Rates, credit and the equity risk premium

Portfolio Management

1 A story: two price tags

- Conventional bond: fixed money payments
- Inflation linked bond: payments rise with prices
- Nominal yield minus real yield = the break-even
- A hint about inflation, not a clean forecast

IN THE LESSON

- Imagine a baker who sells you a loaf every week for a year.
- She offers two deals.
- In the first deal you pay a fixed amount today and she promises you a loaf each week, whatever happens to flour prices.
- In the second deal she promises you whatever the loaf costs at the time, adjusted for the rise in prices.
- Which deal is better depends on how fast prices rise.
- Government bonds work the same way.
- A conventional bond pays fixed money.
- An inflation linked bond pays money that rises with consumer prices.
- Its yield is a real yield, measured after inflation.
- Comparing the two yields hints at what the market expects, but only a hint, and this section is about why.

2 What a break-even is made of

Break-even = Nominal yield − Real yield = Expected inflation + Risk premium − Liquidity premium

Nominal yield	Conventional government bond
Real yield	Inflation linked, same maturity
Expected inflation	What investors truly expect
Risk premium	Pushes the break-even up
Liquidity premium	Pushes the break-even down

IN THE LESSON

- Here is the formula.
- The break-even inflation rate is the nominal yield on a conventional government bond minus the real yield on an inflation linked bond of the same maturity.
- It is the inflation rate at which the two bonds would give you the same result, which is why it is called break even.
- Now the second line, which is the one examiners care about.
- The break-even equals expected inflation, plus an inflation risk premium, minus a liquidity premium.
- The risk premium is extra yield that holders of conventional bonds demand for bearing the danger that inflation comes in higher than expected.
- The liquidity premium sits in the linker yield, because linker markets are smaller, and it pushes the real yield up and so shrinks the break-even.

3 Example 1: stripping a break-even

10-year bonds. Nominal 4.3%, real 1.8%, risk premium 0.4%, liquidity 0.2%

Break-even	4.3 − 1.8	**2.5%**
Add back liquidity premium	2.5 + 0.2	**2.7%**
Remove risk premium	2.7 − 0.4	**2.3%**
Expected inflation	2.5 − 0.4 + 0.2	**2.3%**
Naive error	2.5 − 2.3	**0.2**

IN THE LESSON

- Example one.
- Mira, an analyst at a fictional fund, sees a ten year conventional government bond yielding four point three per cent, and a ten year inflation linked bond with a real yield of one point eight per cent.
- The break-even is four point three minus one point eight, which is two point five per cent.
- Now she wants expected inflation.
- Her model puts the inflation risk premium at zero point four, and the liquidity premium in the linker yield at zero point two.
- First add the liquidity premium back, because it had squeezed the gap: two point seven.
- Then take away the risk premium: two point three.
- Expected inflation is two point three per cent, not two point five.
- Treating the break-even as the forecast overstates it, a small but real error.

4 The same break-even, in pieces

Per cent a year

Expected inflation	**2.3**
Risk premium	**+0.4**
Liquidity effect	**−0.2**
Break-even	**2.5**

IN THE LESSON

- Here is the same example as bars.
- The vertical axis shows per cent a year.
- The first bar is expected inflation, two point three.
- That is what investors really believe.
- The next bar is the inflation risk premium, which adds zero point four on top, because conventional bond holders want paying for the danger of surprise.
- The third bar is the liquidity effect, which takes away zero point two, because the thin linker market already pays investors extra, and that extra raises the real yield and cuts the gap.
- Put the three together and you get the last bar, the break-even of two point five.
- Many different mixes of beliefs and premiums give the same quoted number, which is exactly why you cannot read it as a pure forecast.

5 Example 2: a downturn moves the premiums

Downturn: expectations 2.0%, risk premium 0.1%, liquidity 0.5%

New break-even	2.0 + 0.1 − 0.5	**1.6%**
Fall in break-even	2.5 → 1.6	**−0.9**
Fall in expectations	2.3 → 2.0	**−0.3**
Share from premiums	(0.9 − 0.3) ÷ 0.9	**two thirds**

IN THE LESSON

- Example two.
- Now a downturn arrives.
- Mira's view is that expected inflation falls from two point three to two point zero.
- Inflation uncertainty eases, so the risk premium shrinks from zero point four to zero point one.
- But markets are nervous and the linker market gets thinner, so the liquidity premium grows from zero point two to zero point five.
- The new break-even is two point zero, plus zero point one, minus zero point five, which is one point six per cent.
- The break-even fell zero point nine, from two point five to one point six.
- Yet expectations fell only zero point three.
- So two thirds of the move came from the premiums, not from any change in beliefs.
- Reading the quote as a forecast would exaggerate how much hope for low inflation the market has.

6 What widens and narrows the break-even

Direction of the break-even

Change	Break-even
Expected inflation rises	Widens
Uncertainty rises, as in expansions	Widens
Linker liquidity premium rises	Narrows
Downturn	Tends to narrow

IN THE LESSON

- Let us collect the moves in one table, so you can answer a direction question quickly.
- When expected inflation rises, the break-even widens, because conventional yields rise but real yields do not.
- When inflation becomes more uncertain, as it often does in strong expansions, the risk premium rises, and the break-even widens even if the average forecast has not moved.
- When the linker market gets thinner and investors want extra yield, the liquidity premium rises, and the break-even narrows without any change in beliefs.
- In downturns, falling expectations and lower uncertainty narrow it.
- The exam trap is to call the break-even expected inflation without removing the premiums.

7 A story: the lender's fee

- Credit spread = corporate yield minus government yield
- A fee for the chance that the borrower fails
- Lenders ask a bigger fee when times look bad
- So the fee moves with the business cycle

IN THE LESSON

- Picture a neighbour who lends money to the shop on your street.
- When the shop is thriving, she asks for a small fee over what the bank pays her, because she is sure to be repaid.
- When trade slows, she asks for a bigger fee, for two reasons.
- She now thinks the shop is more likely to fail, and she is more worried about her own finances, so she is less willing to take any risk at all.
- Bonds work the same way.
- The credit spread is the extra yield a corporate bond pays over a government bond of similar maturity.
- It is the fee for lending to a company that might not pay you back.
- The fee changes with the economy.

8 What a credit spread pays for

Pieces of one spread

Expected default losses → Reward for risk in bad times → Illiquidity → Credit spread

IN THE LESSON

- Let us open the fee up.
- A spread has three jobs.
- The first is to cover expected default losses: if a few bonds in a thousand will fail and lose part of their value, the rest must earn enough to make up for it on average.
- The second is the extra reward for the risk that losses are higher than expected, and that they arrive in bad times, when investors can least afford them.
- The third is a small payment for illiquidity, because corporate bonds are harder to sell quickly than government bonds.
- Add them together and you have the spread.
- In a recession, the first two grow together, which is why spreads move so sharply.

9 Spreads through the cycle

Chart: Credit spread vs Time through the cycle

- High yield widens most
- Investment grade
- Recession

IN THE LESSON

- Here is the picture.
- The horizontal axis is time through one full cycle, starting in an expansion, passing through a recession in the middle, and recovering.
- The vertical axis is the credit spread.
- Look at the gold line first, investment grade bonds, the safer issuers.
- It is low in the expansion, rises a little as the recession comes, and falls back in recovery.
- Now the red line, high yield bonds, the lower rated issuers.
- It starts low too, but it climbs far higher at the peak of the recession, and falls steeply in the recovery.
- The weaker the issuer, the bigger the move in basis points.

10 The price effect of a spread move

Price change ≈ − Duration × Δ Yield − Spread duration × Δ Spread

Price change	Approximate percentage change
Spread duration	Price sensitivity to the spread
Spread change	In percentage points

IN THE LESSON

- To measure what a spread change does to a bond, we use spread duration, which says how much the price falls for each one point rise in the spread.
- For a plain fixed rate bond it is close to its ordinary duration.
- The price change from the spread is about minus spread duration, times the change in spread.
- If the spread widens, the change is positive and the price falls.
- If it narrows, the price rises.
- To get the full return you add the effect of the move in government yields, which is minus duration times the change in the yield.
- In a recession these two effects pull in opposite directions, and the spread effect on weaker bonds can be much the bigger one.

11 Example 3: a recession bites

Gov. yields −1.0. IG: duration 4.5, spread +0.8. HY: duration 4.0, spread +4.0

Government bond	4.5 × 1.0	**+4.5%**
Investment grade	4.5 − 4.5 × 0.8	**+0.9%**
High yield	4.0 − 4.0 × 4.0	**−12.0%**

IN THE LESSON

- Example three, with made up bonds.
- Government yields fall by one point as a recession begins.
- A government bond with duration four point five gains four point five per cent, from the rate move alone.
- An investment grade bond with duration four point five also gains four point five from the rate move, but its spread widens by zero point eight.
- The spread effect is four point five times zero point eight, a loss of three point six, so its total is a gain of zero point nine.
- Now a high yield bond with duration four.
- It gains four from the fall in yields, but its spread widens four points, a loss of sixteen.
- Its total is a loss of twelve per cent.
- Falling government yields did not rescue it.

12 Example 4: the recovery reverses it

Recovery: yields +0.5. Spreads: IG −0.5, HY −2.5

Government bond	−4.5 × 0.5	**−2.25%**
Investment grade	−2.25 + 2.25	**0.0%**
High yield	−4.0 × 0.5 + 4.0 × 2.5	**+8.0%**

IN THE LESSON

- Example four is the recovery.
- Now government yields rise by zero point five, as the economy heals, and spreads fall back: investment grade by zero point five, high yield by two and a half points.
- The government bond, with duration four point five, loses two point two five per cent, because yields rose.
- The investment grade bond loses the same from yields, but gains four point five times zero point five from its narrowing spread, which is two point two five, so it ends flat.
- The high yield bond loses two from yields and gains four times two point five, which is ten, for a gain of eight per cent.
- So credit sensitive bonds underperform in the downturn and outperform in the recovery, and the lowest rated bonds swing the most.

13 Mistakes so far

- Break-even is not pure expected inflation
- Falling gov. yields do not guarantee rising corporate prices
- Lower rated spreads move far more than investment grade
- Spread widens: price falls. Spread narrows: price rises

IN THE LESSON

- Time to stop and collect the traps from the first half.
- The first is to read a break-even as a pure forecast of inflation.
- It contains an inflation risk premium that pushes it up and a liquidity effect that pulls it down, so you must adjust before calling it expected inflation.
- The second is to say that, because government yields fall in a recession, corporate bond prices must rise.
- For weaker issuers the spread widening can easily swamp the rate effect, as the high yield bond showed.
- The third is to assume every credit moves the same amount.
- Spreads on lower rated issuers widen by far more in basis points.
- And keep the signs straight, because widening hurts price and narrowing helps it.

14 A story: the bakery and the ice cream stall

- Bakery: steady demand, loyal customers
- Ice cream stall: weather, rivals, no pricing power
- Same debt, very different chance of repayment
- Credit depends on the market, not only on the loan

IN THE LESSON

- Two friends want to borrow the same amount of money.
- One runs a bakery in a village, where everyone buys bread every day, whatever the weather and whatever the news.
- The other runs an ice cream stall on a beach, which does well in sunshine and nothing in the rain, and where a dozen other stalls sell almost the same cone.
- A lender would worry far more about the stall.
- The debt is the same, but the stall's income swings, it cannot raise prices without losing customers, and its costs run on even when nobody comes.
- The market a business sells into shapes how steady its cash is, and steady cash is what pays the lender.

15 Which markets support credit

Features of the market a company sells into

Feature of the market	Effect on credit
Stable, predictable demand	Stronger
Pricing power, high barriers to entry	Stronger
Commodity product, many rivals	Weaker
High fixed costs, volatile demand	Weaker

IN THE LESSON

- Here are the features an analyst looks for.
- Stable and predictable demand supports credit, because revenue does not vanish in a downturn.
- Pricing power and high barriers to entry do too: if a firm can pass on higher costs and keep new competitors out, its margin holds.
- The opposite list is the weak credit.
- Many rivals selling commodity like products leaves no pricing power.
- High fixed costs and volatile demand mean profit collapses when sales dip.
- So two firms at the same leverage can sit in very different places on the credit ladder, depending on the market.

16 The two ratios, and the cost shape

Leverage = Debt ÷ EBITDA
Cover = EBITDA ÷ Interest

Leverage	Years of earnings to repay debt
Interest cover	Times earnings cover interest
EBITDA	Revenue − variable − fixed costs
Fixed costs	Do not fall when sales fall

IN THE LESSON

- Analysts start with two ratios.
- Leverage is debt divided by operating earnings, which we write EBITDA, so it says how many years of earnings it would take to repay the debt.
- Interest cover is operating earnings divided by interest, so it says how many times the earnings can pay the interest bill.
- Then comes the cost shape.
- Earnings equal revenue minus variable costs minus fixed costs.
- If fixed costs are large, a small fall in revenue becomes a big fall in earnings, because the fixed costs do not shrink.
- That is operating leverage, and it comes from the market as much as from the firm.
- The ratios are today's picture.
- The market tells you what they become in a downturn.

17 Example 5: two issuers today

Utility: debt 2,000, interest 100. Boards: debt 1,000, interest 60

Utility: EBITDA	1,000 − 500	**500**
Utility: leverage, cover	2,000 ÷ 500; 500 ÷ 100	**4.0x; 5.0x**
Boards: EBITDA	2,000 − 900 − 600	**500**
Boards: leverage	1,000 ÷ 500	**2.0x**
Boards: cover	500 ÷ 60	**8.3x**

IN THE LESSON

- Example five.
- Delta Utilities, a fictional regulated water style business, has revenue of one thousand, costs of five hundred which we treat as fixed, debt of two thousand and interest of one hundred.
- Its earnings are five hundred, so leverage is two thousand over five hundred, four times, and interest cover is five hundred over one hundred, five times.
- Birch Boards, a fictional maker of commodity packaging, has revenue of two thousand, variable costs of nine hundred, fixed costs of six hundred, debt of one thousand and interest of sixty.
- Its earnings are also five hundred, but leverage is only two times, and cover is about eight point three times.
- On today's numbers, Birch looks much the stronger credit.

18 Example 6: the same recession hits both

Utility revenue −2%. Boards volume −10% and price −10%

Utility: EBITDA	980 − 500	**480**
Utility: cover, leverage	480 ÷ 100; 2,000 ÷ 480	**4.8x; 4.2x**
Boards: revenue	2,000 × 0.9 × 0.9	**1,620**
Boards: EBITDA	1,620 − 810 − 600	**210**
Boards: cover, leverage	210 ÷ 60; 1,000 ÷ 210	**3.5x; 4.8x**

IN THE LESSON

- Example six is the recession.
- The utility sells an essential service at regulated prices, and its revenue falls just two per cent, to nine hundred eighty.
- Its costs are fixed, so earnings are four hundred eighty, cover is four point eight times and leverage about four point two.
- Birch Boards is different.
- Volumes fall ten per cent and, because it has no pricing power, its prices fall ten per cent too, so revenue drops to sixteen hundred twenty.
- Variable costs fall with volume, to eight hundred ten, but the fixed six hundred stay.
- Earnings are two hundred ten, down fifty eight per cent from a nineteen per cent fall in revenue.
- Cover falls to three point five, and leverage rises to about four point eight.
- The firm with half the debt is now the weaker credit.

19 Cover today and in the downturn

Interest cover (times)

Utility today	**5.0**
Utility downturn	**4.8**
Boards today	**8.3**
Boards downturn	**3.5**

IN THE LESSON

- Here are the cover figures as bars.
- The vertical axis shows times cover, earnings divided by interest.
- Look at the two utility bars first.
- Today the cover is five, and in the downturn it is four point eight.
- A small slip.
- The utility is a steady business.
- Now the two bars for Birch Boards.
- Today the cover is eight point three, the tallest bar on the page, which is why the firm looks so safe.
- In the downturn it falls to three point five, the shortest.
- The ranking has turned over.
- The lesson is to ask not only what cover is today, but what the market would do to it in a bad year.

20 What the analyst asks, and the trap

- How steady is demand in a recession?
- Can it pass on higher costs? How easy is entry?
- How much of the cost base is fixed?
- Stress revenue and margins, then recompute the ratios
- Trap: ranking on today's leverage alone

IN THE LESSON

- So what does a credit analyst ask about the market?
- How steady is demand through a recession?
- Can the firm raise prices when its costs go up?
- How easily could a new competitor enter?
- What share of costs is fixed?
- Then the analyst stresses the revenue and margins, and recomputes the ratios.
- The trap is ranking issuers on today's leverage alone.
- A cyclical producer with modest debt can be a worse credit than a utility like business carrying more debt, exactly as our example showed.

21 A story: the umbrella seller

- Umbrella business pays when you are short of money
- Sun cream business pays when you are comfortable
- Insurance-like assets accept a lower expected return
- It is the timing of payoffs that is priced

IN THE LESSON

- Imagine you could buy one of two small businesses.
- One sells umbrellas, and it earns most of its money in rainy seasons.
- The other sells sun cream, and it earns most in sunny seasons.
- Now suppose your income comes from an outdoor job, so that rainy weeks are the weeks you earn nothing and worry about bills.
- The umbrella business pays you most exactly when you most need cash.
- You would happily accept a lower return on it, because it is a form of insurance.
- The sun cream business pays when you are already comfortable, so it must offer more.
- The same idea applies to assets.
- Investors do not care only about the average payoff.
- They care about when it arrives.

22 Pricing by when the money arrives

Price today = Σ Probability × Value of money × Payoff

Price today	What the asset costs now
Probability	Chance of each state
Value of money	Higher when consumption is low
Payoff	What the asset pays in that state

IN THE LESSON

- Here is a way to price any asset by timing.
- Think of a few possible states next year, such as a boom and a recession.
- Each has a probability.
- Each also has a value of money, which says how much one unit arriving in that state is worth today.
- It is higher in a recession, where consumption is low and each extra unit of wealth matters more.
- This value reflects both patience and how badly money is wanted in that state.
- The asset's price today is the sum, across states, of probability times the value of money times the payoff in that state.
- An asset that pays more in the states where money is dear gets a high price, and so a low expected return.

23 Example 7: three assets, one average payoff

Boom and recession 50/50. Value of money 0.80 and 1.10

Risk-free bond: price	0.5×0.8×100 + 0.5×1.1×100	**95**
Equity-like: price, return	100 ÷ 92 − 1	**92; 8.70%**
Hedge: price, return	100 ÷ 98 − 1	**98; 2.04%**
Equity premium over bond	8.70 − 5.26	**3.4 points**

IN THE LESSON

- Example seven.
- Two states, boom and recession, each with probability one half.
- A unit of money arriving in the boom is worth zero point eight today, and in the recession one point one.
- A risk free bond pays one hundred in both states.
- Its price is a half times zero point eight times one hundred, plus a half times one point one times one hundred, which is ninety five.
- Its return is one hundred over ninety five, minus one, five point two six per cent.
- An equity like asset pays one hundred twenty in the boom and eighty in the recession, so its price is ninety two.
- Its expected payoff is one hundred, so its return is eight point seven per cent, a premium of about three point four over the bond.
- A hedge, paying the reverse, costs ninety eight and returns two point zero per cent, below the risk free rate.

24 Same average payoff, different expected return

Expected return (%)

Risk-free bond	**5.26**
Equity-like	**8.70**
Hedge	**2.04**

IN THE LESSON

- Look at the picture.
- The vertical axis is the expected return in per cent.
- The first bar is the risk free bond, five point two six.
- The second bar is the equity like asset, eight point seven.
- It pays an average of one hundred, the same as the others, and has the same spread of outcomes as the hedge, just mirrored.
- Yet it earns much more, because it pays less in the recession, when money is dear.
- The third bar is the hedge, two point zero.
- It earns less than the risk free bond, because it pays most in the recession.
- This is the heart of the outcome.
- Equities are poor consumption hedges, so they must offer a sizeable premium over safe bonds.

25 Example 8: the premium rises in bad times

More fearful: value of money 0.70 in a boom and 1.20 in a recession

Risk-free bond: price	0.5×0.7×100 + 0.5×1.2×100	**95**
Equity-like: price, return	100 ÷ 90 − 1	**90; 11.11%**
Equity premium	11.11 − 5.26	**5.8 points**
Hedge: price, return	100 ÷ 100 − 1	**100; 0.0%**

IN THE LESSON

- Example eight shows that the premium moves.
- Keep the same assets, but now investors have become more worried, so money in a recession is dearer relative to money in a boom.
- The values become zero point seven in the boom and one point two in the recession.
- The bond still costs ninety five, so its return is still five point two six per cent.
- The equity like asset now costs half times zero point seven times one hundred twenty, plus half times one point two times eighty, which is ninety.
- Its return is eleven point one one per cent.
- The premium has grown from three point four to about five point eight points.
- The hedge now costs one hundred, so it returns nothing.
- Higher risk aversion lifts the equity premium and lowers equity prices.

26 Assets by when they pay

- Insurance-type assets
- Government bonds
- Company bonds
- Shares

IN THE LESSON

- Here is a line of assets, from those that pay in bad times on the left to those that pay in good times on the right.
- These are illustrations of the idea, not data.
- On the far left sit insurance like assets, which pay when things go wrong.
- Such assets can offer an expected return below the risk free rate, the price paid for protection.
- Government bonds in a normal recession sit left of the middle, because their yields tend to fall and their prices to rise when growth is weak.
- Company bonds sit nearer the right, because their spreads widen at the worst moment.
- Shares sit furthest right, because profits and prices fall in recessions.
- The further right an asset sits, the larger the premium.

27 The trap: volatility is not the price

- Same volatility, very different expected returns
- Ask when the payoff arrives, not how wide it swings
- A hedge may earn less than the risk-free rate
- The premium tends to rise in bad times

IN THE LESSON

- A classic exam trap sits right here.
- A board member says the most volatile asset must carry the biggest premium.
- But our equity like asset and our hedge had the very same spread of outcomes, a hundred and twenty or eighty, and yet one earned eight point seven and the other two.
- Volatility alone told you nothing.
- What mattered was the timing: does the asset pay when consumption is low and money is dear, or when it is high?
- Another trap is to say the premium is fixed.
- It tends to rise in bad times, when risk aversion is high, which is also when prices are low.
- So ask when the asset pays, not only how much it swings.

28 Recap of the whole lesson

- Break-even = expected inflation + risk premium − liquidity
- Spreads widen in recession; high yield moves most
- Price effect ≈ − spread duration × spread change
- Steady, protected markets support credit
- Equity premium pays for poor consumption hedging

IN THE LESSON

- Let us pull it together.
- First, the break-even is nominal yield minus real yield.
- It equals expected inflation plus an inflation risk premium minus a liquidity premium, so it overstates expected inflation when the risk premium is positive.
- Second, credit spreads pay for expected default, for bad timing and for illiquidity.
- They widen into and during a recession, and narrow in the recovery, with lower rated issuers moving by far the most.
- The price effect is about minus spread duration times the change in spread.
- Third, steady, protected markets support credit, while cyclical, commodity like markets with fixed costs weaken it, whatever today's leverage says.
- And fourth, shares pay a premium because they pay badly when money is dear.

29 Try three quick questions

1. Nominal 3.8%, real 1.5%, risk premium 0.3%, liquidity 0.2%. Expected inflation?
   Answer: Break-even 2.3%; 2.3 − 0.3 + 0.2 = 2.2%.
2. HY: duration 5, yields −0.6, spread +2.0. Return?
   Answer: +3.0% from rates, −10.0% from spread: −7.0%.
3. Pays in recessions, or in booms: which needs the higher return?
   Answer: The boom payer: it pays when money matters least.

IN THE LESSON

- Now try three quick questions.
- Pause after each one.
- Question one.
- A ten year conventional bond yields three point eight per cent and the linker has a real yield of one point five.
- The risk premium is zero point three and the linker liquidity premium is zero point two.
- What is expected inflation?
- The break-even is two point three.
- Subtract the risk premium and add the liquidity premium, and expected inflation is two point two per cent.
- Question two.
- A high yield bond has a spread duration of five.
- Government yields fall zero point six and its spread widens two points.
- What is the return?
- Rates add three, the spread takes away ten, so it loses seven per cent.
- Question three.
- Which pays better, an asset that pays in recessions, or one that pays in booms?
- The boom asset must offer the higher expected return, because it pays when money matters least.