CHARTA LEARNING · LESSON NOTES

Economic Capital Frameworks

FRM Part II

1 A story: two answers to one question

- The board asks: how much capital do we really need?
- Two teams, two answers, one over three times the other
- No arithmetic mistake: different choices
- Every step of economic capital involves a judgement

IN THE LESSON

- Kestrel Bank's board asks a simple question.
- How much capital do we really need to survive a terrible year?
- The regulator already sets a minimum, but the board wants the bank's own view, built from its own portfolio.
- Two teams go away to answer it.
- The credit team comes back with one number, the risk team with a number more than three times as large.
- Neither team has made an arithmetic mistake.
- They have simply made different choices about what to measure, how confident to be, and how risks combine.
- This lesson is about why that happens.
- Economic capital is a powerful tool, but almost every step of building it involves a judgement, and the judgements are hard to check against data.

2 What economic capital is

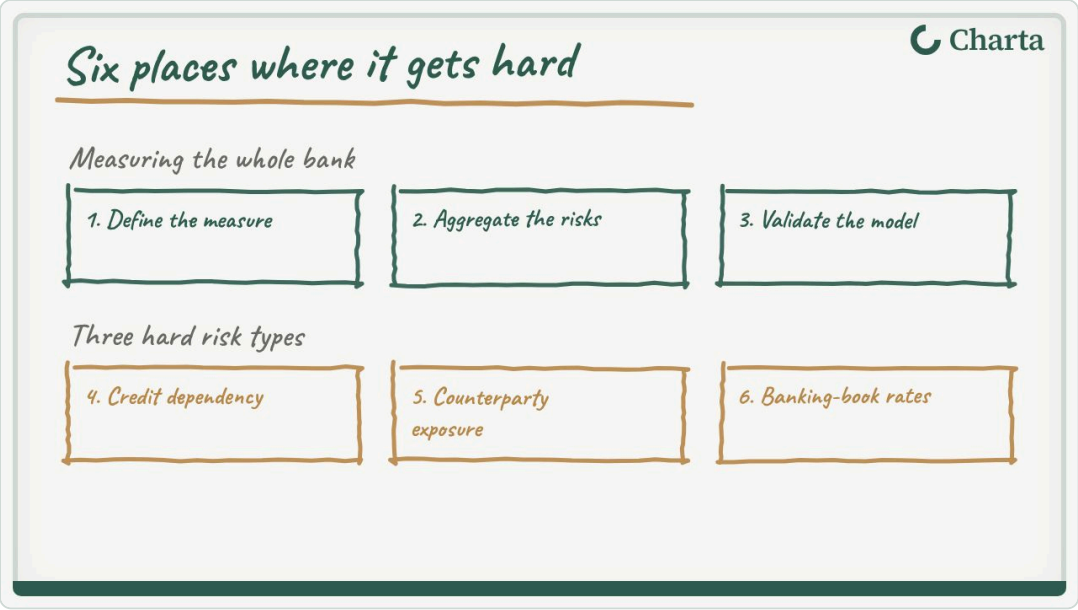
EC = Loss at confidence level − EL
Typical: 1 year, 99.9% or higher, often tied to target rating
Target PD 0.05% → 99.95%

Loss at the confidence level	Not exceeded with that probability
Expected loss	Average loss: priced and provided
Economic capital	Buffer for unexpected loss

IN THE LESSON

- Here is the definition.
- Economic capital is the capital a bank's own models say it needs to absorb unexpected losses, at a chosen confidence level, over a chosen horizon.
- Start from the distribution of possible losses.
- The loss at the confidence level is the loss that will not be exceeded with that probability.
- Expected loss, the average, is a cost of doing business, covered by pricing and provisions.
- Economic capital is the gap between the two, the buffer for unexpected loss.
- That is the usual convention; a bank that did not cover expected loss through pricing and provisions would hold capital for the whole loss at the confidence level.
- In practice, the horizon is usually one year and the confidence level ninety nine point nine per cent or higher, which is one bad year in a thousand.
- The level is often tied to a target rating.
- A bank aiming for a rating with a one year default probability of about five hundredths of one per cent would choose ninety nine point nine five per cent.

3 Six places where it gets hard



IN THE LESSON

- The difficulties sit in six places, grouped here in two rows.
- The top row is about measuring the whole bank.
- First, defining the measure.
- Second, aggregating risks, which means adding credit, market and operational risk into one figure.
- Third, validating the model, meaning proving it is right.
- The bottom row is about three risk types that are hard to model.
- Fourth, dependency in credit risk, which is how borrowers default together.
- Fifth, counterparty credit risk on derivatives.
- Sixth, interest rate risk in the banking book, the loans and deposits a bank holds rather than trades.
- We take each in turn, and for each one we will ask the exam question: what is the root cause?

4 Difficulty 1: defining the measure

Each choice is defensible, and banks choose differently

Choice	Options
Risk measure	VaR, or expected shortfall
Confidence level	99% to 99.97%+; 99.9%+ typical
Horizon	Usually one year
Risk coverage	Which risks are in or out

IN THE LESSON

- The first difficulty is that there is no single definition.
- Look at the choices.
- The risk measure can be value at risk, written V a R, which is a quantile of the loss distribution, or expected shortfall, the average loss beyond that quantile.
- Expected shortfall sees the shape of the tail, V a R does not.
- The confidence level runs from ninety nine per cent to ninety nine point nine seven per cent and above, with ninety nine point nine per cent or higher typical, and a higher level means more capital.
- The horizon is usually one year, but some banks hold positions longer or shorter.
- And risk coverage differs: one bank includes business risk or reputational risk, another leaves them out.
- Each choice is defensible, and banks make them differently, so two banks' figures are rarely comparable as reported.

5 Example 1: one book, many answers

Kestrel's credit book: expected loss $40m. Same loans, four definitions. $m

99% VaR − EL	150 − 40	**$110m**
99.9% VaR − EL	340 − 40	**$300m**
99.97% VaR − EL	420 − 40	**$380m**
99.9% ES − EL	410 − 40	**$370m**
Highest ÷ lowest	380 ÷ 110	**3.5 times**

IN THE LESSON

- Here is Kestrel's credit book.
- Expected loss is forty million dollars.
- The ninety nine per cent loss is one hundred and fifty million, so V a R minus expected loss gives one hundred and ten million.
- At ninety nine point nine per cent the loss is three hundred and forty million, giving three hundred million.
- At ninety nine point nine seven per cent the loss is four hundred and twenty million, giving three hundred and eighty million.
- Using expected shortfall at ninety nine point nine per cent, the average loss beyond the quantile is four hundred and ten million, giving three hundred and seventy million.
- The highest answer is about three and a half times the lowest, for exactly the same loans.
- The trap is to compare figures without asking how each was defined.

6 Difficulty 2: aggregating risks

- Simple sum assumes perfect correlation: usually overstates
- Correlation matrix: a correlation for each pair of risks
- Copula: links the separate loss distributions
- Diversification benefit: simple sum minus combined
- Inputs rest on thin data: benefits vary widely

IN THE LESSON

- The second difficulty is aggregation.
- Kestrel measures credit, market and operational risk separately, each with its own model.
- How should it add them?
- Adding the stand-alone figures assumes perfect correlation, that the worst year for every risk happens at once.
- That usually overstates capital, though with value at risk and heavy tails it is not guaranteed to.
- The alternative is to assume less than perfect dependence, using a correlation matrix, which is a table of correlations between each pair of risks, or a copula, a more general tool that links the separate loss distributions.
- The difference between the simple sum and the combined figure is the diversification benefit.
- But the inputs rest on thin data, because joint bad years are rare.
- Different, equally defensible inputs give very different benefits.

7 Example 2: two defensible correlation sets

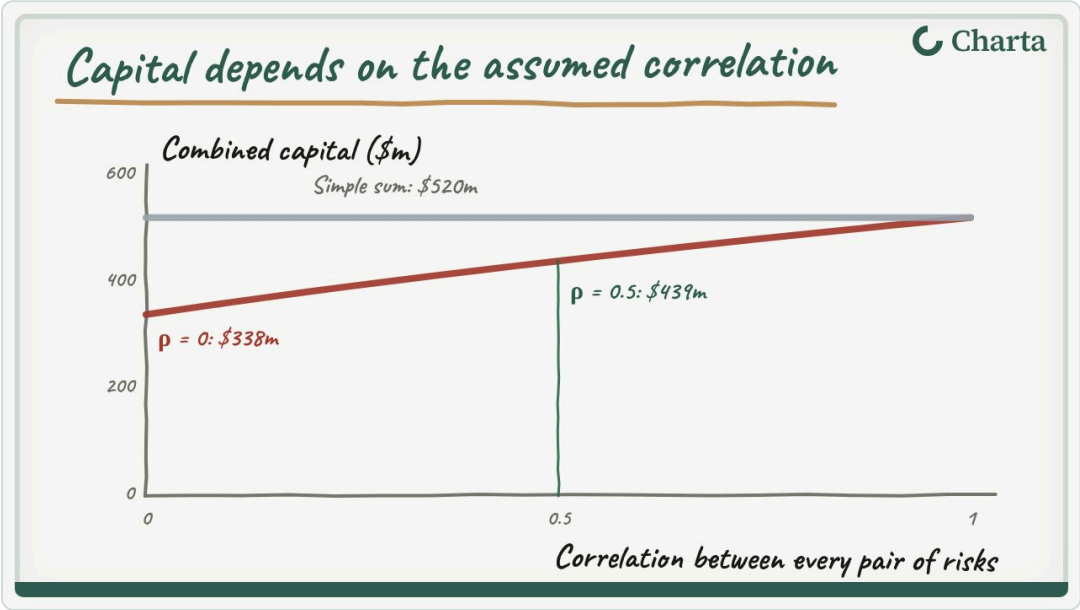
Stand-alone: credit $300m, market $100m, operational $120m

Simple sum	300 + 100 + 120	**$520m**
Set A: 0.5, 0.2, 0.2	√(sum of squares + 2ρ × pairs)	**$404m**
Benefit under set A	520 − 404	**$116m**
Set B: 0.8 for each pair	same formula	**$489m**
Benefit under set B	520 − 489	**$31m**

IN THE LESSON

- Kestrel's stand-alone figures are three hundred million dollars for credit, one hundred million for market and one hundred and twenty million for operational risk.
- The simple sum is five hundred and twenty million.
- The combined figure is the square root of the sum of the squares, plus twice each correlation times the two figures it links.
- Set A uses a correlation of point five between credit and market, and point two for the other two pairs.
- That gives about four hundred and four million, a diversification benefit of about one hundred and sixteen million.
- Set B uses point eight for every pair, which some would call prudent.
- That gives about four hundred and eighty nine million, a benefit of only thirty one million.
- Both sets are plausible, and data cannot settle which is right.

8 Capital depends on the assumed correlation



IN THE LESSON

- This chart shows the same point as a picture.
- Along the bottom is a single correlation applied to every pair of Kestrel's three risks, from zero to one.
- Up the side is the combined economic capital, from zero to six hundred million dollars.
- The grey line is the simple sum, five hundred and twenty million, which the curve reaches only at a correlation of one.
- At zero correlation, the curve starts at about three hundred and thirty eight million.
- At a correlation of one half, it is about four hundred and thirty nine million.
- The whole range from the bottom of the curve to the top is about one hundred and eighty million dollars, and it is driven by one number that the bank can barely estimate.

9 Difficulty 3: a standard nobody can backtest

Kestrel has 20 years of history and a 99.9% one-year standard

Breach chance a year (model)	1 − 99.9%	**0.1%**
Breaches expected in 20 years	20 × 0.1%	**0.02**
If truth is 0.5% a year	five times higher	**0.5%**
Chance of no breach anyway	(1 − 0.5%)^{20}	**90.5%**

So: benchmarking, stress tests and expert review

IN THE LESSON

- The third difficulty is validation.
- For market risk V a R at ninety nine per cent over one day, a bank can count how often losses beat the forecast, which is called backtesting.
- Economic capital at ninety nine point nine per cent over one year is a one in a thousand year standard.
- Suppose Kestrel has twenty years of history.
- The model expects a breach once in a thousand years, so over twenty years it expects only point zero two breaches.
- Now suppose the model is badly wrong, and the true chance of a breach is five times higher, half of one per cent a year.
- The chance of seeing no breach at all in twenty years is still about ninety per cent.
- So a clean history proves almost nothing.
- Banks rely instead on benchmarking against other models, stress tests and expert review.

10 Difficulty 4: how credits default together

Book $1,000m, PD 1%, LGD 50%. Worst case = N[(N⁻¹(PD) + √ρ N⁻¹(99.9%)) ÷ √(1 − ρ)]

Worst case rate, ρ = 0.10	one-factor formula	**7.75%**
Capital, ρ = 0.10	1,000 × 50% × (7.75% − 1%)	**$34m**
Worst case rate, ρ = 0.20	one-factor formula	**14.55%**
Capital, ρ = 0.20	1,000 × 50% × (14.55% − 1%)	**$68m**

Correlation and copula choice drive the tail, and both are hard to calibrate

IN THE LESSON

- The fourth difficulty is dependency in credit risk.
- Capital for a loan book depends on how likely borrowers are to default together, which a single factor model captures with the asset correlation between borrowers' asset values.
- The choice of copula matters too, because some produce more joint defaults in the tail.
- Neither can be observed, and defaults are too rare to calibrate them well.
- Take Kestrel's corporate book of one thousand million dollars, with a default probability of one per cent and loss given default of fifty per cent.
- At ninety nine point nine per cent, the worst case default rate is the cumulative normal of the inverse normal of the default probability plus root rho times the inverse normal of the confidence level, all over root one minus rho.
- With an asset correlation of point one, that rate is about seven point seven five per cent, and capital is about thirty four million.
- With point two, it is about fourteen point five five per cent, and capital doubles to about sixty eight million.

11 Difficulty 5: counterparty credit risk

Volta Holdings: PD 2%, LGD 60%. Exposure rises if its currency collapses

Expected exposure, normal times	model average	**$10m**
EL if independent	2% × 60% × 10m	**$120,000**
Exposure when Volta defaults	currency has collapsed	**$25m**
EL with wrong-way risk	2% × 60% × 25m	**$300,000**
Understatement	300,000 ÷ 120,000	**2.5 times**

IN THE LESSON

- The fifth difficulty is counterparty credit risk, the risk that the other side of a derivative defaults while owing the bank money.
- Unlike a loan, the exposure is stochastic: it depends on where markets move.
- And wrong way risk links the exposure to the default itself.
- Kestrel has a currency swap with Volta Holdings, a company whose income is in a local currency, and Volta pays Kestrel in dollars.
- If the local currency collapses, the swap is worth more to Kestrel just when Volta is most likely to fail.
- In normal times, the expected exposure is ten million dollars.
- With a default probability of two per cent and loss given default of sixty per cent, expected loss is one hundred and twenty thousand dollars.
- But in the scenarios where Volta defaults, exposure is twenty five million, so expected loss is three hundred thousand, two and a half times larger.

12 Difficulty 6: interest rates in the banking book

- Banking book: not traded, so value must be modelled
- Non-maturity deposits: repayable now, yet most stay
- How long they stay is assumed, not contracted
- Mortgages: early prepayment makes timing uncertain
- Behavioural assumptions dominate the result

IN THE LESSON

- The sixth difficulty is interest rate risk in the banking book.
- Kestrel's mortgages and deposits are not traded, so their value has to be modelled, and their cash flows depend on customer behaviour.
- Non maturity deposits, such as current and savings accounts, can be withdrawn on demand, but in practice most stay for years.
- How long they are assumed to stay is a behavioural assumption, not a contract term.
- Mortgages are the reverse: borrowers can prepay early, so the timing of their cash flows is uncertain too.
- These behavioural assumptions dominate the result.
- They cannot be observed directly, and the history used to estimate them may not hold when rates move sharply.

13 Example 3: one deposit assumption, half the loss

Mortgages $1,000m, duration 5. Deposits $900m. Rates rise 2 points

Mortgage side	1,000 × 5	**5,000**
Deposits short: side	900 × 0.25	**225**
Loss if deposits short	(5,000 − 225) × 2%	**$95.5m**
Deposits sticky: side	900 × 3	**2,700**
Loss if deposits sticky	(5,000 − 2,700) × 2%	**$46m**

IN THE LESSON

- Here is the effect in numbers.
- Kestrel holds one thousand million dollars of mortgages with a duration of five years, funded by nine hundred million of non maturity deposits.
- Rates rise by two percentage points, and the loss in economic value is about the asset duration times assets, minus the deposit duration times deposits, times the rate rise.
- The mortgage side is five thousand.
- If deposits are treated as short, with a duration of a quarter of a year, the deposit side is two hundred and twenty five, and the loss is about ninety five and a half million dollars.
- If deposits are treated as sticky, with a duration of three years, the deposit side is two thousand seven hundred, and the loss falls to forty six million.
- The balance sheet and the shock are the same.
- Only the assumption changed.

14 Exam point: tie each difficulty to its cause

Two causes run through the list: scarce data and unobservable dependence

Difficulty	Root cause
Defining the measure	No common standard
Aggregation, credit dependency	Dependence is unobservable
Validation at 99.9%	Too few tail events
Counterparty exposure	Stochastic, wrong-way link
Banking-book rates	Behaviour assumed, not contracted

IN THE LESSON

- For the exam, tie each difficulty to its cause, and notice how often the causes repeat.
- Defining the measure is hard because there is no common standard for the measure, the level, the horizon or the coverage.
- Aggregation and credit dependency are hard because dependence cannot be observed and joint bad events are rare.
- Validation is hard because a one in a thousand year standard produces too few tail events to test.
- Counterparty exposure is hard because it is stochastic and wrong way risk ties it to default.
- And banking book interest rate risk is hard because customer behaviour is assumed rather than contracted.
- Two causes run through the whole list: scarce data and unobservable dependence.

15 Built for managers, read by supervisors

- Economic capital was built for management, not regulation
- BIS: use with care
- Do not adopt it as the requirement
- Do not dismiss it either
- It shows how the bank itself sees its risks

IN THE LESSON

- Now change seats.
- You are Kestrel's supervisor.
- Kestrel hands you its economic capital figure.
- What should you do with it?
- Remember that economic capital models were built for internal management, to price loans and steer the business, and not for regulation.
- The Bank for International Settlements, the B I S, asks supervisors to use these numbers with care.
- They should neither adopt them as the capital requirement, nor dismiss them as irrelevant.
- Used well, they show how the bank itself sees its risks, which is valuable information.
- Used carelessly, they can mislead, because the design choices behind them were made for a different purpose.

16 First, understand the design choices

Similar portfolios can give very different figures for these reasons alone

Design choice	Question to ask
Confidence level	Higher or lower than the rules?
Time horizon	One year, or other?
Risks covered	What is in, what is out?
Diversification assumed	Within and between risks?
Capital compared with	Which definition of capital?

IN THE LESSON

- The supervisor's first task is to understand the design choices that make economic capital differ from regulatory capital.
- There are five.
- The confidence level, which may be higher or lower than the one behind the regulatory rules.
- The time horizon.
- The risks covered, since a bank may include risks the rules leave out, or leave out risks the rules include.
- The diversification assumed, both within and between risk types.
- And the definition of capital that the figure is compared with, since a bank's available capital may count items that regulatory capital does not.
- Two banks with similar portfolios can report very different figures for these reasons alone.

17 Example 4: putting two banks on a common basis

Kestrel: 3 risks, diversified. Fenwick: 2 risks, simply added. $m

Kestrel as reported	set A, diversified	**$404m**
Fenwick as reported	380 + 100, no operational	**$480m**
Kestrel, common basis	300 + 100 + 120	**$520m**
Fenwick, common basis	480 + 60	**$540m**
Fenwick minus Kestrel	480 − 404, then 540 − 520	**$76m → $20m**

IN THE LESSON

- Here is why the supervisor must put figures on a common basis before comparing them.
- Kestrel reports four hundred and four million dollars.
- That covers credit, market and operational risk, and takes the diversification benefit from correlation set A.
- Fenwick Bank, a made up peer, reports four hundred and eighty million, which is credit of three hundred and eighty plus market of one hundred, simply added, with operational risk left out.
- Fenwick looks riskier.
- Now use one basis for both: all three risks, simply added, with no diversification.
- Kestrel's figure becomes five hundred and twenty million.
- Fenwick's becomes four hundred and eighty plus its own operational figure of sixty, which is five hundred and forty million.
- The gap shrinks from seventy six million to twenty million, so most of the headline difference came from design, not risk.

18 Next, weigh the quality and the use

- Quality of model validation
- Quality of data, especially for tail events
- Quality of governance and change control
- Use: does the bank really decide with these numbers?
- A figure made only for the supervisor deserves little weight

IN THE LESSON

- Once the design is understood, the supervisor weighs how much trust the number deserves.
- First, the quality of model validation.
- Has someone independent challenged the model, its assumptions and its benchmarks?
- Second, the quality of the data, especially for rare tail events.
- Third, the quality of governance.
- Does the board understand the key assumptions, and are changes controlled?
- Fourth, and very telling, how far the bank really uses the numbers in its decisions, such as limits, pricing and pay.
- A figure the bank uses every day has been tested by people with money at stake.
- A figure produced only for the supervisor deserves much less weight.

19 Supplementary evidence, not a verdict

Kestrel: regulatory minimum $560m, economic capital $404m

Regulatory minimum	set by the rules	**$560m**
Economic capital	Kestrel's own model	**$404m**
Gap	560 − 404	**$156m**
Wrong reading	a verdict on risk	**Mistake**
Right reading	check the five choices	**A question**

Supplementary evidence in the dialogue, never a replacement for the minimum

IN THE LESSON

- Economic capital then plays one role in supervision.
- It is supplementary evidence in the supervisory dialogue, the ongoing discussion between bank and supervisor about risk and capital.
- It is not a replacement for the regulatory minimum.
- Suppose Kestrel's regulatory minimum is five hundred and sixty million dollars, and its economic capital is four hundred and four million.
- The gap is one hundred and fifty six million.
- The wrong reading is that the rules overstate Kestrel's risk by that much, or that the bank is understating it.
- The right reading is that the gap is a question to investigate.
- Check the confidence level, horizon, coverage, diversification and capital definition first.
- The usual mistake is to read a gap between the two measures as a verdict on risk.

20 Every exposure gets a capital cost

- Every exposure carries a capital cost; hurdle rate 12%
- 1. Managing the credit portfolio
- 2. Pricing for risk
- 3. Customer and unit profitability
- 4. Management incentives

IN THE LESSON

- Now back inside Kestrel, where the framework earns its keep.
- Once economic capital is allocated, every exposure carries a capital cost, because shareholders expect a return on the capital it ties up.
- We use one hurdle rate throughout: Kestrel's cost of capital, twelve per cent a year.
- That capital cost alters decisions in four areas.
- The first is managing the credit portfolio, deciding which loans and concentrations to hold.
- The second is pricing for risk, setting the rate on each loan.
- The third is analysing how profitable customers and business units really are.
- The fourth is shaping management incentives, meaning what managers are paid for.
- We take them in order.

21 Area 1: capital follows contribution to risk

Same rating, stand-alone capital $10m each. Contribution = stand-alone × ρ

Loan A: concentrated sector	10 × 0.8	**$8m**
Loan B: new sector	10 × 0.3	**$3m**
Charge on A at 12%	12% × 8m	**$960,000**
Charge on B at 12%	12% × 3m	**$360,000**

Same rating, very different capital: concentration and correlation matter

IN THE LESSON

- In credit portfolio management, a loan's capital is driven by its contribution to the risk of the whole portfolio, not by its own risk alone.
- A common rule sets the contribution at the stand-alone figure times the loan's correlation with the portfolio.
- Kestrel has two loans with the same rating, each with stand-alone capital of ten million dollars.
- Loan A is to a property developer, and Kestrel already has a large property concentration, so its correlation with the portfolio is point eight.
- Its contribution is eight million.
- Loan B is to a firm in a sector Kestrel barely lends to, with correlation point three, so its contribution is three million.
- At a twelve per cent hurdle, Loan A carries a capital charge of nine hundred and sixty thousand dollars a year, and Loan B three hundred and sixty thousand.
- Concentration and correlation matter, not only the rating.

22 Area 2: pricing for risk

Minimum rate = Funding + Operating cost + EL + k × EC
All as a share of the loan

Funding cost	What Kestrel pays to borrow
Operating cost	Making and running the loan
Expected loss	Average annual credit loss
Capital charge	k × EC: the capital charge

IN THE LESSON

- In pricing, the minimum rate on a loan must cover four things.
- The funding cost, which is what Kestrel pays to borrow the money it lends.
- The operating cost of making and running the loan.
- The expected loss, the average annual credit loss, as a share of the loan.
- And a charge for the capital used, which is the hurdle rate times the economic capital, again as a share of the loan.
- Below that minimum, the loan does not pay for the capital it uses.
- Because riskier loans have both a higher expected loss and more capital, they must carry a higher rate.
- A bank without economic capital tends to price only the first three, which makes risky loans look cheap.
- This simple form charges the full hurdle on capital; some banks charge only the excess of the hurdle over the funding rate, since capital also funds part of the loan.

23 Example 5: pricing two loans

Funding 3%, operating cost 0.5%, hurdle 12%. Two $100m loans

Safer: EL	0.8% × 50%	**0.40%**
Safer: capital charge	12% × 8%	**0.96%**
Safer: minimum rate	3 + 0.5 + 0.4 + 0.96	**4.86%**
Riskier: EL, capital charge	2.5% × 60%; 12% × 12%	**1.50%; 1.44%**
Riskier: minimum rate	3 + 0.5 + 1.5 + 1.44	**6.44%**

IN THE LESSON

- Let us price two one hundred million dollar loans.
- Both carry a funding cost of three per cent and an operating cost of half of one per cent.
- The safer loan has a default probability of point eight per cent and loss given default of fifty per cent, so expected loss is point four per cent.
- Its economic capital is eight per cent of the loan, and twelve per cent of that is a capital charge of point nine six per cent.
- The minimum rate is four point eight six per cent.
- The riskier loan has a default probability of two and a half per cent and loss given default of sixty per cent, so expected loss is one and a half per cent.
- Its capital is twelve per cent, so the charge is one point four four per cent, and the minimum rate is six point four four per cent.

24 Area 3: RAROC and economic profit

RAROC = (Revenue − Costs − EL) ÷ EC
EP = NI − k × EC
RAROC > k ⇔ EP > 0

Expected loss	Average loss, deducted first
Economic capital	Capital the unit ties up
Net income	Revenue − costs − EL
Cost of capital	Hurdle rate: 12% at Kestrel

IN THE LESSON

- For customer and unit profitability, Kestrel uses two linked measures.
- R A R O C, risk adjusted return on capital, is revenue minus costs minus expected loss, all divided by economic capital.
- A customer or unit is judged by comparing its R A R O C with the hurdle rate.
- The second measure is economic profit.
- Write N I for net income, here revenue less costs less expected loss, before tax and with no return credited on the capital itself, and k for the cost of capital.
- Economic profit is net income minus k times economic capital.
- It is the profit left after paying shareholders for the capital used.
- Some texts use after tax income instead.
- The two always agree on the sign: R A R O C above the hurdle means positive economic profit, and below it means negative.

25 Example 6: profitable, yet destroying value

Economic capital: corporate $250m, retail $100m

Corporate: net income	60 − 20 − 15	**$25m**
Corporate: RAROC; EP	25 ÷ 250; 25 − 12% × 250	**10%; −$5m**
Retail: net income	40 − 16 − 6	**$18m**
Retail: RAROC; EP	18 ÷ 100; 18 − 12% × 100	**18%; +$6m**

IN THE LESSON

- Here are two of Kestrel's units.
- Corporate lending ties up two hundred and fifty million dollars of economic capital, and retail only one hundred million.
- Corporate earns revenue of sixty million, with costs of twenty and expected loss of fifteen, so net income is twenty five million.
- Divided by its capital, its R A R O C is ten per cent, below the twelve per cent hurdle.
- Its economic profit is twenty five minus thirty, which is minus five million.
- Retail earns revenue of forty, with costs of sixteen and expected loss of six, so net income is eighteen million, less than corporate.
- But on its smaller capital, its R A R O C is eighteen per cent, and its economic profit is eighteen minus twelve, plus six million.
- Corporate earns more profit, yet destroys value once the capital charge is deducted.

26 Area 4: incentives, and the usual mistake

- Pay on raw profit or volume: corporate looks like the star
- Pay on RAROC or economic profit: retail is the star
- Aligns managers with shareholders
- Mistake: ranking on net income or return on assets
- A profitable unit can still destroy value

IN THE LESSON

- The fourth area is incentives.
- If Kestrel pays managers on raw profit or loan volume, the corporate head in our example looks like the star, because twenty five million beats eighteen million.
- Paying on R A R O C or economic profit changes that: retail becomes the star, because it earns a good return on the capital it uses, which is what shareholders want.
- So the framework aligns managers with shareholders.
- The usual mistake is to rank units on net income or on return on assets, which ignores the capital each unit consumes, since two units with the same assets can carry very different risk.
- The exam point is that a unit can be profitable and still destroy value once the capital charge is deducted.

27 Governance starts at the top

- Board and senior management approve the policy
- They understand key assumptions and model limits
- They use results: limits, pricing, performance
- Unused, it becomes a reporting exercise

IN THE LESSON

- Finally, who keeps the framework honest?
- Good governance of economic capital starts at the top.
- The board and senior management approve the economic capital policy.
- They must understand the key assumptions, such as the confidence level and the correlations we have seen, and the limits of the model, meaning what it cannot capture.
- Most important, they make real use of the results: in setting limits, in pricing, and in measuring performance.
- A framework the board does not understand, or does not use, quickly becomes a reporting exercise.
- Use matters because people who decide with a number have a reason to question it.

28 Good practice, piece by piece

Clear ownership, independent validation, controlled change

Piece	Good practice
Policy and use	Board and senior management
Development, parameters	Clear ownership
Validation	Independent of developers and business
Changes to methodology	Documented, approved, monitored
Reporting	Sensitivity, not one point estimate

IN THE LESSON

- Here is good practice, piece by piece.
- Policy and use belong to the board and senior management, as we have just seen.
- Model development and parameter setting need clear ownership, so everyone knows who is responsible for each model and each input.
- Validation must be independent of both the developers and the business lines whose capital charge depends on the output.
- Changes to methodology and parameters should be documented, approved and monitored, so that capital cannot drift quietly.
- And reporting should show sensitivity to the key assumptions, such as the correlations, rather than one point estimate, because we saw how much the answer moves when an assumption moves.

29 The main concerns

Each one is a reason the mathematics alone cannot be trusted

Concern	What goes wrong
Conflicts of interest	Units shape their own parameters
Model risk	Over-reliance on one number
Poor data	Worst for rare tail events
Weak integration	Model runs, decisions unchanged
Procyclicality	Capital rises in downturns

IN THE LESSON

- Now the main concerns.
- First, conflicts of interest, when business units influence the parameters that set their own capital.
- Second, model risk, and over reliance on a single number that hides how uncertain it is.
- Third, poor data, which is especially serious for the rare tail events that drive capital.
- Fourth, weak integration with decisions, when the model runs alongside the business but does not change what it does.
- Fifth, procyclicality.
- In a downturn, default probabilities and correlations rise, so economic capital rises.
- The bank then cuts lending just when the economy needs it, which deepens the downturn.
- Each concern is a reason why the mathematics alone cannot be trusted.

30 Example 7: the parameter the business chose

Corporate lending: net income $25m. The team sets its own correlation

Before: RAROC	25 ÷ 250	**10%**
Before: EP	25 − 12% × 250	**−$5m**
After lobbying: capital	lower correlation	**$200m**
After: RAROC	25 ÷ 200	**12.5%**
After: EP	25 − 12% × 200	**+$1m**

Same loans, new verdict: validation must be independent

IN THE LESSON

- Here is the first concern in numbers.
- Recall corporate lending, with net income of twenty five million dollars and economic capital of two hundred and fifty million.
- Its R A R O C was ten per cent, and its economic profit minus five million.
- Now suppose the corporate team, which also sets the correlation assumption for its own book, argues for a lower figure.
- Capital falls to two hundred million.
- R A R O C becomes twenty five over two hundred, twelve and a half per cent, now above the hurdle.
- Economic profit becomes twenty five minus twenty four, plus one million.
- Nothing about the loans changed, yet a unit that destroyed value now appears to create it, and its managers may be paid for it.
- That is why validation must be independent of the business lines.

31 Mistakes to avoid

- Trap: treating the model as the control
- Do not compare figures without checking definitions
- Do not read the regulatory gap as a verdict on risk
- Do not rank units on profit, ignoring capital
- Governance and challenge matter as much as the maths

IN THE LESSON

- Let us gather the traps.
- The usual mistake in governance is to treat the model as the control.
- The model is a tool.
- The control is the people and processes around it: an informed board, independent validation, documented and approved changes, and reporting that shows sensitivity.
- Remember the other traps too.
- Do not compare economic capital figures without checking how each was defined.
- Do not read a gap between economic and regulatory capital as a verdict on risk.
- Do not rank units on profit while ignoring the capital they use.
- The exam point is that governance, independence and challenge matter as much as the mathematics.

32 Try three quick questions

1. Credit $200m, market $80m, ρ = 0.5. Combined capital and benefit?
   Answer: √62,400 ≈ $250m; benefit ≈ $30m.
2. Revenue 50, costs 20, EL 6, EC 160, hurdle 12%. RAROC and EP?
   Answer: 24 ÷ 160 = 15%; EP = 24 − 19.2 = $4.8m.
3. A business line sets the parameters for its own capital. Concern?
   Answer: Conflict of interest: validation must be independent.

IN THE LESSON

- Now try three quick questions.
- Pause the video, think, then listen to the answers.
- Question one.
- Stand-alone economic capital is two hundred million dollars for credit risk and eighty million for market risk, with a correlation of point five.
- What is the combined figure, and the diversification benefit?
- The combined figure is the square root of sixty two thousand four hundred, about two hundred and fifty million, a benefit of about thirty million.
- Question two.
- A unit has revenue of fifty million, costs of twenty, expected loss of six and economic capital of one hundred and sixty.
- With a twelve per cent hurdle, what are its R A R O C and economic profit?
- Twenty four over one hundred and sixty is fifteen per cent, and economic profit is four point eight million.
- Question three.
- A business line sets the parameters that drive its own capital.
- What is the main concern?
- A conflict of interest, so validation must be independent of the business.