CHARTA LEARNING · LESSON NOTES

Pricing Conventions, Discounting, and Arbitrage

FRM Part I

1 A story: money now or money later

- Money today beats the same money later
- Interest, need and risk all explain why
- So a future payment is worth less today
- The question: how much less?

IN THE LESSON

- Imagine a friend offers you a choice.
- One hundred dollars today, or one hundred dollars in two years.
- Nearly everyone takes the money today, and there are good reasons.
- You could put it in a bank and earn interest.
- You might need it sooner.
- The future payment might never arrive.
- So a promise of money later is worth less than the same money in your hand now.
- The whole of this lesson rests on that fact.
- The only question is how much less, and the answer is a number we can write down for every date in the future.
- That number is called a discount factor, and we meet it next.

2 What a discount factor is

- d(t) = today's price of 1 unit received at date t
- Positive rates: d(t) is below 1
- Every date has its own factor
- All the factors together: the discount function

IN THE LESSON

- A discount factor is the price today of exactly one unit of money promised on a particular future date.
- If a safe promise of one dollar in two years costs ninety four cents today, then the discount factor for two years is point nine four.
- Each date has its own factor, written d of t, where t is the number of years.
- When interest rates are positive, every factor is below one, because waiting costs you the interest you could have earned.
- The full set of factors, one for each date, is called the discount function.
- Think of it as a price list for money delivered on different future days.

3 Present value with a discount factor

PV = Amount × d(t)

Present value	Worth today
Amount to be received	Cash promised at date t
Discount factor, d(t)	Factor for that date only

IN THE LESSON

- Here is the first working formula.
- The present value of a cash flow is the amount you will receive, multiplied by the discount factor for the date you receive it.
- If you are promised one thousand dollars at the two year date, and the factor is point nine four, it is worth nine hundred and forty today.
- Going backward is just division.
- If you want to know what amount at a future date has a given present value, divide the present value by that date's factor.
- Multiplying when you should divide is the classic slip.
- A bond is a bundle of payments, so its value is each payment times its own factor, added up.

4 A discount function

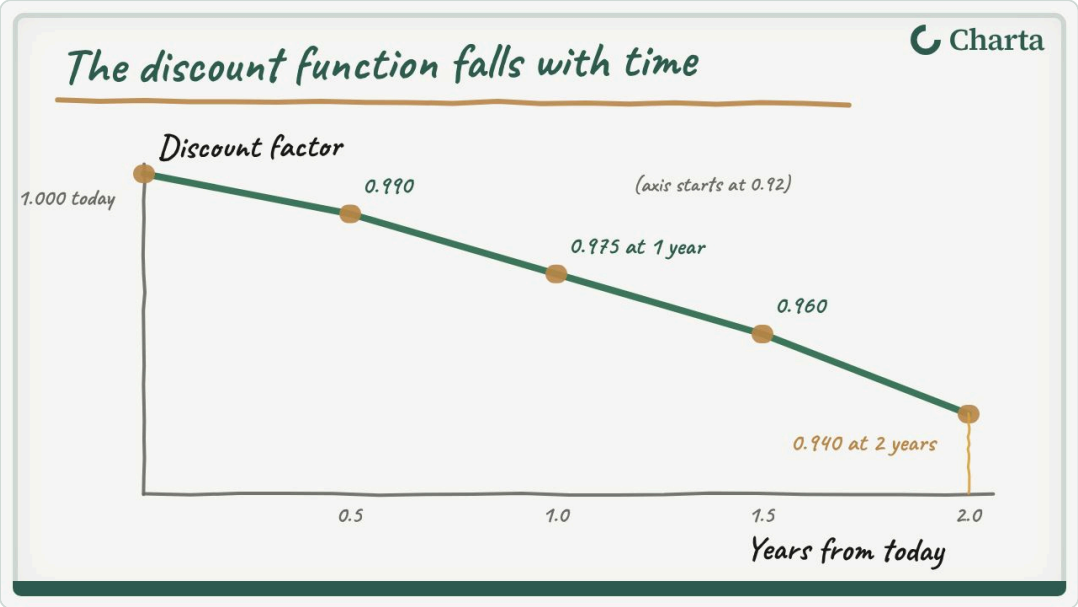
Illustration: made-up factors for one unit of currency

Date (years)	Discount factor d(t)
0.5	0.990
1.0	0.975
1.5	0.960
2.0	0.940

IN THE LESSON

- Let us fix a small discount function and use it for most of the lesson.
- The numbers are made up, but they behave as real ones do.
- A promise of one dollar in half a year costs ninety nine cents today.
- In one year, ninety seven and a half cents.
- In one and a half years, ninety six cents.
- In two years, ninety four cents.
- Notice the pattern: the further away the date, the lower the factor, because you wait longer and so give up more interest.
- Keep this table in mind.
- Whenever we need a price for a payment on one of these four dates, this is where it comes from.

5 The discount function falls with time



IN THE LESSON

- Here are the same four factors drawn as a picture.
- Along the bottom is time, in years from today.
- Up the side is the discount factor.
- At time zero the factor is exactly one, because a dollar today is worth a dollar today.
- Then the line slides downward: point nine nine at half a year, point nine seven five at one year, point nine six at a year and a half, and point nine four at two years.
- This downward slope is the signature of positive interest rates.
- If the line ever rose, or climbed above one, something would be wrong, and later in the lesson we will see that it would hand a trader free money.

6 Example 1: three uses of the factors

Use d(0.5)=0.99, d(1)=0.975, d(1.5)=0.96, d(2)=0.94

PV of 1,000 at year 2	1,000 × 0.94	**940**
Amount at 1.5 worth 480	480 ÷ 0.96	**500**
Move 1,000 from yr 1 to yr 2	1,000 × 0.975 ÷ 0.94	**1,037.23**

IN THE LESSON

- Let's put the table to work.
- First, what is one thousand dollars at the two year date worth today?
- Multiply by point nine four and you get nine hundred and forty.
- Second, what amount at one and a half years has a present value of four hundred and eighty?
- Divide by the factor, point nine six, and you get five hundred.
- Third, how do we move one thousand dollars from year one to year two?
- Multiply by the factor of the starting date, point nine seven five, to get its value today, then divide by the factor of the arrival date, point nine four.
- The answer is about one thousand and thirty seven dollars.

7 Example 2: from a spot rate to a factor

Spot rate 5% for 2 years, compounded twice a year

Half-year rate	5% ÷ 2	**2.5%**
Number of half-years	2 × 2	**4**
Growth per half-year	1 + 0.025	**1.025**
Discount factor	1.025 ^ −4	**0.9060**

A separate example, so not the 0.940 of our table

IN THE LESSON

- Often we are given an interest rate instead of a factor.
- A spot rate is the yearly rate for a payment on one particular date, and in the United States bond market it is quoted with half yearly compounding.
- To turn it into a factor, divide the rate by two, add one, and raise the result to the power of minus two times the number of years.
- Suppose the two year spot rate is five per cent.
- Half of that is two and a half per cent, so we use one point zero two five.
- Raised to the power of minus four, because two years has four half years, the factor is about point nine zero six.

8 Check the date before using a factor

- Each cash flow takes the factor for its own date
- Never one factor for every payment
- Present value: multiply by d(t)
- Future amount from a present value: divide by d(t)

IN THE LESSON

- Two habits will save you marks and money.
- First, always check which date each factor belongs to.
- A bond pays many cash flows, and each one must be discounted with the factor for its own date, never with a single factor for the whole bond.
- Using one rate for every payment is the most common error.
- Second, watch the direction.
- To find a present value, you multiply by the factor.
- To find the amount that will be paid later, you divide.
- If your answer for a future amount comes out smaller than the present value, you multiplied when you should have divided, and the factor, being below one, quietly gave you away.

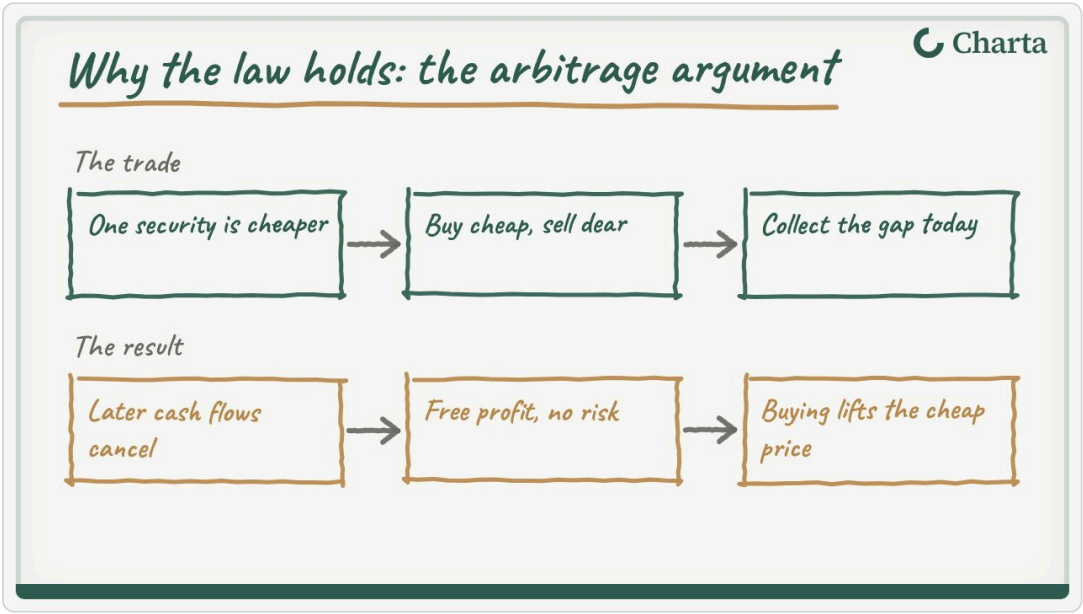
9 The law of one price

- Identical cash flows, in every circumstance
- So the price must be identical
- Not similar: identical
- Enforced by traders chasing free money

IN THE LESSON

- Now a big idea.
- The law of one price says that two securities which deliver exactly the same cash flows in every possible circumstance must sell for the same price.
- Not similar cash flows, but identical ones, on the same dates, in the same amounts.
- Why must this be true?
- Because if it were not, someone could make money without risk, and traders would rush to do it.
- The law is not a rule that anyone enforces.
- It is what you see when many people are hunting for free money.
- And once you accept it, it gives us a powerful tool for valuing bonds, as we will see.

10 Why the law holds: the arbitrage argument



IN THE LESSON

- Follow the boxes.
- Suppose two securities pay exactly the same cash flows, but one costs less.
- A trader buys the cheap one and sells the dear one.
- Today the trader collects the difference between the two prices.
- Later, the cash flows that come in from the one held exactly cancel the cash flows owed on the one sold, so the trader owes nothing.
- That is an arbitrage: a profit today with no cost later and no risk.
- But the buying pushes the cheap price up and the selling pushes the dear price down, until the gap closes.
- So the gap cannot last, and the prices must end up equal.

11 Pricing a bond with the law of one price

Price = Σ Coupon × d(t) + Principal × d(T)

Bond price	What the bond is worth
Coupon	Each coupon, own date's factor
Principal	Paid at maturity, date T
Sum over dates	Over all coupon dates

IN THE LESSON

- Here is how the law is put to work.
- Every safe cash flow due on a given date is worth the same, whichever bond carries it.
- So we price a coupon bond by taking each coupon and multiplying by the discount factor of its own date, then adding the principal times the factor of the maturity date.
- The sum runs over all the coupon dates, and the principal arrives on the last one.
- Notice what this means.
- We never need to look at other bonds with the same coupon.
- The factors, learned from the market once, price every bond.
- Two bonds with different coupons rightly sell at different prices, because they pay different cash flows.

12 Example 3: pricing a two-year bond

2-year bond, 4% coupon, paid twice a year, face 100

Coupon at 0.5	2 × 0.99	**1.98**
Coupon at 1.0	2 × 0.975	**1.95**
Coupon at 1.5	2 × 0.96	**1.92**
Final 102 at 2.0	102 × 0.94	**95.88**
Price	add the four	**101.73**

IN THE LESSON

- Take a two year bond with a four per cent coupon, paid every six months, and a face value of one hundred.
- Each coupon is half of four, which is two.
- The coupons arrive at half a year, one year, one and a half years and two years, and at the last date the face value comes too.
- Discount each payment with its own factor from our table.
- Two times point nine nine is one point nine eight.
- Two times point nine seven five is one point nine five.
- Two times point nine six is one point nine two.
- And the last payment, one hundred and two, times point nine four, is ninety five point eight eight.
- Add them: one hundred and one point seven three.

13 Different coupons, different prices

All priced with d(0.5) to d(2) from before, face 100

Bond, 2 years	**Price per 100**
Zero coupon	94.000
4% coupon	101.730
6% coupon	105.595
Same maturity?	Not the same price

IN THE LESSON

- Now compare some bonds, all priced from the same discount factors.
- The four per cent bond we just valued costs one hundred and one point seven three.
- A six per cent bond of the same maturity pays three every six months, so each coupon is bigger, and its price comes to one hundred and five point five nine five.
- A two year zero coupon bond, with nothing but the face value at the end, costs ninety four.
- All three obey the law of one price: they differ because their cash flows differ.
- The trap is to think any two bonds with the same maturity must cost the same.
- The law covers identical cash flows only.

14 Spotting an arbitrage in a bond

- Value the cash flows with factors from other securities
- Compare with the quoted price
- Cheap: buy the bond, sell the cash flows
- Rich: sell the bond, buy the cash flows

IN THE LESSON

- So how do you spot a mispriced bond?
- The method has three steps.
- First, take the bond's certain cash flows.
- Second, value those same cash flows using discount factors taken from other instruments, for example the prices of strips, which are single payments traded alone.
- Third, compare the result with the quoted price.
- If the quote is lower than the value, the bond is cheap.
- Buy it, and sell the matching cash flows.
- If the quote is higher, the bond is rich.
- Sell it and buy the matching cash flows.
- The profit today is the price gap, scaled by the face amount, and the later cash flows cancel.
- Mixing up cheap and rich is the common slip.

15 Example 4: a cheap bond

Quoted 100.50 against the value from the factors

Value from the factors	1.98+1.95+1.92+95.88	**101.73**
Quoted price	from the dealer	**100.50**
Gap per 100	101.73 − 100.50	**1.23 cheap**
Profit, face 1,000,000	1.23% × 1,000,000	**12,300**

IN THE LESSON

- Our four per cent two year bond has a value, from the discount factors, of one hundred and one point seven three.
- Suppose a dealer quotes it at one hundred point five zero.
- The quote is below the value, so the bond is cheap by one point two three for every hundred of face value.
- The trade for a face amount of one million dollars: buy the bond for one million and five thousand, and sell the matching strips, which bring in one million seventeen thousand three hundred.
- You pocket twelve thousand three hundred dollars today.
- The coupons and principal you receive from the bond exactly pay the strips you sold, so nothing is owed later.

16 Other prices that break the rules

A broken rule is a free-money signal

If you see	The trade
Factor above one	Sell the claim, hold cash
Longer factor above shorter	Sell long zero, buy short
Bond below its replica	Buy bond, sell replica
Bond above its replica	Sell bond, buy replica

IN THE LESSON

- Arbitrage can show up even without comparing a bond with a copy.
- Some sets of prices simply break basic bounds.
- A discount factor can never be above one, because cash held in a safe place earns at least nothing, so a promise of a dollar later cannot cost more than a dollar today.
- And factors must fall as maturity lengthens.
- If a longer zero coupon bond costs more than a shorter one, sell the longer one and buy the shorter.
- You collect cash today, and the shorter bond's payment, held safely, covers what you owe later.
- The table shows each break and the trade that follows.

17 Parts of a US Treasury bond

- Par value: repaid at maturity
- Coupon rate: stated yearly percentage of par
- Maturity date, with coupons every six months
- Notes: 2 to 10 years. Bonds: longer

IN THE LESSON

- Now meet the most important bonds in the world.
- A United States Treasury coupon security has four things to know.
- The par value, also called face value, is the amount repaid at the end.
- The coupon rate is a stated yearly percentage of par.
- The maturity date is when the principal comes back.
- And coupons are paid every six months, so each payment is half of the yearly amount.
- Securities that mature in two to ten years are called notes, and those that run longer, such as twenty or thirty years, are called bonds.
- On the exam, expect to be asked to count the pieces and to tell them apart.

18 The size of each coupon

Coupon = Rate × Par ÷ 2

Each coupon	Paid each six months
Coupon rate	Stated yearly percentage
Par value	Face value
Divide by 2	Two payments a year

IN THE LESSON

- The coupon is easy to work out, with one trap.
- Multiply the coupon rate by the par value to get the yearly amount of interest.
- But the Treasury pays twice a year, so each payment is only half of that.
- The trap is paying the full yearly amount at every payment date, which would double the interest.
- Always divide by two.
- Notice also what the coupon does not depend on: it is fixed when the security is issued, and it stays the same whatever happens to market prices and yields afterward.
- Only the market price of the security moves, while the coupon cheque stays exactly the size it was.

19 Example 5: a five-year note

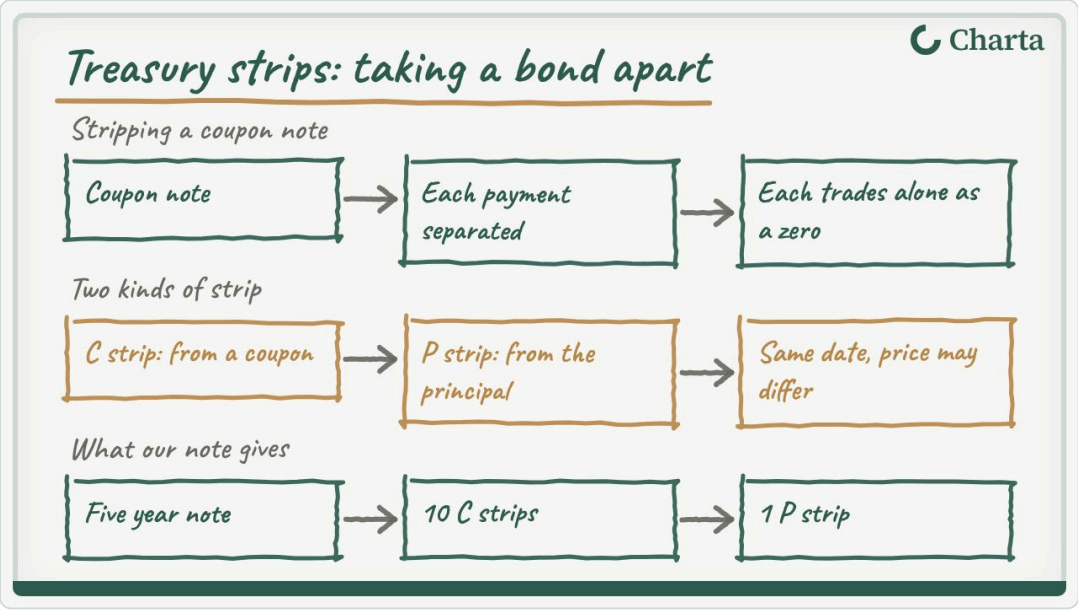
Par 100,000, coupon rate 4.5%, maturity 5 years

Yearly interest	4.5% × 100,000	**4,500**
Each coupon	4,500 ÷ 2	**2,250**
Number of coupons	5 years × 2	**10**
Total coupons	10 × 2,250	**22,500**

IN THE LESSON

- Take a five year Treasury note with a coupon rate of four and a half per cent and a par value of one hundred thousand dollars.
- The yearly interest is four and a half per cent of one hundred thousand, which is four thousand five hundred.
- Because payments come every six months, each coupon is half of that, two thousand two hundred and fifty.
- Over five years there are ten payment dates, so the total of the coupons is twenty two thousand five hundred, and at the end the note repays the one hundred thousand of par.
- Keep this note in mind, because next we will take it apart into its separate payments.

20 Treasury strips: taking a bond apart



IN THE LESSON

- Now the idea behind strips.
- Each payment of a coupon security can be separated from the rest, and then every piece trades on its own as a zero coupon security.
- The name stands for separate trading of registered interest and principal of securities.
- A piece that came from a coupon payment is called a C strip.
- A piece that came from the principal payment is called a P strip.
- At the maturity date, the last coupon becomes a C strip and the principal becomes a P strip, and the two can trade at slightly different prices, even though both pay on the same day.
- Our five year note would give ten C strips and one P strip.

21 Coupon bond against strip

Same maturity, different cash flows

	Coupon bond | Strip
Payments	Many | One
Coupons	Every 6 months | None
Duration	Below maturity | Equals it
Made	Issued | Cut from a bond

IN THE LESSON

- Let's compare the two.
- A coupon bond makes many payments, one every six months and the principal at the end.
- A strip makes exactly one payment, on a single date, and pays no coupons in between.
- That has a neat consequence for risk.
- The average waiting time of a strip's cash, which is its duration, is simply its maturity, since there is only one payment.
- A coupon bond of the same maturity returns part of your money early through the coupons, so its duration is shorter.
- The strip therefore reacts more strongly to changes in interest rates than a coupon bond of the same maturity does.

22 A replicating portfolio

- A mix of longs and shorts that copies the target
- Start at the longest maturity
- Match each earlier date with the instruments due then
- Cost of the copy = price of the target

IN THE LESSON

- Now a very practical idea.
- A replicating portfolio is a mix of long and short positions in other securities whose cash flows match those of a target security, date by date.
- Long means you own it, and short means you have sold it without owning it, so you owe its payments.
- If you can build such a copy, the law of one price tells us the target must cost the same as the copy.
- Build it by working backward from the longest maturity.
- First match the final cash flow, then see what that leaves at each earlier date, and correct any excess or shortfall with instruments that mature on that date.

23 Example 6: copying a bond

Target pays 3 at year 1 and 103 at year 2. Tools: 5% 2-yr bond, 1-yr zero

Year 2: size of 5% bond	103 ÷ 105	**0.981**
It pays at year 1	0.981 × 5	**4.905**
Excess over the 3 needed	4.905 − 3	**1.905**
Fix: 1-year zero, face	short 1.905	**−1.905**

IN THE LESSON

- Let's copy a two year bond that pays three per cent a year, yearly for simplicity.
- Its payments are three at year one and one hundred and three at year two.
- We have two instruments: a two year bond paying five per cent, and a one year zero coupon bond.
- Work backward.
- At year two the five per cent bond pays one hundred and five, and we need one hundred and three, so we hold one hundred and three over one hundred and five of it, about point nine eight one.
- That also pays about four point nine zero five at year one, but we need only three, so we sell about one point nine zero five of the one year zero.

24 Pricing the copy and the common errors

- Cost of copy = 99.745 = value of the target
- Quoted below that: buy target, sell copy
- Error: matching only the final payment
- Error: coupons scale with the position size

IN THE LESSON

- Now price the copy.
- With a one year factor of point nine seven five and a two year factor of point nine four, the five per cent bond costs one hundred and three point five seven five, and the one year zero costs ninety seven point five per hundred.
- The copy costs about point nine eight one times the first, minus one point nine zero five times point nine seven five per unit, which is ninety nine point seven four five.
- That equals the target's own value.
- If the target is quoted at ninety nine, it is cheap, so buy it and sell the copy.
- Two errors to avoid: matching only the final payment, and forgetting that coupons scale with the size of the position.

25 Quoted price against price paid

- Clean price: the quote, without accrued interest
- Dirty price: what the buyer actually pays
- Accrued interest repays the seller for coupon earned
- The buyer collects the full coupon later

IN THE LESSON

- Now a practical puzzle.
- A bond pays coupons only on certain dates, say every six months.
- If you buy it halfway between two coupon dates, you will hold it when the next coupon arrives, and the buyer collects the whole coupon, even though the seller owned the bond for the first half of that period.
- That would be unfair to the seller.
- So the buyer pays the seller for the interest earned so far, which is called accrued interest.
- The price quoted on screens leaves it out, and is called the clean price.
- The price the buyer really pays at settlement is called the dirty price, also known as the full or invoice price.

26 Dirty, clean and accrued

Dirty price = Clean price + Accrued interest

Dirty price	What the buyer pays
Clean price	The quoted price
Accrued interest	Coupon earned, not yet paid

IN THE LESSON

- The link is simple.
- The dirty price equals the clean price plus accrued interest.
- In the simple form used here, the accrued interest is the coupon for one period, multiplied by the days since the last coupon, divided by the number of days in that coupon period.
- Put in words, it is the fraction of the period that has gone by, times the coupon.
- Notice that the coupon here is the payment per period, not the yearly amount.
- Another useful link: when a price is worked out from a yield, the result is the dirty price first.
- Subtract the accrued interest, and you reach the clean price that traders quote.

27 Example 7: from the quote to the invoice

Coupon 2.50 per period, 182 days in period, 73 days since last coupon, quote 101.20

Fraction of period gone	73 ÷ 182	**0.401**
Accrued interest	2.50 × 0.401	**1.00**
Clean price	the quote	**101.20**
Dirty price	101.20 + 1.00	**102.20**
Wrong: whole coupon	101.20 + 2.50	**103.70**

IN THE LESSON

- A bond has a five per cent coupon on a face value of one hundred, paid twice a year, so each coupon is two and a half.
- The current coupon period has one hundred and eighty two days, and seventy three days have passed since the last coupon.
- The fraction is seventy three over one hundred and eighty two, about point four zero one.
- Accrued interest is two and a half times that, about one dollar.
- The quote is one hundred and one point two zero, so the dirty price is about one hundred and two point two zero.
- A common error is to treat the whole coupon as accrued, which would wrongly give one hundred and three point seven zero.

28 Why quotes use the clean price



IN THE LESSON

- Here is why the market quotes clean prices.
- The picture shows an illustration at an unchanged yield.
- The dirty price, in green, climbs steadily as the days pass, because interest keeps building up.
- Then on the coupon date it falls by the size of the coupon, as the seller is paid and the accrued interest resets to zero.
- The line then climbs again.
- The clean price, in grey, has no such saw tooth.
- It shows no jump on the coupon date.
- That makes quotes comparable across bonds and across dates, so you can tell whether a bond really got cheaper or whether it simply paid a coupon.

29 Day count conventions

- Actual/Actual: US Treasury notes and bonds
- 30/360: US corporate, agency, municipal bonds
- Actual/360: money markets, floating-rate loans
- Always match the convention to the instrument

IN THE LESSON

- One question remains.
- How exactly do we count the days when interest builds up?
- Different markets use different day count conventions, which fix how interest accrues.
- The three you must know are these.
- Actual over actual is used for United States Treasury notes and bonds.
- It counts the real days that have passed, over the real days in the coupon period.
- Thirty over three sixty is used for corporate, agency and municipal bonds.
- It pretends every month has thirty days and the year has three hundred and sixty.
- Actual over three sixty is standard in money markets and many floating rate loans.
- Always match the convention to the instrument.

30 Accrued interest, for any convention

Accrued = Coupon per period × Elapsed days ÷ Days in period

Accrued interest	Interest earned so far
Each coupon	Payment for one period
Elapsed days	Counted by the convention
Days in the period	Also counted by the convention

IN THE LESSON

- The accrual formula keeps one shape whatever the convention.
- Accrued interest is the coupon per period times elapsed days, divided by the days in the period.
- Only the counting changes.
- In actual over actual, both counts are real calendar days.
- In thirty over three sixty, a day thirty one is treated as thirty, each month has thirty days, and so a half year period always has exactly one hundred and eighty days.
- The days between two dates are three hundred and sixty times the difference in years, plus thirty times the difference in months, plus the difference in days.
- And remember: use the coupon per period, never the annual coupon, in this formula.

31 Conventions at a glance

Match the convention to the instrument

Convention	Used for
Actual/Actual	US Treasury notes and bonds
30/360	US corporate, agency, municipal
Actual/360	Money markets, floating loans
30/360 half-year	Always exactly 180 days

IN THE LESSON

- This table gathers the rules in one place.
- Under actual over actual, the Treasury way, you count real days in both the top and the bottom of the fraction.
- Under thirty over three sixty, used for corporate, agency and municipal bonds, each month is thirty days, the year is three hundred and sixty, and a semiannual period is always one hundred and eighty days.
- Under actual over three sixty, for money market instruments, interest equals principal times rate times actual days over three hundred and sixty.
- Because the year is counted as only three hundred and sixty days, that pays a little more than a three hundred and sixty five day year would.

32 Example 8: the same days, three counts

Coupon dates 15 Jan and 15 Jul, settle 15 Apr.
Loan: 1,000,000 at 4%, 90 days

Treasury: Actual/Actual	2.5 × 90 ÷ 181	**1.24**
Corporate: 30/360	2.5 × 90 ÷ 180	**1.25**
Loan on Actual/360	1m × 4% × 90 ÷ 360	**10,000**
Same loan, Actual/365	1m × 4% × 90 ÷ 365	**9,863**

IN THE LESSON

- Let us count a quarter.
- A bond has coupon dates on the fifteenth of January and the fifteenth of July, and a settlement date on the fifteenth of April.
- Its coupon per period is two and a half.
- As a Treasury, actual over actual gives ninety days elapsed out of one hundred and eighty one, so accrued interest is about one point two four.
- As a corporate bond, thirty over three sixty gives ninety out of one hundred and eighty, exactly one point two five.
- Now a money market loan of one million dollars at four per cent for ninety days.
- On actual over three sixty, it pays ten thousand dollars.
- On actual over three sixty five, it would pay only about nine thousand eight hundred and sixty three.

33 Recap: the main ideas

- Price = each cash flow × the factor for its own date
- Same cash flows, same price; else arbitrage
- Cheap: buy bond, sell copy. Rich: the reverse
- Dirty = clean + accrued; coupon = rate × par ÷ 2
- Match the day count to the instrument

IN THE LESSON

- Let's pull the lesson together.
- A discount factor is the price today of one unit received on a date, and a bond is a sum of cash flows each times its own factor.
- The law of one price says identical cash flows must cost the same, because otherwise arbitrage pays.
- A bond whose quote differs from its value is cheap or rich, and you trade it against the matching cash flows.
- Treasury coupons are half the yearly amount, and strips are single payments cut from coupon securities.
- Replicating portfolios are built backward from the longest date.
- Dirty equals clean plus accrued interest, and the day count convention decides how the accrual is counted.

34 Try three quick questions

1. d(1)=0.97, d(2)=0.94. PV of 200 at year 2?
   Answer: 200 × 0.94 = 188. Use the factor for year 2.
2. Rate 6%, par 1,000, paid twice a year. Each coupon?
   Answer: 6% × 1,000 ÷ 2 = 30. Half the yearly amount.
3. Clean 98, coupon 3, 45 of 90 days gone. Dirty?
   Answer: Accrued = 3 × 45 ÷ 90 = 1.5. Dirty = 99.5.

IN THE LESSON

- Now try three quick questions yourself.
- Pause the video, think, then listen.
- Question one.
- With a one year factor of point nine seven and a two year factor of point nine four, what is a payment of two hundred dollars at year two worth today?
- Two hundred times point nine four is one hundred and eighty eight dollars.
- Question two.
- A bond has a coupon rate of six per cent on a par value of one thousand, paid twice a year.
- What is each coupon?
- Six per cent of one thousand is sixty, and half of that is thirty dollars.
- Question three.
- A clean price is ninety eight, the coupon is three, and forty five of ninety days have passed.
- What is the dirty price?
- Accrued is three times forty five over ninety, which is one and a half, so dirty is ninety nine and a half.