CHARTA LEARNING · LESSON NOTES

Credit risk: ratings, spreads and expected loss

CFA Level I · Fixed Income

You will learn: Explain the two parts of credit risk, calculate expected loss, read and notch credit ratings, break a credit spread into its pieces, and estimate how a spread move changes a bond's price.

Running example: Worked examples follow one made-up company, Calder Freight. Its senior unsecured bond has face value 100, a 4% coupon paid twice a year, 5 years to maturity, and the government bond yields 3.00%. All figures are examples.

1. Credit risk and expected loss

- Credit risk is the risk that a borrower fails to pay in full and on time. Failing to pay is default. Two questions measure it: how likely is default, and how much is lost if it happens?
- Exposure is the amount lent. Probability of default (PD) is the chance of default over the period, usually a year. Recovery rate is the share of exposure got back; loss given default (LGD) is one minus the recovery rate.
- Expected loss is the average loss per year if the same loan were made many times, not what happens in one case. Seniority changes the loss, not the odds: bonds of one issuer share the same PD but differ in recovery.

Expected loss = Exposure × PD × LGD; LGD = 1 − Recovery rate

CALDER, EXPOSURE 10 MILLION, PD 0.50%

Senior unsecured: recovery 50%	LGD 50%; 10,000,000 × 0.005 × 0.50	**25,000**
Secured: recovery 70%	LGD 30%	**15,000**
Subordinated: recovery 20%	LGD 80%	**40,000**
Rough patch: PD 3%, recovery 35%	LGD 1 − 0.35 = 65%	**195,000 (1.95%)**
The trap: multiplying by recovery	3% × 35%	**1.05% (wrong)**

Watch out: Using the recovery rate instead of the loss given default.

2. Credit ratings and notching

- Rating agencies (S&P, Moody's, Fitch) publish a letter grade, with AAA the safest. A rating is an opinion about relative default risk, not a fact, not a price and not advice to buy. The issuer usually pays for it, which raises a conflict of interest.
- From BBB− upward is investment grade; below that is high yield (speculative grade). Many investors, such as pension funds, may hold only investment grade. S&P style letters are used; Moody's writes BBB− as Baa3.
- The issuer rating describes the borrower's senior unsecured debt. An issue rating is for one bond. Notching moves from issuer to issue rating: secured up, subordinated down.
- Holding company debt is notched down because of structural subordination: the operating company pays its own lenders first, and only the leftover goes up to the holding company.

CALDER GROUP, ISSUER RATING BBB

Secured bond, up one notch	BBB → BBB+	**BBB+**
Subordinated bond, down two	BBB → BBB− → BB+	**BB+**
Holding company bond, down one	BBB → BBB−	**BBB−**
Still investment grade?	BB+ is high yield	**No**

Watch out: Forgetting to notch; a subordinated bond may fall out of investment grade.

3. Where ratings fall short

- Ratings lag the market. Agencies move slowly on purpose, so the spread has often already widened before a downgrade is announced.
- Ratings are opinions on default risk only: they say nothing about whether the price is fair, and they ignore liquidity and the risk of spread widening short of default.
- Agencies can disagree with each other, and slow changes create cliff effects when a downgrade comes suddenly. A rating is a starting point, not the whole analysis.
- Credit risk is more than default. Credit migration (downgrade) risk is the market judging the borrower riskier so the price falls. Market liquidity risk is being unable to sell without a worse price.

RATINGS LAG THE MARKET (MADE-UP)

Spread before the market worries		**1.0%**
Spread on the day of the downgrade	already risen	**2.4%**

4. The pieces of a credit spread

- The yield spread is the extra yield on a corporate bond over a government bond of the same life. It pays for more than default.
- Pieces: expected loss (PD × LGD); a credit risk premium for the uncertainty of the loss, since a real default is a lump; a liquidity premium for the difficulty of selling; and other items, such as the risk that the spread widens, and tax in some markets.
- The trap: spread minus expected loss is not free profit. The rest pays for real risks. Expected default losses explain only a fraction of investment grade spreads, so never say the whole spread is expected loss.

> **Spread = Expected loss + Credit risk premium + Liquidity premium + Other**

SPLITTING A 150 BASIS POINT SPREAD (MADE-UP); BASIS POINT = 0.01%

Expected loss	0.5% × 0.5	**25bp**
Credit risk premium		**45bp**
Liquidity premium		**55bp**
Other		**25bp**
Total	25 + 45 + 55 + 25	**150bp**
Rough patch: spread 4.00%, expected loss 1.95%	400 − 195; 195 ÷ 400	**205bp left; 49%**

5. From spread to price

- The required yield is the government yield plus the spread; discount the cash flows at it to get the price. A wider spread means a lower price.
- After purchase a spread can move even if the company never misses a payment. The price change is about minus duration times the change in spread, in per cent. The estimate slightly overstates the fall for large moves because the price curve bends (convexity).
- Spread risk is price risk. An investor forced to sell takes the loss; one who can hold to maturity and be paid in full does not, as long as the issuer survives.

> **Price change (%) ≈ − Duration × Change in spread**

CALDER 4% SEMIANNUAL, 5 YEARS, PER 100 OF FACE

Required yield	3.00% + 1.50%	**4.50%**
Price at 3.00% (no spread); at 4.50%		**104.61; 97.78**
Price lost to the spread	104.61 − 97.78	**6.83**
Spread widens to 2.30%: new yield	3.00% + 2.30%	**5.30%, price 94.36**
Exact change in price	94.36 ÷ 97.78 − 1	**−3.51%**
Estimate with duration 4.5	−4.5 × 0.80	**−3.6%**

6. Why the average year understates the bad one

- PD and LGD respond to different things. A secured lender may see PD rise while recovery holds steady; a subordinated lender sees both worsen together. In a recession defaults rise and recoveries fall at the same time.
- Multiplying the average PD by the average LGD therefore understates the loss. Expected loss is only part of the spread and understates the tail.
- A rule of thumb: if investors cared only about the average loss, the spread would roughly equal PD × LGD. Real spreads are higher, so this gives a floor, not the whole answer.

RECESSION ONE YEAR IN FIVE (MADE-UP), LOSS AS % OF EXPOSURE

Benign year: PD 1%, LGD 50%	**0.5%**
Recession year: PD 8%, LGD 70%	**5.6%**
Product of the average PD and average LGD	**1.3%**
True average of the two kinds of year	**1.52%**

Key takeaways

- Credit risk has two parts: how likely default is (PD) and how much is lost (LGD = 1 − recovery rate).
- Expected loss = exposure × PD × LGD; seniority changes the loss, not the odds.
- A rating is an opinion on relative default risk; notch from the issuer rating, and BBB− is the investment grade line.
- Ratings lag the market and ignore price, liquidity and spread widening.
- Spread = expected loss + credit risk premium + liquidity premium + other; the rest is not free profit.
- A wider spread lowers the price by about duration × change in spread, even with no default.

Quick check

1. Exposure 5m, PD 2%, recovery 40%. Expected loss?
   Answer: LGD 60%. 5m × 0.02 × 0.60 = 60,000.
2. Issuer BBB; subordinated notched down two. Rating? Investment grade?
   Answer: BB+. No, it is high yield.
3. Spread 120 bp, expected loss 30 bp. What pays for the rest?
   Answer: 90 bp: risk premium, liquidity, other.