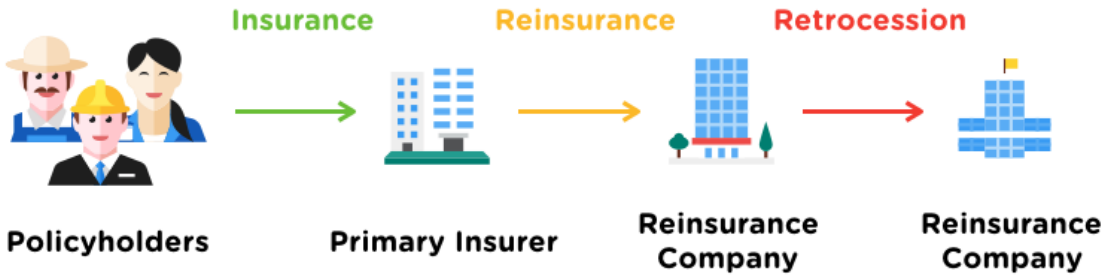
Reinsurance 20M

When insurance companies issue insurance policies, they assume risk from the public. If the insurance companies (i.e. the primary insurers) want to pass this risk to other entities, they can purchase ***reinsurance***.

Reinsurance is essentially insurance for insurance companies. Under a reinsurance contract, the primary insurer, also known as the ***cedant***, cedes some or all of its risk to a reinsurance company. There are many different types of reinsurance, which will be discussed later.

A reinsurance company can further cede the risk to another reinsurance company, in a process called ***retrocession***.



Functions of Reinsurance

Reinsurance is important for many reasons.

- **Capital relief**
  Insurance companies are required to have adequate reserves for the risk they assume. However, they are not required to have reserves for reinsured risk. Thus, reinsurance frees up capital so that it can be used for other purposes.
- **Increase underwriting capacity**
  Reinsurance provides a platform for insurance companies to assume risk that is greater than their risk appetite by allowing a portion of the risk to be ceded to reinsurance companies.
- **Catastrophe protection**
  Insurance companies are protected against catastrophic losses by engaging in reinsurance.

- **Stabilize loss experience**
  Reinsurance protects insurance companies against fluctuations in losses from non-catastrophic claims.
- **Risk diversification**
  Through reinsurance, insurance companies can diversify their portfolio and avoid having a high concentration of risk in one geographical area or of one specific type of risk.
- **Technical expertise**
  Reinsurance companies usually have a lot more experience handling claims with large losses. Thus, insurance companies can transfer this risk to reinsurance companies and benefit from their expertise.
- **Withdrawal**
  Insurance companies can exit the market by ceding all their risk through reinsurance.

Types of Reinsurance

Reinsurance can be categorized as either *treaty* or *facultative* and as either *pro rata* or *excess of loss*.

TREATY VS. FACULTATIVE

For **treaty reinsurance**, the cedant and reinsurer agree that all risks in a specific line or class of business will be ceded to the reinsurer. Under this agreement, the reinsurer is usually unable to underwrite each risk individually.

Facultative reinsurance, on the other hand, is used for ceding individual risks. The primary insurer determines the risks to be ceded. Then, the reinsurer underwrites each risk individually and decides which to accept and which to reject.

PRO RATA VS. EXCESS OF LOSS

Under reinsurance agreements, the primary insurer and the reinsurer have to decide how to share or allocate the risk. When both the cedant and reinsurer share the risk, premium, and losses, the agreement is called **pro rata** reinsurance, or *proportional* reinsurance.

There are two types of pro rata reinsurance: *quota share* and *surplus share*.

- Under quota share contracts, both parties share a percentage of the total risk. An example of quota share reinsurance is a 70%/30% agreement, for which the primary insurer pays 70% and the reinsurer pays 30% of any claims arising from the covered risks.

- Under surplus share contracts, both parties share a percentage of the total risk above a specified amount. This amount is the **primary insurer's** ***net retention***, or ***retention limit***. This is also known as the **reinsurer's** ***attachment point***. An example of surplus share reinsurance is an agreement where the primary insurer and reinsurer respectively pay 70% and 30% above the retention of 50,000. In this case, the primary insurer will be responsible for 100% of claims up to 50,000, after which the primary insurer and reinsurer will share the costs at a 70%/30% split.

  Not all surplus share contracts are as simple as the example above. The sharing of risk above the retention limit can be split into multiple layers with varying percentages. This will be demonstrated in Example S1.2.2.2.

Coach's Remarks

Quota share reinsurance is similar to the application of coinsurance, while surplus share reinsurance is similar to the combination of a deductible and coinsurance.

Let Y be the insurer's claim payment without reinsurance, δ be the attachment point, and a and $1-a$ be the shares of the total risk above any attachment point for the insurer and reinsurer, respectively.

Under quota share reinsurance, the claim payment for the insurer, Z_I, and the claim payment for the reinsurer, Z_R, are:

$$Z_I = aY$$

$$Z_R = (1-a)Y$$

Under simple surplus share reinsurance, the claim payment for the insurer, Z_I, and the claim payment for the reinsurer, Z_R, are:

$$Z_I = \begin{cases} Y, & Y \leq \delta \\ a(Y-\delta)+\delta, & Y > \delta \end{cases}$$

$$Z_R = \begin{cases} 0, & Y \leq \delta \\ (1-a)(Y-\delta), & Y > \delta \end{cases}$$

Note that in both cases, $Z_I + Z_R = Y$.

In addition to sharing premiums and losses, the reinsurance company often pays a ***ceding commission*** to the primary insurer to partially reimburse the primary insurer for the administrative and general costs of writing risks for insureds.

Example S1.2.2.1

Living Right Insurance Company has a 70% surplus share treaty with Stockholm Reinsurance, where 70% represents the portion paid by Living Right. Living Right's net retention is 500,000.

Calculate:

1. Living Right's payment amount for a claim of size 450,000.
2. Stockholm's payment amount for a claim of size 650,000.

Solution to (1)

Since the claim amount is less than the net retention, Living Right is responsible for the whole amount. Thus, Living Right's payment amount is $\mathbf{450{,}000}$.

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Solution to (2)

Since the claim amount is greater than the net retention, both parties share the excess above 500,000. Stockholm's share is:

$$0.3(650{,}000 - 500{,}000) = \mathbf{45{,}000}$$

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Coach's Remarks

For exam questions on pro rata reinsurance, we believe the SOA should specify which portion is covered by each party. This is because neither the official readings nor the Notation and Terminology Used document addresses this issue. However, if an exam question does not specify, then assume the percentage mentioned in the question is the portion covered by the **reinsurer**. For example, if the question states "70% quota share", assume the reinsurer covers 70% of the losses.

If you do see a question on the exam with this ambiguity, we encourage you to provide feedback to the SOA via the post-exam survey at your test center.

Example S1.2.2.2

A primary insurer has a surplus share reinsurance treaty with a net retention of 1,000,000. The reinsurance treaty is structured in layers as such:

- Layer 1: 70% of 500,000 in excess of 1,000,000
- Layer 2: 80% of 500,000 in excess of 1,500,000
- Layer 3: 90% in excess of 2,000,000

The percentages given are the portion covered by the reinsurer.

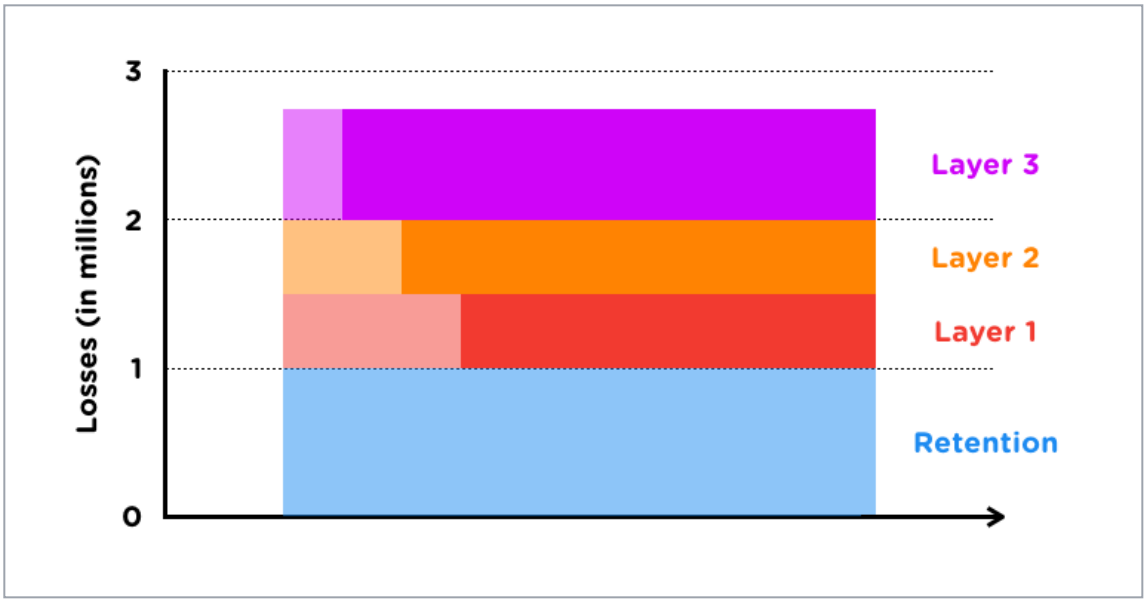
Calculate the total loss incurred by the reinsurer for a loss of 2,750,000.

Solution

The reinsurer does not pay anything up to the retention point. For the first layer, the reinsurer pays 70% of 500,000. For the second layer, the reinsurer pays 80% of 500,000. For the third layer, the reinsurer pays 90% of 750,000. Thus, the total loss is:

$$\begin{aligned} Z_R &= 0.00\,(1{,}000{,}000) + 0.70\,(500{,}000) + 0.80\,(500{,}000) + 0.90\,(750{,} \\ &= \mathbf{1{,}425{,}000} \end{aligned}$$

Below is an illustration of the surplus share layers in millions. The lighter areas represent the portion retained by the insurer while the darker areas represent the portion ceded to the reinsurer.



Unlike pro rata reinsurance, under **excess of loss** reinsurance, the reinsurer is responsible for all claim amounts above the primary insurer's retention. This is similar to a deductible provision. For a simple case with an attachment point of δ, the claim payment for the insurer, Z_I, and the claim payment for the reinsurer, Z_R, are:

$$Z_I = \begin{cases} Y, & Y \leq \delta \\ \delta, & Y > \delta \end{cases}$$

$$Z_R = \begin{cases} 0, & Y \leq \delta \\ Y - \delta, & Y > \delta \end{cases}$$

Excess of loss reinsurance works differently depending on the basis: ***per risk***, ***per occurrence***, or ***aggregate (stop-loss)***.

- Per-risk excess of loss reinsurance covers claims for a single policy.
- Per-occurrence excess of loss reinsurance covers claims resulting from one occurrence or event that impacts multiple policies.
- Aggregate excess of loss reinsurance covers aggregate losses within a specific policy period.

Example S1.2.2.3

You are given an insurer's claim information from an earthquake:

Claim Number	Policy Number	Loss ($)
1001	A3001	250,000
1002	A2936	236,500
1003	A3001	325,000

The insurer has an excess of loss reinsurance treaty with a retention limit of 500,000.

Calculate:

1. the retained losses for the primary insurer if the treaty is on a per-risk basis.
2. the losses for the reinsurer if the treaty is on a per-occurrence basis.

Solution to (1)

For a per-risk excess of loss reinsurance contract, the reinsurer pays the loss amount in excess of the retention limit for each policy. Notice that Claims 1001 and 1003 are from the same policy. Since the sum of these two claims is greater than the retention limit, the retained loss for Policy A3001 is 500,000.

For Claim 1002, since the amount is less than 500,000, the retained loss for Policy A2936 is the loss amount, or 236,500.

Therefore, the primary insurer's retained losses are **736,500**.