CHARTA LEARNING · LESSON NOTES

What is inside an interest rate?

CFA Level I · Quantitative Methods

You will learn: Break a nominal interest rate into its five parts, build a required return from a risk-free rate and a risk premium, and isolate a single premium from market yields.

Running example: Examples use made-up figures: a five-year loan to a small, reliable company with a real risk-free rate of 1.5%, expected inflation of 2.5%, a default premium of 2%, a liquidity premium of 0.5% and a maturity premium of 0.75%.

1. The five parts of a nominal rate

- An interest rate is five reasons added together. The nominal rate is the headline rate you see quoted, before any adjustment.
- Real risk-free rate: the pure reward for giving up spending today and waiting, assuming the borrower is certain to repay. Expected inflation: the top-up for rising prices; it is a guess when the loan is agreed.
- Default risk premium: extra for the chance of non-payment (the shakier the borrower, the bigger). Liquidity premium: extra for being unable to sell quickly without losing value. Maturity premium: extra for tying money up longer, since more can go wrong.
- Real risk-free rate plus expected inflation is the nominal risk-free rate: what a completely safe borrower would pay.

Nominal rate = real risk-free rate + expected inflation + default premium + liquidity premium + maturity premium

Watch out: Treating a yield as one number, and forgetting that the market rate is nominal and already contains inflation.

2. Adding is an approximation

- Adding the real rate and inflation is a shortcut. The exact way is to multiply the growth factors.
- For small rates the shortcut is fine and most questions allow it. If a question gives the exact approach, or wants more decimals, use the multiplying version.

(1 + nominal) = (1 + real) × (1 + inflation)

REAL RATE 1.5%, EXPECTED INFLATION 2.5%

Shortcut: add	1.5% + 2.5%	**4.00%**
Exact: multiply	(1.015 × 1.025) − 1	**4.04%**
Difference	tiny for small rates	**0.04%**

3. Building a rate and reading the news

- Build the rate in two steps: the safe part (real rate plus inflation), then the three risk premiums. Everything above the safe part is payment for risk.
- When a yield moves, ask which piece moved. If the company's own results worsen, the default premium rises. If a loan becomes hard to trade, the liquidity premium rises.
- Quick test: if safe government yields moved too, the news is about inflation or the real rate. If only the company's yield moved, the news is about that company's risk.

FIVE-YEAR LOAN TO A SMALL, RELIABLE COMPANY

Safe part: real + inflation	1.50 + 2.50	**4.00%**
Three risk premiums	2.00 + 0.50 + 0.75	**3.25%**
Nominal interest rate	4.00 + 3.25	**7.25%**
News: yield rises 7.25% to 8.25%	bad results: default premium; faster inflation expected: expected inflation (government yields rise too); loan hard to trade: liquidity premium	

Watch out: Reading a yield as one number hides which piece moved.

4. Required return

- The required return is the minimum return an investor would accept. Below it, walk away; above it, be interested. It is built from the same pieces.
- The risk-free rate is the yield on short-term loans to a very safe government, such as a treasury bill. It is nominal, so it equals the real risk-free rate plus expected inflation. Risk-free means almost no chance of non-payment, not a guaranteed win over prices.
- The risk premium is the sum of the extras an investment carries: default, liquidity and maturity for loans. The equity risk premium is the extra return required for owning shares rather than safe government loans.
- Required return is what you demand; expected return is what you think the investment will deliver. Expected above required: attractive, buy. Expected below required: pass. Buying pushes price up and expected return down until the two roughly match.

> **Required return = risk-free rate + risk premium**

SHOULD YOU BUY THE COMPANY BOND?

Risk-free rate		**4.00%**
Risk premium	2.00 + 1.00 + 0.50	**3.50%**
Required return	4.00 + 3.50	**7.50%**
Offer A: yields 7.0%	7.0 < 7.5	**Pass**
Offer B: yields 8.2%	8.2 > 7.5	**Buy**

Watch out: Mixing up required and expected return.

5. Isolating a premium from market yields

- Compare two instruments that differ in only one way. The whole gap between their yields then belongs to that one difference.
- If the two instruments differ in more than one way, you cannot isolate a single premium, so check what is the same and what is different.
- Work from the baseline up: the one-year Treasury bill is the risk-free rate, then maturity, then default, then liquidity. The pieces must rebuild the highest yield.

> **Premium = yield of the instrument that differs − yield of the baseline instrument**

REAL RATE 2%, EXPECTED INFLATION 3% (ILLUSTRATIVE YIELDS)

Risk-free rate	(1.02 × 1.03) − 1 = 1-year Treasury bill	**5.06%**
Maturity premium	10-year Treasury 5.96 − 5.06	**0.90%**
Default premium	10-year corporate (trades often) 7.16 − 5.96	**1.20%**
Liquidity premium	same company, rarely trades 7.56 − 7.16	**0.40%**
Check	5.06 + 0.90 + 1.20 + 0.40	**7.56%**

Watch out: Calling a gap one premium when two things differ.

Key takeaways

- A nominal rate is five parts: real rate, expected inflation, default, liquidity and maturity premiums.
- Real rate plus expected inflation is the nominal risk-free rate; adding is a shortcut, multiplying is exact.
- When a yield moves, ask which of the five pieces the news is about.
- Required return = risk-free rate + risk premium; buy only if the expected return is above it.
- To isolate a premium, subtract the yields of two instruments that differ in one way only.
- Rising expected inflation lifts nominal rates on all loans.

Quick check

1. A company bond yields 6.5%. A government bond of the same maturity, equally easy to sell, yields 4.5%. What is the 2.0% gap?
   Answer: Default risk premium. Only the borrower differs.
2. Expected inflation rises by 1 percentage point. What happens to nominal rates?
   Answer: They rise by about 1 point on all loans. Inflation is in every rate.
3. Two bonds, same company, same maturity. The harder to trade yields 0.5% more. What is that 0.5%?
   Answer: The liquidity premium.