Pricing, Reserving and Actuarial Basics

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INT.NP.1.a · Pricing

Build a gross premium from frequency, severity and loadings, and say which assumption would move it most.

Pricing starts with what the insurer expects to pay. Expected claims cost per unit of exposure, such as per car-year or per 1,000 of sum insured, is the pure premium, and it equals claim frequency (claims per unit of exposure) multiplied by severity (the average cost of a claim). The gross premium then adds loadings: commission and other expenses that vary with premium, fixed costs per policy, and a margin for profit and risk. Because most loadings are percentages of the final premium, the usual calculation divides by one minus those percentages rather than multiplying the pure premium up. The result also implies a target loss ratio, the share of each premium meant to go on claims. Frequency and severity are tracked separately because they move for different reasons, and a fall in one can hide a rise in the other. Interviewers ask this to see whether you know where a price comes from and which assumption would hurt most if wrong. Typical mistakes are adding the percentages to the pure premium, forgetting fixed expenses, and treating pure premium as the price.

WORKED EXAMPLE: PRICING A YOUNG-DRIVER MOTOR POLICY AT FENWICK DIRECT

Fenwick Direct, an invented motor insurer, expects 7.0% of young-driver policies to claim each year (frequency) at an average of 3,200 per claim (severity). Variable expenses including commission are 18% of premium, fixed expenses are 25 per policy and the profit target is 5% of premium. Convention: one policy is one policy-year, ignore tax and investment income. Find the gross premium, then test a frequency of 8.0%.

Answer: The indicated gross premium is 323.38, built from a pure premium of 224. Frequency is the assumption to watch: moving it from 7.0% to 8.0% raises the price by 12.9%.

> **Interview tip:** Say the build in one line (frequency times severity, then divide by what is left after expenses and profit) and name the assumption you would check first. State your conventions, such as ignoring tax and investment income.

INT.NP.1.b · Pricing

Explain rating factors and the difference between experience rating and exposure rating, and blend the two for a customer.

Insurers rarely charge everyone the same price. A rating plan starts from a base rate and applies rating factors for characteristics that predict claims, such as driver age, postcode, building type or security. Factors are usually multiplied: an area factor of 1.20 and a vehicle factor of 0.90 give 1.08 times the base. Each factor should reflect a real difference in expected cost, typically estimated from large data sets with statistical models, and in many markets some characteristics may not lawfully be used, so practice varies. For a large commercial customer with its own record, experience rating projects its past losses, as a burning cost per unit of exposure, onto the coming year. When history is thin or dominated by one large loss, exposure rating uses the risk's characteristics, such as sum insured and occupancy, with a rate taken from similar risks. In practice the two are blended, with a weight, called credibility, that rises as claims data builds. Common mistakes are trusting one good or bad year, ignoring changes in exposure, and double-counting factors that are correlated.

WORKED EXAMPLE: PRICING A BAKERY CHAIN'S PROPERTY COVER FOR LARKFIELD FOODS

Larkfield Foods, an invented bakery chain with 12 shops, is renewing property insurance with sums insured of 18.0m. For this class, the underwriting team's exposure rate is 0.80 per 1,000 of sum insured. Larkfield's five-year record has losses already restated to today's cost level. The pricing team gives the experience 30% credibility. Convention: ignore large-loss and catastrophe loadings, and load the blended cost for expenses and profit totalling 28% of premium.

Answer: The blended technical premium is about 26,020, between an exposure-based price near 20,000 and an experience-based price near 40,066.

Interview tip: Say why you blend: the customer's own record is relevant but noisy, the class rate is stable but generic. Always give the weight and say what would change it, such as more years or a documented fix to the cause of the losses.

INT.NP.1.c · Pricing

Trend past claims costs to the period a new price will cover and explain how frequency and severity trends combine.

A premium is a promise about the future, but the data is about the past, so past claims must be brought to the cost level of the period the policies will be in force. Trend is the expected change in claims cost per unit of exposure, built from a frequency trend and a severity trend. These multiply: a 6% rise in severity and a 2% fall in frequency give 1.06 x 0.98 = 1.0388, a net rise of 3.9% a year, not 4%. Severity trend is often called claims inflation and can run well above general price inflation, for example when repair costs, medical costs, legal costs or court awards rise faster than prices generally; in some lines the pattern changes suddenly. The length of trend is measured from the average accident date of the past data to the average accident date of the policies being priced, which for annual policies written through a year is later than the start of that year. Mistakes include ignoring trend, extrapolating one unusual year, and applying general inflation to everything.

WORKED EXAMPLE: TRENDING EMPLOYERS' LIABILITY LOSSES AT STOURHEAD INSURANCE

Stourhead Insurance, an invented commercial insurer, found that its small-firm employers' liability losses in 2024 cost 410 per policy. Frequency is expected to fall 2% a year and severity to rise 6% a year. The new rates apply to policies whose average accident date is three years after the 2024 data. The current average premium is 620 and the permissible loss ratio (the share of premium available for claims) is 70%. Convention: ignore changes in the mix of business, and take trend rates as constant.

Answer: Trending changes the message from a 5.5% rate cut to a 5.9% rate increase. The net trend is 3.88% a year, and the trended loss cost is 459.6 per policy.

Interview tip: Say which way the answer flips if you forget trend, and say you would test whether the trend assumption is stable and what drives it. Never trend a single unusual year without understanding why it happened.

INT.NP.2.a · Reserving

Distinguish case reserves from IBNR and use a claims triangle and the chain-ladder idea to estimate an ultimate cost.

A reserve is money set aside for claims that have already happened but are not yet fully paid. A case reserve is the claims handler's estimate of what a reported claim will still cost. IBNR, incurred but not reported, covers what case reserves do not: claims that have occurred but have not yet been reported, plus further development on reported claims (some use IBNER, incurred but not enough reserved, for the second part). To estimate ultimate cost, actuaries arrange claims by accident year and by age in a triangle, then measure how much each year typically grew between ages, giving development factors. The chain-ladder method multiplies the latest figure for each year by the factors still to come, and IBNR is the ultimate minus what is already reported. It assumes the past pattern will repeat, so it can mislead when the business, claims handling or case-reserving strength has changed, and it is weakest for immature years. Mistakes include mixing paid and incurred figures, forgetting the tail beyond the last observed age, and treating the answer as exact.

WORKED EXAMPLE: A CHAIN-LADDER ESTIMATE FOR ASHDOWN MOTOR MUTUAL

Ashdown Motor Mutual, an invented insurer, has this triangle of cumulative reported claims (paid plus case reserves) in GBP millions, at 12, 24, 36 and 48 months of age. Accident year 2022: 8.0, 11.2, 12.3, 12.6; Accident year 2023: 8.8, 12.1, 13.3; Accident year 2024: 9.6, 13.6; Accident year 2025: 10.4. Convention: use volume-weighted factors rounded to three decimals, assume claims are complete at 48 months (tail factor 1.000), and ignore inflation. Estimate ultimate claims and IBNR for each accident year.

Answer: The chain-ladder IBNR is about 8.0m in total, of which 5.96m is the latest accident year. Ultimate claims are 12.60m, 13.62m, 15.30m and 16.36m.

Interview tip: Explain the idea before the arithmetic: how much do claims typically grow from one age to the next, and what is still to come. Then name the assumption that would break it, such as a faster case-reserving pace.

INT.NP.2.b · Reserving

Explain how reserve adequacy is judged and how a reserve release or strengthening changes reported profit and the combined ratio.

Reserves are estimates, so each year the insurer compares what it expected to emerge with what actually did, often called actual against expected, and revisits the booked amounts. If prior years turn out cheaper than reserved, the difference is released and reported claims fall, which is favourable development; if they turn out dearer, reserves are strengthened and

profit falls. Either way, the effect lands in the current year's results even though it relates to earlier accident years. A common rule of thumb is to look at the combined ratio (claims plus expenses as a percentage of premium) before and after prior-year development, because the underlying figure shows how this year's business performed. Repeated releases can flatter results, mask weak pricing and set up later strengthening, and releases do not by themselves add cash. Adequacy is judged against an actuarial best estimate and its range, and boards and auditors often look at trends over several years, not one number. Mistakes include treating a release as underwriting skill and forgetting that strengthening also affects capital.

WORKED EXAMPLE: RESERVE DEVELOPMENT AT GARRICK PROPERTY AND CASUALTY

Garrick Property and Casualty, an invented insurer, earned 200.0m of premium. Current accident year claims were 66% of premium and expenses 31%. Reserves for earlier years were reviewed and 8.0m was released. Convention: ignore tax, investment income and reinsurance, and treat the release as a reduction of claims.

Answer: The reported combined ratio is 93.0% against an underlying 97.0%, because of a 4.0-point release. A 12.0m strengthening instead would have produced 103.0%.

> **Interview tip:** Always give both numbers: reported and underlying. Say a release is a change in estimate of the past, not a sign of better underwriting today, and that practice and disclosure vary between insurers.

INT.NP.2.c · Reserving

Describe what actuaries do at an insurer and show how judgement enters when different reserving methods disagree.

Actuaries apply probability, statistics and financial maths to the uncertain cash flows of insurance. In a general insurer they typically work in pricing (indicated rates and rating models), reserving (best estimate of future claims and its range), capital modelling (how bad a bad year could be), reinsurance and reporting. A best estimate is the expected value of future payments, with no deliberate optimism or prudence; any margin is a separate management or regulatory decision, and practice varies. Methods can disagree. Chain ladder leans on the reported experience, so it is volatile for a young year, whereas the Bornhuetter-Ferguson method (BF) blends an expected loss ratio from pricing for the unreported part with actual claims to date. The actuary selects, weights and documents the choice, with a range, and the work is usually reviewed and challenged. Interviewers look for numeracy, an understanding that actuaries advise but boards decide, and the ability to explain uncertainty to non-specialists. Mistakes include false precision and giving the answer management wants.

WORKED EXAMPLE: CHOOSING BETWEEN METHODS FOR PENHALLOW MARINE'S LATEST YEAR

Penhallow Marine, an invented cargo insurer, earned 60.0m of premium in the latest accident year. Pricing assumed an expected loss ratio of 70%. After 12 months, reported claims are 18.0m, and the historical pattern implies that claims at this age are typically 1 / 2.2 of ultimate. Convention: ignore inflation and reinsurance. Estimate the ultimate with the chain-ladder and BF methods and select a figure.

Answer: The chain ladder gives 39.6m, BF gives 40.9m and a 50/50 selection gives about 40.3m, with a range quoted around it.

> **Interview tip:** Say that no method is right on its own, that the choice depends on how mature the year is, and that you would show the range and the reasoning. Avoid false precision, such as quoting a figure to the nearest thousand.