Pricing swaps: interest rate, currency and equity

Derivatives

1 Two promises, swapped

- Ana borrows at a floating rate
- She swaps it for a fixed payment
- Fixed payer pays fixed, gets floating
- No cash changes hands at the start

IN THE LESSON

- Let us begin with a story.
- Ana Lindgren is an analyst at a fund called Kestrel Capital.
- Her fund has borrowed money at a floating rate, which changes every year.
- She would love to know her interest bill in advance.
- So she finds a bank willing to take her floating payments, and in return she promises the bank a fixed payment every year.
- That agreement is an interest rate swap.
- She is the fixed payer, and the bank is the fixed receiver.
- Neither of them pays anything at the start, because the fixed rate is chosen to make the trade fair.
- Our job is to find that fair rate, and then to value the swap as the years go by.

2 Who pays what in a plain swap

Fixed payer

Pay fixed rate → Receive floating rate → Net payment only

Fixed receiver

Receive fixed rate → Pay floating rate → Mirror image

IN THE LESSON

- Here is the picture.
- Read the top row first.
- The fixed payer sends a fixed rate to the other side every settlement date.
- Below it, the same payer receives the floating rate, which is reset to the market rate each period.
- Now the bottom row is the mirror image, the fixed receiver.
- It collects the fixed payments and hands over the floating ones.
- Both rows use the same amount, called the notional.
- The notional is only used to calculate the payments and it never changes hands.
- In practice the two payments are netted, so only the difference moves.
- One side wins or loses a little each period, and the swap is set up so that, at the start, the two sides expect to break even.

3 A reminder from Level One

- Discount factor = value today of 1 later
- DF = 1 ÷ (1 + spot)ⁿ
- Floating leg at a reset is worth par
- So only the fixed leg needs pricing

IN THE LESSON

- A quick reminder of two tools.
- First, a discount factor.
- It is what one unit of money, received at a future date, is worth today.
- You get it from the spot rate for that date: one divided by one plus the spot rate, raised to the number of years.
- Second, a floating rate bond.
- Straight after each reset, a bond that pays the current market rate is worth exactly its face value, its par.
- So the floating leg of a swap is always worth par at a reset date.
- That is a big simplification, because it means we never have to forecast the floating payments one by one.
- We only need the fixed leg, and we price it as a bond.

4 Discount factors for Ana's curve

Spot rates and discount factors (annual compounding)

Maturity and spot rate	Discount factor
1 year at 2.0%	0.98039
2 years at 2.5%	0.95181
3 years at 3.0%	0.91514
Sum of the three	2.84734

IN THE LESSON

- Here is the curve we will use, and every number is made up.
- Spot rates for one, two and three years are two per cent, two and a half per cent and three per cent.
- Turn each into a discount factor.
- One divided by one point zero two is zero point nine eight zero three nine.
- One divided by one point zero two five squared is zero point nine five one eight one.
- And one divided by one point zero three cubed is zero point nine one five one four.
- Notice the factors fall as the date moves further away, because money later is worth less.
- Add the three together and you get two point eight four seven three four.
- That sum is the value today of receiving one unit at the end of each of the three years.

5 The swap rate

Swap rate = (1 − final DF) ÷ sum of DFs

Final discount factor	Factor for the last payment date
Sum of discount factors	Factors for every payment date
Swap rate	Makes the value zero at start

IN THE LESSON

- Now the key formula.
- The swap rate equals one minus the final discount factor, divided by the sum of the discount factors on every payment date.
- Take the terms one at a time.
- The final discount factor is the factor for the last payment date.
- The sum of discount factors adds up the factors for all payment dates.
- Why does it work?
- The fixed leg is a bond that pays the swap rate every year and returns par at the end, and a fair swap needs that bond to be worth exactly par.
- Set the price equal to one.
- The coupons are the rate times the sum of factors, the principal is the final factor, and rearranging gives our formula.
- That is why we say the fixed leg is priced like a par bond.

6 Example 1: the three-year swap rate

Three-year annual swap, factors from the table

1 − final factor	1 − 0.91514	**0.08486**
Sum of factors	0.98039 + 0.95181 + 0.91514	**2.84734**
Swap rate	0.08486 ÷ 2.84734	**2.980%**
Value at the start	fixed bond = par	**zero**

IN THE LESSON

- Example one.
- Use the discount factors from the table.
- First the top of the fraction.
- One minus the final discount factor is one minus zero point nine one five one four, which is zero point zero eight four eight six.
- That is what the principal loses by being paid in three years instead of today.
- Now the bottom.
- The sum of the three factors is two point eight four seven three four.
- Divide the top by the bottom.
- Zero point zero eight four eight six divided by two point eight four seven three four is zero point zero two nine eight, or two point nine eight per cent.
- So Ana's fair fixed rate on a three-year swap is two point nine eight per cent, and at that rate the swap is worth nothing to either side at the start.

7 A blend of forward rates

Rate (% a year)

Forward, year 1	**2.00%**
Forward, year 2	**3.00%**
Forward, year 3	**4.01%**
Swap rate	**2.98%**

The swap rate blends the forwards

IN THE LESSON

- Here is a picture to fix an idea.
- The first three bars are the forward rates, the floating rates the curve implies for year one, year two and year three: two per cent, three per cent, and about four per cent.
- They rise, because the curve slopes upwards.
- The last bar is our swap rate, two point nine eight per cent.
- See where it sits.
- It is a blend of the three forward rates, weighted by the discount factors, so the earlier and larger factors count a little more.
- It is not a simple average of the spot rates, which would be two point five per cent, and it is not the three-year spot rate of three per cent either.
- The swap rate is a weighted average of forwards, and that is the sentence to remember.

8 The swap rate is not an average of spots

- Not an average of the spot rates
- A discount-weighted blend of forwards
- Zero value at the start by design
- Same factors set the rate and the value

IN THE LESSON

- Here is the exam trap that comes with this formula.
- A tempting shortcut says the three-year swap rate is the average of the one, two and three-year spot rates.
- That would give two point five per cent.
- It is wrong, for two reasons.
- First, the swap rate is a weighted blend of forward rates, not spot rates.
- Second, the weights are the discount factors, which are not equal.
- Another trap is to think the swap starts with a value of zero by luck.
- It does not.
- It starts at zero by construction, because we set the fixed rate from the same discount factors that we use to value the swap.
- Change the curve, and the fair rate changes with it.

9 Value of a swap after it starts

Value = (new rate − old rate) × sum of DFs × N

Market swap rate now	Fair rate today, remaining term
Original fixed rate	The rate the payer agreed to
Sum of discount factors	Current factors, remaining dates
Notional	Amount the payments are based on

IN THE LESSON

- Time passes and rates move.
- Now the swap has a value.
- For the fixed payer, the value equals the new market swap rate minus the original fixed rate, times the sum of the current discount factors, times the notional.
- The terms again.
- The market swap rate now is the fair rate today for the remaining years.
- The original fixed rate is what the payer actually agreed to pay.
- Their difference is the saving, or the extra cost, each period.
- The sum of current discount factors turns that stream of saving into a value today.
- Finally, the notional scales it.
- If the new rate is higher, the payer gains.
- If it is lower, the payer loses.
- The receiver always holds the opposite value.

10 Example 2: one year later (set-up)

$10m notional, two payments left

Original fixed rate	agreed at the start	**2.980%**
Current factors	0.97087 and 0.93351	**1.90438**
Market rate now	(1 − 0.93351) ÷ 1.90438	**3.491%**
Value to Ana	fixed payer	**?**

IN THE LESSON

- Example two.
- A year has passed, and the first payment has just been settled.
- Two payments remain.
- The notional is ten million dollars.
- Rates have risen.
- The market swap rate for a two-year swap is now three point four nine one per cent, and the current discount factors for the two remaining dates are zero point nine seven zero eight seven and zero point nine three three five one.
- First check that this new rate is consistent.
- One minus zero point nine three three five one is zero point zero six six four nine.
- Divide by the sum of the factors, one point nine zero four three eight, and you get three point four nine one per cent.
- Ana is locked in at two point nine eight, so she is paying less than the market.

11 Example 2: the value to the payer

V = (3.491% − 2.980%) × 1.90438 × $10m

Rate gap	3.491% − 2.980%	**0.511%**
Gap × sum of factors	0.511% × 1.90438	**0.973%**
Value to payer	× $10m	**$97,300**
Value to receiver	mirror image	**−$97,300**

IN THE LESSON

- Now the calculation.
- The gap between the new rate and the old is three point four nine one minus two point nine eight, which is zero point five one one per cent.
- That is how much less than the market Ana pays, in each of the two remaining years.
- Next, discount.
- Multiply the gap by the sum of the current discount factors, one point nine zero four three eight.
- That gives about zero point zero nine seven three per cent of the notional.
- On ten million dollars, the value is about ninety-seven thousand three hundred dollars, and it is a gain for Ana, because she is the fixed payer and rates rose.
- The bank, the fixed receiver, has the opposite value: a loss of about ninety-seven thousand three hundred dollars.

12 How the payer's value moves with rates

Chart: Value to payer vs Market swap rate now

- Original rate 2.98%: value zero
- Rates up: payer gains
- Rates down: payer loses
- Example: +$97,300

IN THE LESSON

- Let us see this as a picture.
- The horizontal axis is the market swap rate for the two years that remain, from two to four per cent.
- The vertical axis is the value of the swap to the fixed payer, from a loss at the bottom to a gain at the top.
- The grey horizontal line is zero, and the grey vertical line marks our original rate of two point nine eight per cent.
- The green line is the payer's value, and it rises in a straight line.
- It crosses zero exactly where the market rate equals the original rate.
- Move right, to a higher market rate, and the payer gains.
- Our example sits on the right, at about ninety-seven thousand dollars.
- Move left, and the payer loses.

13 Who gains, who loses

Direction of value after rates move

Market swap rate now	Fixed payer
Above the original rate	Gains
Below the original rate	Loses
Same as the original	Zero
Fixed receiver	Opposite sign

IN THE LESSON

- A short table to keep the signs straight.
- The fixed payer locked in a rate, so think of that rate as a price.
- If market rates rise, the price Ana locked in looks cheap, so she gains.
- If market rates fall, she is stuck paying more than the market, so she loses.
- The fixed receiver is the mirror image in every row.
- What does the value mean in practice?
- It is the amount one side would be paid, or would have to pay, to leave the swap today.
- And it is also what the other side stands to lose if its partner fails to pay, which is the credit exposure.
- The positive side is the one that carries the risk of default.

14 Currency swaps: a story

- Swap principal at the start and the end
- In between, swap interest in two currencies
- Each side has its own fixed rate
- The exchange rate links the two sides

IN THE LESSON

- Now currency swaps.
- Imagine Kestrel Capital wants to build an office in Europe, and it needs eight million euros.
- But its home market is in dollars, and borrowing dollars is cheaper for it.
- So it borrows dollars, and a bank gives it euros in exchange.
- At the start the two sides swap the principal.
- Then, each year, Kestrel pays euro interest and receives dollar interest, and at the end the principal is swapped back at the same amounts.
- Notice what is new compared with the plain swap.
- There are two currencies, the principal really moves at both ends, and the interest on each side is fixed.
- That is why the exchange rate suddenly matters.

15 Each leg is a bond

Dollar leg, received

Pay USD 10m now → Receive 3.0% a year → Receive USD 10m at end

Euro leg, paid

Receive EUR 8m now → Pay 1.5% a year → Pay EUR 8m at end

IN THE LESSON

- Look at the picture from the point of view of Kestrel, which receives dollars and pays euros.
- The top row is a dollar bond that Kestrel holds.
- It pays ten million dollars at the start, collects three per cent a year, and gets ten million back at the end.
- The bottom row is a euro bond that Kestrel has issued.
- It receives eight million euros at the start, pays one and a half per cent a year, and repays eight million at the end.
- The two principals were matched at the spot rate of one dollar twenty-five per euro, since ten divided by eight is one point two five.
- So on day one both rows are worth the same, and the swap is worth nothing.

16 Setting the two fixed rates

Each rate comes from its own curve

Dollar swap rate	dollar factors only	**3.0%**
Euro swap rate	euro factors only	**1.5%**
Dollar notional	chosen first	**USD 10m**
Euro notional	10m ÷ 1.25	**EUR 8m**

IN THE LESSON

- How are the fixed rates chosen?
- Exactly as in a plain swap, but separately in each currency, using that currency's own discount factors.
- The dollar rate is one minus the final dollar factor, divided by the sum of the dollar factors.
- The euro rate does the same with euro factors.
- To keep the numbers simple, suppose both curves were flat at the start.
- A flat dollar curve at three per cent has factors that give a swap rate of exactly three per cent, and a flat euro curve at one and a half per cent gives one and a half.
- Each leg is then worth par in its own currency.
- The spot rate only links the two principals, and it does not set either coupon.

17 Value of a currency swap

Value = leg received − spot × leg paid

Leg you receive	Coupons and principal, bond price
Leg you pay	Same, in its own currency
Spot rate today	Dollars per euro, not the old one

IN THE LESSON

- Now the value, once time has passed.
- Price each leg as a bond in its own currency, using that currency's current discount factors, and include the final principal.
- Convert the foreign leg into your home currency at today's spot rate.
- Then the value equals the leg you receive minus the leg you pay.
- The terms: the leg you receive is the present value of the coupons and the principal on the side you collect.
- The leg you pay is the same for the side you owe, in its own currency.
- The spot rate today converts the paid leg across.
- Use the spot rate of today, not the one at the start, because the old rate is history and today's rate is what a purchase would cost now.

18 Example 3: the dollar leg

Two payments left; dollar factors 0.97 and 0.94

Coupons per 1	0.03 × (0.97 + 0.94)	**0.0573**
Plus final principal	discounted: 0.94	**0.9400**
Dollar leg per 1	0.0573 + 0.94	**0.9973**
Dollar leg	× USD 10m	**USD 9.973m**

IN THE LESSON

- Example three.
- A year has passed and two payments remain.
- Today's dollar discount factors are zero point nine seven and zero point nine four.
- Start with the dollar leg that Kestrel receives.
- Per one dollar of notional, the coupons are three per cent times the sum of the two factors, which is zero point zero five seven three.
- Add the final principal, discounted: zero point nine four.
- The total is zero point nine nine seven three.
- On a notional of ten million dollars, that is nine million nine hundred and seventy-three thousand dollars.
- This is the value of the bond Kestrel holds.
- Notice it is a little under ten million, so dollar rates have risen since the start, and a bond paying three per cent is worth less than par.

19 Example 3: the euro leg and the value

Euro factors 0.99 and 0.975; spot now USD 1.10 per EUR

Euro leg per 1	0.015 × 1.965 + 0.975	**1.0045**
Euro leg	× EUR 8m	**EUR 8.036m**
In dollars at today's spot	× 1.10	**USD 8.839m**
Value to Kestrel	9.973m − 8.839m	**USD 1.134m**

IN THE LESSON

- Now the euro leg, which Kestrel owes.
- Euro discount factors today are zero point nine nine and zero point nine seven five.
- Per one euro, the coupons are one and a half per cent times one point nine six five, about zero point zero two nine five.
- Add the discounted principal, zero point nine seven five.
- The total is about one point zero zero four five.
- On eight million euros, that is about eight point zero three six million euros.
- Now convert.
- The spot rate today is one point one zero dollars per euro, so the leg is worth about eight point eight three nine million dollars.
- Finally subtract.
- Nine point nine seven three million minus eight point eight three nine million is about one point one three four million dollars, in Kestrel's favour.

20 Which exchange rate counts

Value (USD millions)

Dollar leg received	**9.973**
Euro leg, spot 1.10	**8.839**
Euro leg, wrong 1.25	**10.045**

Convert at today's spot, never the old one

IN THE LESSON

- This picture shows why the choice of spot rate matters so much.
- The first bar is the dollar leg that Kestrel receives, nine point nine seven three million dollars.
- The second bar is the euro leg Kestrel owes, converted at today's rate of one point one zero.
- It is about eight point eight four million, a lot smaller than the first bar, so the swap is a gain.
- The third bar is the same euro leg, wrongly converted at the original rate of one point two five.
- It jumps to about ten point zero four five million, which is more than the dollar leg, and the swap would look like a small loss.
- The euro has fallen since the start, and that fall has made the euros Kestrel still owes much cheaper.

21 Mistakes to avoid

- 1. Gap × sum of factors, not × payments
- 2. Swap rate: blend of forwards, not spots
- 3. Currency swap: today's spot, not old
- 4. Keep the final principal in each leg
- 5. Payer gains when rates rise; receiver loses

IN THE LESSON

- Time to collect the mistakes that cost marks so far.
- One.
- In a plain swap, multiplying the rate gap by the number of remaining payments.
- You must multiply by the sum of the current discount factors, because later savings are worth less today.
- Two.
- Calling the swap rate an average of spot rates.
- It is a discount-weighted blend of forward rates.
- Three.
- In a currency swap, converting at the original spot rate.
- Always use today's rate.
- Four.
- Leaving out the final principal exchange.
- The coupons alone give a tiny number and miss most of the story.
- Five.
- Mixing up the sign.
- The payer gains when rates rise, and the receiver has the mirror image.

22 Equity swaps: a story

- Receive the return on an index
- Pay a fixed rate on the notional
- No shares bought, nothing stored
- Could pay floating or another index

IN THE LESSON

- Last, equity swaps.
- Ana now advises a pension trust that wants the return of a share index, but does not want to buy hundreds of shares.
- So it enters an equity swap.
- It receives the return on the index, and in exchange it pays a fixed rate on a notional.
- Payments are settled once a year.
- This is cheaper and quicker than buying the shares, and nothing needs to be sold or stored.
- The trust could also pay a floating rate, or the return on another index, but we will price the commonest case, equity for fixed.
- The question again is the same pair.
- What fixed rate makes the trade fair at the start, and what is the swap worth later?

23 The equity leg resets

Equity receiver

Receive index return → Pay fixed rate → Equity leg resets to notional

IN THE LESSON

- Here is the picture.
- On the top row, the trust receives the index return since the last settlement.
- On the middle step, it pays a fixed rate on the notional.
- And at the end of each period, both payments are made and the equity leg starts again from the notional.
- This reset is the big idea.
- Just after a settlement the equity leg is worth exactly its notional, because it has just paid out everything it earned.
- So the equity leg is like a floating rate bond, and the swap starts at zero when the fixed leg is also worth its notional.
- Between resets, the legs drift apart.
- The index moves on one side, and interest rates move the bond on the other.

24 The fixed rate is the plain swap rate

- Equity leg resets to notional each time
- So the fixed leg must be worth par
- Same formula as the plain swap rate
- The index forecast plays no part

IN THE LESSON

- So what is the fixed rate on an equity swap?
- It is exactly the plain interest rate swap rate for the same dates.
- One minus the final discount factor, divided by the sum of the discount factors.
- The reason is the reset.
- The equity leg is worth its notional at the start, and again after every settlement, just like a floating rate bond.
- So to make the swap worth zero, the fixed leg must be worth its notional too, and that gives the same formula as before.
- Notice what the fixed rate does not depend on.
- It does not depend on the expected return of the index.
- Someone might say a hopeful forecast should raise the rate.
- It should not.
- No arbitrage fixes it from the curve alone.

25 Value of an equity swap between resets

Value = (index ratio × N) − fixed bond

Index now ÷ index at reset	Growth of the index since reset
Equity leg	Index ratio times the notional
Fixed leg, a bond	Coupons plus notional, discounted
Value to equity receiver	Equity leg less fixed bond

IN THE LESSON

- Now the value between resets.
- For the investor who receives the equity return and pays fixed, the value is the equity leg minus the fixed leg.
- The equity leg is the index now divided by the index at the last reset, times the notional.
- That is the notional grown by the return since the reset.
- The fixed leg is a bond.
- It is the fixed rate times the sum of the current discount factors, plus the final factor for the notional, all times the notional.
- Discount at today's rates, and do not forget the notional at maturity.
- The value to the equity receiver is the equity leg less the fixed bond, and the payer of equity has the opposite sign.

26 Example 4: the fixed rate

$10m, two years, annual settlement

1 − final factor	1 − 0.9518	**0.0482**
Sum of factors	0.9756 + 0.9518	**1.9274**
Fixed rate	0.0482 ÷ 1.9274	**2.50%**
Index at reset	index level	**4,000**

IN THE LESSON

- Example four.
- Kestrel's pension client enters a two-year equity swap on ten million dollars, receiving the index and paying fixed, with annual settlements.
- The discount factors at the start are zero point nine seven five six for one year and zero point nine five one eight for two years.
- The fixed rate is one minus zero point nine five one eight, which is zero point zero four eight two, divided by the sum of the two factors, one point nine two seven four.
- The answer is zero point zero two five, or two point five per cent.
- This is the plain swap rate.
- Six months later the index has risen from four thousand to four thousand two hundred, and we will value the swap then.

27 Example 4: the two legs and the value

Index 4,200; factors 0.985 and 0.960

Equity leg	4,200 ÷ 4,000 × $10m	**$10.500m**
Fixed leg per 1	0.025 × 1.945 + 0.960	**1.0086**
Fixed leg	× $10m	**$10.086m**
Value to equity receiver	10.500m − 10.086m	**$0.414m**

IN THE LESSON

- Now six months on.
- The index is at four thousand two hundred, up five per cent.
- The equity leg is four thousand two hundred divided by four thousand, times ten million, which is ten and a half million dollars.
- Now the fixed leg, a bond.
- The remaining payments fall at half a year and one and a half years, with current factors zero point nine eight five and zero point nine six.
- Per one dollar, the coupons are two and a half per cent times the sum, one point nine four five, plus the final factor zero point nine six.
- That is one point zero zero eight six.
- On ten million, it is about ten point zero eight six million.
- The value to the equity receiver is ten point five minus ten point zero eight six, about four hundred and fourteen thousand dollars.

28 Zero at the reset, then apart

Value ($ millions)

Both legs at reset	**10.000**
Equity leg now	**10.500**
Fixed leg now	**10.086**

The swap is worth the gap between the legs

IN THE LESSON

- Let us look at the three bars.
- The first is the value of each leg just after a reset: ten million dollars, with both legs equal and the swap worth nothing.
- The second bar is the equity leg six months later, ten and a half million, because the index rose five per cent.
- The third bar is the fixed leg, a bond worth about ten point zero eight six million.
- It also rose above par, because six months of coupon has built up, and the discount factors changed only slightly.
- The value of the swap is the gap between the second and third bars, about zero point four one four million, or four hundred and fourteen thousand dollars.
- The index supplied five hundred thousand of it, and the bond took back about eighty-six thousand.

29 Example 5: the index falls

Index falls from 4,000 to 3,800

Equity leg	3,800 ÷ 4,000 × $10m	**$9.500m**
Fixed leg	unchanged	**$10.086m**
Value to equity receiver	9.500m − 10.086m	**−$0.586m**
Value to equity payer	mirror image	**+$0.586m**

IN THE LESSON

- One more case, because equity can go down too.
- Suppose the index had fallen instead, from four thousand to three thousand eight hundred, a drop of five per cent.
- Keep the same discount factors.
- Now the equity leg is three thousand eight hundred divided by four thousand, times ten million, which is nine and a half million dollars.
- The fixed leg is unchanged at ten point zero eight six million.
- The value to the equity receiver is nine and a half minus ten point zero eight six, about minus five hundred and eighty-six thousand dollars.
- This is a loss for the receiver, who must pay the fixed leg and collects less from the index.
- The equity payer takes the other side, a gain of the same size.

30 Equity swap traps

- Fixed leg is a bond, not par
- Keep the notional in the fixed leg
- Fixed rate ignores the index forecast
- Equity receiver gains as the index rises

IN THE LESSON

- Before we recap, the equity swap traps.
- First, valuing the fixed leg at par.
- After the reset, the fixed bond is not worth ten million exactly.
- It is worth the coupons and the discounted notional at current rates, and valuing it at par would give five hundred thousand dollars here, overstating the swap by about eighty-six thousand.
- Second, forgetting the notional in the fixed leg.
- The coupons alone are tiny, just under half a million, and setting that against ten and a half million of equity gives a number with no meaning.
- Third, using the expected return of the index to set the fixed rate.
- The fixed rate comes from the curve.
- Fourth, the sign.
- The equity receiver gains when the index goes up.

31 Recap: one idea, three swaps

Swaps: price each leg as a bond

Interest rate swap	Gap × sum of DFs × notional
Currency swap	Leg received − spot × leg paid
Equity swap	Index leg − fixed bond
The shared idea	Each leg is a bond, so discount it
The shared trap	Skipping the discount factors

IN THE LESSON

- Let us pull it together.
- The interest rate swap rate is one minus the final discount factor, divided by the sum of the factors, and it gives the swap a zero value at the start.
- Later, the payer's value is the gap between the new and old rates, times the sum of current factors, times the notional.
- A currency swap treats each leg as a bond in its own currency, including the principal, converts the foreign leg at today's spot, and subtracts.
- An equity swap marks the equity leg to the index, and values the fixed leg as a bond with the notional.
- The shared idea is that each leg is a bond, and the shared trap is the shortcut that skips the discounting.

32 Try three quick questions

1. Final DF 0.9, sum of DFs 2.8. Swap rate?
   Answer: (1 − 0.9) ÷ 2.8 = 3.57%.
2. Rate up 0.5%, sum of DFs 1.9, $10m. Payer gains?
   Answer: 0.5% × 1.9 × $10m = $95,000.
3. Currency swap: which spot rate converts the leg?
   Answer: Today's spot rate, never the original.

IN THE LESSON

- Now try three quick questions yourself.
- Pause after each one.
- Question one.
- The discount factors for years one, two and three sum to two point eight, and the final factor is zero point nine.
- What is the swap rate?
- One minus zero point nine is zero point one, divided by two point eight, which is three point five seven per cent.
- Question two.
- A swap's market rate rose by half of one per cent, the sum of current factors is one point nine, and the notional is ten million.
- What does the payer gain?
- Half a per cent times one point nine times ten million is ninety-five thousand dollars.
- Question three.
- In a currency swap, which spot rate converts the foreign leg?
- Today's rate, never the original one.