Yield curve returns and credit spreads

Portfolio Management

1 A story: the sticker price

- Yield is the sticker price, not the return
- Build the return from separate pieces
- Each piece is a forecast that can be wrong
- Start from the right base, or count twice

IN THE LESSON

- A car has a sticker price, but the real cost of owning it includes fuel, repairs and what you get back when you sell.
- A bond fund is the same.
- The yield on the screen is only the sticker price.
- Naomi Ellery wants to know what Brightwater will actually earn over the next year.
- That means starting with what the bonds pay, adding what they gain just by growing older, and then adding or taking away what her view on interest rates will do, along with any credit losses.
- Each piece is a separate forecast, and some will be wrong.
- Our job is to build the estimate honestly, and then say how it could fail.

2 From yield to expected return

What the bonds earn if the curve stands still

Yield income → Rolldown → Rolling yield

What the manager's view and the credit risk change

Rate view → Credit losses → Expected return

IN THE LESSON

- Here are the pieces, in the order Naomi uses them.
- Yield income is what the bonds pay over the year.
- Rolldown is the extra gain as a bond ages along the yield curve.
- Picture a bond sliding down a hill: as it gets shorter, it moves to a lower yield on an upward sloping curve, and its price rises.
- Yield income plus rolldown is called the rolling yield.
- It is what the portfolio earns if the curve does not move at all.
- The second row holds the forecasts.
- The rate view is the price change from her expectation about yields.
- Credit losses come off for bonds that might default.
- A currency term would join here for an unhedged foreign bond.

3 Rolldown on the yield curve

Chart: Yield (%) vs Maturity (years)

- 5-year: 3.90%
- 4-year: 3.75%
- Today's curve

IN THE LESSON

- Here is rolldown drawn.
- The horizontal axis is the maturity of the bond in years, and the vertical axis is its yield.
- The green line is the yield curve as it stands today.
- It slopes upward, because longer bonds pay more.
- Brightwater holds a five year bond, marked at three point nine zero per cent.
- Now let a year pass while the curve itself stays put.
- The bond is now a four year bond, and the same curve says four year bonds yield three point seven five per cent.
- The red line shows that slide down the curve.
- The bond moved to a lower yield, and a lower yield means a higher price.
- That price gain is the rolldown.

4 Example 1: rolldown and rolling yield

Brightwater holds 5-year bonds, modified duration 4.0

Yield today, 5-year		**3.90%**
Yield a year on, 4-year	curve unchanged	**3.75%**
Fall in yield	3.90 − 3.75	**0.15%**
Rolldown return	4.0 × 0.15%	**0.60%**
Rolling yield	3.90% + 0.60%	**4.50%**

IN THE LESSON

- Let us put numbers on rolldown.
- Brightwater holds five year bonds yielding three point nine zero per cent.
- Along the unchanged curve, a year from now each bond has become a four year bond, and the curve says four year bonds yield three point seven five per cent.
- The yield has fallen by point one five per cent.
- A falling yield means a rising price.
- With a modified duration of four point zero, the gain is four times point one five, or point six zero per cent.
- That is the rolldown return.
- Add it to the three point nine zero of yield income and we get a rolling yield of four point five zero per cent.
- This is what the portfolio earns if nothing happens to the curve.

5 The expected return formula

$E(R) \approx$ yield income + rolldown − MD × Δy + ½ × C × (Δy)² − credit loss

Yield income	What the bonds pay
Rolldown return	Gain from ageing, curve unchanged
Rate view	Duration times expected rise
Convexity	Small and positive
Credit loss	Default chance times loss

IN THE LESSON

- Now the formula.
- Expected return is approximately yield income, plus rolldown, minus modified duration times the change in yield, plus a convexity term, minus credit losses.
- Yield income plus rolldown is the rolling yield.
- The rate view term is the duration effect: if yields are expected to rise, the price falls, so it is negative.
- The convexity term is half the convexity times the change in yield squared.
- It is always positive, and small for modest moves.
- Credit losses are the probability of default times the loss given default.
- Notice the key phrase.
- The change in yield is measured from the curve after rolldown, the unchanged curve, not from today.
- We will see why that matters in a moment.

6 Example 2: Naomi's expected return

View: 4-year yield at 4.05% in a year; convexity 30

Rolling yield	3.90% + 0.60%	**4.50%**
Rate view: +0.30%	−4.0 × 0.30%	**−1.20%**
Convexity	½ × 30 × 0.003²	**+0.01%**
Credit loss	0.5% × 30%	**−0.15%**
Expected return	4.50 − 1.20 + 0.01 − 0.15	**3.16%**

IN THE LESSON

- Now Naomi's view.
- She expects the four year yield, a year from now, to be four point zero five per cent.
- Measure that against the rolled down curve, not today's: four point zero five minus three point seven five is a rise of point three zero per cent.
- The duration effect is minus four times point three zero, which is minus one point two zero.
- Convexity is thirty, so the term is a half times thirty times point zero zero three squared, about plus point zero one.
- Credit losses: a half of one per cent chance of default, times a thirty per cent loss, is point one five.
- Add it up.
- Brightwater is expected to earn three point one six per cent, well below the rolling yield.

7 One portfolio, three rate views

Expected return (%)

Yields −0.30%	**5.56%**
Curve unchanged	**4.35%**
Yields +0.30%	**3.16%**

Return reaches zero if yields rise 1.09% (4.35 ÷ 4.0)

IN THE LESSON

- A single number hides how much rests on the view, so Naomi checks three.
- The vertical axis is the expected one year return, in per cent.
- Each bar uses the same rolling yield, convexity and credit loss, and changes only the move in yields from the rolled down curve.
- If yields fall thirty basis points, the return is five point five six.
- If the curve simply stands still, it is four point three five.
- Her base view, a rise of thirty basis points, gives three point one six.
- The note shows the cushion.
- Yields could rise one point zero nine per cent from the rolled down curve before the return falls to zero.
- That tells her how wrong her view can be.

8 Example 3: the double count

Rolling yield 4.50%; forecast 4-year yield 4.05%. Ignore convexity and credit

Right: rise from 3.75%	4.05 − 3.75	**+0.30%**
Right return	4.50 − 4.0 × 0.30	**3.30%**
Wrong: rise from 3.90%	4.05 − 3.90	**+0.15%**
Wrong return	4.50 − 4.0 × 0.15	**3.90%**
Overstated by	3.90 − 3.30	**0.60%**

IN THE LESSON

- Here is the classic trap.
- The forecast is a four year yield of four point zero five per cent in a year.
- A careless analyst measures the rise from today's five year yield of three point nine zero.
- That is only plus point one five.
- The duration effect then looks like minus point six zero, and the return comes out at three point nine zero.
- But rolldown has already moved the starting point to three point seven five.
- From there the rise is point three zero, the duration effect is minus one point two zero, and the true figure is three point three zero.
- Counting the full rolldown while measuring the view from today's curve credits the same ageing twice, and overstates the return by point six zero.

9 How the strategy can go wrong

Four ways the estimate fails

Risk to the estimate	What goes wrong
Rate view is wrong	Bigger duration loss
Curve shape is unexpected	Steepens or twists
Leverage or options	Scaled loss; time decay
Rolldown counted twice	Return overstated

IN THE LESSON

- The estimate is a forecast, so Naomi lists the ways it can fail.
- The first is the rate view itself: if yields rise by more than she expects, the duration loss is larger than the rolling yield.
- The second is the shape of the curve.
- Rolldown assumed an unchanged curve, but if the curve steepens or twists, the bonds do not slide down it as planned.
- Third, leverage and options.
- If she borrows to hold more bonds, gains and losses are both scaled up, and if she expresses the view with options, time decay eats the premium each day.
- And fourth, the double count we just saw, which is an error of method, not of the market.

10 A story: the insurance premium

- Spread is the premium for carrying credit risk
- Default risk: the issuer fails and the loss follows
- Spread risk: spreads widen and prices fall
- Liquidity risk: selling costs more in stress

IN THE LESSON

- A credit spread is like an insurance premium.
- A company bond pays more than a government bond because the investor has agreed to carry risks the government bond does not have.
- The most obvious is default: the company fails and the investor loses money.
- But there is a second risk that is far more common.
- Spreads move.
- When worry rises, investors demand a bigger premium, and the price of every existing bond falls, even though no company has defaulted.
- The third risk is liquidity: when everyone wants out, buying and selling becomes expensive.
- Naomi's credit sleeve earns the spread, and the question is whether the spread is enough to cover all three risks.

11 One-year expected excess return

Excess return ≈ spread − SD × Δspread − PD × LGD

Spread	Premium earned over the year
Spread duration	Price sensitivity to spread
Change in spread	Expected widening
Default probability	Chance of default in a year
Loss given default	Share lost if it defaults

IN THE LESSON

- Here is the formula for a one year credit position.
- The expected excess return over a government bond is approximately the spread you earn, minus spread duration times the expected change in spread, minus the probability of default times the loss given default.
- Spread duration is how much the price moves for a given change in the spread, much as modified duration does for yields.
- The middle term is the price loss if spreads widen, and the last term is the expected default loss.
- Loss given default is the share lost if the issuer fails.
- It equals one minus the recovery rate.

12 Example 4: an investment-grade bond

Spread 1.40%, spread duration 6.0, widening 0.15%, default 0.4%, LGD 60%

Spread earned		**1.40%**
Loss from widening	6.0 × 0.15%	**−0.90%**
Loss from default	0.4% × 60%	**−0.24%**
Expected excess return	1.40 − 0.90 − 0.24	**0.26%**
Widening against default	0.90 ÷ 0.24	**3.75 times**

IN THE LESSON

- Take an investment grade bond in the credit sleeve.
- Its spread is one point four zero per cent and its spread duration is six.
- Naomi expects spreads to widen by fifteen basis points, which is point one five per cent.
- The price loss is six times point one five, or point nine zero per cent.
- The probability of default is point four per cent and the loss given default is sixty per cent, so the expected default loss is point two four.
- Now subtract.
- One point four zero, minus point nine zero, minus point two four, leaves point two six per cent.
- Most of the premium has gone, and notice which term took it.
- The loss from widening is nearly four times the loss from default.

13 Where the loss comes from

Expected loss (%)

IG: widening	**0.90%**
IG: default	**0.24%**
HY: widening	**2.00%**
HY: default	**2.40%**

HY: 4.50 − 4.0 × 0.50 − 4% × 60% = 0.10%

IN THE LESSON

- Now put a high yield bond beside it.
- The vertical axis is the expected loss in per cent.
- The first pair of bars is the investment grade bond.
- The widening loss is point nine zero and the default loss is only point two four.
- The second pair is a high yield bond with a spread of four point five zero per cent, a spread duration of four, a widening of fifty basis points and a default probability of four per cent.
- Its widening loss is two point zero zero, and its default loss is two point four zero.
- So at the low end of the market, spread risk dominates.
- At the high end, default is the bigger term, which is why credit selection there starts from default and recovery.

14 Duration times spread

DTS = spread duration × spread (in bp)

Spread duration	Sensitivity to a spread change
Spread	Wider spreads move more
Duration times spread	Compare across ratings

IN THE LESSON

- There is a catch with spread duration.
- It tells you the price move for a given change in the spread, but lower rated bonds do not see the same change.
- When worry rises, a wide spread tends to widen by a bigger number of basis points than a tight one.
- In fact, spread changes tend to be roughly proportional to the spread level.
- So a better measure of exposure is duration times spread, usually shortened to D T S.
- Multiply the spread duration by the spread in basis points.
- It is a ratio you can add across a portfolio and compare across ratings.
- A bond with a short spread duration but a very wide spread can carry far more spread risk than its duration suggests.

15 Example 5: the tempting swap

IG: spread 140 bp, SD 6.0. HY: 450 bp, SD 4.0. Both widen 10%

IG: DTS	6.0 × 140	**840**
HY: DTS	4.0 × 450	**1,800**
HY against IG	1,800 ÷ 840	**2.14 times**
IG loss, spread +14 bp	6.0 × 0.14%	**0.84%**
HY loss, spread +45 bp	4.0 × 0.45%	**1.80%**

IN THE LESSON

- An analyst proposes selling the investment grade bond and buying the high yield bond, because its spread duration of four is shorter than six, so surely the spread risk falls.
- Check it with duration times spread.
- The investment grade bond is six times one hundred and forty, which is eight hundred and forty.
- The high yield bond is four times four hundred and fifty, which is one thousand eight hundred.
- That is more than twice as much.
- Now suppose both spreads widen by ten per cent of their level.
- That is fourteen basis points for the first, and forty five for the second.
- The price losses are point eight four and one point eight zero per cent.
- The swap raises spread risk, and adds default risk too.

16 Why the risks arrive together

In a recession

Economy weakens → Spreads widen → Defaults rise

Then the market seizes up

Dealers step back → Bid-ask gaps widen → Forced sellers push down

IN THE LESSON

- The last point is that these risks do not diversify one another.
- They arrive together.
- The top row is the chain of cause and effect in a recession.
- The economy weakens, spreads widen across the market, and defaults begin to rise.
- The bottom row shows what that does to trading.
- Dealers hold back from buying, so bid and ask prices move further apart, the cost of selling goes up, and the investors who must sell, perhaps to meet redemptions, push prices down further.
- For a fund like Brightwater, that means a quiet year of tidy dealer quotes says little about the cost of selling in a crisis.
- A sound manager holds a buffer of liquid assets, and sizes positions with that scenario in mind.

17 A story: the wobbly ruler

- A spread is the gap to some benchmark
- Every benchmark has a flaw
- Maturity mismatch, one yield, hidden options
- We need a ruler that compares like with like

IN THE LESSON

- Measuring a spread is like measuring a table with a ruler.
- If the ruler is too short, or bends, the answer is wrong.
- A spread is the gap between a bond's yield and some benchmark, and the trouble is that every benchmark has a flaw.
- Government bonds may not match the maturity of the corporate bond.
- A single yield ignores the shape of the curve.
- And some bonds, such as callable ones, contain an option that changes their yield for reasons that have nothing to do with credit.
- Naomi needs a ruler that compares like with like.
- Each measure on the next slide fixes one flaw and leaves another, until we reach the option adjusted spread.

18 A ladder of spread measures

Each measure fixes one flaw

Measure	Strength; flaw
Benchmark spread, G-spread	Government base; one yield
I-spread	Swap rates; bank risk
Z-spread	Whole curve; option inside
Option-adjusted spread	Option out; needs volatility

IN THE LESSON

- Here is the ladder.
- The benchmark spread is the bond's yield minus the yield of a government bond of similar maturity.
- It is simple, but the maturities rarely match exactly.
- The G spread improves on it by interpolating the government curve to the bond's exact maturity.
- The I spread uses swap rates instead of government yields, which is useful when government bonds are scarce or distorted, but then the swap curve carries its own bank credit risk.
- The Z spread is the constant spread added to every spot rate on the curve that reproduces the bond's price, so it uses the whole curve.
- But for a callable bond it still includes the option.
- The option adjusted spread finally takes the option out.

19 Example 6: benchmark against G-spread

7-year corporate yields 4.80%; government 5-year 3.60%, 10-year 4.20%

Benchmark spread vs 10-year	4.80 − 4.20	**60 bp**
Interpolated 7-year yield	3.60 + 2/5 × 0.60	**3.84%**
G-spread	4.80 − 3.84	**96 bp**
Hidden by the mismatch	96 − 60	**36 bp**
Better measure	exact maturity	**G-spread**

IN THE LESSON

- Let us see the maturity mismatch in numbers.
- Brightwater holds a seven year corporate bond yielding four point eight zero per cent.
- The nearest government benchmark is the ten year bond at four point two zero, so the benchmark spread is sixty basis points.
- But there is no seven year government bond.
- The G spread interpolates between the five year at three point six zero and the ten year at four point two zero.
- Seven is two fifths of the way from five to ten, so the government yield at seven years is three point six zero plus two fifths of point six zero, which is three point eight four.
- The G spread is four point eight zero minus three point eight four, ninety six basis points.
- The mismatch hid thirty six basis points.

20 Example 7: finding a Z-spread

2-year bond, 5% coupon, price 100.96; spot rates 3.00%, 3.50%

Add 1.00% to each spot rate	4.00%, 4.50%	**z = 1.00%**
Year one cash flow	5 ÷ 1.040	**4.81**
Year two cash flow	105 ÷ 1.045^2	**96.15**
Total present value	4.81 + 96.15	**100.96**
Matches the price	so the Z-spread is	**100 bp**

IN THE LESSON

- Now the Z spread.
- Imagine a two year bond paying a five per cent coupon, with a price of one hundred point nine six.
- The government spot rate for one year is three per cent, and for two years, three point five per cent.
- The Z spread is the one number we add to both spot rates so the discounted cash flows equal the price.
- Try one per cent.
- The rates become four and four and a half.
- The year one cash flow of five, discounted at one point zero four, is four point eight one.
- The year two cash flow of one hundred and five, discounted at one point zero four five squared, is ninety six point one five.
- The total is one hundred point nine six, exactly the price.
- So the Z spread is one hundred basis points.

21 The option hides in the Z-spread

Spread (bp)

Callable: Z	**190**
Callable: OAS	**135**
Option-free: Z	**165**
Option-free: OAS	**165**

Option 55 bp. Callable: 25 cheaper on Z, 30 dearer on OAS

IN THE LESSON

- Now the problem.
- The vertical axis is the spread in basis points.
- Naomi compares two bonds from the same sector, with similar credit quality.
- The first pair of bars is a callable bond.
- Its Z spread is one hundred and ninety basis points, but its option adjusted spread is one hundred and thirty five.
- The fifty five basis point gap is what the market pays the investor for selling the issuer a call option.
- That is not credit compensation.
- The second pair is an option free bond.
- With no option to remove, both bars are one hundred and sixty five.
- On the Z spread, the callable bond looks twenty five basis points cheaper.
- On the option adjusted spread, it is thirty basis points more expensive.

22 Example 8: the volatility catch

Callable bond, Z-spread 190 bp; option values are illustrative

Volatility 10%: option 40 bp	190 − 40	**OAS 150**
Volatility 15%: option 55 bp	190 − 55	**OAS 135**
Volatility 20%: option 72 bp	190 − 72	**OAS 118**
Option-free bond	Z = OAS	**165 bp**
Verdict	option-free pays more	**at every level**

IN THE LESSON

- The option adjusted spread is the measure of choice, because it makes callable and option free bonds comparable.
- But it has a weakness, and it is one input.
- To strip out the option, the model needs an assumption about how much interest rates will move, called volatility.
- The higher the assumed volatility, the more the call option is worth, so more of the Z spread is put down to the option and the option adjusted spread falls.
- These option values are illustrative.
- At ten per cent volatility the option is worth forty basis points, leaving one hundred and fifty.
- At fifteen per cent, fifty five, leaving one hundred and thirty five.
- At twenty per cent, seventy two, leaving one hundred and eighteen.
- That is why two dealers can quote different figures for one bond.

23 Two cross-checks from other markets

Comparing the bond with other markets

Measure	What it compares
Asset swap spread	Bond against floating rate
CDS basis	CDS spread − bond spread
Example: CDS 140, bond Z 125	Basis +15 bp

IN THE LESSON

- There are two more measures that compare a bond with other markets.
- The asset swap spread compares the bond with the floating rate market.
- Imagine swapping the bond's fixed coupons for floating payments, and ask how much extra over the floating rate the bond earns.
- The CDS basis compares the bond with the credit default swap market, where investors buy and sell protection against default.
- The basis is the credit default swap spread minus the bond's spread.
- Say the credit default swap spread is one hundred and forty basis points and the bond's Z spread is one hundred and twenty five.
- The basis is plus fifteen.
- The two markets are pricing the same credit risk differently, and that may point to a trade, or to a funding or liquidity difference.

24 Mistakes to avoid so far

- Counting rolldown twice in the rate view
- Watching default and missing spread widening
- Judging spread risk by spread duration alone
- Reading a callable Z-spread as credit pay
- Treating the OAS as exact: it depends on volatility

IN THE LESSON

- Let us collect the common mistakes from the first three topics.
- One: counting rolldown twice, by measuring the rate view from today's curve while also adding the full rolldown.
- Two: watching default and missing spread widening, which for investment grade bonds is the larger term.
- Three: judging spread risk by spread duration alone, when a bond with a short duration and a very wide spread can carry more risk.
- Four: reading the Z spread of a callable bond as pay for credit risk, when part of it is the price of the call.
- Five: treating the option adjusted spread as exact, when it depends on a volatility assumption.

25 A story: the detective

- Top down: where is the whole market going?
- Bottom up: which issuers pay more than their risk?
- A wide spread is a clue, not an answer
- Always ask why the spread is wide

IN THE LESSON

- Top down investing asks which way the whole market will go.
- Bottom up investing is detective work, issuer by issuer.
- Naomi's job is to find the bond that pays more than its risk deserves, and a spread by itself cannot say that.
- A wide spread might be a bargain, or it might be the market spotting a problem before the rating agency does.
- So the detective asks a chain of questions.
- Which sector is the bond in?
- How strong is the company?
- What spread does that strength usually earn?
- And if this bond pays more, why?
- The answer to that last question decides whether the investor has found a bargain or a trap.

26 The bottom-up process

Find the candidates

Split into sectors → Assess each issuer → Rank spread for risk

Test and manage them

Ask why it is wide → Size the position → Monitor the issuer

IN THE LESSON

- Here is the process in two rows.
- First, split the universe into sectors, such as utilities, industrials or banks, so that like is compared with like.
- A utility and a technology firm with the same debt level do not deserve the same spread.
- Second, assess each issuer's credit quality and compare it with its spread.
- Third, rank the bonds by spread for the risk taken.
- In the second row, check why any bond looks cheap, since the cheapest are the most likely to hide a problem.
- Then size the position, with less for a bond whose story you cannot fully explain.
- Finally, keep monitoring, because a rating lags the news and the spread usually moves first.

27 What the detective checks

Issuer-level credit checks

Check	What it tells you
Leverage	Debt against earnings
Interest coverage	Earnings over interest bill
Cash flow	Money to pay the debts
Business risk, covenants	Steady markets; contract

IN THE LESSON

- This table lists what Naomi checks when she assesses an issuer.
- Leverage is how much debt the company carries against its earnings.
- Interest coverage is how many times its earnings cover the interest bill.
- Cash flow shows whether the company really generates the money to pay.
- Business risk covers how steady the firm's markets and margins are.
- Covenants are the promises in the bond contract, such as limits on more borrowing, which protect the investor.
- No single item decides the answer.
- A bond with rising leverage and falling coverage deserves a wider spread, and if it is not paying one, the rating is probably lagging behind the real position.

28 Example 9: spread per unit of risk

Three same-rated industrial bonds; spread in bp

Bond A, leverage 2.6x	140 ÷ 4.0	**35.0 bp**
Bond B, leverage 2.5x	210 ÷ 5.0	**42.0 bp**
Bond C, leverage 4.6x	260 ÷ 5.5	**47.3 bp**
Widest per unit of risk	but leverage is far higher	**Bond C**
Same risk, more spread	leverage like A's	**Bond B**

IN THE LESSON

- Now a worked comparison.
- Naomi screens three industrial bonds with the same rating.
- To compare bonds of different maturities, she divides each spread by its spread duration.
- Bond A pays one hundred and forty basis points with a spread duration of four, which is thirty five per unit.
- Bond B pays two hundred and ten with a spread duration of five, which is forty two.
- Bond C pays two hundred and sixty with five point five, which is forty seven point three.
- On this yardstick, C looks best.
- But look at the leverage.
- A and B carry two point six and two point five times debt to earnings, while C carries four point six.
- C pays the most because it is the riskiest, and its rating may be out of date.

29 Wide for a reason, or wide for none

Chart: Spread (bp) vs Leverage (debt ÷ earnings)

- ● A 140, on the line
- ● B 210, +74 above
- ● C 260, +40 above
- Fair spread for the sector

IN THE LESSON

- Here is the same screen as a picture.
- The horizontal axis is leverage, debt against earnings, and the vertical axis is the spread in basis points.
- The green line is the spread the sector usually pays for each level of leverage, the fair spread.
- Anything above the line is spread that the leverage does not explain.
- Bond A sits on the line at one hundred and forty, so it is fairly priced.
- Bond B has almost the same leverage but pays seventy four basis points above the line.
- That is the pattern a bottom up investor hunts for.
- Bond C is the widest, but most of its spread is explained by its leverage.
- Only forty basis points sit above the line, and that is the extra reward for the risk of a stale rating.

30 Example 10: high yield looks at default

H1 pays 5.00%, H2 pays 6.20%; recoveries 40% and 30%

H1: expected loss	3% × 60% LGD	**1.80%**
H1: spread after loss	5.00 − 1.80	**3.20%**
H2: expected loss	5% × 70% LGD	**3.50%**
H2: spread after loss	6.20 − 3.50	**2.70%**
Verdict	wider pays less	**Prefer H1**

IN THE LESSON

- In high yield, the process leans harder on default and recovery.
- Naomi compares two high yield bonds.
- H one pays five per cent over government bonds, with a three per cent chance of default and a recovery of forty per cent.
- The loss given default is sixty per cent, so the expected loss is one point eight zero, and what is left is three point two zero.
- H two pays six point two zero, with a five per cent chance of default and a recovery of thirty per cent.
- The loss given default is seventy, the expected loss is three point five zero, and what is left is two point seven zero.
- The wider bond pays less after expected losses.
- Widest is not best, so she prefers H one.

31 A wide spread: what to conclude

Always compare within the same sector

If the spread is ...	Then ...
Wide, fundamentals sound	Candidate to buy
Wide, leverage rising	Avoid or hold small
Tight, fundamentals weakening	Sell or avoid
Wide, hard to trade	Hold a small amount

IN THE LESSON

- To finish, here is a short guide for the decision.
- If a spread is wide and the fundamentals are sound, the bond is a candidate to buy, because the extra spread is not explained by the credit.
- If a spread is wide and leverage is rising, the market may be seeing deterioration the rating has not caught, so avoid it or hold a small position.
- If a spread is tight and the fundamentals are weakening, the bond is expensive for its risk, and a sale may be sensible.
- If a spread is wide because the bond is small and hard to trade, ask for the extra compensation, but keep it small.
- And always compare within the same sector.

32 Recap: the lesson in five lines

- Return = rolling yield + view + convexity − credit loss
- Credit: default, spread widening, liquidity
- Option-adjusted spread compares like with like
- Bottom up: spread for the risk, inside a sector
- Ask why a spread is wide before buying it

IN THE LESSON

- Let us pull the lesson together.
- First, a yield curve strategy earns its rolling yield, which is yield income plus rolldown, and then the rate view, convexity and credit losses are added, with the view always measured from the rolled down curve.
- Second, credit positions carry default, spread and liquidity risk, and for investment grade bonds spread widening usually matters most.
- Third, the option adjusted spread compares callable and option free bonds fairly, though it depends on a volatility assumption.
- Fourth, bottom up investors compare spread with risk within a sector and ask why it is wide.
- Fifth, widest is not best.

33 Try three quick questions

1. Income 3.0%, rolldown 0.40%, MD 5.0, yields +0.20% vs rolled curve. Return?
   Answer: 3.0 + 0.40 − 5.0 × 0.20 = 2.40%.
2. Spread 2.00%, SD 4.0, widening 0.25%, PD 2%, LGD 50%. Excess return?
   Answer: 2.00 − 1.00 − 1.00 = 0.00%.
3. Callable Z 160 bp (option 45 bp); option-free Z 130 bp. Which pays more?
   Answer: Callable OAS 115 bp. Option-free pays 15 bp more.

IN THE LESSON

- Now try three quick questions yourself.
- Pause after each one.
- Question one.
- Yield income is three per cent, rolldown is point four zero, modified duration is five, and yields end point two zero above the rolled down curve.
- Expected return, ignoring convexity and credit?
- Three point four zero, minus five times point two zero, is two point four zero per cent.
- Question two.
- A bond has a spread of two per cent, spread duration four, expected widening point two five, default probability two per cent and loss given default fifty per cent.
- Excess return?
- Two, minus one, minus one, is zero.
- Question three.
- A callable bond has a Z spread of one hundred and sixty basis points, of which forty five is the option.
- An option free bond has a Z spread of one hundred and thirty.
- Which pays more for credit risk?
- The callable bond's option adjusted spread is one hundred and fifteen, so the option free bond pays fifteen more and is the better buy.