par in total.
- During the year five issues default.
- The issue default rate is five divided by two hundred, which is two point five per cent.
- Now count dollars.
- The five defaulted issues carried two billion dollars of par.
- The dollar default rate is two divided by forty, which is five per cent, twice the issue rate.
- Why the difference?
- The average issue outstanding is two hundred million dollars, but the average defaulted issue is two billion divided by five, four hundred million.
- The defaulters were larger than average, so the dollar rate is higher.

27 Example 11: averaging recovery by par

Illustration: two defaulted issues

Issue A recovery	40% × $100m	**$40m**
Issue B recovery	20% × $300m	**$60m**
Simple average, wrong	(40% + 20%) ÷ 2	**30%**
Par-weighted recovery	$100m ÷ $400m	**25%**
Loss given default	1 − 25%	**75%**

IN THE LESSON

- Example eleven, an illustration of a common slip.
- Two issues default.
- Issue A has a par of one hundred million dollars and recovers forty per cent, which is forty million.
- Issue B has a par of three hundred million and recovers twenty per cent, which is sixty million.
- A simple average of the two recovery rates is forty plus twenty over two, thirty per cent.
- But that treats the small issue and the large one alike.
- Weight by par instead.
- Total recovered is one hundred million out of four hundred million of par, which is twenty five per cent.
- The loss given default is one minus twenty five per cent, seventy five per cent.
- When averaging recovery across defaults, weight by par amount, not by count.

28 The return a bond investment delivers

Total return = (Coupons + Reinvestment income
+ Ending price − Beginning price) ÷ Beginning price

Coupons	Interest paid by the bond
Reinvestment income	Earned on the coupons received
Ending price	Price at the end of the horizon
Beginning price	Price paid at the start

IN THE LESSON

- Finally, what return should an investor expect?
- A bond return has three components.
- The first is coupon income.
- The second is capital gain or loss, from the change in price.
- The third is reinvestment income, earned by investing the coupons as they arrive.
- Over a horizon, the total return equals coupons plus reinvestment income plus the ending price minus the beginning price, all divided by the beginning price.
- To annualize it, take the root of the terminal wealth ratio that matches the number of years.
- Realized return depends on the holding period, because the price moves with yield and spread, and is pulled toward par as time passes.
- Yield to maturity is a promise, not a forecast.

29 Example 12: a two-year total return

Illustration: buy at 100, 6% coupon, reinvest at 5%, sell at 101

Coupons	6 + 6	**$12.00**
Reinvestment income	6 × 5%	**$0.30**
Price gain	101 − 100	**$1.00**
Total return	13.30 ÷ 100	**13.3%**
Annualized	√1.133 − 1	**6.44%**

IN THE LESSON

- Example twelve, an illustration.
- An investor buys a bond at one hundred with a six per cent annual coupon and holds it for two years.
- The coupons are six plus six, twelve dollars.
- The first coupon, six dollars, is reinvested for one year at five per cent, which earns thirty cents.
- The second coupon arrives at the end and earns nothing.
- At the end of the two years, the bond sells for one hundred and one, a gain of one dollar.
- Adding up, twelve plus point three plus one is thirteen point three dollars on one hundred, a total return of thirteen point three per cent.
- The wealth ratio is one point one three three.
- Its square root minus one is six point four four per cent a year.

30 Example 13: promised yield against expected return

Illustration: quoted YTM 7.0%, PD 3% a year, recovery 40%

Promised yield (YTM)	quoted	**7.0%**
Probability of default	per year	**3.0%**
Recovery rate	share of par	**40%**
Expected credit loss	3% × (1 − 40%)	**1.8%**
Expected return	7.0% − 1.8%	**5.2%**

IN THE LESSON

- Example thirteen, an illustration.
- A credit bond is quoted at a yield to maturity of seven per cent.
- That is a promised return.
- It assumes the bond is held to maturity, no default occurs, and every coupon is reinvested at the yield itself.
- For a credit bond, the expected return is lower than the promised yield by the expected credit loss.
- Suppose the annual probability of default is three per cent and the recovery rate is forty per cent.
- The expected credit loss is three per cent times one minus forty per cent, which is one point eight per cent.
- The expected return is seven minus one point eight, which is five point two per cent.
- The quoted yield overstates the expected return.

31 Four mistakes to avoid

- Yield = Treasury only: add the spread too
- Spread loss called default: it is a mark-to-market loss
- Averaging recovery by count: weight by par
- Quoted yield as return: subtract expected loss

IN THE LESSON

- Four mistakes come up again and again.
- One.
- Looking only at the Treasury yield.
- A corporate yield is the benchmark plus a spread, and the spread can move the price on its own.
- Two.
- Treating every price drop from credit worries as a default loss.
- A wider spread is a mark to market loss while the issuer is still paying, whereas default is a realized loss.
- Three.
- Averaging recovery rates by count.
- When several issues default, weight the recovery by the par amount, and remember that the dollar default rate and the issue default rate can differ.
- Four.
- Treating the quoted yield to maturity as the return you will earn.
- Subtract the expected credit loss, and remember the holding period matters.

32 Recap

- OTC; clean + accrued = dirty; yield = Treasury + spread
- Indenture and covenants; trustee acts for holders
- High yield: below BBB−/Baa3; EL = PD × LGD × exposure
- Spread risk: price effect; event risk: sudden shock
- Early retirement; recovery by par; expected return < yield

IN THE LESSON

- Here is the whole lesson in one pass.
- Corporate bonds trade over the counter at a bid and an ask; the quote is a clean price, and the buyer adds accrued interest to reach the dirty price.
- The yield is the benchmark plus the spread.
- The indenture sets the terms and covenants, and the trustee acts for the holders.
- High yield means below triple B minus or Baa three, with fallen angels and payment features like the P I K.
- Default risk is expected loss; spread risk is a price effect; event risk is a sudden shock.
- Seniority drives recovery.
- Bonds can be called, made whole, or retired by a sinking fund.
- Return is coupons, price change and reinvestment, less expected credit loss.

33 Try three quick questions

1. 8% coupon, twice a year, $1,000 face, 120 of 180 days. Accrued interest?
   Answer: Coupon $40; 40 × 120 ÷ 180 = $26.67.
2. $10m, PD 4%, recovery 50%. Expected loss?
   Answer: LGD = 1 − 50% = 50%; 4% × 50% × $10m = $200,000.
3. Modified duration 7, spread up 0.50%, no default. Price change?
   Answer: −7 × 0.50% = −3.5%, a mark-to-market loss.

IN THE LESSON

- Now try three quick questions yourself.
- Pause after each one.
- Question one.
- A bond has a coupon of eight per cent paid twice a year, a face value of one thousand dollars, and one hundred twenty days have passed in a one hundred eighty day period on the thirty three sixty day count.
- What is the accrued interest?
- Question two.
- A ten million dollar position has a probability of default of four per cent and a recovery rate of fifty per cent.
- What is the expected loss?
- Question three.
- A bond has a modified duration of seven and its spread widens by half a point, with no default.
- What is the approximate price change?
- The answers are on the board.