Institute of Insurance Sciences

AN INTRODUCTION TO REINSURANCE

FUNDACIÓN**MAPFRE**

INTRODUCTION

FUNDACIÓN MAPFRE (*MAPFRE Foundation*) is involved in activities of general interest to society in various professional and cultural fields, as well as initiatives aimed at improving the economic and social conditions of the less fortunate members and sectors of society. Within this framework, FUNDACIÓN MAPFRE's Institute of Insurance Sciences promotes and develops educational and research activities in insurance and risk management.

In the field of education, its activities include academic post-graduate and specialist training, provided in cooperation with the Pontifical University of Salamanca, as well as courses and seminars for professionals that are held in Spain and Latin America. These tasks extend to other geographical areas through cooperation with Spanish institutions and those of other countries, as well as through an Internet training programme.

The Institute sponsors research in the scientific areas of risk and insurance and maintains a Documentation Centre specialising in insurance and risk management which provides support for its activities.

The Institute also promotes and prepares regular reports and papers on insurance and risk management, in order to contribute to a better understanding of these subjects. In some cases, these works serve as reference material for those starting to study or practice insurance, and in other cases, they are sources of information for researching specific subjects. Such activities include the publication of this book.

For some years now, the Internet has been the most widely-used medium for carrying out our activities, offering users quick and efficient access, worldwide, to our activities, using the latest-generation Web support via the www.fundacionmapfre.org website.

FOREWORD

This book is the result of two factors, the first being the FUNDACIÓN MAPFRE Institute of Insurance Sciences' need for a basic text to be used for training on such a little-known subject as reinsurance. The second being MAPFRE Re's interest in incorporating into one single book the work of several people over many years who have accepted the challenge of taking on training as a goal for their professional and personal growth. This book cannot and does not claim to contain all the practical cases, examples and exercises used in the training courses, for the simple reason that they have been developed over time and contain many real cases which are too extensive to be included in this introduction.

Some reinsurance manuals are set against a very theoretical or scientific background whilst others are extremely simplistic. For this reason, we have preferred not to describe this book as a manual. It is a realistic and practical introduction to the profession for anyone new to the sector, containing clear definitions, formulae and appropriate examples which, undoubtedly, make it easier to read and, more importantly, easier to understand. It is structured in modules which can be consulted separately for specific purposes or used for a progressive and solid understanding of reinsurance business.

Today's reinsurance environment is more complex than ever. Capital models, catastrophe models and programmes for rating risks and treaties now form part of our everyday work. They are all based on mathematical calculations from extensive databases that provide extraordinarily precise answers to complicated problems.

We trust that this brief introduction to reinsurance will allow the reader not to lose sight of the essence of this business and that it will provide basic criteria for analysing risks properly, enabling well-supported decisions to be taken using basic business principles and common sense. To achieve this, we recommend that you should start at the beginning of the book and slowly move on to the more complex formulae, thereby understanding and absorbing the principles naturally.

I would like to thank everyone who has contributed in one form or another for their efforts, their capacity to consolidate and their expertise, all of which have made this book a reality. In particular, I must highlight the work of David Baron, Javier Mordillo, Miguel Ángel Rosa and Carlos Sanzo and, also, FUNDACIÓN MAPFRE for their strong support and interest.

Pedro de Macedo
CEO of MAPFRE RE

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1. DEFINITION AND PURPOSE

1.1. Reinsurance: "insurance for insurers"

This is perhaps the briefest, simplest and most understandable definition, despite the existence of various general (legal, technical, etc.) suggestions.

> *"Reinsurance is the insurance of the risk borne by the insurer".*

Reinsurance would not be possible without the existence of insurance and, conversely, insurers could not exist (they would do so very precariously) if it were not for reinsurers.

1.2. A few notes on insurance

The insurance contract

An insurance contract or policy is a contractual relationship between an insurer and an insured which provides the latter with the financial means to compensate a pecuniary claim or reduce the consequences of personal injury sustained in a claim.

Risks

In everyday life, people are exposed to an infinite number of risks that may affect their person or their property. So, in consideration of remuneration calculated in advance, the insured (an individual or company) transfers those risks to an insurer, transforming the variable costs of a claim into a fixed cost (the premium).

Insurance as a stabilizing factor

On the basis of the previous point, one can consider insurance to be a factor that can be used to stabilize the personal or business future in the event of negative financial consequences which may have been suffered by the insured as a result of possible adverse events.

The insurer's financial activity

Insurers receive income prior to incurring expenditure: they receive the price of the insurance, or premium, before providing financial compensation for the loss (claim). Using this income, they set up a fund which is sufficient to provide compensation (indemnity) for the risks transferred to them.

Premiums

These are calculated in advance, using different mathematical and statistical techniques. However, the insurers' liability depends totally on chance, which means that there can be major deviations from their forecasts or, in other words, strong fluctuations in the behavior of the claims experience which do not exempt them from the contractual liability to indemnify claims.

2. INSURANCE AND REINSURANCE CONTRACTS

2.1. Applicable legislation

In an insurance contract, one of the parties, the insurer, draws up the document governing the contractual relationship, i.e. the insurance policy. The other party, the insured, accepts it and the relationship commences. This presupposes "technical superiority" on the part of the insurer which, over time, has led to the need to establish systems for protecting the insured which are governed by legislation.

But what happens with reinsurance? Here, the contract is agreed and drawn up between two parties that are equally expert on the subject, with neither of them having "technical superiority". Therefore, the protectionism referred to in respect of the insurance contract is not necessary, and the contract, like any other commercial contract, will be subject to ordinary law and, logically, to the governing clauses agreed by the parties.

2.2. Risk analysis

"Good faith" is a characteristic of both the insurance and the reinsurance contract, but, in the latter case, it is of particular importance. Why? Because the insurer can analyze each of the risks it writes and decide on its conditions, whereas the reinsurer does not have this possibility or does not usually exercise it.

The reinsurer, therefore, has to rely on the accuracy and validity of the information provided by the insurer, which is usually of a general nature and based on statistics. In other words, it has to rely on the good management and selection of risks by its reinsured.

We will see later on that there is an exception to this rule: facultative reinsurance, which is usually transacted on a risk-by-risk basis, thus allowing reinsurers to analyse each risk that they have written.

3. BRIEF HISTORY OF REINSURANCE

3.1. Early insurances

Even in Greek and Roman times, a type of marine insurance known as "bottomry loans" existed and was governed by Roman law *(foenus nauticum)*. This continued up to the Middle Ages and constituted a fledgling insurance system.

These contracts were used to finance the purchase of commodities that were going to be transported by sea so that, if the cargo reached its destination safe and sound, the person financing the voyage received the amount of the loan plus substantial interest.

3.2. The first reinsurance contract

The first known reinsurance contract, written in Latin, was effected in Genoa in July 1370. It concerned a cargo that was to be carried by sea from Cadiz (in Spain) to Sluis (in Flanders) and was insured. However, because of the dangerous nature of the voyage, the insurer transferred most of the risk to a second insurer, who accepted it. This represented a true reinsurance between the insurer and reinsurer, without the owner of the cargo having any contractual relationship with the reinsurer. The contract also had two interesting aspects in relation to reinsurance:

– Firstly, only the last part of the route was reinsured (not from Genoa to Cadiz, but from Cadiz to Flanders) due to its particular risk.

– The most probable or substantial risk was transferred, a form that is also in general use today.

This reinsurance agreement did not mention the premium that had to be paid, most probably because of the canon laws against usury that prevailed in Genoa at the time.

3.3. From "*rasichurare*" to "*riassicurare*"

We move on to the 15th century, and more specifically to 16 May 1409 in Florence, where a reinsurance contract appears for a shipment of wool worth 200 gold florins from Southampton to Porto Pisano, in which the term "*rasichurare*", equivalent to modern-day "*riassicurare*", appears for the first

time. This term seems to have been adopted by other European languages to refer to this type of commercial relationship.

Anyway, it was in Renaissance Italy where these written agreements were first drawn up, due, amongst other things, to the considerable increase in trade between influential Mediterranean cities which, in turn, extended their business relations with the countries of the Orient.

3.4. The first insurance companies

Records show that the first insurer (as we understand the term today) known to have used printed insurance policies was based in Seville in 1552; the oldest printed policy in Italian is dated 1583 and comes from Venice.

Those early insurers needed to dilute the risks accepted and they managed to do this by adopting a system of coinsurance: the largest risks were shared amongst themselves according to different, previously agreed, percentages.

The sums insured per policy grew rapidly, leading the number of coinsurers per risk to grow too, as each one generally did not want to have significant shares.

3.5. The Consolidation of reinsurance

This situation led these first insurers into cumbersome administrative situations and even, in some cases, to a lack of capacity. In this way, pure reinsurance began to develop and strengthen, becoming thoroughly accepted in the 17th century with the almost simultaneous formation of joint-stock insurance companies.

These grew stronger over time, and even more so with industrial development and the appearance of large accumulations of sums insured per risk.

3.6. Some differences from modern-day reinsurance

In the early period of reinsurance development, the term "reinsurance" was used to refer to different types of agreements which were very different from what we now understand by the concept. It did not have a uniform meaning and was not clearly defined. So, agreements similar to reinsurance – such as those we will look at below – were also referred to as "reinsurance".

An insurer took over the obligations accepted by another insurer who either wished to withdraw from the business or had died or gone bankrupt. This transaction, which took place in Amsterdam in 1595, differs from the current meaning of reinsurance, since it involves a 100% transfer of the obligations of the first insurer and there is also a direct relationship or an agreement between the second insurers (supposed reinsurer) and the insured.

Another case, which existed in a Bilbao ordinance dated 1738, said that, to avoid the risk of its insurer suffering insolvency, the insured arranged a second contract with another insurer, the latter accepting the risk on a subsidiary basis. This agreement, which is described as reinsurance, is obviously not reinsurance as it was arranged directly by the insured and at its own expense.

3.7. The England case

Reinsurance expanded rapidly in Europe but, curiously, was interrupted in England by the intervention of Parliament. In order to avoid abuses which had occurred, a paragraph was added to the Act of 1746 declaring the practice of reinsuring British vessels and the merchandise carried on them to be illegal. This provision was withdrawn in 1864, though there are signs that reinsurance was still practised in some cases, despite the prohibition.

3.8. Reinsurance and other classes of insurance

We have seen that both insurance and reinsurance basically originated in maritime trade. As a natural development, however, for the other classes of insurance, the need to reinsure began to appear as new forms of insurance were consolidated. Some examples are given below:

– The first known fire reinsurance contract dates back to 1813, between Eagle Fire Insurance Company, of New York, and Union Insurance.

– Another similar one appeared in 1824, between National and Imperial Fire.

– Fire reinsurance started to become international at that time. Sun Insurance Office accepted an offer from Germany's Aachener und Münchener and extended its acceptances to all European countries, India and America.

– The oldest known hail reinsurance contract dates back to 1854 in Trieste, between Magdeburger and Riunione Adriatica.

– The first life reinsurance contracts were effected in England in 1844 and on the Continent in 1858, between Schweizerische Rentenanstalt and Frankfurter Rück.

– The first accident reinsurance was taken out by two Scottish companies in 1888.

4. THE STATISTICAL BASIS OF PREMIUMS

Insurers meet their indemnity commitments by setting up funds which, in turn, are made up from premiums received from their insureds. And how are these premiums calculated? In principle, on a purely statistical basis.

So what does the risk premium depend on?

The answer is: on the number of insured risks that will be affected by a claim and the frequency with which claims occur. The calculation of the premium to be applied may prove to be of greater or lesser accuracy.

The accuracy of the calculation is thus directly related to the number of samples taken and the periods of time observed. Clearly, the more material that is analyzed (law of large numbers), the less deviation there will be in the insurance premium calculations.

Below we will look at various statistical sources that may be used in the insurance sector, depending on what is trying to be achieved and the field in which the activities are to be carried out.

4.1. Statistics from outside the insurance industry

A typical example of these statistics are the mortality tables which are necessary for and which are usually official (published by Government bodies) and prepared by geographical area and by risk group. Insurers in turn make adjustments according to trends for periods of time subsequent to those considered in the original statistics. They will also adjust for the different types of life insurances.

Further examples of this type of statistics are those prepared by Spain's *Dirección General de Tráfico* (Traffic Authority) relating to road accidents and used by motor insurers. Another example is the statistics on total claims in maritime navigation published annually by Lloyd's of London.

4.2. Statistics prepared by insurer associations

These are reliable enough to be used by insurers as they are compiled by all or a representative majority of insurers operating in a specific market. In Spain, those published by UNESPA (*Unión Española de Entidades Aseguradoras y Reaseguradoras*) [Spanish Union of Insurance and Reinsurance Companies], the Directorate-General for Insurance and Pension Funds and ICEA (*Investigación Cooperativa entre Entidades Aseguradoras*) [Cooperative Research by Insurance Companies] are worthy of mention.

4.3. Statistics prepared by insurance companies themselves

Information from companies' own portfolios can also be used. Insurers' statistics enable them to analyse its business trends and to correct possible deviations by observing and comparing them with the general market statistics.

4.4. Statistics on individual insureds

We know that the higher the number of elements observed, the more accurate the statistic will be. Applied to insurance, it will therefore be more reliable in classes of business that have more uniform risks. That being the case, it is advisable to prepare individual claim statistics for so-called *large risks* i.e. macro-businesses with a large number of manufacturing or sales facilities.

For businesses of this type, insurers have to balance the premiums received with the frequency and intensity of the claims covered. In order to do this, they will have to consider the frequency of small and medium-sized claims and set up a reserve for a possible large claim. Therefore, it is advisable to compile information based on the longest periods of time possible, so that the longer period of time observed can substitute or mitigate the lack of a sufficient number of similar businesses to analyze.

4.5. Statistics produced by reinsurers

How can the statistics prepared by reinsurers be used to calculate premiums? To answer this question, one should first take into account the fact that the sphere of activity of companies dedicated to reinsurance is international.

Because of their international nature, they are able to collate and compile statistics from different countries to complement those obtained locally. This information is returned to the different countries by the reinsurers, thus giving the different insurers a further element which they are able to compare with the local information they already handle.

4.6. Premiums for "large risks"

We mentioned, previously, the difficulty of obtaining statistics on large risks and this is where the information from reinsurers acquires greater importance. Certain types of insured companies only exist in very small numbers in each country, which means that statistics based on just one country's data would not be very reliable. This is the case of oil refineries, power stations, hydroelectric plants, nuclear plants, steel works, etc.

Only international reinsurers have sufficient information as they operate in the various countries in which these large companies are situated. Passed on to the insurers of each country, it will be used to make the best estimate for premiums charged to their individual insureds. Statistics based on the country's figures alone are unreliable. Consider refineries: international reinsurers will have sufficient information if they do business in the various countries in which these large companies are situated.

4.7. "Force *majeure*" premiums and claims

The statistical service provided by reinsurers acquires even greater significance in cases of claims caused by *force majeure* or natural events, for which the periods of reoccurrence, local circumstances and possible accumulations involved in each one are very different.

Who can compile the data required to best estimate aspects of risk such as their frequency, probability and intensity? Only international reinsurers who have been operating for long enough periods will have this information.

5. FLUCTUATIONS IN THE TECHNICAL RISK

As we have seen above, the insurer is subject to imponderables which it tries to overcome by applying statistical techniques. In any case, the price of the premium is established before knowing whether a claim will occur with the consequent indemnity, the amount of indemnity and when it will have to be paid.

We can see, therefore, how the information used by the insurer corresponds to the past and how, in order to set the premiums, statistical assumptions are used to adjust for the future. However, there are causes that may make the forecasts incorrect, with the result that the risks can then fluctuate. We can look at two examples.

Technological development is one of them. In virtually all industrial processes, recent years have seen the introduction of new raw materials derived from the petrochemical industry, electronic control systems, etc. The same has also happened with domestic risks (households, vehicles, etc.). If the insurer uses past statistics as a basis, it will have to take special care and constantly analyze the trends of risks.

Another source of possible deviations can be natural disasters: earthquakes, floods, cyclones, etc. During the period covered by the statistics, there may not have been any occurrences but, if they occur, they can have a significant effect on a large number of a company's insureds, even over different classes of business. However, there are other factors that may alter an insurance company's statistical calculations when setting the amount and adequacy of the premiums for the risks covered under their policies. We will consider below two risks that have a significant effect on these calculations:

– The risk of random fluctuations
– The risk of change

5.1. The risk of random fluctuations

This type of risk has to be taken into consideration in the calculations that the insurer has to make when establishing the amount of the premium. That being

the case, it will have to decide what percentage of deviation it can accept without excessively exposing the business balance sheet.

In order to calculate this percentage, it will have to devise models that enable it to determine the probability of occurrence of a number of defined claims over a specific period of time and for the number of policies it handled at the time. The outcome of this study will be the degree to which greater or lesser deviation is accepted and the logical conclusion is that the lower the degree of deviation accepted, the more confidence in the statistical result.

One difficulty: non-uniformity of the portfolio

For the insurer, the greatest difficulty for determining the acceptance level will actually be the non-uniformity of its portfolio, since the sums insured on the different risks covered can vary enormously, even though (as in any statistical study) the probability of deviation will reduce as the number of insured risks increases.

One solution: reinsurance

Insurance portfolios are normally comprised of a larger number of medium/low insured risks and a few with higher sums insured. One solution to the problem of a portfolio's diversity is to have a cut-off amount for sums insured and to cede everything above that amount to reinsurers. In this way, a more uniform portfolio will be achieved, giving the insurer a more accurate idea of the margin of deviation accepted for the risk of fortuitous deviations.

5.2. The risk of change

This is another factor that can affect insurers' statistical calculations and it concerns the variability of the data that will be taken into consideration when preparing that information. The fact is that if all the circumstances relating to the frequency and amount of claims are taken into account, it is unlikely that the factors taken into consideration during the period of time studied statistically will remain constant. This almost certain variation can give rise to an increase or reduction in the liabilities borne by the insurer.

The risk of change is determined by a series of factors, some more obvious than others, as the following examples show.

Salaries and manufacturing costs

If we look at the claim amounts that an insurer has to indemnify, these are the two values that have the most effect. Variations in salaries and manufacturing costs are very difficult to quantify in advance as it is only known that the tendency is to increase but not to what extent. These are two of the most obvious examples of the risk of change but they are not the only ones.

In theft insurance

The tendency is for people's standard of living to improve. This social trend is accompanied by even greater growth in the crime rate which will naturally affect theft insurances.

In marine insurance

Thanks to technological progress and the larger size of vessels, there has been a significant reduction in the number of total claims affecting these insurances. By way of illustration, we can say that it has been calculated that, whereas some 200 years ago partial claims accounted for only 3% of paid claims, in the 19th century the risk premium was made up of equal amounts for total claims and partial claims. Currently, only 20% of the risk premium accounts for total losses.

In motor insurance

It is common knowledge that the total number of vehicles is known to have experienced rapid growth, and this growth has totally changed the medium and long-term statistical data. So, what has to be done? The data must be compiled over shorter, more immediate periods.

But this is not the only factor that affects motor insurance. Factors such as the considerable improvements in the road network and also the weather conditions (depending on whether there are periods of drought or of rain and snow) need to be taken into consideration.

In liability insurances

This is another class of insurance that has most suffered from the risk of change. The improvement in the standard of living and, consequently, in the level of culture and consumer pressure have meant that the frequency and amount of liability claims have increased almost exponentially in recent years. This means that insurers are forced to revise their calculations and increase premiums, with annual reviews.

5.3. Fluctuations in risk: differing effects

With regard to this point, it is interesting to emphasize that the aforementioned risks affect different insurances in different ways:

– The risk of fortuitous fluctuations affects portfolios subject to possible total losses and those subject to more partial losses in practically the same way.
– The risk of change, however, has a greater effect on insurance portfolios in which most of the claims paid are in respect of partial losses, since these are those affected by increases in salaries and manufacturing costs.

It has been shown that these factors may lead to errors in calculations when based on the insurer's statistics. The insurer is left with two options for minimizing as far as possible the risk of endangering the financial balance of its business:

– To accept the technical risk itself by increasing the premiums with high contingency loadings (problems of competition with other insurers) and/or ensuring that greater assets are available.

– It may also share this technical risk with reinsurers, thereby managing to convert part of the variable costs into fixed costs.

5.4. The practical solution

In practice, insurers in fact tend not to exclusively use either of the solutions mentioned above, but rather a combination of the two: part of the risk is retained for their own account with some contingency loading on the premiums and, at the same time, the rest of the risk is protected by means of suitable reinsurance.

The greater or lesser degree of either of the solutions will depend on many factors such as the size or financial capacity of the insurer, the class of insurance in question, the situation of the reinsurance market, etc. All of these situations and possibilities will be commented on later.

6. CAPITAL RESERVES AND THE ROLE OF REINSURANCE

All the imponderables mentioned above oblige insurers to set up capital reserves – for purely technical reasons and due to legal requirements – which enable them to accept liability at any time towards their insureds for indemnifying claims.

Different reserves can or should be set up, some of which are mentioned below:

– Unexpired risk reserves, in order to be able to attend to risks remaining in force at the close of the accounting year.

– Outstanding losses reserves.

– Special reserves for claims ratio deviations.

– Mathematical reserves for life insurance.

In accordance with legal provisions, the insurer must comply with the so-called solvency margin.

In other words, the insurer has to maintain a given ratio between premiums retained for its own account and its available assets. If this ratio required by

law (reduction in own funds or increase in retained premiums) is not maintained, the insurer has two options:

– To increase its funds by increasing capital.

– To reduce the amount of the premiums retained for its own account by ceding a larger amount of premium to reinsurers.

To summarize, the insurer has two options for maintaining its solvency margin: to increase capital or use reinsurance. It may also opt for a combination of the two. The choice will depend on factors such as availability, time and price.

6.1. One option: increasing capital

Obtaining capital by means of finance involves interest which, at least in the medium term, will create greater problems for the insurer. And if it decides to increase capital by issuing shares, even under the most favorable conditions, it will take time for the funds to become available or to be accepted as available by the supervisory authorities.

6.2. The reinsurance option

Here, the reinsurer performs an important financial role as a provider of funds. The insurer can obtain the necessary balance and alter the capital funds by means of reinsurance, which is more flexible, immediate and can even be retroactive (in some cases). Any other form of obtaining capital, as has often been proven, will take longer and be more costly. Reinsurance has the added advantage that the relationship with the reinsurer may be increased or reduced at the beginning of each financial year.

In any case, it should not be forgotten that, besides the advantages of flexibility, availability and time, capitalization through reinsurance leads to a reduction in the technical risk, which does not happen with an increase in capital.

7. APPLICATION OF THE REINSURER'S EXPERIENCE AND INFORMATION

Reinsurance business provides the insurance world with information which, based on experience, is of great use, both to insurance companies and to other reinsurers.

7.1. Risk prevention

Practiced actively by both reinsurers and insurers, this prevention can be used to reduce the number and amount of claims and the knowledge acquired

makes it possible to prevent their recurrence in many cases. This is an example of how advice to insureds or reinsureds, as the case may be, can prove to be effective.

7.2. Statistical data

We have already seen how only reinsurers have information on certain risks due to their size or their small number in each country (oil refineries, steel works, etc.) and how their experience is of use when they operate internationally.

7.3. Claims handling

Many reinsurance contracts contain clauses requiring the reinsurer to assist its reinsured with claims handling, and it is usual to establish an amount for each claim above which the reinsured is entitled to request the reinsurer's cooperation.

It is often the case that, for the handling of certain claims or special classes of insurance, only the reinsurer has the expertise and specialists required. This is generally the case in the engineering classes of insurance.

This is another example of why reinsurers, with their international presence, are necessary since, if the insurer is not present or represented in the place of the claim, reinsurers can take the necessary measures more quickly and economically.

7.4. Calculation of premium rates

As regards these calculations, two points should be made clear:

– Firstly, only reinsurers have the experience required to set the premiums necessary for large risks.

– Secondly, they implicitly acquire the right for their calculations to be applied, as they have to pay the largest part of the indemnity.

7.5. Providing advice, ideas, programs etc.

Reinsurers are interested in establishing the most favorable balance between there insured's expenses and their own expenses. For this reason they provide ideas and specific programs to improve the collation of data, which helps to simplify and improve the insurer's administration. They will provide advice on different ways of putting together reinsurance programs according to the different type of reinsurance and, also, taking into consideration the ratio of self-retention and reinsurance cessions.

7.6. Other services

Reinsurers often bring out technical publications which are made available to insurers and generally contain information on loss prevention, new technologies, new risks, etc. based on their own experience. They also expand this service by providing training for the insurers' technicians by means of short courses, training days, conferences, etc.

CHAPTER 2
PARTIES INVOLVED IN REINSURANCE

1. DIRECT INSURERS

These are the largest buyers of reinsurance and the amount purchased partly depends on the structure of the insurance market in each country

The size of any claim, or accumulation of claims, arising from one single event, that an insurance company retains for its own account tends to increase directly in proportion to: a) the volume and distribution of the policies issued and b) the size of its reserves in relation to written premiums. Consequently, the tendency is that the greater the spread of a country's insurance business between new and small companies, the greater the total demand for reinsurance.

Consequently, changes in market structures, such as insurance company mergers in many countries, can have a significant effect on the demand for reinsurance.

2. REINSURERS

2.1. A brief history

As we have seen, the reinsurance institution grew up mainly in relation to marine transport. However, it is in the fire class of business where it has developed most.

The development of fire reinsurance in the second half of the 19th century:

The first two reinsurers to be set up, as such, were Germany's Kölnische Rück and Aachener Rück, around 1850, prompted by the Great Fire of Hamburg in 1842.

This rapid development was also due to major fires in New York (1835), Germany (Memel, 1854), Switzerland (Glarus, 1861) and England (Tooley Street Fire, 1861).

2.2. The large reinsurance companies

If we refer to volume of business, the two largest reinsurance companies have their Head Offices in Europe, specifically in Germany and Switzerland. They are followed in size by the North American reinsurers.

US reinsurers are relatively small in relation to the size of the country's market. This is because:

– American reinsurers write most of their business for the national market and, since the direct insurance companies are very strong financially, there is less need for reinsurance protection.

– The large European reinsurance companies have set up offices in the United States, where they have acquired some of the largest American reinsurers.

2.3. Reinsurance companies in England

The first companies

– The first reinsurance companies to be set up, such as the Reinsurance Company Limited in 1867, disappeared after a short time.

– English reinsurance became consolidated with the creation of the Mercantile and General Reinsurance Co. in 1907 and other companies.

The reinsurance market in England

With the creation of these companies, British reinsurance grew to the extent that it became a globally recognized market.

2.4. The international nature of reinsurance

Lloyd's conducts reinsurance business internationally and is not alone in this – in the rest of Europe too, as in almost every country in the world, there are large reinsurance companies conducting business internationally.

It should be pointed out that being international is not a prerequisite for transacting reinsurance, as many reinsurers only operate on a national level.

2.5. Direct insurance companies in reinsurance

Whilst, so far, we have only referred to professional reinsurers, it should not be forgotten that a large number of direct insurance companies also act as reinsurers.

2.6. Lloyd's

The name

Lloyd's is named after Edward Lloyd, the owner of a coffee house in London in the 17th century where merchants who wrote marine insurance would meet.

Its structure

– According to the general concept of mercantile law, Lloyd's is not really an insurance and reinsurance company but a corporation made up of a large number of independent syndicates.

– The syndicates are formed by groups of members called *names* who come together and pool their resources to share a common liability.

– Administration is carried out by *underwriting agencies* that appoint *underwriters* to conduct reinsurance business on the members' behalf.

– The corporation is managed and controlled by a committee which is elected annually.

Problems

This institution suffered a major financial imbalance due to various factors:

– The large number of different underwriters: in 1981 there were around 19,000 members or *names*.

– Acceptance of reinsurance business from every country in the world.

– Delay in knowing the results of the business, as balance sheets were only published every three years.

– The international reinsurance situation in the early 1990s.

Current situation

– In 1997 the number of members, both individual and corporate, had fallen to 10,000.

– A new entity called Equitas was set up which took care of controlling the results and enabled the institution to be totally restructured.

– The rating agencies give it a solvency rating of "good" to "excellent".

3. RETROCESSIONAIRES

3.1. A definition of retrocession

A retrocession is reinsurance ceded by a reinsurer to another insurance or reinsurance company in order to release a part of the risks it has written and, in this way, stabilizing its results and homogenizing its liabilities. It is reinsurance for the reinsurer.

3.2. When a retrocession is made

This can be when an insurer writes very large risks that exceed the capacity of the national market and which, when ceded to reinsurance, also exceeds the

retention that any reinsurer wishes to retain for its own account. As a result, the spread of risk is produced via reinsurance and its retrocessionaires.

An *example* of such spread of risk was the sinking of the Italian passenger ship the *Andrea Doria* in 1956.

– The sum insured for the hull amounted to 16 million dollars.

– When the claim was settled, it was found that the original policy, underwritten by 16 Italian insurance companies, had been distributed amongst 300 companies throughout the world.

– Some reinsurers participated via 25 companies originating from five different countries.

– As regards the indemnity, only 10% remained in the Italian market, 30% being in the USA and 60% in the British market.

3.3. Retrocession as a service

Spreading risks via reinsurance and retrocessions is also a service provided by reinsurers for their ceding insurers, it means that they do not have to contact reinsurers in different countries.

A reinsurer who has agreed to participate in a risk with higher shares than it wishes to retain for its own account has to look for retrocessionaires in order to distribute the risk.

3.4. Methods of distributing large risks

Many of these reinsurance cessions and retrocessions tend to be carried out via obligatory (or 'automatic') treaties. This system has two possible drawbacks:

– There is the risk that some accepting offices find themselves participating with higher shares than they would like, due to their obligatory treaties.

– Other participants, in the confidence that they will receive automatic participations, may reject underwriting offers and consequently not participate to the extent that they would like.

Finally, we would point out that experience has shown that the international distribution of large risks is the best means of distributing the risks and utilizing the international underwriting capacity.

4. REINSURANCE BROKERS

4.1. Relations between insurers and international reinsurers

There are different ways in which an international reinsurer can establish business relations with the insurers of a specific country.

1. **Travel:** The reinsurer may opt to make regular trips and visits to its clients.

2. **Opening a representative office or branch:** This is the most effective way, but it is also, usually, the most expensive as, in order to optimize its technical service and its relations with its reinsured, the reinsurer will need a team of people who know and are expert in the various subjects and specialities.

3. **Use of reinsurance intermediaries or brokers:** Reinsurers are always prepared to increase their volume of business and also to accept reinsurance through brokers in order not to lose this business segment, although they are aware that they have to pay commission to these intermediaries.

None of the three options exclude the others and the three types can co-exist simultaneously, as often happens in the case of large reinsurers.

4.2. Specific situations for using brokers

An insurance company may arrange its reinsurance directly with reinsurers but, for certain forms of reinsurance or in specific reinsurance market situations, brokers are used to place reinsurance.

In the case of Lloyd's, insurers cannot place reinsurance directly because the syndicates are not able to do business on a direct basis and have to operate through brokers who must be accredited by the Lloyd's Committee that examines their experience and financial situation.

These accredited brokers can also carry out transactions with other insurers and reinsurers, apart from Lloyd's.

4.3. The functions of a broker

In return for commission, which is deducted from the premium paid to reinsurers, brokers perform the following duties:

– When an insurance company wishes to arrange reinsurance, the broker will look for the best financial, technical and solvency conditions. Brokers also advise ceding companies on the most appropriate reinsurance program for their insurance portfolio.

– Brokers have more knowledge about the international reinsurance markets and have information on legislation, rules, customs and normal procedures in the different countries. They can pass on this information to reinsurers not established in the country in question.

– By keeping up to date with the latest trends and types of cover provided by reinsurers, as well as with rating methods, risk-distribution, administrative

systems, etc., they are in a position to offer insurance companies a good service.

4.4. Duty of disclosure

The reinsurance broker generally acts as an agent and is usually authorized to negotiate and bind reinsurance on behalf of the party for which it is acting. It is therefore required to inform the reinsurer of the conditions of the insurance in question and of any circumstance and information provided by the ceding company. The information must be correct, appropriate and adequate.

If this duty is not complied with, the reinsurer is entitled to deny liability and even cancel the acceptance on the grounds of misleading information.

In order to protect their position, British brokers often write the letters E&OE (errors and omissions excepted) on their slips (summary of the conditions offered) and, with regard to statistical data, "this information is not guaranteed". In this way, when slips containing such annotations have been signed, the reinsurer waives the right of cancellation in the event of negligence or error in the information, except in the case of proven fraudulent conduct on the part of the broker. Both insurers and reinsurers always try to deal only with brokers that are accredited for their professionalism and moral solvency.

4.5. Payments through brokers and the disadvantages

When reinsurance is arranged through brokers, payments may be made in two different ways:

Both parties' payments are made through the broker

This tends to be the most common system, for reasons of convenience, as brokers usually place the reinsurance with a large number of reinsurers, thus saving the insurer considerable time and money if the broker handles the accounts and remittances.

This system has several disadvantages

The procedure has the disadvantage that it can lead to delays in transferring the money, with the consequent loss of interest and even producing the need to have to finance claims payments due to possible delays in their recovery.

Only the accounts pass through the intermediary, but payments are transferred directly to the interested parties

This is done only in the case of special agreements, or in some countries where making payments through the broker is prohibited by law.

5. INSURANCE AND REINSURANCE POOLS

5.1. What is a pool?

A pool is a cooperation agreement between a number of companies operating in a specific market, the basic idea of which is to obtain a balance in the results of the business originating from the pool's members. There are two types of pools: coinsurance pools and reinsurance pools.

The main reason for setting up pools is the need to exhaust a market's or a country's capacity in respect of risks that can produce large or widespread claims, as in the case of nuclear risks, or for risks which are of a limited number in a market so that it is not possible to apply statistical calculations, such as oil pools, environmental pollution pools, etc.

5.2. The coinsurance pool

In this pool, the members undertake to underwrite the risks stipulated within the structure of the pool and not for their own account. They must cede such risks to the pool and, in return, receive a share in all the business arranged by the pool in accordance with a previously agreed system of apportionment.

The pool has a series of advantages and disadvantages for its members.

Advantages

– Where underwriting is carried out as a group, the pool's retention limits are fixed according to the financial resources of the group, totally or partially replacing the retention of each member and, as a result, reducing the need to cede to reinsurance.

– If the pool is constituted by a group of insurers with a relevant weight in the market, they can exert influence by introducing a certain professional discipline in that market and, thereby, limit any possible deterioration in the business due to excessive competition.

Disadvantages

In this type of arrangement, the members have to operate in accordance with the rules established by the pool, which may detract from their being competitive vis-à-vis other companies outside the pool.

5.3. Differences between a reinsurance pool and a coinsurance pool

Reinsurance pools operate in a similar way to pools of insurers, although there are some differences.

– In pools of insurers, since this involves coinsurance, all the participating members have to appear on the policy, each with their respective share.

– In a reinsurance pool, the policy is issued by one of the members and apportioned among the remainder according to the percentages agreed within the pool, but unknown to the insured.

6. CAPTIVE COMPANIES

6.1. The concept of a captive company

Captive insurance and reinsurance companies are referred to as *captives* because they are founded by large industrial or commercial companies, almost always multinationals, in order to obtain insurance or reinsurance cover for their own risks. This leads to a situation in which the insured, insurer and reinsured share the same company philosophy and some common interests.

Certain captives not only insure the interests of their group but extend their activities to underwriting business from other companies.

6.2. How captives are formed

– **The captive of a company that only operates in a certain country:** An insurance company is usually set up to protect its risks and to obtain more favourable reinsurance conditions.

– **Captives of industrial multinationals:** Multinationals tend to set up a captive reinsurance company domiciled in the most advantageous country for tax purposes or in the country where legislation most facilitates its establishment, thereby avoiding having to set up various captives in the different countries in which it operates.

6.3. How captives work

Captives use a local insurer as a *fronting company,* thereby acting as intermediary. The latter generally underwrite the whole risk, retaining a very small share for their own account and ceding the rest to the captive.

For this service they receive a commission and the portion of premium corresponding to their retention.

After fixing its own retention, the captive cedes to the reinsurance market as a retrocession.

6.4. Setting up of captives

These are usually set up in tax havens such as the Bahamas, Bermuda, the Seychelles, etc. and, in Europe, generally in small principalities, where they enjoy very favourable tax treatment and are practically just a "PO Box".

6.5. The disadvantages of captives

For the reinsurance markets, the formation of these captives constitutes an increase in their accepted business, because most companies do not wish to invest more capital than necessary in their captives, and so the captives' net retentions are lower than what they would normally be for traditional companies.

Despite this, captives also have disadvantages:

– A reinsurer accepting cessions from a captive should examine whether its underwriting policy meets normal insurance criteria, whether it is committed to continuity and whether it has the financial capacity to accept liability for its self retentions.

– The accepting reinsurer may experience difficulties in respect of the prevention and settlement of claims. Although they write almost the entire risk, and therefore have to settle the majority of any claim, reinsurers do not have a say in risk prevention or claims handling, unless special clauses are incorporated.

It should always be remembered that the interests of the insurer/reinsurer and the claimant are the same, which means that there can often be a tendency to settle claims in the most favourable manner.

6.6. Management of captives

Captives do not normally have technical staff, large volumes of business or experience and, consequently, are dependent on the prevailing reinsurance markets and brokers. This means that part of the cost saving arising from eliminating an insurer's general expenses has to be paid as commission to intermediaries. For that reason, specialized companies have been set up to deal with the administration, accounting aspects, etc. of these captives.

CHAPTER 3
TYPES OF REINSURANCE CONTRACTS: FACULTATIVE REINSURANCE

1. INTRODUCTION

Relations between direct insurance companies (cedants) and reinsurers are formalized in writing by means of a document called a reinsurance contract.

In general, the legal parameters that have to be taken into account in a reinsurance contract are as follows:

– Enacted laws, both public and private.

– Court judgments.

– The contract itself as applicable law.

– Reinsurance custom and practice.

Practice has shown that the provisions agreed in the contract and international custom and usage in reinsurance transactions tend to have priority over the possible applicable legislation and jurisprudence.

In addition to the rules normally imposed by mercantile law (ability to contract, intention to create a legal relationship, etc.), reinsurance contracts must also satisfy the minimum conditions prevailing for any insurance contract:

1. **Insurable interest:** insurable and, in this case reinsurable, interest must exist and commences when it is applicable for the direct insurer; in this way, the interest for the reinsurer, and also its liability, commences from the time the direct insurer issues the policy, and is limited by the amount and liability that it accepts under the contract.

2. **Utmost good faith:** as this is the principle upheld in the insurance profession, it has to be one of the principles maintained by reinsurance. In this business, utmost good faith is absolutely essential and must be very strictly observed, since it is a relationship between professionals of the same level, one of which, the reinsurer, on accepting a contract, virtually hands the ceding company a blank check. The implicit trust can only be achieved, in practice, through the cedant's observance of this principle over time.

   This principle is manifested in various ways in the course of the reinsurance relationship:

– **Information.** The cedant has to provide the reinsurer with complete and reliable information on the circumstances of the business ceded. This information is especially valuable as the reinsurer will decide on its participation, rates to be applied and share to be written. The reinsurer should be informed of increases in risk, those that the cedant decides to cover for commercial reasons (covers granted as a favor) and any deviations from the provisions of the contract.

Another way in which the principle of good faith is manifested is when the cedant excludes from its policies those risks which, although accepted, can be construed as inappropriate for the risks for which the contract was created; special risks, etc.

As regards general information on accepted business, the cedant must provide reliable information on claims estimates, outstanding losses reserves, reliable and clear statistics, etc.

3. **Indemnity:** reinsurance contracts are contracts of indemnity. Contracts based on a purely speculative interest do not make sense.

4. **Solidarity of interests (follow the fortunes):** it is generally accepted that the reinsurer's and reinsured's fortunes go hand in hand which means that, when a circumstance arises that benefits one of the parties, it must also benefit the other. In other words, the reinsurer and the reinsured must share equally any profits or claims that arise. Although the principle of following the fortunes applies to all types of reinsurance, in excess of loss contracts, situations can arise that favor just one of the parties. Both parties are aware of this fact and it is studied in detail in the relevant chapter.

   This principle is invaluable when interpreting dubious cases that can often arise in view of the need for flexibility in reinsurance contracts and it is related to the principle of continuity commented on below.

5. **Risk transfer**: an actual transfer of risk must take place in the business reinsured (in the case of proportional contracts), or an actual risk must be covered (in the case of non-proportional contracts and facultative excess of loss reinsurance) between the cedant and the reinsurer.

6. **Principle of continuity:** closely related to the principle of following the fortunes, this principal enables the parties to stabilize the results obtained over time, compensating the other for claims transferred or, alternatively, paying back part of the profits obtained.

   By maintaining the reinsurance relationship over time, the reinsurer and the cedant can participate in the results generated by the reinsurance transactions.

7. **Arbitration**: in the event of dispute between the cedant and the reinsurer, arising from the interpretation of the reinsurance contract, instead of taking legal action through the courts of justice, differences are usually resolved by arbitration, the arbitrators being professionally recognized reinsurance experts.

8. **Reinsurer's solvency**: since reinsurance cession transactions involve an undertaking of future payment by the reinsurer, the reinsurer is required to have a high level of solvency to cover the liabilities it accepts. A reinsurer's insolvency is very damaging for a cedant that is not released from its liabilities towards its insureds.

Obviously, a reinsurance contract, in the same way as an insurance policy, has to be set out in a written document, signed by both parties, setting out the characteristics of the risk transfer:

– Period of cover

– Class of business reinsured

– Territorial limits

– Type of risk transfer (cession) and its characteristics.

However, and as happens in any commercial transaction, there are many different ways of establishing this reinsurer/reinsured relationship.

One basic difference and, therefore, general classification is the one that lists the parties' contractual obligations depending on whether they are irregular and sporadic (facultative placements) or whether they are permanent and fully binding obligation for both the insurer and the reinsurer for whole groups of business, whether by insurance class or entire portfolios (obligatory treaties).

Obligatory reinsurance is also known as automatic reinsurance.

1.1. Classification according to the reinsurer's and the insurer's "positions"

		Reinsurer's position	
		Has to accept the risk	Free to accept the risk
Insurer's position	Obligation to cede the risk	Obligatory (or automatic) reinsurance	Obligatory-facultative reinsurance
	Free to cede the risk or not	Facultative Obligatory Reinsurance	Facultative Reinsurance

1.2. Classification by type

```
                    ┌─────────────────────────┐
                    │     CLASSIFICATION       │
                    │     OF REINSURANCE       │
                    └─────────────────────────┘
           ┌──────────────────────┐    ┌──────────────────────┐
           │      OBLIGATORY       │    │      OBLIGATORY       │
           │       TREATIES        │    │       TREATIES        │
           └──────────────────────┘    └──────────────────────┘
```

Proportional (Based on sum insured or PML)	Non-proportional (Based on amount of claims)
Quota share treaties	Per-risk XL
Surplus treaties	Per-event XL
Other types	Excess of loss or Stop loss

Facultative proportional	Facultative non-proportional
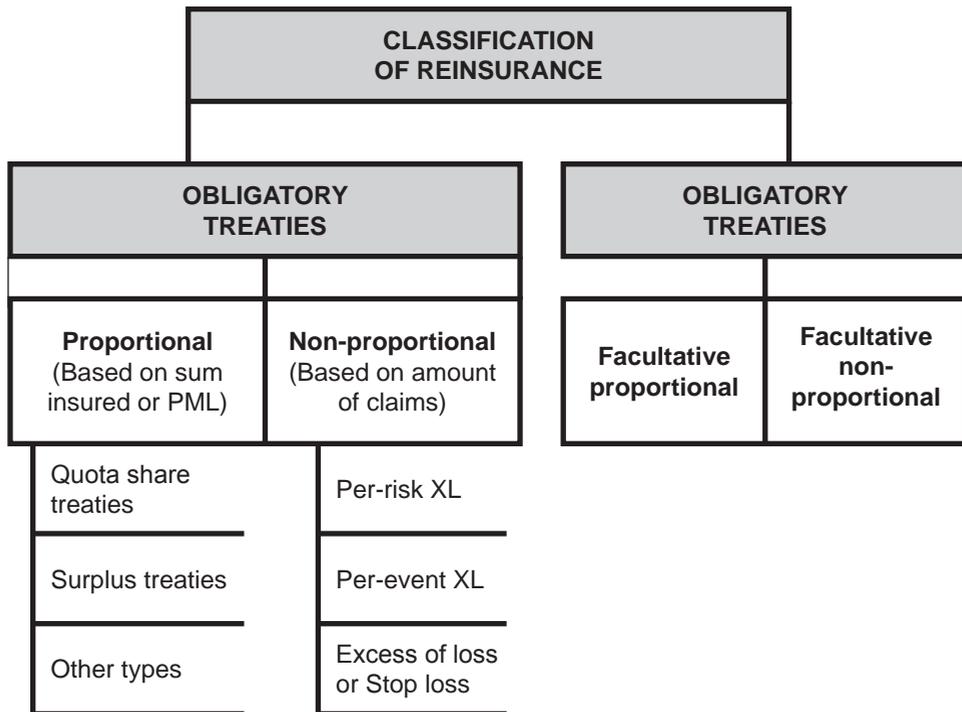
2. CONCEPT AND NATURE

Facultative reinsurance is the name given to the type of reinsurance whereby both the insurer (or cedant) and the reinsurer have the "faculty" or option to cede and accept, respectively, the business in question.

Facultative reinsurance usually applies *to risks in isolation, named and detailed individually.*

The term "facultative" is used to define something that is optional and, according to the dictionary, applicable to an act that is not necessary but that can be freely carried out or not.

These terms, therefore, describe the very essence of facultative reinsurance: the insurer's freedom to decide whether or not to cede a transaction and to choose which reinsurer is to be offered the risk. By the same philosophy, the reinsurer has the power to accept or refuse the transaction offered.

First of all, the direct insurer has to submit a precisely defined offer to the reinsurer, containing all information on the risk offered. Then, after examining the offer, the reinsurer decides whether to accept (a share) the risk or reject it.

Facultative reinsurance is the oldest form of reinsurance.

Some people maintain that facultative reinsurance is actually the only type that conforms to the classic principles of reinsurance insofar as the conditions of each risk are analyzed from an *extraordinarily technical perspective.* This is the second feature of facultative reinsurance: *its individuality.* The cessions refer to individual risks with specific features which make them particularly suitable for facultative handling since, for one reason or another, they fall outside the rules governing policies that fall into the contractual framework of obligatory treaties.

Similarly, the relationship between the insurer and the reinsurer, and the latter's knowledge of the cedant's underwriting philosophy, constitute a key factor for assessing the professionalism, prestige and technical expertise used by the direct insurer's underwriters.

3. USE AND UTILITY

The development of facultative business in recent years is linked to the increasing size of risks in technical and also financial terms, together with the enormous concentration of values in small areas.

It is precisely these features, together with a few other less important ones, that determine the use of facultative reinsurance: everything that cannot be ceded to treaties, mainly due to size, but also due to its nature.

Those cases in which certain risks are placed facultatively are listed below:

1. The non-availability of specific protection under a treaty as a special type of cover is required or because the small number of policies issued by the cedant does not warrant the arrangement of a reinsurance treaty.

2. Policies which, due to their high sum insured, exceed the capacity of a treaty.

3. Risks that are among those excluded from automatic obligatory treaties.

   As will be seen below, obligatory reinsurance treaties usually have a list of exclusions which may relate to:

   – Geographical area covered

   – Nature of the insured business

   – Type of policy

   – Perils not covered

   – Atypical covers

The insurer will need to look for reinsurance individually and therefore on a facultative basis.

4. Transactions which, although not excluded from the treaty, represent an increase in risk which, in the cedant's opinion, could prejudice the treaty's results, as it incorporates an exposure factor that could distort a more uniform portfolio.

5. Tailor-made policies for preferential clients that fall outside the standard conditions owing to their size and complexity.

6. New types of insurance being introduced into the market.

7. Specific cooperation agreements whereby an undertaking has been given to supply a reinsurer with facultative cessions in return for certain concessions.

4. ADVANTAGES AND DISADVANTAGES OF FACULTATIVE REINSURANCE

Any consideration of advantages and disadvantages always involves an element of subjectivity depending on the position taken, since what may constitute a facility for the reinsurer may end up being an obstacle for the insurer.

4.1. Advantages

1. It increases underwriting capacity as it enables risks to be written over and above the capacity of automatic treaties.

2. It makes the insurer's underwriting policy more flexible.

> **For example,** it allows the underwriting of risks excluded from automatic obligatory treaties.

3. It provides access to reinsurers' experience on specific types of risks or covers.

4. It enables automatic treaties to be protected, reducing their exposure to hazardous risks.

5. It makes it possible to ascertain the reinsurers' level of response and service.

4.2. Disadvantages

1. **Administrative complexity:** it increases management expenses substantially. As special risks are involved, i.e. with a high hazard level, the

ceding insurer has to seek and obtain sufficient reliable protection through international reinsurance. This increases its expenses to a great extent since, in general, it has to contact specific reinsurers located in different countries, requesting their reinsurance cover and providing full information on the risk in question. It also takes longer to undertake this work.

2. Lack of agility: since these are individual transactions, many of which are extraordinarily complex, it is not always possible to access acceptances with the desired speed. In fact, to the extent that delays arise, the cedant is able to compare the levels of service offered competing reinsurers in terms of speed of response.

3. **Lower levels of commission:** the increase in the insurer's administrative costs is accentuated because the commission that the reinsurer normally pays for facultative cessions is normally lower than that available under obligatory treaties. This is due to the technical instability they represent and to the shorter term reinsurer/reinsured relationship with facultative reinsurance.

4. **Dependence:** given the reinsurers' "faculty" to accept the risk or not, it is necessary to have full confirmation of their support before issuing the cover document (policy).

4.3. How can management expenses be reduced?

The most common way of reducing management expenses in facultative reinsurance is to engage an intermediary (broker or reinsurance broker) to look for sufficiently solvent reinsurance. These intermediaries generally have a good knowledge of the reinsurance market, since they are constantly informed of changes and alternatives in the market and know which reinsurers and reinsurance markets are more inclined to accept or decline certain classes of risk or classes of insurance.

4.4. Use of brokers and the risk information questionnaire

Although management expenses are reduced through the use of brokers, the disadvantage that may arise from using these intermediaries is that, for facultative reinsurance, the reinsurer requires full and precise information on the risk in question in order to decide whether or not to participate.

This information can only be provided by the insurer and, when it passes through an intermediary, it may be distorted or be insufficient for reinsurers to acquire sufficient knowledge of the risk they are prepared to accept.

In order to partly overcome the disadvantage of using intermediaries, fairly general questionnaires exist which include the most essential information for decisions to be taken.

The information included in the questionnaire generally refers to the following aspects:

- ○ Date of commencement and expiry of the original risk and cession

- ○ Description of the risk

- ○ Cover provided

- ○ Exclusions from cover

- ○ Conditions relating to the rate and payment of the premium

- – These questionnaires are also used as an "*offer note*", i.e. the information accompanies the offer of cession to the reinsurer who, if interested, returns the document to the insurer bearing its signature, indicating the share it accepts and the commission granted in return for the cession.

5. TYPES OF FACULTATIVE REINSURANCE

The facultative transaction will usually be effected through one of the following methods: proportional or non-proportional.

- – In the case of a proportional cession, the reinsurer accepts a share of all claims, regardless of their amount, in return for an equivalent percentage of the original premium.

  The normal practice is for the reinsurance premium to correspond to the premium of the original insurance, from which the reinsurance commission is deducted.

  However, this practice has evolved for merely practical reasons. In reality, the reinsurance premium should equate to the so-called *risk premium*, i.e. to the policy premium less any loadings which the insurer has to include for internal administration costs and its external expenses (commissions and intermediaries).

  However, as these expenses vary depending on the case, the facultative relationship would become very complicated, bearing in mind that the facultative offer is often made under pressure of time.

- – The non-proportional (or excess of claim or XL) method, on the other hand, implies that the reinsurer will only pay the share accepted on those risks that exceed the cedant's retention or the capacity provided by the placement in respect of the stipulated line.

  The differences from using one system or the other are considered not only in the calculation of the premium but also in practical aspects. An insurer placing its risks on a proportional basis thus enjoys the same "fortunes" as the reinsurer (following the fortunes) by ceding the policy in accordance with the original terms, conditions and premiums.

The consequences are different in non-proportional reinsurance, as the liability accepted only comes into play when the claim exceeds the net retention. On the other hand, the price of the reinsurance is naturally different, as the reinsurer does not participate in small and medium-sized claims but does so for large ones.

From this perspective, the non-proportional option is, in theory, considerably cheaper for the insurer as it retains a larger portion of the original premium.

In this way it can calculate its maximum liability by managing its portfolio through uniform quantitative profiles, in the knowledge of where the limit of its commitment lies. From this threshold, it avoids any large claim by transferring it to reinsurance.

On the other hand, one must consider the important question of the costs of the operation. In proportional reinsurance, the level of commission granted is based on the cedant's actual expenses, so that the reinsurer contributes towards those costs. This justification is not applicable in non-proportional reinsurance since the premium is calculated net for the reinsurer. The costs are borne by the insurer and charged to the higher retained premium.

Example

Construction of a dam with a sum insured of 100 million.

Let us look at two forms of facultative reinsurance:

If there is a claim of 30 million, how is this cost shared between the reinsurer and the insurance company?

	Situation 1	Situation 2
Type of reinsurance	Reinsured proportionally with a 40% cession	Reinsured non-proportionally with a net retention of 20m
The reinsurer will pay	40% of 30m = 12m	30m – 20m = 10m
The insurer will pay	60% of 30m = 18m	Net retention = 20m

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6. TECHNICAL ASPECTS

6.1. Organization of the facultative reinsurance department

The specific nature of facultative reinsurance, in that it deals with transactions that fall outside the norm and have a high technical content, requires the staff involved in the management of this type of reinsurance to have a wealth of experience and knowledge.

On the cedant's side, there are two ways of managing facultative reinsurance: either through the reinsurance department or from within the actual underwriting department that can manage the cessions but not from the accounting point of view. In the first case, knowledge of reinsurance is key and, in the second, knowledge of direct insurance. However, for the purposes of placing and negotiating this type of reinsurance, it is always easier for a direct underwriter to deal with reinsurers than for a simple risk placer to master the "secrets" of underwriting. Where reinsurance brokers are involved in these operations, there is normally a greater degree of complexity, as they often involve risks with certain difficulties due to the size, coverage, conditions or poor experience. The professionalism of all the participants – in this case the three parties– in the process of placing this type of transaction is decisive due to the specific particularity of facultative reinsurance.

In any event, risk survey reports and PML calculations made by qualified risk surveyors that accompany facultative offers, are highly valued by reinsurers.

Another option is for reinsurers who have these inspection services to offer to carry out the survey, whether the risks are new or renewals.

6.2. Technical procedure

SPECIMEN FACULTATIVE OFFER IN THE FIRE CLASS OF BUSINESS

Fax from Company A sent to Reinsurer B
For the attention of...
Date...
Fax number...
Sent by ....
Department..
Reference:
Name of Insured..
Company's business..
Risk Protections..
Location of the risk..
Types of building... Value in euros
Types of contents.. .... Value in euros
.... Total in euros

```
Policy cover:
I. Basic cover…….…............……………………........………..  Value in euros (100%)
                                          ………..………....……… Retention in euros
II. Extensions of Cover.........……………………………..…  Value in euros (100%)
                                          ………..………....……… Retention in euros
III. Other covers(theft, electronic equipment, public liability, etc.)
                                          ………………..Value in euros (100%)
                                          ……………….…Retention in euros
Net policy premium……………………….......………………………  euros (100%)
Our offer: ...……………. %

                    For the Company, signed                    For the Reinsurer
                                                          Accepted……………….. %
```

a) **New business:** one of the most notable peculiarities of facultative reinsurance is that the only written account of this exchange of business is limited to the aforementioned "cover note" or "offer and acceptance note", which does not contain any of the conditions or requirements normally established in obligatory reinsurance treaties. So, almost all facultative placements are subject to reinsurance custom and usage and, in practice, are subject to the terms and conditions set out in the original insurance policy. In fact, most facultative reinsurance cover notes are often an example of incomplete contract documentation and are, therefore, imperfect.

The reinsurer will examine the offer in the light of the information received and give a more or less favorable opinion depending on the level of detail of this information which, in any event, should contain the following essential data:

- Insured

- Class of business (type of insurance)

- Activities to be covered

- Geographical area

- Values and sums insured

- Currency

- Conditions of cover (wordings and clauses)

- Rates and resulting premium

- Perils (fire, explosion, earthquake, flood, etc.)

- Protections

- Claims experience (claim record)

- Inception and expiry date of the policy or reinsurance

- Share offered

- Coinsurers and respective percentages

- Retention

- Capacities ceded to treaties

- Known accumulations

- Commissions and other expenses

- Structure of the reinsurance (proportional or XL) or combinations of the two

Some years ago, this process was carried out by telephone or, in highly professional markets, "face to face" with the reinsurer. Nowadays, modern communication systems allow information to be provided automatically, the delay in receiving a response being no more than the time taken to study the transaction.

It should be pointed out here that reinsurance practice requires the cedant to provide all available information without omitting any aspect that might affect the reinsurer's decision. Failure to comply with this duty, in bad faith, could give rise to the refusal to pay any claims arising.

The reinsurer may give its final opinion on its level of participation when the risk is submitted, or it may indicate its acceptance subject to further information being provided.

It should also be pointed out that the reinsurer has to give its express acceptance and tacit acceptances, in the absence of any response within a certain period, are not valid. Within the standard practices of the reinsurance world, especially in the British market, the document traditionally used follows a classic form: the "slip". The slip contains certain minimum data, including the percentage accepted by each reinsurer with its stamp and signature. However, electronic acceptance systems now make it possible to speed up this process in a way that was unimaginable just a few years ago.

The practices developed in the British market over many years have created a set of specific clauses that operate in the reinsurance world and are known by specific initials, acronyms or abbreviations. These references (NMA, LIRMA, etc.) are included in the slips as technical indications of the conditions of cover or contractual provisions applicable to a specific transaction.

The prudent placing of a specific risk with several reinsurers may in certain cases lead to *overplacing*, which means that the reinsurance capacity obtained is higher than that required. In such cases, a process known as *signing down* takes place, which requires the participations to be reduced, causing certain prejudice for a reinsurer that has committed capacity which is ultimately not used.

Cession documents:

SPECIMEN FACULTATIVE CESSION BORDEREAU
FOR THE FIRE CLASS OF BUSINESS

Cession No. .... from Company............................ to Reinsurer...

Class of business.. Currency...

Details of insurance:
Policy No.. Period...
Policyholder...
Subject-matter insured...
Location of the risk...

                                 Sums insured............................. Premiums

        Sum insured by the Company.......................... %...................................

        Sum insured by other companies.................... %...................................

        Total sum insured.. 100% ....

Details of cession
Of the total, the Company cedes to the aforesaid Reinsurer................................ %
i.e., a sum of.. euros.
for a premium of... euros, commission of...................... %
Observations:

Date and signature   Date and signature

Ceded: By the Company   Accepted: By the Reinsurer

b) **Renewals:** In the case of one-off operations, ceded for a specific period, obviously there is no renewal of the risk since it was originally accepted up to its natural expiry. In all other cases, a policy renewal procedure must be carried out which the cedant must obviously control in order to avoid risks not being renewed.

A reinsurer will, therefore, be informed one or two months in advance of the risks to be renewed and the claims affecting the policy, and reference made

in particular to any amendments or changes. These must be specifically accepted by the reinsurer, especially if they involve an increase in its liability or an increase in risk.

The same process as that used for new offers is applied here, in that it is necessary to obtain the reinsurer's express consent. Sometimes, when it has not been possible to close the renewal negotiations between the insurer and insured, the reinsurer may be asked for a special 30-day extension in order to redefine the new conditions.

c) **Claims:** Although claims handling is normally assigned to the cedant, where major claims are involved the reinsurer is sent a *claim advice* containing the circumstances and estimates of the claim, as well as the basic policy details and the cession references.

When specific *claims cooperation or control* clauses have been agreed, the reinsurer intervenes directly in the claims settlement, to the extent that, without its express authorization, agreements cannot be reached between the cedant and the insureds or injured parties, without endangering the recovery from reinsurers of the sums advanced by insurers.

In the same way as for cessions, claims details are compiled by means of two lists remitted at regular intervals.

○ List of paid claims

○ List of outstanding losses reserve

In the latter case, the list of outstanding losses reserve is of particular importance when the annual reinsurance accounts are closed, as it contains the amounts of the applicable claims reserves. This information constitutes the reinsurer's reference for setting its own outstanding losses reserves.

6.3. Accounting procedures

The aforementioned technical processes are backed up with accounting procedures that reflect the premiums ceded, commissions, paid claims and the resulting balances.

It is important to point out that the balances must be paid within a reasonable period, which in some markets determines the actual validity of the reinsurance agreement: if they are not paid, there is no cover. In the case of individual transactions accepted through a broker, and in order to avoid excessive delays, acceptance is agreed by means of a *payment guarantee clause*, which requires the balance to be paid within the specified period.

In the same way that reinsurers require prompt payment of balances, so the cedant is entitled to receive prompt payment of cash claims (cash calls)

from the reinsurer, especially in the case of large claims, so as not to reduce cash flow.

7. CONCLUSION

We have seen how facultative reinsurance shares the same essential features as direct insurance and requires a highly professional treatment by both the ceding company and the reinsurer. It is used for special operations that go beyond normal risks and involves classes of business of a highly technical complexity.

These characteristics demand efficient communication between both parties, so that they can convey their respective experience, making use of the advisory services provided by the reinsurer – that normally has wider experience, as it receives information from different sources and, in turn, can provide details of developments in the direct insurance market.

It is precisely this level of sophistication and complexity that produces high maintenance costs and gives rise to higher profitability demands by the reinsurer. It also involves some complex administration mechanisms for the cedant.

A portfolio of facultative business will, therefore, contain a number of special risks with a certain degree of exposure, not frequency, which can generate sufficient volume of premiums to make this type of reinsurance attractive to the reinsurer and justify the setting up of a local office that can provide a first class service for the local insurance market. The cedant must also promote a climate of trust, providing as much reliable technical information as possible and assist in the administration of this type of complex reinsurance with fast, clear and efficient procedures.

CHAPTER 4
TYPES OF REINSURANCE CONTRACTS:
OBLIGATORY TREATIES

1. CONCEPT AND NATURE

The characteristic feature of obligatory reinsurance is that, once reinsurance conditions are agreed for a particular type of operation, the insurer is required to cede them and the reinsurer is required to accept them.

The cover agreed with the reinsurer includes all the risks insured in a specific portfolio, or part of the portfolio, which is specified in the obligatory treaty. This means that the reinsurer must accept cover for all those risks included under the terms of the treaty and, on the other hand, the insurer has to cede all those risks referred to in the treaty (except for special cases, as seen with regard to facultative reinsurance).

1.1. The purpose of obligatory reinsurance

The real reason for reinsurance under an obligatory treaty is to offer the insurer a series of facilities for developing its commercial relations, since it means that the insurer avoids the tremendous task of having to look for and to arrange reinsurance for every accepted risk. From a legal point of view, in treaty reinsurance, a new acceptance is not necessary for each new piece of business as it has already been agreed under the treaty provisions. Each risk is accepted without the need to make an express declaration. Moreover, each risk is automatically covered by the treaty even before the reinsurer has been notified of its existence.

1.2. The period of the obligatory treaty does not have to coincide with that of the policies it covers

It is not necessary for the period of cover of a treaty to coincide with that of the policies included in it since, by incorporating all policies arranged by the insurer over a specific period of time (generally one year), it maintains the reinsurance protection at least up until the expiry of the insurances in force or up to the termination of the treaty itself; it may even continue providing protection for many years after the period of active transfer of the risks has ended.

1.3. Definition of an obligatory reinsurance treaty

As a general definition, we transcribe below that proposed by Professor Donati: "It is a contract which, when the reinsurer accepts the insurances provided for therein, gives rise to a variety of simple and diverse reinsurance transactions which are of an undetermined number and differing characteristics at the time of conclusion of the treaty, but determinable if the cases contemplated should arise".

All insurance relationships, and especially obligatory treaties, are based on different assumptions that are not always easy to set out in a contractual document. Such assumptions include the following:

Need for an accurate description

Both parties have to provide a full and accurate description of the business that comprises the subject-matter of the treaty. Any inaccuracy before, during or after it comes into force could create an ambiguous situation which, in theory, can only be resolved through cancellation. However, that is not always possible, given that the treaty has been in force for a certain time and has committed the parties from its inception.

Confidence in the parties' solvency

Another essential and almost tacit supposition with a treaty is the confidence of each of the interested parties in the ongoing solvency of the other party, in the appropriate management of its business, and in its relevant official authorization.

The management by the reinsured must be in line with the reinsurer's interests

It is important also, particularly for the reinsurer, that the reinsured maintains adequate underwriting and does not delegate powers for that purpose to third parties outside the contractual relationship. Any significant change in production, administration or claims handling should be duly reported.

The reinsurer also expects the cedant to handle claims prudently and professionally, and not be influenced by factors outside the cover granted; in short, the cedant is expected to handle claims taking the reinsurer's interests into account.

1.4. Basic contract provisions under obligatory treaties

Developing an obligatory reinsurance treaty that contemplates all possible variations and provides for any eventuality is, in principle, very difficult. It would be too rigid and broad a treaty and difficult to apply in practice, since it

would not leave any room for the parties' discretion as regards the manner in which they negotiate or organize themselves. Therefore, what the obligatory treaty does is to provide guidelines for sound professional behavior and market practices.

An obligatory treaty must contain basic contract provisions that define the ground rules in the best possible way. These are:

– **The so-called *reinsurance clause***

This describes in detail the mechanism of obligatory risk transfer and is usually expressed by stating: "The cedant undertakes to cede to the reinsurer the insurances described below and the reinsurer undertakes to cover said insurances".

– **A description of the subject-matter**

This is the class of business that is to be reinsured. This description must be as precise as possible, avoiding expressions of doubtful interpretation such as "all business accepted under class of business x"; rather, it should state: "all business in class of business x underwritten by the insurer".

– **Commencement and termination of the treaty**

The treaty's inception date and expiry date must be clearly stated. It is also essential to clearly establish the form of settlement of the business upon cancellation of the treaty, the duration of the parties' subsequent liability, etc.

– **Territorial limits of cover**

Ambiguities must be avoided. The term "worldwide" should not be admissible, although it is not essential for the territorial limits to be limited to the cedant's country of origin; they may extend to other territories stipulated in the treaty, provided they are specifically indicated.

– **Insurer's retention**

It must be clearly stated whether the treaty is proportional or non-proportional and whether a percentage or a specific amount applies.

– **Price of the reinsurance cover**

This must take into account the commission granted by the reinsurer on the premiums ceded and, as will be seen later, the reinsurance premium in the case of non-proportional obligatory treaties.

– **Notification of claims**

The time allowed for notifying such claims to the reinsurer and the form of that notification must be indicated, giving details of which claims are subject to such notification. Time limits for requests to the reinsurer to pay large claims must also be stated.

– **Accounting system for premiums, claims and deposits on account**

Periods for the notification of accounts must be included and their confirmation by the reinsurer, deadlines for payment, settlement of balances, etc.

– **Exclusions**

These must be described as accurately as possible and may refer to causes of possible claims (war, earthquake, etc.), to specific types of insurance (nuclear risks insurances, etc.), or to certain forms of underwriting (inward reinsurance business, second-claim covers, etc.).

– **Resolution of differences in the interpretation of the treaty:**

Any differences in interpretation that may arise are normally settled by applying the principles of reinsurance practice, the custom and usage of which generally leads to a settlement. In the event of dispute, insurers and reinsurers prefer to settle their differences through arbitration, generally entrusted to knowledgeable persons with experience in the insurance and/ or reinsurance sector and very rarely resort to legal proceedings.

2. TYPES
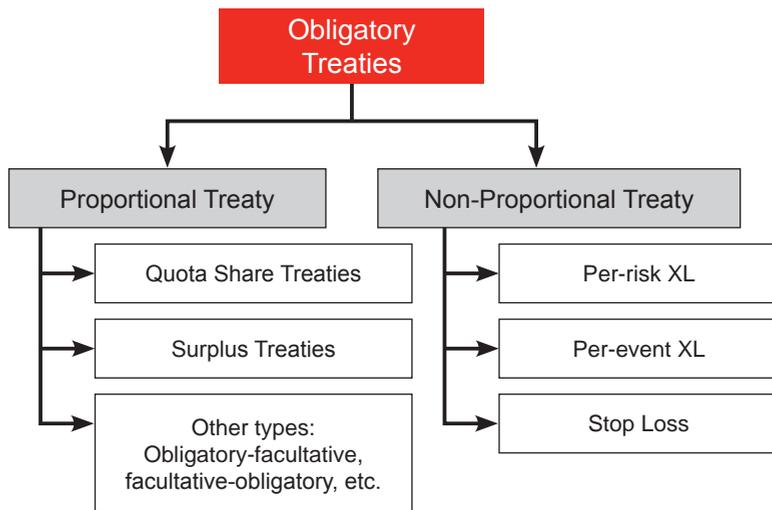
2.1. Proportional obligatory treaties

Within the various types of reinsurance that are available, we have studied an initial classification depending on the type of relationship between the cedant and the reinsurer. We will now look at how treaties may, in turn, be divided into

proportional or *non-proportional* treaties, depending on the system of participation.

Proportional treaties are so called because the reinsurer participates in a predetermined proportion in each and every one of the risks ceded to it.

In the case of property damage insurances, the participation is based on the value of the subject-matter insured in the policy or sum insured. In other classes of insurance such as liability, life, personal accident, etc., the cession to the reinsurer, and consequently its participation, is based on the limit of indemnity stated in the policy, which is established for the purpose of settling claims, the reinsurer's share being in the same proportion as the liability accepted by the insurer under the original policy.

> For a better understanding of the system, we can take as an **example** a policy with a sum insured of 10 million, 40% of which is reinsured under a proportional treaty. (The cession is 40%.)
>
> If the risk in question suffers a claim amounting to 5 million, the reinsurer will pay 2 million of the claim (40% of 5m) and the remaining 3 million is payable within the insurer's retention.

With this type of treaty, the reinsurer accepts liability for a fixed, proportional share of each and every one of the risks included and, as it covers a specific share of any claims occurring, logically it receives a share of the premiums in the same proportion.

The reinsurer has to pay the cedant a commission to offset the expenses incurred by the latter in the underwriting and administration of the shared business, and this commission is deducted from the ceded premium.

Although the features of each type of proportional reinsurance (quota share and surplus) are discussed in greater depth later on, the following is a brief description.

Quota share

With this method of reinsurance, the cession to the reinsurer consists of a fixed percentage of all operations.

> **For example,** in a 50% treaty the insurer is required to write half of the risks that it underwrites and to cede the other half to the reinsurer. This proportion is also applied to claims that occurr, i.e. in the event of a claim, the amount is shared equally between the insurer and the reinsurer.

The most salient feature of quota share treaties is their administrative simplicity. Once the conditions have been agreed, the cedant does not need

to control each of the risks individually, neither for the distribution of premiums nor for claims.

Surplus

The cession to the reinsurer also consists of a proportion or percentage, but only for those risks that exceed a predetermined amount.

When arranging a surplus treaty, it is necessary to decide which risks will be retained by the insurer and which will be borne by the reinsurer (surplus). The risks retained by the insurer are known as "net retained lines", which are predetermined amounts of retention based on the hazardous level of the risks in question. The lower the risk, the higher the insurer's net retained lines; and the higher the risk, the lower the retained lines.

Surplus reinsurance is administratively more complex, but has the advantage of enabling the cedant to determine which risks and for what amount the reinsurer's involvement will not be required.

The greater the risk, the smaller the retention

With so-called "simple risks" or "mass risks", where claims are of a lower probability and intensity and the volume is such that it permits some statistical certainty regarding variations in claims experience, the insurer tries to transfer to the reinsurer the lowest amount of premiums possible. With large risks on the other hand, or those most exposed to claims, the cedant passes on a greater level of liability to the reinsurer, establishing as its net retention the smallest amount possible, even though the number of lines still has to be maintained.

Proportional insurances have their advantage for the insurer

The advantage of proportional reinsurances for the insurer is that they allow it to establish a balance in the risk portfolio retained for its own account, as this is made more stable with a lower probability of deviation in the retained claims by generally fixing retentions which vary in amount according to the risk's level of hazard.

The difficulty of measuring the level of retentions

Should the insurer retain a large number of risks or should it cede a high percentage of them to the reinsurer? The greatest difficulty for the insurer is to calculate the level of these retentions. If it sets it very low because its portfolio is not uniform or because it does not want to retain much risk, it will have to cede too high a proportion of its premiums to the reinsurer and thus become a mere reinsurance manager.

A final point

To conclude this general study of proportional treaties, it should be noted that the main disadvantage they present is that they do not protect the reinsured effectively against the risk of sustaining an accumulation of claims on the insured risks following widespread losses such as natural disasters or other types of claims that affect several insureds at the same time.

2.2. Non-proportional obligatory treaties

This type of treaty, examined hereafter, arose from the need for insurance companies to protect themselves against the consequences of claims the amount or size of which could jeopardise their financial standing.

In the reinsurance treaties studied so far, the direct insurer sought to cede the risk and, consequently, a proportional share of the premiums. However, the direct insurer may also be interested in ensuring that no claim, or series of claims, can cost more than a specific amount. In this case, a different type of reinsurance treaty needs to be arranged: the non-proportional obligatory treaty.

Non-proportional treaties are based on the amount of the claims, which are calculated in different ways:

– Individually;

– Taken as a whole over a specific insurance portfolio;

– According to specific events.

Non-proportional contracts or treaties are generally known as *excess of loss reinsurance*, and in the terminology of reinsurance professionals, *XL contracts* (we therefore find treaties with the abbreviations WXL, Cat XL, etc.).

Their underlying principle is that *the reinsurer undertakes to indemnify the reinsured for all claims or groups of claims whose amounts exceed* a sum previously fixed and known as the *net retention*.

Advantages of non-proportional treaties

Besides protecting the insurer against the consequences of large claims that could prejudice its financial standing, non-proportional treaties provide various other advantages.

– **Savings on administration costs:**

The main advantage offered by non-proportional treaties is that they contribute considerable *savings* in the cedants' *administration costs* due to the simplified administration.

With proportional treaties the cedant has to define each risk underwritten to establish its retention, allocate premiums and claims to the different treaties, etc., whereas with non-proportional treaties, once cover has been arranged, it only has to calculate and notify the reinsurer of any claims exceeding the limit established in the treaty, known as the net retention. The rate or cost of the reinsurance is calculated once only for the whole financial year in question and for the overall total volume of premiums considered.

– **The insurer retains more written premium:**

A second advantage for insurers is that, through the net retention, they can *retain a higher proportion of the gross premiums written for their own account*, as the reinsurer does not receive premiums related to the retention because it does not participate in the smaller, more frequent claims that are claims below the retention.

– **Greater flexibility for underwriting risks:**

With this reinsurance formula, *the insurer has greater flexibility for underwriting risks,* as it is protected against any excess claims experience. However, though this does not mean that the insurer has total liberty, as the treaty incorporates restrictive clauses that attempt to maintain the cedant's underwriting policy as if the protection was not provided.

Difficulties with non-proportional treaties

This type of treaty encompasses several difficulties, mainly with regard to calculating the cost of the cover and fixing the net retention.

Calculating the cost of the cover

The references available to the reinsurer for its estimations are practically limited to the claims record of the portfolio in question for previous periods. This record has to be projected forward in time, and it is often for changing portfolios. However, as we will see later, there are variable-price systems that contemplate possible deviations up to a point.

Fixing the net retention

The insurer has to fix the limit or net retention below which all claims are for its own account. If this net retention is set too high, it runs the risk of destabilising its financial position, but if it opts for too low a retention, the reinsurer will increase the price of its cover considerably since it will have to pay for a higher number of claims. Both parties' administration costs would also be increased, thus distorting the main purpose of such treaties.

Funding problem for cedants

While proportional treaties provide some funding for cedants, with non-proportional treaties the opposite occurs.

At the beginning of the year and before having collected their direct insurance premiums for the year or policy period, cedants have to pay the reinsurance premium, which is generally a deposit premium. Moreover, under certain conditions, this deposit premium may be increased at the year end because claims have exhausted the cover originally provided.

This funding by the insurer is partly mitigated as reinsurers usually accept payment in quarterly or half-yearly instalments.

Payments have to be made even if there is no benefit in return.

Finally, it should be pointed out that, with the various types of non-proportional reinsurance, cedants run the risk of paying the price of the cover without receiving any benefit in return from the reinsurer because there have been no claims in excess of the retention fixed.

3. TECHNICAL ASPECTS OF NON-PROPORTIONAL TREATIES

The features of each of the different types of non-proportional treaties will be described in detail later. The following is a brief description.

3.1. Per-risk excess of loss

This protects the insurer against claims exceeding the amount that it has decided to retain for its own account on a given risk.

3.2. Catastrophe excess of loss (Cat XL)

Unlike with the previous reinsurance, claims arising from one and the same event are added and the retention is applied to this total.

There must be more than one claim caused by the same event and affecting more than one policy.

The best example is a Cat XL treaty protecting the cedant from a catastrophic event such as a storm or earthquake.

3.3. Stop loss

With this type of treaty the insurer fixes the maximum percentage of the overall claims that it is prepared to pay in one year for a certain class of business or type of insurance and the reinsurer bears the excess. This type of treaty is used for insurances with cyclical results, such as livestock or hail insurances, etc. The reinsurer will pay the excess of loss ratio (= total claims divided by the premium) when it exceeds a certain net retention. For example, if the net

retention is 110% and the loss ratio is 130%, the reinsurer will pay the 20 points above the retention.

4. OTHER TYPES OF PROPORTIONAL TREATIES

4.1. Facultative-obligatory reinsurance ("fac-oblig")

So called because *the insurer is free to decide* whether to offer the risk and under what terms. *The reinsurer has to accept* the risks offered in accordance with the terms of the treaty.

The distinctive feature of "fac-oblig" is that it is facultative for the cedant and obligatory for the reinsurer; i.e. the direct insurer may cede or not but, if it decides to do so, the reinsurer is obliged to accept any risk which the cedant wishes to include under this treaty.

This type of treaty is required due to the continued increase in the individual values of risks, particularly industrial risks, which creates the need for insurers to require larger reinsurance capacities.

Facultative-obligatory treaties are therefore usually arranged over and above purely obligatory treaties, thereby also increasing the insurer's possibility of offering higher capacity.

This system is, in this way, a form of additional cover offered by the reinsurer so that the direct insurer can place the peaks of those risks that exceed the limit of the obligatory treaty.

It therefore improves the service for the cedant and provides an additional source of business for the reinsurer.

Although the financial conditions of this type of treaty are normally less favorable for the insurer, *these facultative-obligatory treaties are not normally welcomed by reinsurers since* they have almost all the disadvantages of obligatory treaties and none of their advantages, as they provide a more unbalanced transaction; they lack continuity as business is ceded irregularly and they do not generate a sufficient volume of premiums to obtain a reasonable premium/exposure ratio.

As reinsurers have to accept all risks that the cedant decides to include, they are always exposed to the reinsured selecting the worst and most hazardous risks from its portfolio. Before accepting a treaty of this type, the reinsurer will therefore try to obtain information on:

– The underwriting policy and the type of insurance that the cedant usually underwrites;

– Whether a reasonably sufficient number of risks is expected;

– Whether the insurer will cede to this treaty with certain discretion, or whether, on the contrary, it will use it only to cede clearly hazardous risks.

Exclusions are limited

When arranging a facultative-obligatory treaty, the reinsurer will establish certain restrictions relating to the possible risks to be included (territorial limits, specific types of cover, etc.), but these exclusions must necessarily be few and limited. An extensive list of such exclusions would go against the main objective of this kind of treaty

Open covers

Open covers are a variant of *facultative-obligatory* treaties, and their basic feature is that they are valid up to a limit, the amount of which has been agreed in advance, and normally include several contracts.

This type of treaty, which is clearly selective, arose mainly for the transport class of business and for marine risks in particular, though it was later extended to fire business and to other classes of property insurance.

In general, open covers are normally arranged by reinsurers with reinsurance brokers, to whom they grant automatic capacity to reinsure any risk that meets certain conditions agreed beforehand.

– Before agreeing to this type of cover with a broker, the reinsurer will try to ascertain the estimated volume of business, the type of business, which ceding insurers it will come from and, most importantly, the reputation and moral standing of the broker in the market in which it normally operates.

– This type of facultative-obligatory contract is, at the end of the day, one more way of doing business for reinsurers, despite its unpredictability. For insurers, it is a way of transferring to a broker their possible difficulties in producing reinsurance for certain risks, who can resolve this difficulty by using the available capacity through open covers arranged with one or more reinsurers.

4.2. Obligatory-facultative reinsurance

Unlike the previous reinsurances, *the insurer is required to cede* all the business in question, while the reinsurer can choose whether to accept or reject any of the risks that the cedant has to include.

Obligatory-facultative treaties are a type of reinsurance that is *very rarely used.*

As this system of reinsurance puts the cedant at too much of a disadvantage, *it is normally used only where the reinsurance relationship is established between*

subsidiaries and a parent company, or in the case of companies with branches that have a degree of independence in accepting reinsurance. In any case, these are treaties that only arise when there is a clear relationship of dependence between the parties, which generally involves captive business.

4.3. Reciprocity contracts

Even though we are including this type of contract under the obligatory treaties classification, in reality, reciprocity relationships usually have the nature of agreements rather than treaties as such, and, in fact, are normally arranged by means of a simple correspondence system. A reciprocity agreement is understood to mean an agreement resulting in an exchange of reinsurance business between two parties. This exchange may be between two reinsurers and two insurers, or between one reinsurer and one insurer.

Generally speaking, reciprocity agreements are drawn up for types of reinsurance and business that normally produce a stable result, such as proportional quota share treaties and surplus treaties, as their year-on-year fluctuations are not usually excessively great.

Advantages

Most often, it is insurers who are interested in accepting reinsurance through reciprocity and there are several reasons for this interest, including the following:

1. To reduce their general expenses by receiving business for which they have not had to invest in commercial networks, premises, etc., thereby reducing their average rate of expenditure.

2. To increase their premium volume, by adding to the premiums retained on their own business those originating from the business accepted.

3. To achieve a greater balance in their portfolio by further diversifying its composition with the premiums received from reciprocity.

4. At the national level, reinsurance accepted under reciprocity agreements reduces the outflow of foreign exchange resulting from reinsurance ceded to international reinsurers.

5. This method of acquiring business allows insurers to participate in risks situated in geographical areas other than their own. Besides providing a greater portfolio spread, this enables them to get closer to other countries' operational models and methods without having to set up branches or other types of representative offices.

6. Where a reciprocity relationship is established between an insurer and a foreign reinsurer, the latter will ensure that the risks it accepted do not

coincide with those underwritten in its own field of operation, thereby avoiding any possibility of accumulation. This is the danger involved in drawing up reciprocity agreements between insurers in the same geographical area, as they may accept participations on risks in which they are already involved as a direct insurer, and this accumulation is generally unknown.

7. When the reciprocity relationship is established with reinsurers, the relationship with them is strengthened through the creation of links of common interest which are always favorable to both parties. For reinsurers, it also provides one more way of reducing their peak risks without having to resort to retrocessions.

Disadvantages

1. Reciprocity agreements between insurers (which should not be confused with coinsurance agreements, as here we are talking about an exchange of reinsurance) have the disadvantage that both parties do not always cede business with positive results, which leads to these agreements being constantly renegotiated, as both interested parties set up the agreement with the intention of stabilizing their retained business with the expected good results of the accepted reinsurance.

2. To include risks from other countries does not always produce a more balanced portfolio.

3. Insurers must be extremely prudent in the agreements they arrange and should not get over involved in this type of business; it can considerably increase their administration costs, as they need to establish a system of control which is completely different from their normal one, as well as their lack of experience in handling different types of foreign exchange.

   Insurers are advised to try to obtain stability in their retained business by means of well-formulated reinsurance treaties that are appropriate for the structure of their portfolios, and the expected returns should come from good underwriting, correct calculations of their retentions and partial return of the premiums ceded to their reinsurers via reasonable commissions, profit commission and, in general, through the mechanisms offered by reinsurance treaties.

4.4. New forms of reinsurance

New forms of reinsurance have appeared in recent years, known under the generic name of *financial reinsurance*.

Firstly, through financial reinsurance not only is the underwriting risk transferred to the reinsurer, as in traditional reinsurance, but also the financial

risk in order to protect the insurance company's balance sheet, introducing more accounting flexibility and obtaining other additional guarantees.

Traditional reinsurance is based on transferring the risk of claims, i.e. the uncertainty with regard to the amount and frequency of claims that will have to be paid.

Financial reinsurance enables the following risks to be transferred:

1. **Investment risk:** this is the risk that the return obtained on the investments is lower than that estimated at the time the premiums were calculated.

2. **Credit risk:** this is the risk that the cedant or reinsurer does not pay its commitment.

3. **Timing risk:** this is the risk that the expected claims are paid earlier than anticipated, thereby reducing the period of return on investments.

4. **Asset risk:** the risk that the asset used or invested will reach the estimated value.

5. **Premium risk:** the uncertainty in respect of the amount and time at which the insurer will receive the corresponding price according to the terms of the treaty.

6. **Expenses risk:** the uncertainty in respect of the amount and time at which the acquisition costs and operating expenses of a contract will be paid.

7. **Contractual risk:** the uncertainty as to whether the insured will exercise the rights it granted under a contract treaty and at what time and to what extent.

While traditional reinsurance is based on past claims and their future trend, normally annual, financial reinsurance is based on the **staggering of cover over more than one year**, extending it in time in order to adequately finance future claims(prospective treaties) or past claims (retrospective treaties). Prospective structures are similar to traditional reinsurance.

The best known financial products

– **Time and distance cover:**

This is a retrospective cover that guarantees the cedant will receive payments at given times in the future, based on the initial premium paid, plus interest accrued on the reinsurer's investment.

– **Spread claim cover:**

This type of financial reinsurance applies to a whole portfolio of risks and is based on loss exposure over more than one year.

It is ultimately a credit in which there is a time risk, a risk of return on investment, in respect of the amount of the claim.

This type of cover generally has three components:

1. Prospectively, by which future claims are covered.

2. Aggregate, since it accumulates various individual claims.

3. Excess, since the claims ceded to the reinsurer constitute a certain amount of individual claims that exceed the net retention.

The cedant generally pays the reinsurer an annual premium, and this is deposited in a fund which accrues interest that will be taken into consideration in the final adjustment.

– *Finite risk:*

As with the previous forms, this has more characteristics of a bank loan than of pure insurance or reinsurance. "Finite risk" integrates the concept of cover and premium, i.e. the reinsurer offers the insurer cover which includes the amount of the premium and the corresponding financial income and, if the claims occurring during the period exceed the maximum claims covered, the premium is reimbursed.

CHAPTER 5
PROPORTIONAL REINSURANCE:
TYPES OF TREATIES AND TECHNICAL
ELEMENTS OF PROPORTIONAL TREATIES

1. INTRODUCTION

A reinsurance treaty is an agreement between a cedant and a reinsurer whereby the former undertakes to cede and the latter to accept specific risks under the conditions agreed between the two, which are included in the reinsurance treaty. The cession and acceptance take place simultaneously and apply to all or part of an insurance company's insurance portfolio.

The reinsurance treaty thus becomes a "blank cheque" which the reinsurer grants the cedant in order to provide it with reinsurance capacity during the period of the treaty. The cedant knows the risks ceded to the treaty before the reinsurer does. The reinsurer is informed of the treaty's development by means of quarterly or, sometimes, half-yearly accounts. That is why it is also known as a "blind" treaty.

These treaties are called proportional because the cession to reinsurance is made proportionately to the characteristics of the policy. The cedant and the reinsurer participate proportionally in the insured risk. This proportionality means that premiums, claims and expenses will be apportioned in the proportion established in the treaty.

There is a distinction between proportional facultative reinsurance and proportional treaty reinsurance:

– **Proportional facultative reinsurance:** Reinsurance of individual risks in which both reinsurer and cedant have the right to participate in or cede the risk, respectively.

– **Proportional treaty reinsurance:** Also known as obligatory, automatic or treaty reinsurance; this refers to reinsurance for a portfolio of risks, for example, all of the policies written by a company in the Fire class.

The types of proportional treaties are Quota Share, Surplus, Combined (Quota Share and Surplus) and Mixed (Facultative Obligatory and Obligatory Facultative), which are considered below.

2. QUOTA SHARE TREATY

2.1. The Quota Share concept

In this case the reinsurer participates with a fixed share in all the risks accepted by the cedant in the class of business or type covered by the treaty. The cedant in turn retains part of each risk. The cedant's and reinsurer's participations are fixed based on a certain percentage of each risk written by the cedant. This percentage is agreed as from inception of the treaty and used as a basis for the apportionment of premiums and claims whilst the treaty is in force.

> **Example**
>
> Quota Share (25%/75%)
>
> The above indicates that the cedant will retain 25% of all risks with a Sum Insured equal to or less than the capacity of the reinsurance treaty. The remaining 75% will be ceded to the Quota Share treaty.

The Quota Share treaty is particularly suitable when the aim is to share all the risks in a portfolio, as the reinsurer bears a share of each and every one of the claims. It is also suitable for companies starting to operate in any class of business. The cedant's liability therefore has a very irregular profile, depending on the sum insured on each policy.

Obviously, a quota share treaty does not prevent the reinsured from suffering unexpected increases in the claims experience of its own retention owing to an accumulation of claims arising from one or more events of intensity. For that reason, it has to protect itself with excess of claim treaties.

Number of risks
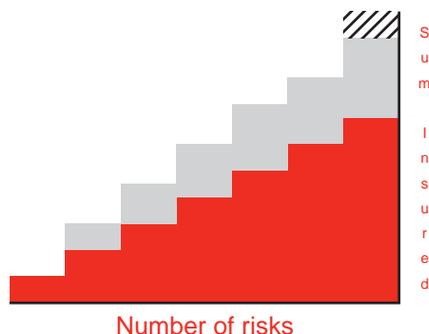
2.2. Advantages of this method of proportional reinsurance

– **Administrative simplicity.** As the predetermined cession percentage applies equally to all policies, premiums and claims, the cedant does not

need to check each of the risks individually, which implies easier administrative handling.

– **Automatic cover for the cedant.** This treaty allows the cedant to choose the percentage retained for its own account that is considered appropriate, and it can focus on acquiring business up to the limit or capacity agreed in the treaty with the certainty that those risks will be reinsured automatically and, at the same time, maintaining its claims within acceptable limits.

– **A more balanced portfolio for the reinsurer.** This type of treaty is usually attractive to the reinsurer because, by receiving a share of all the risks underwritten by the cedant, it has access to a far more balanced portfolio than it would receive through any other type of treaty. The shared interests of the two parties encourages the reinsurer to provide as much technical assistance as possible to its Quota Share cedants since the better or worse underwriting policy of its reinsured will affect it immediately and automatically.

2.3. Disadvantages of this method of proportional reinsurance

– **The retention does not exactly match the Cedant's needs:** The ceding company has to retain a fixed percentage of each and every one of the risks it has underwritten. For the same reason, the ceding company is obliged to cede to the reinsurer the premiums corresponding to lighter risks and for a lower amount than it could retain in full.

– **The size of the risks retained is not homogeneous.**

2.4. Areas of application

– Insurers sometimes seek a Quota Share treaty when they require financial support from their reinsurers, which is also an effective way of improving the solvency levels required by the supervisory authorities, as it facilitates the reduction of the amount of retained premiums, thus maintaining an adequate relation between net income and capital reserves. It may vary depending on the local legislation applicable.

– Where portfolios are homogeneous both in terms of the quality of risks, i.e. the characteristics of the risks are similar to one another, and in the amount of the sums insured.

– For newly-formed insurance companies, since they do not have prior statistics and experience, and they require the finance of reinsurers during the early years. For the same reasons, these treaties are arranged when an insurer commences in a new class of insurance.

– For classes of business with very small portfolios that require reinsurance protection but do not generate sufficient premium income for other types of treaty to be arranged.

– For classes of insurance where there are difficulties in defining the risks individually, such as hail insurances or credit insurances, based on aggregate sums insured or limits.

2.5. An example of a Quota Share treaty

For a better understanding of how this type of treaty operates, an example is shown below:

A Quota Share treaty with a capacity of 100,000 currency units (CU), 40% of which is retained by the insurer and 60% ceded to reinsurance.

– **The sum insured is less than the capacity of the Quota Share.** Let us assume that the sum insured is CU 80,000:

  ○ The retention would be 40% of 80,000, i.e. CU 32,000

  ○ The cession would be 60% of 80,000, i.e. CU 48,000.

– **The sum insured is greater than the capacity of the Quota Share.** Let us assume that the sum insured is CU 150,000.

  As it is greater than the capacity of the Quota Share, a percentage would not be covered by the treaty.

  Firstly, one ascertains the difference between the sum insured of the risk and the capacity of the Quota Share. CU 150,000 – CU 100,000 = CU 50,000.

  As a percentage, this would be: (50,000 / 150,000) x 100 = 33%.

  This 33% would not be covered by the treaty and would have to be reinsured by means of facultative reinsurance.

  ○ The remainder would have to be apportioned according to the ratio specified in the treaty (40/60%).

    The remainder is 67%; the apportionment would therefore be as follows:
    Share retained: 40% of 67% = 26.8%
    Share ceded: 60% of 67% = 40.2%
    Share not covered by the treaty = 33.0%
    Total = 100%

The apportionment of sums insured is:
Share retained: 40% of CU 100,000 = CU 40,000
Share ceded: 60% of CU 100,000 = CU 60,000
Share not covered by the treaty = 33.0%
Sum insured = CU 150,000

How are premiums and claims apportioned?

In the above case, the subsequent distribution of the premiums and possible claims is based on the same proportions as the Quota Share treaty is a method of proportional reinsurance, and that is its basic principle.

− **The sum insured is less than the Quota Share capacity:**

Let us assume that in case a) above there is a claim of CU 10,000:

○ The retention would be 40% of 10,000, i.e. CU 4,000

○ The cession would be 60% of 10,000, i.e. CU 6,000.

− **The sum insured is greater than the capacity of the Quota Share:**

Let us assume that in case b) above there is a claim of CU 10,000:

○ The retention would be 26.8% of 10,000, i.e. CU 2,680

○ The quota share cession would be 40.2% of 10,000, i.e. CU 4,020

○ The cession to facultative reinsurance would be 33%, i.e. CU 3,300

3. SURPLUS TREATY

Surplus reinsurance is also known as reinsurance of "amounts" because *the cedant's retention is fixed as an amount of each risk or policy*. This amount may vary depending on the different quality types of risk forming a portfolio, thus allowing the cedant to retain a greater or lesser proportion of the risks.

In this way, the insurer cedes to the reinsurer the share of the sums insured exceeding its own retention. It is a proportional treaty because both parties participate in the premiums and claims in the same percentage as they have retained and accepted, respectively.

The retention can be adapted perfectly to each ceding company's requirements, namely to achieve a retention which is homogenous in quality and quantity with a very high degree of balance and exposure, which is one of the company's main requirements.

Taking a graphic example:

Example

The reinsurer's liability is defined as a multiple of the Net Retained Line:

Surplus (11 lines of 500,000).
Net retained line: 500,000.
Surplus Capacity: 5,500,000.
Automatic underwriting capacity: 6,000,000.

Reinsurance capacity: 5,500,000

Net Retained Line

Net retained line: 500,000
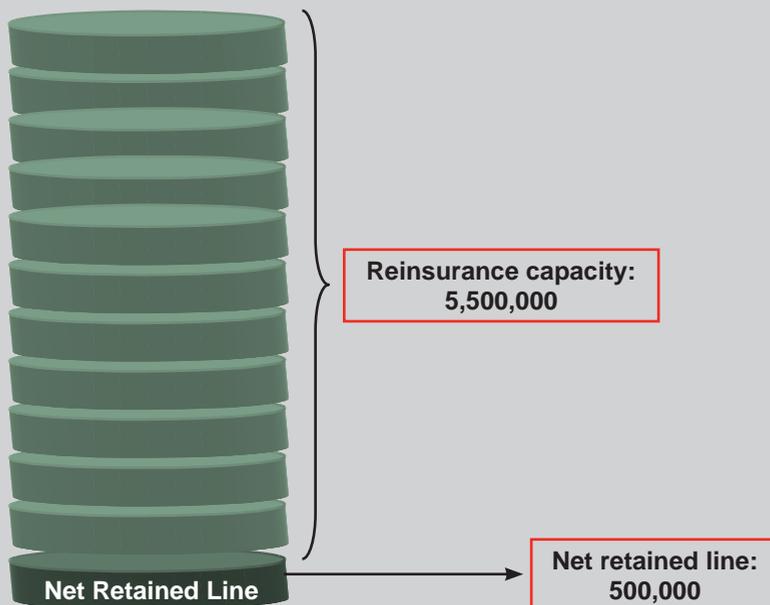
So, an extremely individualised retention is achieved, in terms of both quantity and quality, for each and every one of the risks. This leads to very different proportions being ceded, whilst the profile of the retained portfolio is considerably flatter than the Quota Share profile, depending on the class or rate of risk.

The Surplus capacity is fixed as a multiple and is expressed as a number of retained lines. It is established depending on several parameters: essentially, the company's needs, the type of portfolio, the class of business and the growth expectations. As the capacity granted to the cedant is fixed based on the amount of the line, the reinsurer is looking for a balance in the table, i.e. it tries to neutralise the differences produced by the imbalance of the ceded portion of the risk with the premiums received under the treaty.

The great disadvantage of this type is certainly the administrative complexity involved, as the percentage of cessions is fixed individually, policy by policy,

which in practice and in order to reduce costs, requires the use of a computer programme to undertake the technical accounting process.

It is possible to fix the cedant's retention by means of a scale or Table of Limits which aims specifically to differentiate risks according to their quality. This is generally measured based on the type of risk, as can be seen in the following example:

Example

	TABLE OF LIMITS	
	CEDANT'S NET RETAINED LINE	**LIMIT OF COVER FOR 100% OF THE 25 LINE SURPLUS**
1. Theft or hold-up of cash carriers:	500,000	12,500,000
2. Contents of safes:	1,000,000	25,000,000
3. Contents of strongrooms:	1,500,000	37,500,000
4. Miscellaneous goods, machinery and furniture:	2,000,000	50,000,000

3.1. Advantages of the surplus treaty

Surplus treaties allow the cedant to determine on which risks it will not require the reinsurer's involvement. With this type of treaty, the insurer can increase its underwriting capacity for participating on larger risks than those it could access otherwise. Finally, as there can be large variations in sums insured in most insurance portfolios, with surplus treaties the insurance company can:

– Obtain a uniform portfolio for its own liability; the retained portfolio is homogeneous

– Only risks exceeding the net retained line are ceded.

– It is possible to reduce the retention on risks with high exposure.

3.2. Disadvantages of the surplus treaty

Disadvantages for cedants

The main disadvantage lies in its high administration costs. These are normally higher than with any other form of reinsurance since, for each risk, the insured has to apply the appropriate line of retention, decide on the corresponding cession to reinsurers (there are usually several reinsurers) and, subsequently,

calculate the distribution of claims that arise, undertake the accounting and control any possible changes in the risks ceded, etc.

Disadvantages for reinsurers

For reinsurers, the disadvantage lies in the fact that they are receiving higher proportions of the more hazardous risks and, consequently, the business portfolio they acquire is far more imbalanced than the cedant's and only theoretically compensated for by the fact that these higher risks that they are reinsuring attract higher premium rates.

3.3. Example of a surplus treaty

For a better understanding of how this type of treaty operates, an example is shown below:

A Surplus treaty, with a capacity of 90,000 currency units (CU), and 9 lines, makes the net retained line CU 10,000. The automatic underwriting capacity is therefore CU 100,000.

– **The sum insured is less than the automatic underwriting capacity:**

Let us assume that the sum insured is CU 80,000:

○ The retention would be 12.5% of 80,000, i.e. CU 10,000 / 80,000.

○ The cession would be the remaining 87.5%.

– **The sum insured is more than the automatic underwriting capacity:**

Let us assume that the sum insured is CU 150,000.

As it is more than the automatic underwriting capacity, there would be a percentage not covered by the treaty.

Firstly, one needs to ascertain the difference between the sum insured on the risk and the automatic underwriting capacity.

CU 150,000 – CU 100,000 = CU 50,000.

As a percentage, this would be: (50,000 / 150,000) x 100 = 33.33%.

This 33.33% would not be covered by the treaty and would have to be reinsured by means of facultative reinsurance.

The remainder has to be apportioned according to the net retained line and capacity of the Surplus:

> The remainder is 67%; the apportionment would therefore be as follows:
> Share retained: 10,000 / 150,000= 6.67%
> Share ceded: 90.000/ 150.000 = 60%
> Share not covered by the treaty: 33.33%
> Total = 100%

As for the apportionment of sums insured:
Share retained: 6.67% of CU 150,000 = CU 10,000
Share ceded: 60% of CU 150,000 = CU 90,000
Share not covered by the treaty: 33.33% = CU 50,000
Total sum insured = CU 150,000

How are premiums and claims apportioned?

In the above case, the subsequent apportionment of premiums and possible claims will have to be made on the basis of the risk apportionment percentages previously calculated, as we are still considering a proportional reinsurance:

– **The sum insured is less than the automatic underwriting capacity:**

   Let us assume that in case a) above there is a claim of CU 10,000:

   ○ The retention would be 12.5% of 10,000, i.e. CU 1,250

   ○ The cession would be 87.5% of 10,000, i.e. CU 8,750.

– **The sum insured is more than the automatic underwriting capacity:**

   Let us assume that in case b) above there is a claim of CU 10,000:

   ○ The retention would be 6.67% of 10,000, i.e. CU 667

   ○ The cession to the Surplus treaty would be 60% of 10,000, i.e. CU 6,000

   ○ The cession to facultative reinsurance would be 33.33%, i.e. CU 3,333

   NOTE: The risk has been apportioned exhausting the net line, even though the cedant could have retained an amount below 10,000. In such a case, the capacity of the Surplus would have been reduced in the same proportion and the number of lines would have been maintained.

4. COMBINED TREATIES: QUOTA SHARE/SURPLUS

Combined Treaties favour portfolio growth and the cedant's possibilities of writing business, thereby creating a larger and increasing premium volume which, in turn, will enable the cedant to increase retentions in the future and "take over" an ever greater portion of the Quota Share.

This is sometimes used in companies or classes of business that are starting up because it allows the reinsurer to participate in the cedant's net retention, thus compensating for the initial imbalance in the Surplus treaty. Normally, as and when the balance in cessions to the Surplus treaty is achieved, the Quota Share retention is increased until it is equal to the net retention of the Surplus treaty. As seen above, a Quota Share on the retention can correct the results of the Surplus treaty and, at the same time, favour a policy of exchange and reciprocity.

Let us assume that an insurer wants to have sufficiently high reinsurance cover to have an automatic underwriting capacity that enables it to arrange policies with larger sums insured but, on the other hand, does not wish to particularly expose its own retention. What should it do?

The insurer would not be able to achieve its goal by arranging Quota Share reinsurance alone, as it needs have to cede very high percentages and also retain very low percentages. Naturally, the reinsurer would not be prepared to accept cedants' retentions below 5%, for example, because it would fear that the underwriting might lack technical discipline. On the other hand, the insurer would have to cede to the reinsurer an excessive amount of written premiums, which would not be of interest.

The solution for the insurer would be to arrange a mixed Quota Share and Surplus treaty.

4.1. An example to demonstrate the need for mixed treaties

Let us assume that an insurer wishes to fix its gross retention at CU 500,000 for good risks.

The insurer will only need surplus reinsurance for those sums insured which exceed CU 500,000 in this category of risks. If we consider a risk with a value of CU 2,000,000, the surplus would therefore bear three lines, i.e. CU 1,500,000 (75% of the risk).

If the gross line of CU 500,000 still exceeds the amount that the insurer wishes to retain for its own account and it does not want a net retention of more than CU 250,000, the solution would be to use the mixed system whereby it can arrange a Quota Share reinsurance for its own gross retention, ceding 50% to the reinsurer and retaining the remaining 50%.

4.2. Example of a mixed treaty

Continuing with the example used for the Surplus treaty, we will consider a Quota Share treaty on the net retained line. The Surplus treaty has a capacity of 90,000 currency units (CU), and 9 lines, making the net retained line CU 10,000. The automatic underwriting capacity is therefore CU 100,000.

The net retained line of CU 10,000 will be shared between the cedant and the reinsurer by means of a Quota Share treaty (retention: 70% - cession: 30%).

– **The sum insured is less than the automatic underwriting capacity:**

Let us assume that the sum insured is CU 80,000:

○ The retention would be 70% of 12.5% of 80,000, i.e.:
70% X (10,000 / 80,000) = 8.75%.

- ○ The cession to the Quota Share would be 30% of 12.5% of 80,000, i.e.: 30% x (10,000 / 80,000) = 3.75%.

- ○ The cession would be the remaining 87.5% (it does not change in relation to the example of the Surplus treaty).

- – **The sum insured is more than the automatic underwriting capacity:** Let us assume that the sum insured is CU 150,000. As it is more than the automatic underwriting capacity, there would be a percentage not covered by the treaty.

- ○ Firstly, one has to find the difference between the sum insured on the risk and the automatic underwriting capacity.

$$CU\ 150,000 – CU\ 100,000 = CU\ 50,000.$$

As a percentage, this would be:

$$(50,000 / 150,000) \times 100 = 33.33\%.$$

This 33.33% would not be covered by the treaty and would have to be reinsured by means of facultative reinsurance.

- ○ The remainder has to be apportioned according to the net retained line and capacity of the Surplus:

The remainder is 67%; the apportionment would therefore be as follows:

- ▪ 100% of Quota Share: 10,000/150,000 = 6.67%

  - ▪ Retention = 70% of 6.67% = 4.67%

  - ▪ Quota Share = 30% of 6.67% = 2%

- ▪ Share ceded: 90,000/150,000 = 60%

- ▪ Share not covered by the treaty = 33.33%

As for the apportionment of sums insured:

- ▪ Share retained: 4.67% of CU 150,000 = CU 7,000

- ▪ Share retained: 2.00% of CU 150,000 = CU 3,000

- ▪ Share ceded: 60.00% of CU 150,000 = CU 90,000

- ▪ Share not covered by the treaty: 33.33% = CU 50,000

Total sum insured = CU 150,000

How are premiums and claims apportioned?

In the above case, the subsequent apportionment of premiums and possible claims will have to be made on the basis of the risk apportionment percentages previously calculated, as we are still considering proportional reinsurance:

- **The sum insured is less than the automatic underwriting capacity:**

  Let us assume that in case a) above there is a claim of CU 10,000:

  - The retention would be 8.75% of 10,000, i.e. CU 875

  - The cession to the Quota Share treaty would be 3.75% of 10,000, i.e. CU 375

  - The cession to the Surplus treaty would be 87.5% of 10,000, i.e. CU 8,750

- **The sum insured is more than the automatic underwriting capacity:**

  Let us assume that in case b) above there is a claim of CU 10,000:

  - The retention would be 4.67% of 10,000, i.e. CU 467

  - The cession to the Quota Share treaty would be 2.00% of 10,000, i.e. CU 200

  - The cession to the Surplus treaty would be 60% of 10,000, i.e. CU 6,000

  - The cession to facultative reinsurance would be 33.33%, i.e. CU 3,333

5. FACULTATIVE OBLIGATORY

This is essentially a capacity treaty that directly reflects the reinsurer's trust in an insurer's underwriting. Capacity is the only reason for the existence of this type of reinsurance. It is not a technical form of reinsurance, as there is a very large imbalance between the premiums generated for the treaty and the exposure per risk. Moreover, as the cedant has no retention, it is not directly affected by the result of the facultative obligatory treaty.

The advantage to the cedant is that it eliminates administrative tasks which are typical of pure facultative reinsurance and facilitates a faster response for the underwriting of policies. Another disadvantage for the reinsurer, compared to facultative reinsurance, is that with facultative obligatory reinsurance the right to analyse the risks offered under facultative reinsurance is lost.

CHAPTER 6
TECHNICAL ELEMENTS OF PROPORTIONAL TREATIES

1. RETENTION

Let us imagine that an insurance company has a portfolio in a class of insurance, but no reinsurance programme to protect it. It is known that the portfolio will generate income from the premiums collected and claims that will have to be paid over time. At the same, capital was put up in order to start the insurance operations.

In very simple terms, it is obvious that, in order to meet the claims payments over the following year, the insurance company will have to use its share capital, premiums collected and returns on the investment in capital, less internal management or administration costs and external management expenses or business acquisition costs. In principle, these figures can be budgeted for at the start of the financial year; however, the behaviour of claims experience is a random variable which, although estimated at a probable value, is subject to fluctuations above and below that value.

These fluctuations are caused by the behaviour of those elements that constitute the claims experience, i.e. the frequency of claims and their average cost. It is also possible that a large claim can change either of these elements. The calculation of an insurance (or reinsurance) company's retention will therefore consist in fixing the optimum level of liability per risk that it can accept by reducing the chance of going out of business, due to claims, to an acceptable level. The usual way to achieve this optimum level is by means of reinsurance programmes. In this way, the insurance (or reinsurance) company cedes risks, thereby achieving the double objective of transferring to the reinsurer (or retrocessionaires) the uncertainty of the behaviour of these two elements of the claims experience and also reduces the impact of possible negative deviations on the risk retained. Irrespective of the cession made, the possibility of the company failing still exists, albeit to a lesser extent.

Nevertheless, exceptional cases may arise in which, in some classes of business and under certain conditions, the optimum retention does not require a reinsurance programme, such as a company operating a large portfolio in the funeral expenses class of business.

Fixing the retention is undoubtedly the most difficult task when designing a company's reinsurance programme. Part of this difficulty is due to the lack of definition in the actual concept of risk. In this respect, we will consider that the retention contemplates the maximum probable number of insurance covers that can be affected as a result of a single event, irrespective of the policies and classes of insurance involved.

Consequently, there can be two types of retention:

1. **Retention per event.** The per-event retention is the liability accepted by the company for the maximum probable number of insurance covers that can be affected as a result of a single event, irrespective of the policies and classes of insurance involved. This kind of retention generally associated with risk accumulations generated by the occurrence of large catastrophe events (earthquakes, hurricanes, floods, etc.). There are also other accumulations per event that can exist in an insurance company's portfolio:

   – In a class of insurance:

     ▪ For a fire in a building when there are two or more fire policies.

     ▪ Where different covers under an insurance policy are affected; for example, fire, loss of profits, public liability and debris removal.

     ▪ Accumulations owing to storm, earthquake, flood, hail, etc.

     ▪ The involvement of two or more marine hull policies in a claim.

     ▪ The involvement of two or more cargo policies in a claim.

   – When different classes of business are involved, due to their interdependency:

     ▪ Fire and public liability

     ▪ Engineering insurance and public liability

     ▪ Aviation, personal accident and life

     ▪ Fire and cargo

     ▪ Motor, personal accident, life and travel

     ▪ Fire and personal accident and/or life

     ▪ Marine hull, cargo and liability

   The greater the frequency of coincidence between two or more classes of business or covers in the same event will mean that retentions need to be lower. Therefore, in order to calculate a per-event retention, it is necessary to consider the company's financial position and the potential accumulation within each class of business individually and with other classes of business. It is not impossible for a company to be unaware of the possible

accumulations between different covers and/or classes of business until a claim occurs. For this reason, such interactions have to be analysed as technically and thoroughly as possible.

2. **Per-risk or per-policy retention**. In a similar way to the per-event retention, by definition there cannot be any accumulation within the same class of business or with others; the insured risk is considered alone.

Following these considerations, the question remains: "In monetary terms, what is the per-risk retention that my company can accept?" Despite the numerous and complex mathematical models that attempt to establish the optimum level of retention, they are not sufficiently accurate or satisfactory due to the difficulty of taking into consideration all of the elements that affect the calculation.

For the cedant, setting the retention is a delicate decision, as it will directly affect its profit and loss account. It is a subject that can be looked at from various points of view, but the basic variables to be considered are:

– **Shareholders' equity.** There is a direct relationship between equity and retention. The higher the former, the more able the insurer will be to deal with any deviations in the frequency or occurrence of any large claim. Nevertheless, retentions of 100% are rarely used, except in very special classes of business, such as funeral expenses or health care. Some specialists think that the retention should be a percentage of equity.

– **Quality and composition of the portfolio.** A study of the portfolio claims experience and its fluctuations should help in fixing the percentage amount that the cedant is prepared to "risk" on the basis that the retention is an inverse function of the claims experience.

– **Volume.** An insurance company's size determines all aspects of its development and, essentially, its capacity to retain business. It is also possible to fix the retention as a percentage of the premium volume.

– **Liquidity.** This term is used in a broad sense. The company's capacity to meet the outlays required by growth, a high level of expenditure or abnormally high claims, will imply greater or lesser transfer of liabilities to reinsurers.

– **Underwriting policy.** The expectations of newly-formed companies with regard to the market sector in which they plan to operate will have a varying influence on the fixing of the retention.

– **Other factors.** These are essentially subjective factors which, in the absence of a specific formula can also exert a certain influence: a more or less conservative attitude of the company, market practice, the effect of other conditions of the treaties, the need to culture the confidence of reinsurers, market capacity, etc.

In short, this question does not have a single answer but depends on the individual priority of each company department, which will employ its own approach in the assessment.

The financial director's priority is to protect the company's assets and obtain the maximum possible return on investments. However, this has to be balanced against the potential need to pay claims promptly. From this point of view, the optimum retention should be fixed according to the liquid assets that are to be kept available.

The reinsurance manager seeks to protect the company by avoiding fluctuations in the results and, therefore, will fix the retention and the reinsurance programme based on a plan that limits probable fluctuations to an acceptable level for the company, regardless of the volume of premiums ceded to reinsurance.

At shareholder level, the main concern is not to lose the capital invested and at the same time collect the corresponding dividend. From this point of view, the retention will be fixed in a way that it protects the asset base and generates sufficient profit to allow an increase in reserves and the payment of a dividend.

The three forms of retention have the same objective, but each one reflects the balance of individual or departmental priorities, regardless of the consideration of other factors.

It is therefore up to the General Management to combine the different criteria, weigh up the different arguments and fix a retention that is best suited to the company's overall needs, which means that it will have to communicate the necessary changes to each department involved. The reinsurance department's retention may be considered too prudent in the long term depending on the company's assets. The financial department will have to have a higher percentage of its assets in a more liquid form that it would like. And finally, shareholders have to trust their company managers, even though everything may change.

Senior Management will therefore seek long-term stability for the company through the retention, achieving results that are sufficient to increase the free reserves by retaining profits and paying shareholders a dividend, which represents an adequate return on the capital invested.

To this end, a subjective assessment of a series of factors must be made, some certain and real such as the basic assets and free reserves, and others based on a set of conjectures, such as inflation, competitiveness, level of rates, the reinsurance market, crime rate, etc. In other cases, simple intuition regarding any of the factors subject to probable variation may lead to a change in the retention. The decisions that the insurance company will face in trying to arrive at an optimum retention must take into account certain aspects of particular consequence:

- **The capital and free reserves**

- **The projected reserves or estimated increases in reserves** for a given period based on the increase in portfolio and forecasted results.

- **The retained premiums:** These must offset the net incurred claims and generate a small profit allowing the free reserves to be increased and a dividend to be paid to shareholders.

- **The dividends to shareholders:** As an acceptable return on investment.

- **The characteristics of the risk portfolio:**

  All companies are positive in respect of the good quality of the risks underwritten. However, there are some classes of business which, by their nature, are subject to probable variations in claims experience, either owing to frequency, such as motor or health, or owing to intensity, such as hull, liability or engineering classes of business.

  It is also possible that the uniform retention of good and bad risks is not in the company's best interests. The level of retention normally increases or decreases, depending on the quality of the risks making up the company's portfolio. A portfolio of good risks implies a high retention and a portfolio of bad risks implies a low retention.

  There are two possibilities for establishing different scales of retention:

  ○ Based on the category or hazardous nature of the risk: the more hazardous the risk the lower the retention, and the better the quality of the risk the higher the retention.

  ○ Based on the level of premium rate: the higher the rate, the lower the retention and, the lower the rate, the higher the retention.

  The analysis of the portfolio's profile and claims frequency will help considerably to determine the most suitable retention scales for the company.

- **The portfolio liquidity and its effect on the distribution of claims.** Motor and health portfolios, for example, with high or full retention and a high claim frequency rate, require the company to maintain higher asset liquidity than in the case of a life portfolio.

- **The investment policy**

  The company will try to obtain the highest possible return on investment from its assets. The nature of long-term investments allows high returns to be obtained, but it may be that they cannot be converted into cash as quickly as necessary to pay claims as promptly as required, and this may affect the company's image. That aside, it is not always the right time to sell. Selling early may involve financial costs or generate capital loss. If the

investment consists of cash funds or short-dated securities, the financial returns are lower, forfeiting the possibility of making capital gains.

This investment policy is closely tied up with the reinsurance policy, since the claims distribution function carried out by the latter can reduce the company's cash requirements.

– **The reinsurance policy.** Besides its relationship with the investment policy, reinsurance allows a company to have a higher underwriting capacity than it has in its own right, allowing it to access business with a loss potential, in number and intensity that would exceed its capacity to pay.

– **The price of the reinsurance.** Even taking into account the returns made by investing the funds generated by the business, a price that only covers the actuarial value of the projected claims to be transferred to the reinsurer by the company will not be sufficient. The insurer has to consider its management expenses, a safety margin to cover probable negative fluctuations in the claims ratio, and a reasonable profit. If, as may happen with catastrophe excess of loss covers where the coefficient of variation is high, this loading may be higher than the risk premium.

– **Security and profit.** This relationship may appear to be a contradiction. Ultimately, the retention is the profit-generating element. Security requires finding the greatest possible protection, which may involve a higher cession to reinsurance, but it limits more the probability of ruin. Risk aversion involves a sacrifice that results in lower profit.

– **Inflation.** Although the adjustment of insured values through the effect of inflation is not generally carried out automatically, even though formulae exist for that purpose, it also produces an increase in premiums and an increase in the cost of claims. In a proportional reinsurance programme, if there is no parallel increase in the retention, the cession to reinsurance is increased. The company's capacity to increase the retention, without increasing its probability of ruin, will depend on its capacity to generate results that are sufficient for it to be able to increase its reserves by retaining profits or obtaining additional capital, not forgetting that payments to shareholders still have to be made. In non-proportional reinsurance programmes, stability clauses (index clause) that adjust retentions proportionally to inflation may be dangerous if the company cannot meet the conditions indicated above, as their automatic operation increases the probability of negative results.

– **Market Competition.** In competitive markets or ones showing a competitive trend, the calculation of the possible profit and probable fluctuations are distorted since, if the portfolio underwritten increases during this period, regardless of the effect of inflation, business will have been acquired by

reducing rates offered by other insurers. In this situation, despite the portfolio "increase", the retention will be affected by the same exposure at a lower price.

– **The reinsurance market.** This changes depending on whether results are good or bad. If results are bad, reinsurers tend to require a higher level of retention, so that the insurer is affected by claims to a greater extent, and they try to impose a correction by stimulating a rise in insurance prices in this way. In good times, when the cash flow to reinsurers is higher than expected in theory, insurers can obtain more favourable conditions. The offer from reinsurers is greater when the results are better, more than covering the demand for reinsurance. When reinsurance results are bad, demand exceeds the supply from reinsurers.

– **Legal provisions.** In many countries, the insurance sector's supervisory bodies try to guarantee that insurers are able to meet their liabilities towards their insureds. To that end, they impose, or try to impose, a structure which ensures that their liabilities are not excessive in relation to their assets. This is the so-called solvency margin, which relates a company's free reserves and assets to its net premium income.

2. CAPACITY

Setting the capacity required is another extraordinarily important decision that may affect the quality of the reinsurance schedule, the economic and financial conditions obtained and the reinsurance workload in the company. The aspects to be considered are as follows:

Composition of the portfolio

Analysis of the risks accepted by the cedant and their classification by types of risk, premium rates and total sum insured constitute a very valuable tool (essential, in fact) for establishing the company's capacity requirements.

Underwriting policy

The characteristics of the risks to which the company has or will have access, according to its plans to expand the portfolio balance or access new markets or areas of risk, must be considered when the capacity objective is being set. This has to satisfy both present and future requirements.

Premium Volume

The capacity required of the reinsurer must bear a certain relation to the volume of premiums ceded to it. This is known as the premium/liability balance.

Other aspects

The plan put forward to the reinsurer with regard to other aspects of the treaty at the time of negotiations and the situation in the national insurance and the international reinsurance markets also have an influence.

2.1. The treaty capacity in relation to sum insured

It has repeatedly been stated that proportional treaties are based on sums insured, so that the point of equilibrium between the various factors involved in a proportional reinsurance treaty (cedant's retention, capacity, reinsurer's share, etc) depends on the type of portfolio being insured.

This depends on whether the portfolio contains risks with more or less homogeneous hazards or sums insured. It should always be remembered that a proportional treaty (whether Quota Share or Surplus) is never designed to cover peak risks but, as we know, is designed for the insurer and reinsurer to establish a balanced business relationship based on a solid portfolio, with the least possible fluctuations and, if possible, involving a considerable volume of business.

It should, therefore, be clear that the cedant will always try to obtain the greatest capacity possible, so that it can also have greater freedom to arrange policies with broad reinsurance cover. This should be qualified since, as we will see later, excessive capacity can also give rise to certain disadvantages for the cedant.

2.2. The balance between retention and capacity

A treaty must be constructed in such a way that the retention/capacity balance provides equivalent potential profit or loss for both parties in the medium term. This is difficult to calculate a priori.

In the case of a Surplus treaty, it is generally not advisable to have an excessive number of lines. This would lead to a highly disproportionate relationship between the insurer's and reinsurer's liabilities, with another negative aspect being that the cedant would possibly lose interest in selecting the risks to be underwritten, given the excessive cession to the reinsurer.

It should nevertheless be stressed and remembered that there are no fixed or predetermined rules.

If the reinsurance treaty lacks the necessary balance between the limit of liability and the premiums ceded, the remuneration received from the reinsurer will probably be lower (via commissions and/or profit commission). In this way, one of the attractions of the proportional treaty, which is to provide funding for the reinsured, will be lost.

It is more advantageous for the cedant to limit the capacity and obtain a more reasonable reinsurance commission, ceding any amount in excess of that capacity via facultative reinsurance. Also, bearing in mind that reinsurers normally consider the results of facultative business and obligatory treaties separately, the cedant is able to obtain better financial conditions for the latter.

2.3. Treaty capacity based on PML

Sometimes, and particularly for property/casualty insurances, setting the capacity based on sums insured, as a precaution against the occurrence of a total loss, may lead to an excessive cession to reinsurance, because there is little likelihood of these claims, as generally happens in predominantly industrial portfolios.

We will explain in principle the meaning of the following frequently used abbreviations:

PML: Probable maximum loss.

This can be illustrated with the following example:

Example

Let us suppose that we have an industrial firm insured against fire with a total sum insured of 1,000 currency units (hereinafter CU), which consists of two industrial buildings with a sum insured of CU 300 each, plus two separate warehouses, each with a value of CU 200.

From a technical survey, it is deduced that:

▪ Either of the two warehouses could burn down completely.

▪ The industrial buildings have fire-division walls which prevent fire from spreading from one section to another, so that, in the most serious case, losses would not exceed CU 100, which means that the maximum expected loss would be CU 200.

However, the total sum insured on the policy will be CU 1,000.

The system has certain advantages for the insurer, as it may limit the volume ceded to reinsurance.

If in the above example we assume that the insurer bears 1% of the policy (CU 10) and only wishes to retain for its own account a maximum loss of CU 2 on each risk, with the system of cession based on sum insured, it would have to reinsure 4/5ths of its share. However, if it were to reinsure on the basis of the PML, which is 20%, its share would be 1% of 20%, i.e. the CU 2 it wished to bear for its own account and, so it would not require reinsurance cover.

As it has been seen, this system is obviously not welcomed by reinsurers, but also involves high risks for the cedant.

This type of PML calculation does not tend to be sufficiently accurate as, more often than not, it depends on the experience of the technician making the calculation, which means that serious differences of interpretation may arise between the cedant and the reinsurer.

The PMLs calculated are sometimes not very reliable, as they are influenced by the need to obtain greater reinsurance capacity or to get around the difficulty of finding sufficient reinsurance for certain serious risks.

Moreover, opinions always differ on concepts such as possibility and probability. Particularly if we consider the time factor and accept that the PML will "probably" occur with a frequency of, for example, less than 20 years, 100 years or 1,000 years. Depending on the case, the probability will vary between 0.5% and 0.1%.

To summarize, and as stated above, *we can say that the calculations made on this basis may be conflicting, as they are too affected by subjectivity according to the best or worst experience that the technician making them may have had*.

If the insurer fixes the PML too high, the insurer's cession of business will be excessive. Another possibility is the refusal to underwrite certain risks that would normally be accepted with a correctly calculated PML.

If, on the other hand, the PML estimate is too low, the implications are clear: the cedant may find itself with a far higher share in the claim than expected or foreseen.

Let us look at an example to illustrate this:

> **Example**
>
> Let us assume a surplus treaty based on the PML, where, for a sum insured of CU 10,000,000, a PML of 2% has been calculated, equivalent to CU 200,000, and a self retention of CU 100,000 has been fixed in the treaty. If this policy were to be affected by a claim of, say, CU 1,000,000, the cedant would have reinsurance for 50%, which means that it would find itself having to pay CU 500,000 instead of the CU 100,000 it was prepared to accept.

3. PROTECTED BUSINESS / CLASS OF BUSINESS

This defines the type of business covered with the details of the class of insurance protected, the origin of the insurance transaction and the operations that will be excluded from the reinsurance treaty. The origin of the insurance transaction describes whether the cedant is transferring to the reinsurer risks

that it has underwritten directly (known as direct business, which could include coinsurance transactions) or whether it is also transferring risks accepted under reinsurance (automatic or facultative).

The treaty exclusions generally do not authorise cessions of risks from automatic reinsurance acceptances, whether proportional or non-proportional.

The main classes of business are as follows:

– Life

– Personal Accident

– Health

– Liability

– Fire and Allied Perils

– Engineering

– Marine: Hull and Cargo

– Aviation: Hull and Public Liability

– Nuclear Risks

4. TERRITORIAL SCOPE

The reason for establishing territorial limits in a reinsurance treaty is the variety of direct insurance conditions in each of the markets, making different conditions necessary in reinsurance treaties. Examples include the following:

– Original policy cover.

– Different administration and acquisition costs of direct insurance companies.

– Method of claims settlement.

The territorial limits of the treaty will be defined according to the type or class of business in question. We can distinguish between risks that remain in a fixed location and risks that may move:

– For risks that remain in a precise location, the territorial limits are normally limited to a specific area or country.

– In the case of risks that may move, the place where the insured property is registered, the domicile of the insured, or the country where the insurance commences or ends (as in marine business for example) may be taken as the basis for defining the territorial limits.

– In the case of personal insurance, the domicile of the policyholder or insured may be used.

5. PERIOD

The period of cover or term defines the start and end of the reinsurance treaty. It is important to ask ourselves the following question:

To what period of a reinsurance treaty will the liability for a claim be attributable?

– The period of the reinsurance treaty in which the direct insurance policy giving rise to the claim was issued.

– The period of the reinsurance treaty in which the claim occurred.

– The period of the reinsurance treaty in which the claim was paid.

All three answers are correct but involve different modes of operation under the policy which must be defined in the reinsurance treaty. Following the same order as the answers above, these methods are known as:

– Underwriting year

– Accident year

– Accounting year

We will deal with these three methods of operation in more detail later.

6. EXCLUSIONS

These limit the reinsurance treaty with regard to types of insurance, covers, perils or types of risk for which the reinsurance treaty does not grant cover or which are excluded.

Exclusions can basically be classified as:

– General Exclusions

– Specific Exclusions

Exclusions will vary significantly, depending on the class of insurance or business protected by the reinsurance treaty. By way of example, in a Fire treaty we could find the "Nuclear Risks Exclusion" as general or standard exclusions and "Exclusion of a particular category of risk or activity" as a specific exclusion.

7. OTHER CONDITIONS OF PROPORTIONAL TREATIES

7.1. Cash losses

In order to help the cedant maintain its cash flow budgets, treaties provide for the reinsurer's share of large claims above a certain amount to be paid in

cash, instead of them being included for settlement in quarterly or half-yearly accounts.

This is one of the totally financial conditions that materialises the principle of following the fortunes.

The cedant is also required to report claims exceeding a certain amount.

An example of a cash claim clause is given below:

> **Example**
>
> When the amount of a claim payable under this treaty, paid by the cedant or about to be paid, exceeds the amount indicated in the schedule hereto, the cedant may ask the reinsurer for immediate payment of its share. The reinsurer may deduct from the payment any balances owed by the cedant for any reason.

7.2. Arbitration and jurisdiction

The rules and procedures to be followed in the event of any disagreement between the parties over the interpretation of the terms are set out here, specifying the persons or institutions that will settle the dispute, the time limits, and the jurisdiction to which cases arising from the contracts will be submitted.

7.3. Period for the remittance of accounts / payment of balances

This determines the frequency with which accounts are remitted (the international practice is quarterly) as well as the date for the payment of balances by both parties.

7.4. Concepts used in catastrophe accumulation control

– **Cession Limit under the reinsurance treaty.** This is the total of the catastrophe sums insured that may be ceded to a reinsurance treaty, i.e. the total of the aggregate sums insured of the policies ceded to the reinsurance treaty. It is usually fixed by the ceding company based on its acceptances for catastrophe risks, plus the estimated growth during the period of the reinsurance treaty.

The Cession Limit allows the reinsurer to calculate its liability for the following year, to set up adequate reserves and foresee the necessary retrocessions, from the inception of the reinsurance treaties in which it is participating.

If the actual accumulations ceded to the treaty were higher than the limit of cession, the ceding company would be under-reinsured.

– **Event limit of the reinsurance treaty.** This is the maximum liability borne by the reinsurer as a result of the same event in a reinsurance treaty.

– **Remittance of catastrophe accumulation or aggregate reports.** These correspond to the actual accumulation of business renewed and underwritten by the cedant for each treaty on a specific date. They must be remitted periodically (quarterly or half-yearly), include all existing liabilities for the cover in question (earthquake, flood, tropical cyclone) and be broken down into CRESTA control zones and also by interests (buildings, contents, loss of profits and others, depending on the countries).

The reinsurer processes the information of the quarterly accumulations and compares the trend with the treaty's limit of cession at expiry.

CHAPTER 7
FINANCIAL CONDITIONS OF PROPORTIONAL TREATIES

1. COMMISSIONS

The reinsurer pays the cedant a commission on the premiums it receives, to compensate for the costs of acquiring the business and maintaining the portfolio. To do this, the level of commission should be adjusted to the actual costs borne by each insurer, but this is not strictly adhered to.

In practice it is fixed based on other factors which influence and balance each other out, including the characteristics of the market and, essentially, the quality of the business ceded which is very often the most important factor.

Three systems are commonly used for determining commission:

– A fixed commission system

– A sliding-scale commission system

– An additional commission system

1.1. Fixed commission system

This consists in establishing a certain percentage of the premiums ceded as commission.

This percentage is unaltered for the life of the treaty. The system has the undeniable advantage that the ceding company can budget its income from this source accurately. The disadvantage is that it does not reward the quality of the portfolio and, for this reason, it may be supplemented with additional commission or with a clause providing for a share of the reinsurer's profits (profit commission).

It is important to point out that the percentage of fixed commission established in the reinsurance treaty will not vary throughout the period, regardless of claims.

Example of fixed commission: 30%

1.2. Sliding-scale commission system

This type of commission rewards or penalises the quality of the portfolio protected by the reinsurance treaty.

Automatic regulation of the commission is thus introduced which favours cedants who underwrite profitable portfolios whilst it penalizes less cautious underwriting.

The system consists of agreeing a variable commission, with an increase being calculated on the minimum commission, say 0.5% for every 1% reduction in the loss ratio.

It consists of defining a minimum and a maximum commission for a loss ratio scale, so that:

– If the loss ratio is low, the commission the reinsurer will pay to the ceding company will be higher.

– If the loss ratio is high, the commission the reinsurer will pay to the ceding company will be lower.

With this commission system, the reinsurer will therefore reward an adequate loss ratio with higher remuneration; if the loss ratio increases, however, the ceding company will receive less commission.

It is important to point out that the commission may never be lower than the minimum or higher than the maximum, regardless of whether the respective loss ratio is very high or very low.

Unlike fixed commission, a provisional commission is determined, is charged to the reinsurer in the periodic reinsurance accounts and is adjusted at a later date (indicated in the reinsurance treaty) within the limits of a scale based on the treaty's loss ratio.

Example

Provisional commission: 35%

Commission scale: Minimum 30% for a 60% loss ratio

Maximum 40% for a 40% loss ratio

Premiums earned during the year: 200

Losses incurred during the year: 110

Loss ratio incurred: 110 / 200 = 55%

Commission applicable:

$$\text{Com.min.} + (LR_{max.} - LR_{actual}) \times \frac{(\text{Com.}_{max.} - \text{Com.}_{min.})}{(LR_{max.} - LR_{min.})} = 32.5\%$$

Since the final loss ratio for this period of the treaty falls within the maximum and minimum ratios, the final commission will also fall within the maximum and the minimum.

Should the loss ratio fall outside the limits of the scale (either above or below), it is possible for the treaty to allow such excesses to be taken into account in the calculations of subsequent years' loss ratios.

In any event, for this period of the treaty, the commission can never be less than 30% nor more than 40%.

In the above example, *for each loss -ratio point* of reduction achieved by the ceding company within the loss -ratio scale, the reinsurer will pay *additional commission of 0.5%*.

As the loss ratio has in fact fallen by 5 points in relation to the maximum, the reinsurer pays a commission equivalent to the minimum plus 2.5 points (0.5%*5 points reduction compared to the maximum commission).

If it is agreed that the scale takes into account the current underwriting year, the calculation method for deciding whether a higher commission than the provisional commission will have to be paid at the end of the year would be:

Loss-ratio percentage = (Incurred losses/Premiums earned) x 100

Where:

– Incurred Losses=

Paid losses (including reinsurer's expenses)
+ Reserves for outstanding losses for the year.
– Reserves for outstanding losses from the previous year.

Earned premiums = Premiums for the current year
+ Unearned Premium reserve for the previous year
– Unearned Premium reserve for the year.

Results for the year and commissions

As the results of the treaty can present years with a profit and years with a loss, it is advisable to take into account the carrying forward of the excess profits or losses from previous years. We will look at a comparative example, with and without the carrying forward of results.

Taking a commission scale of 25% to 35% for a loss ratio from 70% up to 50% or less (an additional commission of 0.5% for every 1% reduction in the loss ratio is therefore available).

Example without losses carried forward

	Year 1	Year 2	Year 3
Written premium	1,200	1,350	1,500
Earned premiums	1,120	1,290	1,440
Incurred losses	1,100	650	945
Loss ratio	98.21%	50.39%	65.63%
Commission	300	470	408
Commission percentage	25.00%	34.81%	27.19%
Result	−280	170	87

Example with losses carried forward

	Year 1	Year 2	Year 3
Written premium	1,200	1,350	1,500
Earned premiums	1,120	1,290	1,440
Incurred losses	1,100	650	945
Losses Carried forward		316	63
Loss ratio	98.21%	74.88%	70.00%
Commission	300	338	375
Commission percentage	25.00%	25.00%	25.00%
Result	−280	303	120

Calculation of losses carried forward:

▪ Year 1 to Year 2:

   [98.21% (actual loss ratio) – 70% (maximum loss ratio)] * 1,120

   (Earned premiums) = 316

▪ Year 2 to Year 3:

   [74.88% (actual loss ratio) – 70% (maximum loss ratio)] * 1,290

   (Earned premiums) = 63

As it can be seen, with the system of carrying forward the losses, the reinsurer would pay the minimum commission in year 2 and year 3. If the loss ratio were favourable enough in year 4, the carrying forward the losses would be eliminated and the maximum commission could be charged again.

In some reinsurance treaties it is usual to find a **commission table** for each loss ratio, so that the commission applicable is defined **contractually**. This

avoids discrepancies between the ceding company and the reinsurer when adjusting the commission.

Let us take an example:

Example

Provisional commission: 30%

Commission scale: 20% 40%

Loss-ratio scale: 65% 45%

If loss ratio	65%	Commission	20%
If loss ratio	64%	Commission	21%
If loss ratio	63%	Commission	22%
If loss ratio	62%	Commission	23%
If loss ratio	61%	Commission	24%
If loss ratio	60%	Commission	25%
If loss ratio	59%	Commission	26%
If loss ratio	58%	Commission	27%
If loss ratio	57%	Commission	28%
If loss ratio	56%	Commission	29%
If loss ratio	55%	Commission	30%
If loss ratio	54%	Commission	31%
If loss ratio	53%	Commission	32%
If loss ratio	52%	Commission	33%
If loss ratio	51%	Commission	34%
If loss ratio	50%	Commission	35%
If loss ratio	49%	Commission	36%
If loss ratio	48%	Commission	37%
If loss ratio	47%	Commission	38%
If loss ratio	46%	Commission	39%
If loss ratio	45%	Commission	40%

1.3. Additional commission system

This is a type of commission where there is a fixed commission and, in addition, when the loss ratio for the treaty is below a preset value, the reinsurer will pay the company a higher commission, also fixed in advance.

Higher commission is therefore paid if the loss ratio is below the percentage established contractually, but the fixed commission is not reduced if the loss ratio is high.

The following is an example of a wording:

– Fixed commission: 30%.
– Additional commission: If the loss ratio for the treaty does not exceed 40%, the reinsurer will pay additional commission of 2.5%.

In the above example:

If the loss ratio chargeable to the treaty is:

a) 35%, the commission payable by the reinsurer will be 32.5% (30% + 2.5%).
b) 50%, the commission payable by the reinsurer will be 30%, i.e. the fixed commission.

2. PROFIT COMMISSION

With this clause, the reinsurer allows the insurer to share in the profits obtained on the reinsurance treaty. More often than not, the aim is to balance the result of the treaty for both parties over time, so that the situation does not arise where the reinsurer is constantly in profit from its treaties and the cedant has only incurred losses . Obviously, this also rewards the quality of the portfolio ceded.

2.1. Treaty expenses and results

As a result of the treaty, the reinsurer incurs certain expenses (administration, services provided for the cedant, retrocession, etc.) which are considered as deductions when calculating the results of the treaty at the end of the year. These tend to be fixed amounts of between 2% and 10%, depending on the type of treaty and the volume of premium handled, since the higher the volume of premium the lower the reinsurer's expenses will be, proportionally.

It is also usual to agree that when reinsurance treaties have been making a loss, past losses are offset prior to calculating the profit of the treaty. This is known as an *accumulated loss*, and it may be stipulated that losses may only be carried forward for a limited period of time or until their complete extinction.

2.2. Positive items or income

– Premiums ceded, net of cancellations.
– Unearned premium reserve (UPR) at the end of the previous year and/or portfolio start.
– Outstanding losses reserve (OLR) at the end of the previous year.

2.3. Negative items or outgoings

– Commission paid during the year.
– Losses paid net of recoveries.
– Unearned premium reserve at the end of the year and/or portfolio inception.
– Outstanding losses reserve at the end of the year.
– Reinsurer's administration costs.
– Any negative balance from the previous account, carried forward to extinction or for the number of years agreed between the parties.

2.4. Results of the profit commission account

Positive items or Income – Negative items or Outgoings = Result of the Profit Commission Account.

Profit commission may be granted on the result of a single reinsurance treaty, or on the result of a group of reinsurance treaties.

Here too, the existence of sliding-scale profit commission may be considered.

Determining the cedant's profit commission is somewhat complicated, so we will provide illustrations with a series of examples to clarify the concepts referred to.

Firstly, and for a better understanding of the account, we will give an example.

Example

Take a surplus treaty with the following data and percentages:

▪ Fixed commission: 45%.

▪ The Unearned Premium reserve must be 40%

▪ Reinsurer's expenses: 5%.

▪ Profit commission of 20% has been agreed. The account would be as follows:

DEBIT	CREDIT
Commissions................................54,000	Premiums...120,000
Paid losses....................................31,200	Unearned Premium reserve for previous year
Unearned Premium reserve.........48,000	40,000
Outstanding Losses reserve...........8,000	Lossreserve for previous year....................7,500
Reinsurer's expenses.....................6,000	
Losses carred forward..............._____	_____
147,200	167,500
Profit by difference = 20,300	
Cedant's share, 20% of 20,300 = 4,060	

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* For the purposes of the example, the unexpired risk reserve is equal to the unearned premium reserve.

In the above example, the losses carried forward have not been included, as the calculation and its application were only considered to apply to that year. This is not the most common practice, however.

Fluctuations in results

This is, in fact, normal: reinsurers experience fluctuations in their results from one year to the next and this will inevitably affect the calculation of the cedant's profit commission.

On the one hand, it is not advisable to calculate the loss of profit on the results of a single year, but it should be calculated by carrying forward results for several years or up to extinction, as one positive year is generally not enough to offset subsequent negative years.

Nor is it attractive for the cedant for the calculation to be based on one year, as with losses carried forward it can expect a profit commission in the future after years with a poor claims record.

Moreover, when losses are carried forward, this stops insurers from trying to cancel a treaty after a negative year and looking for a new reinsurer who, not having had to bear previous claims, is prepared to grant profit commission for the forthcoming year.

If the above example were to contain negative results from previous years, these would be taken into account in calculating the profit commission. It would just be a case of entering one more negative item in the profit commission account in respect of the negative result of previous years.

Let us look at two examples with the same details in which we can analyse the impact of the lossesclaims carried forward from previous years:

Example

Calculate the profit commission for each year, based on the following assumptions:

a) With no carrying forward of losses.

b) With losses carried forward to extinction

Details:

Profit commission: 20%

Reinsurer's expenses: 5%

Commission: 45%

Unearned premium reserve (UPR): 40%

Example (continued)

	YEAR 1	YEAR 2	YEAR 3
Premiums:	120,000	150,000	160,000
Paid losses:	61,200	80,000	40,000
OLR:	8,000	10,000	20,000

UPR for year 0 = 40,000

OCR for year 0 = 7,500

a) Without losses carried forward

Year 1			Year 2			Year 3		
Positive items			Positive items			Positive items		
Premiums:	120,000		Premiums:	150,000		Premiums:	160,000	
UPC prev. year:	40,000		UPC prev. year:	48,000		UPC prev. year:	60,000	
OLR prev. year:	7,500		OLR prev. year:	8,000		OLR prev. year:	10,000	
	167,500			206,000			230,000	
Negative items			Positive items			Positive items		
Comissions:	54,000	45.0%	Comissions:	67,500	45.0%	Comissions:	72,000	45.0%
Paid losses	61,200		Paid losses	80,000		Paid losses	40,000	
UPR:	48,000		UPR:	60,000		UPR:	64,000	
OLR:	8,000		OLR:	10,000		OLR:	20,000	
Reins. exp.	6,000	5.0%	Reins. exp.	7,500	5.0%	Reins. exp.	8,000	5.0%
	177,200			225,000			204,000	
Result of PC a/c:	−9,700		**Result of PC a/c:**	−19,000		**Result of PC a/c:**	26,000	
% prof. comm.:	N/A		% prof. comm.:	N/A		% prof. comm.:	20%	
Prof. comm.:			Prof. comm.:			Prof. comm.:	5,200	
Result of reins. treaty			**Result of reins. treaty**			**Result of reins. treaty**		
Prem. earned:	112,000		Prem. earned:	138,000		Prem. earned:	156,000	
Incurred losses	61,700	55.1%	Incurred losses	82,000	59.4%	Incurred losses	50,000	32.1%
Commission	54,000		Commission	67,500		Commission	72,000	
Prof. comm.	0		Prof. comm.	0		Prof. comm.	5,200	
	−3,700			−11,500			28,800	

b) With losses carried forward

Year 1			Year 2			Year 3		
Positive items			Positive items			Positive items		
Premiums:	120,000		Premiums:	150,000		Premiums:	160,000	
UPC prev. year:	40,000		UPC prev. year:	48,000		UPC prev. year:	60,000	
OLR prev. year:	7,500		OLR prev. year:	8,000		OLR prev. year:	10,000	
	167,500			206,000			230,000	

3. LOSS CORRIDOR

Conversely, loss corridor may also be agreed but it is not common to find this in treaties. However, from the point of view of applying the principle of following the fortunes, it seems reasonable for it to exist alongside profit commission. With this clause the insurer participates in any claims the reinsurer may suffer on the treaty; in any event, and for various reasons, it is considered to be a penalty clause. When it is included in treaties, it is normally due to a history of adverse results and failures in the development of measures to improve the portfolio or to improve the treaties.

Let us take an example:

Example

A reinsurance treaty provides for the following los corridor:

50% of loss ratio between 80% and 105%.

Assumption A:

Earned Premiums: 1,000

Incurred losses: 1,200

Example (continued)

Final loss ratio of reinsurance treaty is therefore 120%.

The ceding company's loss corridor will be:

50% of (105% - 80%), i.e.: 12.5%

Assumption B:

Earned Premiums: 1,000

Incurred losses: 900

Consequently, final loss ratio on the reinsurance treaty amount to 90%

The ceding company's loss corridor will be:

50% of (90% - 80%), i.e.: 5%

4. DEPOSITS

4.1. Premium deposits

Deposits are unexpired risk reserves or unearned premium reserves at the end of a certain period of time. In many countries they are often retained by the cedants as a guarantee, as the original period of cover has expired.

Deposits remain in the insurer's possession, even with absolute ownership of any financial assets covering them.

The cedant retains these deposits for various reasons:

– They will provide it with cover in the event of the reinsurer's bankruptcy or insolvency as a form of guarantee that the reinsurer will honour the liabilities agreed.

– Another reason is that, in some countries, this retention is regulated by legal provisions by the relevant authorities.

– But the main reason is that it facilitates the maintaining of additional funds and obtaining financial income from these deposits which improve its solvency margin.

The deposit is usually set up on the basis of a fixed percentage which, in principle, represents the unearned premium at the end of a calendar year.

Naturally, reinsurers do not like to leave these deposits in the cedant's hands, because they would prefer to be free to invest their funds. The establishment of deposits diffuses their assets considerably, at the same time as limiting the money they receive and thereby also reducing their income from investments.

The insurance supervisory body generally requires insurers to keep certain assets to guarantee the total unearned premium reserves (irrespective of the

risks ceded to reinsurance) that they set up for the insurance transactions they carry out. Under normal conditions, the source enabling a company to accumulate these assets will be the premiums generated by the sale of insurance policies. If, under a proportional reinsurance treaty, the company cedes part of its premium to the reinsurer, then its source of funds is automatically reduced. With the premium deposit, the insurer retains a percentage of the premiums ceded in order to be able to guarantee 100% of its unearned premium reserves. Once the unearned premium reserve has accrued (normally after twelve months), the insurer returns the premium deposit retained.

4.2. Loss reserve deposits

In a similar way to the premium deposit, if the authority requires the company to set aside assets to guarantee 100% of its outstanding loss reserves (without the deduction of reinsurance), one of the methods of obtaining funds is to set up loss reserve deposits.

In cases where the authorities do not require these assets to be set aside, or if the deposits made exceed the minimum amount necessary, both the premium and the loss reserve deposits fulfil the function of financing the insurance company by reducing the volume of funds transferred to the reinsurer.

Finally, since a return can be made on any capital, the cedant will have to pay the reinsurer a rate of interest, agreed in advance, generated by the funds withheld from the reinsurer. This appears in the reinsurance treaty as *Interest on deposits*.

CHAPTER 8
ADMINISTRATION OF REINSURANCE
AND PROPORTIONAL TREATY MODEL

1. REINSURANCE ACCOUNTS

The reason for the existence of reinsurance administration (for insurers and reinsurers alike) is due to the need to exchange accounting information taken from statements of account, which can be quarterly, half-yearly or annual.

Statements of account include the reinsurance account headings (premiums, commission, claims) which generate net balances receivable or payable, as well as information on loss reserves.
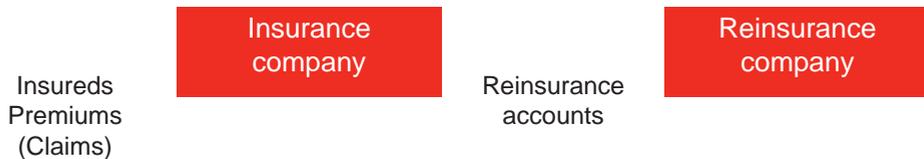
We will talk about the accounting items, although some points have already been explained, starting with a few introductory ideas.

The insurers' business is the factor that conditions reinsurance business. A continuous relationship is established involving typically a mercantile arrangement. In theory, it requires a complicated system of accounting between the reinsurer and the cedant, with entries day by day and policy by policy, specifying each party's share of the cession, the reinsurance commission agreed and matters in respect of claims, and allocating the proportional share to the reinsurer for each policy.

As these debit and credit operations in turn also produce credit and debit balances, this could result in daily remittances, so that administering business in this way would lead to unacceptable expenses for both parties.

A certain frequency is therefore established for the preparation and remittance of accounts and the payment of balances, thereby allowing the payment of reciprocal balances arising from the reinsurance treaty to be systematised through a current account.

1.1. The current-account system

This accounting system is generally used for obligatory treaties and is not applicable, in principle, to the case of facultative reinsurance, as this involves a single operation which is also based on a single risk. But, in reality, the fact is that, once facultative business passes between a cedant and a reinsurer, the volume of operations can reach such a level that it is similar to an obligatory treaty, which is why a current-account system is also usually agreed.

Let us look at a quote from Professor Sánchez Calero referring to the current-account system:

*"A current-account agreement is **one in which the parties undertake to defer the due dates of their reciprocal monetary credits to a specific time** at which they will be offset and a credit established in favour of one of the parties. The Spanish Supreme Court has defined this agreement as a commercial agreement whereby two persons, generally traders, in a continuing business relationship temporarily agree to grant each other credit in the sense that both parties remain obliged to continue placing their mutual remittances to account as debit and credit items, without immediate payment being required, but only the balance in favour of either of them, resulting from a set-off effected on the date agreed."*

The same author adds that a current-account agreement, like any other, requires the concurrence of intentions with the aim of producing the following effects:

a) That the mutual credits originating in a specific period should not be demandable until the time that the parties have predetermined by mutual agreement, which presupposes a specific frequency in the preparation and closing of accounts.

b) That when an account is closed, any credits are offset and it is then being determined who is the debtor or creditor and for what amount. This obviously presupposes a period for the drawing up of accounts, their remittance, a period for their examination and the agreement or objections of the recipient party, in this case the reinsurer.

c) That one of the parties undertakes to record the mutual credits in the accounts.

1.2. Some characteristics of reinsurance contracts

The accounting transactions arising between a cedant and a reinsurer constitute a *sui generis* (i.e. unique) commercial contract which is open-ended, as it regulates long-term relations between the parties.

Reinsurance treaties contain clauses regulating accounting transactions between cedants and reinsurers. They also stipulate what items the accounts have to contain, the period for their preparation, currency, remittance, verification, notice of approval or objections and settlement of balances.

Facultative reinsurance is, however, an exception, because this usually involves an isolated operation requiring only a single account which can be drawn up once the operation has been agreed.

Despite the foregoing, and where a facultative cession for a large amount, it is usual to arrange a system whereby possible claims are paid immediately by the reinsurer, as they could put a risk the insurer's solvency or liquidity.

We shall now look at the various items that make up the accounts and some aspects on the way they are presented.

1.3. Items in the accounts

The items in the accounts will vary, depending on the type of reinsurance treaty and the class of business involved but, whatever the treaty, it should contain a clause listing them. However, in the case of facultative reinsurance involving a single operation, even though no special clause (as usually found in proportional reinsurance) is stipulated, the accounting mechanism is practically the same as for an ongoing treaty.

1.4. Presentation of the accounts

Aspects relating to the presentation of accounts between the cedant and the reinsurer will be dealt with below. Firstly, it should be said that the presentation usually contains three sections.

– **Technical account:** This contains all the items described in the preceding pages: ceded premiums, commissions, payment of losses, retention and return of deposits, interest, taxes, portfolio entries and withdrawals and their respective provisions, etc.

– **Current account:** This includes items relating to the previous balance, the balance for the relevant period or account and remittances in payment of balances, as well as remittances in respect of claims payments or cash calls.

– **Reserves deposit account:** This will show the previous balance, the current status of the technical reserves and the return of freed-up reserves and, finally, the balance carried forward for technical reserves.

Let us look at an example of each of the sections:

Example

Technical Account		
Item	Debit	Credit
Premiums ceded, net of cancellations	—	100
Commissions 35%	35	—
Losses and expenses	240	—
Technical reserves excl. premiums 33.33%	33	—
Technical reserves excl. claims	—	—
Return of technical reserves excl. premiums	—	28
Return of technical reserves excl. claims	—	—
Interest 4%	—	1
Balance		**179**
Equal totals	308	308

Current Account		
Item	Debit	Credit
Previous balance	—	15
Balance for the period	179	—
Remittances	15	—
Cash payment remittances	—	200
Available balance	**21**	
Equal totals	215	215

Example

Reserves deposit account		
Item	Debit	Credit
Previous balance	127	—
Technicalreserves provisions excl. premiums	33	—
and expenses	240	—
Technical reserves excl. claims	—	—
Return of technical reserves	—	28
Balance carried forward	—	132
Equal totals	160	160

We have seen previously how the flow of insurance business requires a current account system reflecting all the cessions to reinsurance, day by day or policy by policy, which would be impossible to administer.

We can imagine an insurer issuing marine policies in fifteen different currencies and, as is obligatory in this class of business, drawing up accounts for the last five underwriting years which, in each case, would lead to seventy-five statements of account (though in such cases it is usually agreed to convert into just one or two of the most used currencies).

In the following pages, we will see a solution to this problem.

1.5. Frequency of preparation of accounts

In order to resolve the problems referred to and, at the same time, save on administration costs, a frequency for the preparation of accounts is established, thereby making it simpler for the cedant and, also, for the reinsurer, who has to check the accounts.

It is important to mention that, in agreeing on a current-account system, the reinsurer (unlike the insurer) will not receive the premium for the risk accepted until the close of the accounting period, but nor will it be charged for the claims settled (with the exception of cash calls) or the commissions and deposits until the actual closing of the accounts.

In proportional reinsurance it is usual to establish a quarterly frequency for the preparation of accounts, as this period provides reasonable cash flow for the purposes of claims settlement.

It is possible that, due to certain circumstances (say a change in the IT system), a cedant is unable to draw up the accounts in the normal fashion. In this case it is advisable – and this is in fact what usually happens – for the reinsurer to accept the delay, provided it receives payments on account based on data from the previous account and thereby ensuring that its liquid assets are not excessively reduced.

It is always important to respect the deadlines for the remittance of accounts as rigorously as possible, one of the reasons being to avoid the risk of currency devaluations. In practice, it is usual to establish a deadline of between six weeks and three months; with IT tools it is expected that these periods will continue to reduce over time.

1.6. Checking and analysis of accounts

Upon receiving statements of account, the reinsurer will need some time to check and analyse them. In recent times, reinsurers no longer check the premiums and claims on the accounts against lists and summaries, which they do not require to be sent. However, they still have to check whether the entry for the commission, be it fixed or variable, corresponds to what has been

agreed; they check the amount of the deposit retained and released and also the interest.

In the statement of account containing the current account items, the reinsurer has to check whether the previous balance has been carried forward correctly to the new account and paid by means of a remittance of funds and, if not, will have to request payment if the ceding company has not previously been asked to pay.

Another point it has to check is whether the payment of a cash claim has been properly entered, as some ceding companies sometimes fail to indicate such cash claims separately in their remittances, which obliges the reinsurer to break down the items making up the remittance amount.

1.7. Confirmation of the statement of account

Obviously, a certain amount of time is stipulated for checking and subsequent confirmation, at the end of which the reinsurer will have to settle any balance in the cedant's favour.

When confirming the accounts, the reinsurer may make any comments it sees fit and, even if it has objections, will still be able to pay that part of the balance with which it is in agreement.

Where there appear to be errors or omissions, a clause established for such cases stating that "any inadvertent errors or omissions shall not affect the rights and obligations of the contracting parties stipulated in the contract but shall be rectified as soon as possible" will apply.

1.8. Delays in the payment of balances

It is also usual to establish a period for undue delays in the payment of balances; in such cases the reinsurer will be entitled to request interest for delayed payment. The same would happen if the original currency of the treaty were to depreciate against that of the reinsurer once the time allowed for the settlement of balances had expired.

It should be said that accounting is fundamental in reinsurance relationships, given that clear, precise and efficient disclosure of the accounting items and timely performance of the obligations accepted is reflected in respecting the condition of good faith, which is paramount in this business. On the other hand, failure to adhere to these principles can lead to a break in the continuity of these relationships when it is precisely that continuity which is fundamental in reinsurance.

2. OPERATIONAL METHODS. PREMIUM AND LOSSES PORTFOLIO TRANSFERS

We should remember the question asked in the previous chapter, under the section entitled "Period":

To what period of a reinsurance contract will the liability for a claim be attributable?

a) The period of the reinsurance contract in which the direct insurance policy giving rise to the claim was issued.

b) The period of the reinsurance contract in which the claim occurred.

c) The period of the reinsurance contract in which the claim was paid.

All three answers are correct but involve different methods of operation which must be defined in the reinsurance treaty. Following the same order as the answers above, these methods are known as:

– Underwriting Year (also named as "Risk Attaching")

– Accident Year (also named as "Loss Occurring During")

– Accounting Year (also named as "Clean-Cut")

Let us look at the above using an example:

Example

Period of the reinsurance treaty: 1/01/-31/12/

Policy inception date: 15/02/2009-14/02/2010

Date of occurrence of the claim (derived from the previous policy): 08/01/2010

Date of payment of the claim: 12/03/2011

Term of the policy:
15/02/2009-14/02/2009

| 31/12/09 | 31/12/10 | 31/12/11 |

Date of
occurrence
of the claim:
08/01/2010

Date of payment
of the claim:
12/03/2011
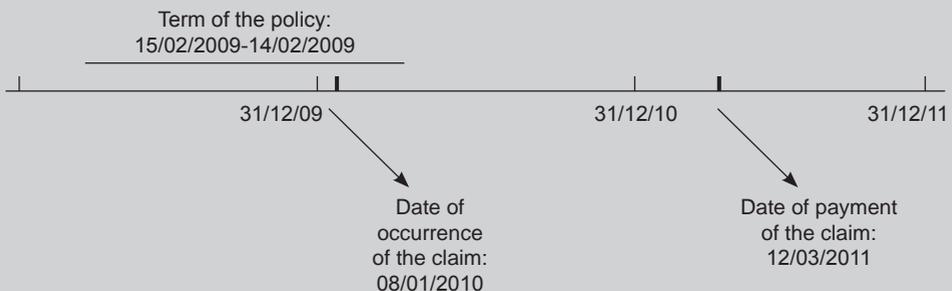
Thus, in the previous diagram we will have three periods for the reinsurance treaty:

▪ 1/01/2009-31/12/2009

▪ 1/01/2010-31/12/2010

▪ 1/01/2011-31/12/2011

The following explains in detail each of the methods described:

a) *By underwriting year*

As all the claims will be allocated to the reinsurers for the period of the reinsurance contract in which the policies that generated the claims were issued, all the premiums generated by these policies will be ceded in the relevant proportion to the reinsurers for that period.

With this method, premiums and claims are allocated to the year of inception/issue of the original policy. Its main advantage is therefore the complete monitoring of the actual real behaviour of the protected portfolio during the underwriting year in question, over time up to its final closure.

Aspects such as the effect of major claims, the development of claims and loss reserves over time, the effect of incurred losses but not reported (IBNR) during the year, the development of the technical measures adopted to improve the quality of the portfolio and other aspects can be ascertained fairly easily using this method. All this information, used appropriately, is crucial for the decision-making in both reinsurance and insurance.

The main disadvantage of this method is that it obliges both the cedant and the reinsurer to keep premium and losses accounts open until the total

closure of operations, something which may only happen several years later. It will therefore be necessary to control the accounting entries for several years and, perhaps, for many reinsurers with whom a practically constant flow of communications also has to be maintained. Another drawback is the uncertainty that arises for the company regarding the life of its reinsurers in order to respond to claims over time – something that is inextricably linked with the concept of security. For the reinsurer, the uncertainty is that it may be liable for a major claim after many years, without having had a chance to set up any kind of loss reserve.

This method is used primarily in the 'long-tail' classes of business characterised by long, drawn-out claims often involving legal proceedings and, consequently, the possibility of major changes in claims evaluations. Fire, Marine, Engineering, Public Liability and Surety are classes of business that normally use this system.

b) *By accident year*

As already stated, claims will be allocated to the reinsurance treaty period in which the claim occurs, regardless of the date of issue of the policy or the date of payment of the claim.

Thus, taking the previous example again:

Example

Period of the reinsurance treaty: 1/01/2009 - 31/12/2009

Policy inception date: 31/12/2009 - 30/12/2010

If the policy was issued on the last day of 2009, any claims will occur during the 2010 reinsurance period, which means that the reinsurers covering that period will be the ones who are liable. If the reinsurers of the 2010 period are accepting the claims arising from this policy, it is logical for them to receive part of the premiums, in this case 364/365ths, as these will be the days that they will be on risk.

These movements of premiums are known as *premium portfolio transfers* and match the reserves for unearned premiums ceded to reinsurance. This will be explained later.

Premiums are allocated by means of premium portfolio movements (+ premium portfolio entry from previous year – premium portfolio withdrawal for the year + premiums ceded for the year).

Claims are allocated by accident year, regardless of their date of payment, which means that both the cedant and the reinsurer must keep losses accounts open as long as there are any outstanding losses. On the other hand, this method does offer an accurate idea of the result in relation to the

premiums earned within the same year. It is used essentially in classes of business covering property risks.

c) *By accounting year (clean-cut)*

Claims will be allocated to the reinsurance treaty period in which the claim is paid, regardless of the date of issue of the policy or the date of occurrence of the claim.

Continuing with our previous example, but introducing a date of occurrence and payment of the claim:

Example

Period of the reinsurance treaty: 1/01/2009 - 31/12/2009

Policy inception date: 31/12/2009 - 30/12/2010

Date of occurrence of the claim: 20/12/2010

Date of payment of the claim: 2/01/2011

The claim will therefore be payable by the reinsurers of the 2011 period. Since a policy issued in 2009 generates a claim which occurs in 2010 and is paid in 2011, the 2011 reinsurers will have to receive some remuneration for taking over any claims that have occurred in the previous period and that will probably be paid during the period of the current contract.

This remuneration will be equivalent to the reserve for outstanding losses and is known as a *loss portfolio transfer*, which will be explained below.

Premiums are allocated through portfolio movements, as described in paragraph b) above, and claims are also allocated through portfolio movements, that is to say portfolio withdrawal at 31 December and portfolio entry at 1 January. The advantage for the cedant is that all accounting operations are carried out within the same year, which means that there is no need to keep accounts open in successive years. These virtues of the clean-cut method for the cedant are marred to some extent by the problems that arise when a reinsurer cancels its participation in the contract. In such a case, the cedant would have to take over all the liabilities from both portfolios, a situation which, although technically correct, is not to be recommended in practice for any cedant.

For the reinsurer, any closure of operations which means the end of its liabilities is welcomed, provided it is done at reasonable terms.

On the other hand, reinsurers tend to be reluctant to use this method from a statistical point of view, as the results observed are strictly accounting results and are not of great value as a guide for future action or for taking a position with regard to a company or market.

To sum up:

Operational method	Key	Premium portfolio	Loss portfolio
Underwriting year	Date of **issue** of the **policy**	No	No
Accident year	Date of **occurrence** of the **claim**	Yes	No
Accounting year	Date of **payment** of the **claim**	Yes	Yes

2.1. Premium and loss portfolio transfers

The period of validity of reinsurance treaties is generally one year. Let us take the case of a reinsurance treaty effective from 1 January to 31 December. When the accounts for each year are closed on 31 December, the reinsurer's liabilities in respect of the business ceded are not extinguished, as:

– Annual policies issued and renewed during the treaty's period of validity from 1 January to 31 December will expire throughout the following year and will generate claims occurring up to the policies' expiry. As the reinsurer will have received premiums for such policies through the reinsurance accounts, it will be obliged to participate in the cost of any claims in the agreed proportion.

– Some of the claims occurring during the period of the treaty and chargeable to the policies covered by the treaty will remain outstanding when the year is closed. Although there will always be a reserve for the claims, based on their estimated cost, it is also the case that the exact amount of the claims will not be known until they are finally settled. It is also possible that claims affecting these policies may have been incurred but not reported, and that the company may therefore not be aware of them for several years. In short, the reinsurer will continue to be bound to the development of the claims right up to their settlement, irrespective of when that happens.

For the cedant, this extended period of liability creates or can create:

– An extraordinary administrative workload and cost, through having to keep accounts open with various reinsurers over a long period of time.

– Uncertainty about the reinsurer's solvency when it may have to cope with the payment of claims, perhaps several years later.

For the reinsurer too, it obviously represents an administrative inconvenience in having to keep accounts open for a long time. In order to overcome this disadvantage, the cedant and the reinsurer can agree on:

Premium portfolio transfer

This is an operation involving the transfer of the share of the unearned premium reserve payable by the cedant and the reinsurers of year N, at that year's reinsurance conditions, to the cedant and reinsurers of year N+1, at the conditions of the new year's reinsurance treaty.

This operation is known as a *premium portfolio* transfer.

– Premium portfolio withdrawal: This means a credit for the ceding company and a debit for the reinsurers of year N.

– Premium portfolio entry: This means a debit for the cedant and a credit for the reinsurers of year N+1.

The effect of the premium portfolio transfer is to transfer from year N to year N+1 the liability for the risk from the insurance policies that will accrue in the following year, so that any claims occurring in year N+1 which are chargeable to policies issued in year N will, in any event, be paid by the cedant and the reinsurers in the proportions indicated in the reinsurance treaties for year N+1.

There are various ways of establishing the premium portfolio:

1. *The pro rata temporis method.* The premium portfolio transfer is carried out policy by policy, i.e. taking account of the unearned premium reserve ceded from each individual policy.

   This method is undoubtedly the most accurate, but requires more administrative work. Thanks to IT systems, this method is becoming more feasible and more frequently used.

2. *Methods using fractions.* Meanwhile, methods that involve splitting the relevant year into fractions are being used – these involve dividing up unearned premiums according to different periods of time and establishing fictitious expiry dates for the policies.

   Since these methods using fractions are those currently most used, we will study some of them in the pages that follow.

   – **Fixed percentage:** This is the simplest method, as it involves agreeing a single 50% split, which is the same as saying that all the policies expire on 1 July (half-way through the year). Here, half the premiums less the reinsurance commission are taken as the reference value.

   This is also the most inaccurate method, as it presupposes that distribution of the expiry dates in the portfolio is linear, when it is common knowledge that more or fewer policies are arranged depending on the time of year. Moreover, there are some classes of insurance – engineering, for example (construction and erection) – in which the value insured at the time the cover is arranged is practically nil, but it

increases progressively over time and is not subject to annual renewal. These classes will therefore require a different system of calculation.

- **The 1/24ths system:** Here, policies are assumed to expire, on average, on the 15th of each month, so that, for example, of the premiums written during the month of January, 23/24ths will be earned premiums.

- **The 1/12ths system:** When dividing the portfolio up into 12 parts, all the policies are assumed to expire on the first or last day of each month, which means that, if they are taken to expire on the last day of the month, the fraction of premiums earned in December will be 12/12ths, and in January 1/12th. If the policies were assumed to expire on the 1st of each month, the fraction of premium earned in December would be 11/12ths.

Loss portfolio transfer

This is another operation, similar to the previous one, involving the transfer of the share of outstanding losses reserve of the cedant and reinsurers of year N, at that year's reinsurance conditions, to the cedant and reinsurers of year N+1, at the conditions of the new year's reinsurance treaty.

This operation is known as a *loss portfolio transfer*.

- Loss portfolio withdrawal: This means a credit for the cedant and a debit for the reinsurers of year N.

- Loss portfolio entry: This means a debit for the cedant and a credit for the reinsurers of year N+1.

The effect of the loss portfolio is to transfer from year N to year N+1 the liability for outstanding losses , so that any paid losses in year N+1 which are chargeable to policies issued in year N or before will, in any event, be paid by the cedant and the reinsurers in the proportions indicated in the reinsurance treaties for year N+1.

In some cases, the loss portfolio entry and withdrawal clause specifies that, in the event of there being any major claim, this can remain chargeable to the reinsurers of the occurrence year until it has been completely settled. The above makes sense in cases of claims which are controversial, of some magnitude, subject to a court ruling etc., insofar as there is a high degree of uncertainty about the settlement amount.

A loss portfolio transfer will be established contractually as a percentage of the outstanding losses reserve at the end of the reinsurance treaty period. This percentage normally varies between 100% and 80% of the outstanding losses reserve.

3. SPECIMEN PROPORTIONAL REINSURANCE SLIP

Concluding our discussion on proportional reinsurance, we see below how a combined quota share and surplus reinsurance treaty is structured.

3.1. Proportional treaty

Article 1. Subject-matter of the treaty

This treaty shall cover all direct insurance and facultative reinsurance written by the Cedant in the classes of insurance and within the territorial scope specified in the schedules hereto.

The following shall be excluded from the cover hereunder: obligatory reinsurances; insurances and reinsurances which are excess of loss covers; the types of insurance, hazards and risks appearing as additionally excluded in the schedules hereto.

Article 2. General terms and conditions of insurance

The general terms and conditions of insurance applying to the classes of business covered by this contract shall form an integral part hereof. Significant additions or alterations shall be reported to the reinsurer without delay.

Article 3. Retention

The type and amount of the Cedant's retention are stated in the schedules. Should the Cedant learn of a claim before it has set its retention, the latter shall be determined in accordance with the table of limits contained in the schedules. Where a table of limits has not been agreed, the retention in question shall be set by applying the principles which the Cedant usually follows for the same or similar risks.

Article 4. Reinsurer's share

The Cedant undertakes to cede to the Reinsurer such shares of all insurances and reinsurances hereby covered as are specified in the schedules. The Reinsurer in turn undertakes to accept those shares.

The Reinsurer's share shall be carried out at the premium due to the Cedant, as well as at the original terms and conditions and currencies.

The Reinsurer's liability during the period of this contract shall begin and end at the same time as that of the Cedant.

Article 5. Reinsurance commissions

The Reinsurer shall pay to the Cedant the commissions stated in the schedules hereto.

Article 6. Bordereaux

The sending of bordereaux in respect of risks ceded under the treaty and of losses occurring is regulated in the schedules hereto.

The premium bordereaux sent by the Cedant to the Reinsurer shall serve exclusively to inform the Reinsurer of risks ceded within the context of the treaty. Risks not covered under this contract, shall be reinsured hereunder only if they are offered separately and expressly accepted by the Reinsurer; a simple unilateral reference by the Cedant in the premium bordereau shall not be construed as an extension to Reinsurer's liability.

Article 7. Losses

Indemnity payments, plus all specific expenses in respect of loss adjustments expenses (legal costs and adjustment expenses, for example), shall be charged under Losses. On the other hand, the salaries of the employees responsible for losses adjustment and the Cedant's internal organisation costs shall not be charged under Losses.

The Reinsurer shall participate in proportion to its interest in all receipts from any recoveries.

In those cases where the limit for cash-call payments set out in the schedules is reached or exceeded, the Reinsurer shall, upon request, immediately make available to the Cedant its share of any cash calls by virtue of its contractual interest. The Reinsurer shall be entitled to deduct from such payments any balance due and arising out of any of its accounts with the Cedant.

Article8. Follow the fortunes

For the purposes of and within the framework of this contract, the Reinsurer shall follow the underwriting fortunes of the Cedant in respect of the risks which the Cedant has accepted under insurance contracts and cover notes.

Article 9. Management rights and Reinsurer's obligation to follow the Cedant

This contract shall not restrict the Cedant in exercising its management rights. The Cedant shall be expressly entitled to agree, refuse or settle claims and shall act in such a manner as would a reasonable and responsible insurer that was not reinsured. To this extent, the Reinsurer shall be bound by all the decisions taken by the Cedant.

Article 10. Rendering of accounts

– Accounting period. The Cedant shall send the Reinsurer quarterly accounts as soon as possible, but no later than within six months following the end of each quarter.

- Accounting items. The accounts shall include the following items, separately by class of insurance and indicating the Reinsurer's contractual share:

  - Premiums net of cancellations (if the Reinsurer has accepted liability for a risk that is covered, it shall be due the proportional premium even in cases where the Cedant has not received the relevant premium).

  - Paid losses, less any recoveries.

  - Cash-call payments.

  - Reinsurance commissions.

  Where other items come under consideration, these will be indicated in the schedules hereto.

- *Currency:* The accounts shall be rendered in the original currency.

- Confirmation of accounts. The Reinsurer shall confirm the accounts or raise any objections to them within four weeks of their receipt.

- Payment of balances. The Cedant shall pay any balance due to the Reinsurer on the same date on which it sends the accounts. The Reinsurer shall pay any balance due to the Cedant at the same time as it confirms the accounts, but no later than within four weeks after receipt thereof. Even in the event of disagreement, the Reinsurer shall nevertheless pay the confirmed part of the balance immediately. As soon as the outstanding points have been clarified, the debtor shall pay the difference immediately.

- Alterations in the exchange rate. If the periods specified in this contract for the payment of balances are not observed, the debtor shall bear any changes in the exchange rate of the creditor's currency, where such changes exceed five percent, once the respective expiry dates have expired, unless the debtor is not responsible for the failure to observe the aforementioned periods.

Article 11. Reinsurer's right of inspection

Upon request, the Cedant shall provide the Reinsurer with detailed information on the risks reinsured under this contract. In particular, the Reinsurer shall be entitled to request that:

a) copies of all or part of any documents relating to the risks ceded and their reinsurance shall be made available at its own expense;

b) During normal office hours, the Cedant shall grant a representative, appointed by the Reinsurer for that purpose, the right to inspect the documents mentioned under point a) below. Notification of such visits shall generally be given two weeks in advance and, in urgent cases, at least 48 hours in advance.

The Reinsurer shall have this right of inspection for as long as one of the two parties to this contract has claims against the other arising from this contract.

Article 12. Errors and omissions

Inadvertent errors or omissions shall not affect the rights and obligations of the contracting parties agreed under this contract but shall be rectified as soon as possible.

Article 13. Arbitration

Any dispute which may arise between the contracting parties concerning its interpretation and validity shall be submitted to the decision of an arbitration panel, consisting of three members, which shall meet at the location of the defendant party.

The members of the arbitration panel shall be active or retired executives of insurance or reinsurance companies.

Each party shall nominate its arbitrator. In the event of one of them failing to appoint its arbitrator within four weeks of having been required by the other party to do so, the second arbitrator shall be appointed by the Chairman of the Chamber of Commerce at the location of the first party to act. Before initiating procedures, the two arbitrators shall elect an umpire. Should they fail to agree on an umpire within four weeks of their own appointment, the umpire shall be nominated by the Chairman of the Chamber of Commerce at the location of the defendant party.

The arbitrators shall perform their task primarily in accordance with reinsurance custom and practice and shall be relieved of all legal formalities. They shall reach their decision within four months of the appointment of the umpire.

The decision of the arbitration panel shall be final and not subject to appeal. The arbitration panel shall also decide on the costs of the proceedings and their payment.

Any actions for the payment of confirmed balances shall be brought before the ordinary courts.

Article 14. Commencement and termination of the contract

This contract shall take effect on the date indicated in the schedules for an indefinite period. The parties may nevertheless cancel one or all of the participations specified in the schedules attached to this general contract, on the respective dates indicated therein, by giving at least three months' notice.

Each of the parties may cancel this contract prior to the date indicated, without having to observe a period of notice:

- if it is impossible to comply with this contract *de jure* or *de facto* for reasons not attributable to the party giving notice;

- if the other party experiences payment difficulties, is declared to be in a state of bankruptcy or liquidation, or if its licence to transact insurance business is revoked;

- if the other party loses all or part of its paid-up share capital;

- if the other party undergoes a merger or there is a significant change in its ownership or control;

- if the other party fails to meet its obligations under this contract;

- if the country in which the other party has its registered office or principal administrative domicile becomes involved in armed conflicts with any other country, even when there has been no declaration of war, or if it is wholly or partially occupied by another foreign power. Notice of termination shall be given in writing (by registered letter or fax) and addressed to the principal place of business of the recipient or to any other address which has been supplied for that purpose. Should communications between the parties be interrupted, any notice of termination shall take effect as soon as it has been dispatched or dispatch has been attempted.

Article 15. Portfolio management

Management of the premium portfolio and of the outstanding losses reserve upon inception or expiry of the contract, or when there is a change in the share, shall be as stated in the schedules hereto.

3.2. The schedule for an obligatory treaty

Throughout the specimen wording of the general terms and conditions of the proportional treaty above, reference is repeatedly made to the *schedule*, which is to say the special conditions.

We shall now look at how the schedule would look in the case of an obligatory combined quota share and surplus treaty.

1. *Subject-matter and territorial scope of the contract (Article 1)*

    - Classes of insurance included:

    - Territorial scope: Spain

2. *Additional exclusions (Article 1)*

    - Covers in the form of line slips, binding authorities, broker covers and captive pools.

– Any class of business not specified under the "Classes of insurance" paragraph.

3. *Retention (Article 3):* €500,000.

   Net retention: 50% share of the gross retention. The gross retention is determined from the attached table of lines as a maximum sum insured of €500,000.

4. *Reinsurer's share (Article 4)*

   Type of cession: 50% share of the gross retention.

   15-line surplus. A line corresponds to 100% of the gross retention as defined above.

   Amount of cession:
   Quota share cession: €250,000
   Surplus cession: €7,500,000

   The limits of cession are based on the sum insured.
   Reinsurer's share of the cession:
   Quota share cession: 100% of 50%.
   Surplus cession: 100%,
   or a maximum of €7,750,000.

5. *Reinsurance commissions (Article 5)*

   Commission:

   Quota share: 32.5%
   Surplus: 30%
   Profit commission: 20%
   Premium reserve: 40%
   Outstanding Losses reserve: 100%
   Reinsurer's administration costs: 5%
   Losses carried forward: to extinction.

6. *Bordereaux (Article 6):*

   Premiums: quarterly bordereaux within four weeks following the end of each quarter, separately according to classes of business and types of cession.

   Losses: quarterly bordereaux within four weeks following the end of each quarter, separately by class of business and type of cession.

   Immediate notification if the loss is greater than €250,000 for 100% of the share of all reinsurers under this contract.
   Outstanding losses reserves: annually within three months from the end of each year, separately by class of business and type of cession, broken down by accident year.

7. Losses *(Article 7)*

Cash call limit: €500,000 for 100% of the shares in losses of all the reinsurers participating in this contract.

8. *Right to participate in losses adjustments (Article 9):*

Right to participate in the adjustment of claims greater that €500,000 for 100% of the shares of all reinsurers participating in this contract.

9. *Rendering of accounts (Article 10)*

Separately by class of business
Accounting period: quarterly
Time limit for rendering accounts: within 6 weeks
Currency of the accounts: Euros (€)
Time limit for confirmation of the accounts: 30 days
Time limit for the settlement of balances: 15 days
Maximum time limit applicable to the due date of balances: 75 days

10. *Deposits (Article 10)*

Premiums: 40%, interest: 3%.

11. *Arbitration (Article 13)*

See the wording of the contract.

12. *Commencement and termination of the contract (Article 14)*

Commencement of the contract: 1 January, 20...
Period of notice: 3 months prior to the end of each year
Termination of the contract: premiums, to natural expiry
Losses, to natural expiry

13. *Other agreements*

In the case of exceptionally exposed risks, the Cedant shall consult the Reinsurer. The latter will make available to the Cedant its experience on the matter with respect to the business ceded under this contract.

CHAPTER 9
NON-PROPORTIONAL REINSURANCE

1. CONCEPT AND CHARACTERISTICS

1.1. Concept

In non-proportional reinsurance, the allocation of liabilities between the cedant and the reinsurer is based on *claims* and not on the *sum insured* as is the case in proportional reinsurance. The reinsurer accordingly undertakes to indemnify the cedant when the amount of claims exceeds a previously agreed amount (the *deductible*) and up to a maximum limit (the *limit of cover*)*.*

1.2. Characteristics

- The amount of the cession is not determined on a case-by-case basis, which means that the cedant only has to send *claims bordereaux*.

- Accounting operations are reduced to a minimum, being limited to the payment of premium and recovery of the claim when this exceeds the *deductible*.

- The above leads to a reduction in administration costs.

- The reinsurance premium is not calculated on the basis of each cession but on the cedant's entire *portfolio*, or part of it within an individual class of business.

- The cost of the reinsurance (the premium) is a factor which is determined beforehand, thereby allowing the cedant to budget for the expense. This cost can vary considerably from one year to the next, depending on how the claims experience develops and also on the reinsurance market.

- There is not normally any *profit commission* to reward the cedant if results are positive.

- The reinsurer does not deposit the premium for the non-proportional treaty with the cedant to allow for unexpired risks reserves, which means that the cedant has to finance the business on its own.

1.3. Advantages for the cedant

– *Reduction in administration costs.* The amount of the *cession* is not determined on a case-by-case basis, which means that the cedant does not have to send cession bordereaux or monitor reinsurance but only has to send claims bordereaux. Accounting operations are therefore reduced to a minimum.

The reinsurance premium is not calculated on the basis of each cession but on the cedant's entire *portfolio*, or part of it within an individual class of business.

– *Higher retention of the premiums written by the cedant.* The XL protects the cedant, above an absolute limit of retention, against the cost of a claim caused by a particular event(1), whilst the proportional insurance participates in the claim.

1.4. Disadvantages for the cedant

– The XL cover only protects the cedant against very large isolated claims or against a succession of claims as a result of one and the same event. This means that there is no protection against an increase in the loss ratio (excluding stop loss) and only partial protection against an increase in the number of major losses.

– Most of the premium is paid at the start of the contract and in advance (although it can also be half-yearly or quarterly). This therefore generates negative *cash flow* during the first part of an underwriting year.

– In a proportional treaty, the accounts are sent quarterly, half-yearly and in some cases annually, ceding premiums which the cedant has already accounted. Balances are paid after the accounts have been sent, which leads to a positive cash flow for the cedant.

There is no profit commission in an XL to reward the cedant if the business goes well. Nor is there any premium deposit for the unexpired risks reserve, which means that the cedant has to finance its business on its own. The cash-flow factor is important when interest rates are high.

_____

(1) The term "Claim Event" means the individual claims that arise from the same catastrophe and which are a direct consequence thereof. However, the duration and extent of any "Claim Event", thus defined, shall be limited as follows: 72 consecutive hours in respect of earthquake, seaquake, giant wave and volcanic eruption; 72 consecutive hours and within the confines of the city or town in respect of riot, civil commotion and malicious damage; 168 consecutive hours for any claim of whatever nature. No individual claim caused by any insured peril, that occurs beyond these periods or time frames will be included in the aforesaid "Claim event".

– One of the functions of reinsurance is to help finance the start-up of underwriting in a particular class of business or of an insurance company. If, as we have said, the XL places the cedant in a negative cash flow situation, then it is clear that this is not a good formula for accompanying an insurance company's initial development.

– The cedant is largely dependent on developments in the reinsurance market, and prices can vary substantially from one year to the next, depending on how the international claims experience goes (post Hurricane Andrew or post World Trade Centre).

1.5. Advantages from the reinsurer's point of view

– The reinsurer gets more information from the portfolio covered, for the purposes of pricing the XL reinsurance.

– The reinsurance premiums are set by the reinsurer based on the cover offered and the quality of the business.

– Premiums are collected in advance, generating considerable cash flow for the reinsurer.

– Claims per cover are limited to an annual maximum amount.

1.6. Disadvantages from the reinsurer's point of view

Disparity in the results. The ratio between the premium and the liability accepted is very high, which means that any total loss would take years to recover.

Let us look at what we have talked about so far with the help of some practical examples.

Example No. 1

Let us suppose that a company wishes to write simple risks with a underwriting limit of up to 500,000,000 per policy. The company's capital amounts to 1,000,000,000 and the financial director instructs its underwriting department not to take a net retention of more than 20,000,000 per risk, or 2% of its capital.

The premium income for this class of business is 500,000,000

▪ Capital: 1,000,000,000

▪ Underwriting Limit: 500,000,000

▪ Retention: 20,000,000

▪ EPI: 500,000,000

(Estimated Premium Income for the treaty)

Example No. 1 (continued)

The cedant decides to set up a **4/96 quota share:**

4%   96%   500,000,000

20m   480m
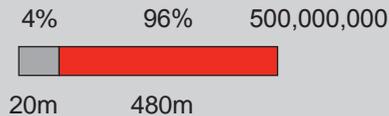
The company retains 4% of the premiums, i.e. 20m. We can say by way of conclusion that:

a) The cedant is underwriting for reinsurers.

b) The reinsurer cannot rely on a cedant that only retains 4% of the value of its risks.

Example No. 2

The company decides on a new structure for its programme.

1. A quota share with a capacity of 100 million and retention of 20%.

2. A four-line surplus.

Q/S   Surplus
100m   400m   Capacity: 500 million

Retention

20m   80m

EPI 300m   200m   EPI: 500 million
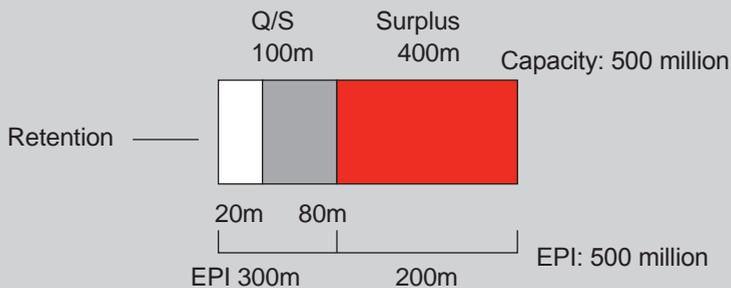
The portfolio is made up of simple risks and the bulk of the premium therefore comes from the quota share. As we know, a surplus is always a contract with a strong imbalance as regards the premium-to-liability ratio.

That said, let us suppose that the EPI for the quota share is 300,000,000 and the rest goes to the surplus. In this way, the cedant retains 60m, i.e. 20% of 300m.

Example No. 3

Now let us see what happens if the cedant decides to buy XL protection for its retention in the quota share, which is now going to be 50%.

100m   400m   Capacity: 500 million

30m
Retention percentage
20m

EPI 300m   200m   EPI: 500 million
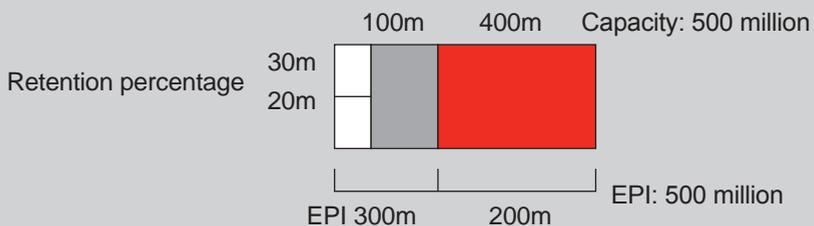
Example No. 3 (continued)

As we know, the cedant's retention cannot exceed 20m. For its quota share retention, which amounts to 50m, the cedant therefore decides to buy XL protection of 30m xs 20m.

Let us see what effect this decision by the cedant has on the premium retention:

If we have an EPI of 300m for the quota share, the cedant retains 150m, which is 50% of the quota share. Let us suppose that the cost of the XL protection is 15% of that 150m of <u>protected premiums</u>. We then have 85% of 150m, i.e. 127.5m, being retained by the cedant, and the cost of arranging XL protection in excess of 20m costs 22.5m.

1.7. Apportionment of claims for the cedant

Let us suppose that we have a risk with a sum insured of 300m and a claim of 200m and that we allocate these amounts in accordance with the three preceding examples:

Example 1.   4% x 200m = 8m   Claim payable by the cedant: 8m

Example 2.   Sum insured = 300m

1/3 share = 100m

Claim 1/3 of 200m = 66.6m

Claim for cedant = 13.33m

Example 3.   Sum insured = 300m

1/3 share = 100m

Claim 1/3 of 200m = 66.6m

Claim for cedant = 66.6 x 50% = 33.3 less recovery from the XL 30m xs 20m = 20m

2. TYPES OF NON-PROPORTIONAL TREATIES

2.1. Per-risk cover

This protects the insurer against claims exceeding the amount that it has decided to retain for own account on a given risk.

Example

The company decided to retain 100,000 on all the textile factories in its portfolio (or 100,000 on the overall risks making up each factory: buildings, machinery, raw materials, semi-manufactured products and finished products). The company protects its retention by means of an excess of loss cover of 60,000 xs 40,000 (i.e. the reinsurer pays up to 60,000 after the cedant has paid out at least 40,000). If a claim of 75,000 occurs in a factory, the cedant will have to bear 40,000 and the reinsurer 35,000.

This can be represented graphically as follows:

PER RISK XL COVER
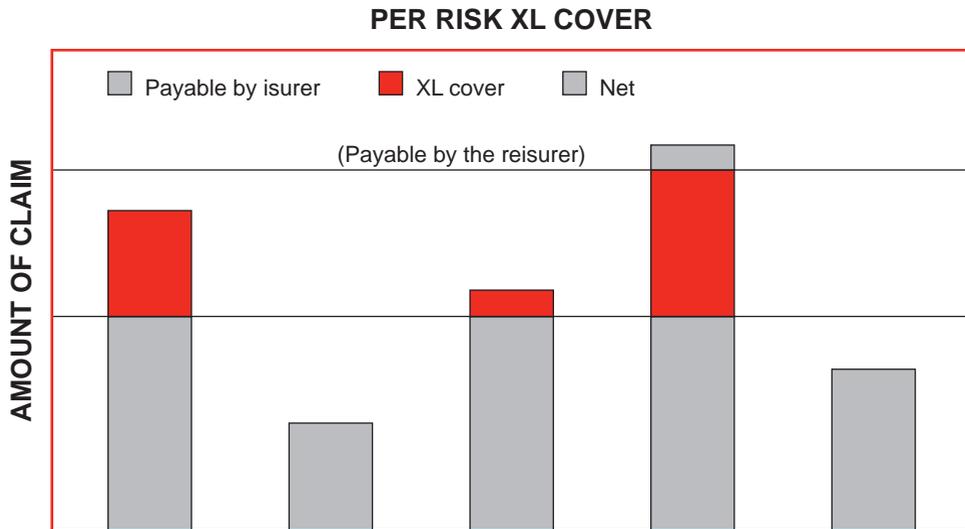
This type of cover generally replaces part of the surplus reinsurance programme; however, for reasons of cost, it cannot match the latter's capacity.

2.2. Per-event cover (Catastrophe XL)

This offers the insurer protection against accumulations(2) which arise when numerous claims are caused by the same event (storm, earthquake) affecting many policies; it generally covers the retention against catastrophe risks.

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(2) The situation that occurs when certain parts of the same risk are simultaneously insured by the same insurer or when certain different risks are affected by the same event. In the latter case, it is said that there is a risk accumulation, for example, when there are different factories within the same industry and their proximity makes it possible for a fire commencing in one of them could spread to the other.

Example

A storm causes 1,000 claims under 3,000 household policies entirely retained by the company for its own account. The company had arranged excess of loss reinsurance for 2,000,000 xs 500,000 (2,000,000 payable by the reinsurer after the cedant has paid the first 500,000). This claim is divided up as follows:

- Cedant's retention per claim: 500,000
- Reinsurer's cover: 2,000,000
- Excess payable by the cedant: 500,000
- Total claim: 3,000,000

This is how it looks in graph form:

CATASTROPHE XL COVER
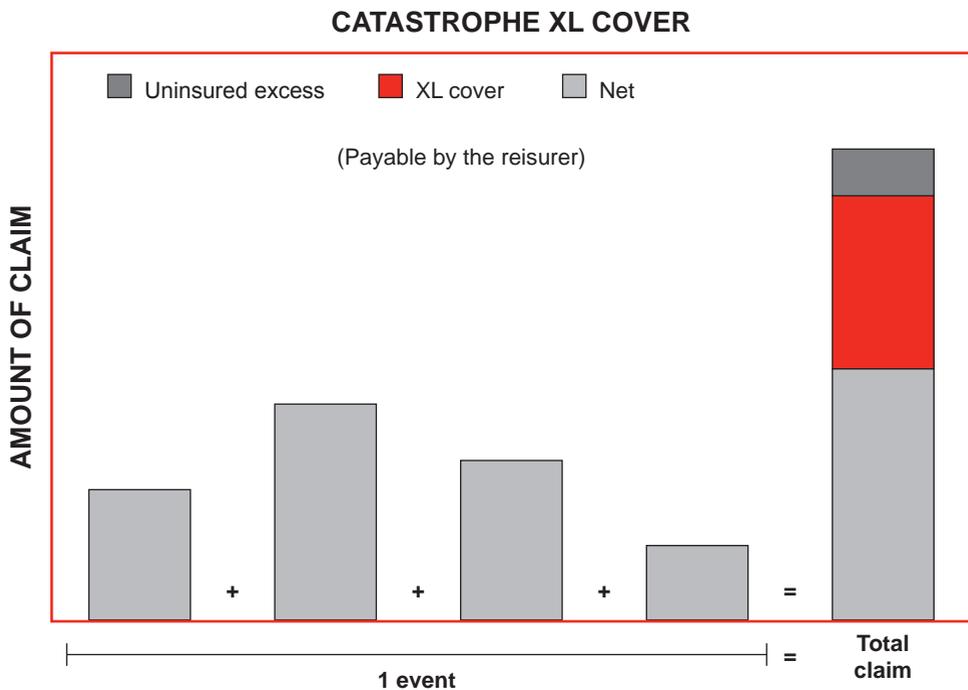
Per-event cover is used in all classes of business in which there is the possibility of accumulations: Fire, Marine, Personal Accident, Aviation, Glass, etc. Without it, the development of modern insurance would not have been possible.

2.3. Stop-loss cover

Its purpose is to protect the company's annual results in a class of business against a negative deviation due to a high incidence of claims, either in number or size.

Example

The company decides to protect the results of the Hail class of business by means of 50% cover above an annual loss ratio of 90%. On closing the accounts, the loss ratio is found to be 102%. The reinsurer will have to bear the 12%.

The stop loss (SL) can be represented graphically as follows:

STOP-LOSS COVER
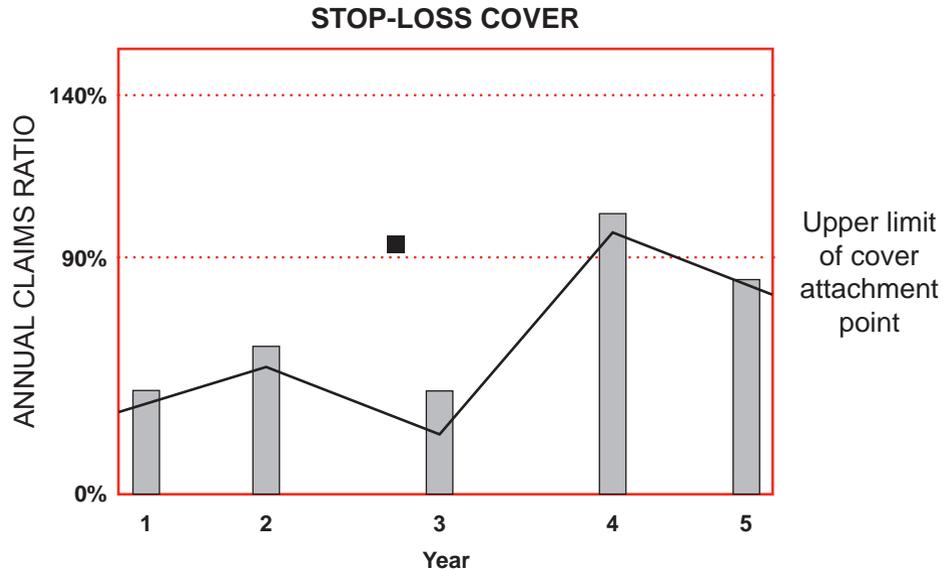
3. TECHNICAL AND FINANCIAL ASPECTS OF NON-PROPORTIONAL TREATIES

The particular elements of these types of reinsurance treaty are listed below (3):

3.1. Limit

This is the maximum cover granted under a non-proportional treaty. It is also the maximum liability accepted by a reinsurer, either per risk or per event.

3.2. Deductible

In excess of loss reinsurance, this is the name given to the amount that the ceding company retains for its own account on each claim and, in this respect, it acts as a retention borne by the insurer.

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(3) These terms are included in the treaty wording. The document in which the risks are covered provisionally before the treaty is signed is called the "slip" or "cover note".

It can be defined as the figure above which the excess of loss reinsurance is triggered in case a loss occurs.

3.3. Period

This is the period of cover of the treaty. It is not to be confused with the treaty *term*, as a treaty with an annual term can cover claims occurring over a greater period.

3.4. Premium

The excess of loss premium is the price the reinsurer needs for the cover it grants to the cedant. This premium is made up of three main parts:

– The risk premium, which has to cover the average claims cost chargeable to the cover.

– The fluctuation loading, which covers deviations from the average claims ratio (spread).

– The margin for the reinsurer's administration costs and profit.

For practical reasons, the total premium obtained is converted into a percentage, which is applied to the amount of premium from the business covered.

Types of premiums

The premium for excess of loss treaties can be:

– Fixed: for practical reasons the premium is expressed as a fixed rate or percentage.

– Variable: this is subject to the influence of the treaty's claims ratio (excess) and is expressed as a variable rate.

– Flat: the premium is expressed with an amount and not a percentage.

As we already know, in the first two cases, the rates are applied to the protected premiums.

3.5. Subject Premium Income

This is the premium written by the company during the period of cover, less cancellations and premiums in respect of reinsurance contracts that reduce the risk of the excess cover.

3.6. Expected reinsurance premium

This is the result of applying the rate to the subject premium income.

3.7. Reinstatement

In non-proportional reinsurance, the amount of cover is reinstated when it is consumed by a claim, and for that a premium is charged which is proportional to the limit consumed ("pro rata capita" or "pro rata on the amount") and/or to the time that has passed ("pro rata temporis" or "pro rata as to time").

Example

XL COVER (layer)	: 500,000 xs 500,000
PROTECTED BASIC PREMIUM	: 20,000,000
RATE 0.65%	: 130,000
CLAIM FROM GROUND UP	: 800,000
DATE OF CLAIM	: 01/09/X0
PERIOD OF REINSURANCE	: 01/01/X0 31/12/X0

CLAIM IN CHARGE TO THE XL COVER = 300,000

1. If the reinstatement is on a double pro rata basis (pro rata temporis and pro rata capita):

   Reinstatement premium:

   $$\frac{\text{Claim for the XL cover}}{\text{Limit of XL cover}} \times \frac{\text{No. of days to expiry}}{365} \times \text{Premium}$$

   Calculation:

   $$\frac{300,000}{500,000} \times \frac{122}{365} \times 130,000 = 26,071.23$$

2. If the reinstatement is pro rata capita only, the date of claim is not taken into account.

   $$\text{Reinstatement premium } \frac{300,000}{500,000} \times 1 \times 130,000 = 78,000$$

In fact, the type of reinstatement used most is 100% pro rata capita.

3.8. ROL/Pay back

Rate on line (ROL)

This is the relation between the reinsurance premium of a particular XL cover compared to the limit of cover, expressed as a percentage.

$$\frac{\text{Reinsurance premium for the cover}}{\text{Limit for the cover}} \times 100$$

Pay back

Period of time needed to recover the payment of a total claim affecting one particular cover or all of the excess of loss treaty. It is expressed in years.

3.9. Ultimate net loss

The term "*ultimate net loss*" means the sum actually paid by the company in respect of any claim occurrence, including litigation expenses, if any, and all other claim expenses. Salvage and recoveries, including recoveries from all other reinsurances, other than underlying reinsurances provided for herein, will be deducted from such sum to arrive at the amount of liability attaching hereunder.

This concept is used a great deal in non-proportional reinsurance.

Any salvage, recovery or payment received or recovered subsequent to any claim settlement hereunder shall be applied as if recovered or received prior to the aforesaid settlement, and all necessary adjustments shall be made *a posteriori* by the parties hereto.

Nothing in this clause shall be construed to mean that a recovery cannot be made under this excess of loss reinsurance until the company's ultimate net loss has been ascertained.

3.10. Layering

Excess of loss treaties are divided into layers. The main reasons for layering are as follows:

1. The business is easier to place. Some reinsurers prefer lower layers with higher premium but more exposed, while others prefer higher layers with lower premium but less exposed.

2. Possibility of setting a different price for each layer.

Example

COVER REQUIRED: 49,500,000 xs 500,000

Possible layering:

500,000 xs 500,000

1,000,000 xs 1,000,000

2,000,000 xs 2,000,000

6,000,000 xs 4,000,000

10,000,000 xs 10,000,000

30,000,000 xs 20,000,000

Possible alternative:

750,000 xs 500,000

1,500,000 xs 1,250,000

3,500,000 xs 2,750,000

6,250,000 xs 6,250,000

12,500,000 xs 12,500,000

25,000,000 xs 25,000,000

3.11. Quotation methods

The quotation process involves assigning a price to a non-proportional treaty. There are various methods for calculating the premiums needed for the reinsurer to be able to write risks.

CHAPTER 10
NET RETENTION, CAPACITY, REINSTATEMENTS AND NON-PROPORTIONAL REINSURANCE PREMIUMS

1. THE DEDUCTIBLE: INITIAL COMMENTS

We have previously seen that in non-proportional treaties the cedant's retention or *deductible* is fixed in different ways, depending on the type of treaty in question: it may be fixed as an amount, as happens in stop-loss treaties, or as a specific percentage of the loss ratio, which may be combined with a limit in amount.

1.1. Price of the reinsurance and calculation of the retention

When the cedant is fixing the retention that it requires or is able to accept, besides considering factors common to any type of reinsurance treaty (probability of claims, estimated amount, type of portfolio etc.), it also has to take into account the price that the reinsurer is going to calculate to grant the cover requested, since the price of the reinsurance in non-proportional treaties has an important specific effect on the cedant's budget.

Example

An insurer calculates that, in principle, it can accept for its own account a *deductible* of 100,000, and it has to take into account a reinsurance premium of 5%, which exceeds its first calculations. What can we do?

- Ask the reinsurer for a second quotation, doubling its *deductible* to 200,000 and receiving a proposed premium of 1.75% instead.

- The cedant will have to estimate whether the deviation in the claims ratio that this will cause in its retention is equal to, greater than or less than the 3.25% difference in the reinsurance rate, and then decide whether or not to bear the higher retention amount.

The decisions are sometimes difficult because there is not always sufficient statistical material available, quite apart from the imponderables that can arise, such as, for example:

– Claims settlements taking longer than anticipated.

– Unexpected changes in interest rates.

– Changes in legislation.

– Salary increases, etc.

1.2. Reinsurer's claims experience

This is another imponderable factor for the cedant: experience from previous years and, even more so, the reinsurer's experience in similar portfolios. Just as insurers use systems for offsetting risks in accordance with the law of large numbers, so reinsurers have to obtain offsetting formulae for the whole of their business.

1.3. Non-proportional working expenses and deductible

With treaties of this kind, also known as *working covers*, it is clear that any cedant that only has this protection will have to pay all medium and small claims, which means that the retention that fixes for the working cover will usually be less than the *deductible* that would have been set in the case of a proportional surplus treaty.

So on what does the level of *deductible* depend? It is on the degree of fluctuation in the loss ratio which the cedant is prepared to accept and on the distribution of the claim amounts.

Let us look at the following example:

Example

Let us consider two portfolios (A and B) in which the same claims ratio of 70% has been assumed for both, with a deviation of plus or minus 10% in recent years and administration costs of 27%.

Amount of claims		Value of claims as a percentage of the total claims in the portfolio	
From	To	Portfolio A	Portfolio B
0	25,000	45%	50%
25,000	50,000	15%	20%
50,000	75,000	29%	15%
78,000	100,000	10%	8%
More than 100,000		1%	7%

From this example we can deduce that:

A *deductible* of around 100,000 would probably be too high in the case of portfolio A, because the cedant would then bear 99% of the total cost of the

claims. This would be excessive considering the claims ratio and the level of expenses.

A suitable *deductible* would probably be one of around 75,000. In this way, 11% of the claims amount would be charged to the per risk (working) reinsurance cover.

In the case of portfolio B, a *deductible* of 100,000 would be more in line with the claims ratio since 7% would affect the reinsurance treaty.

1.4. Staggered *deductible*

In the example shown, the cedant could fix staggered retentions and, will do so (where appropriate) according to risk groupings and the likelihood of them suffering a major claim. We will try to clarify this with an example.

Suppose we have a portfolio made up of 5,000 risks and that all have the same sum insured or PML of 1,000,000.

With a *deductible* of 100,000, and knowing statistically that five claims higher than the *deductible* occur each year and that there is a frequency of 1‰, the cedant would have working cover for all claims exceeding a loss ratio of 10%.

But if the insurer has sufficient statistics to classify the risks by groups of different frequency –higher or lower– it will be able to reduce fluctuations in the retained business considerably.

Let us see an example based on fictitious data:

Type of risks	Claims amount	Retention on the working cover	Reinsurer's liability
A	100,000	20,000	80,000
B	75,000	15,000	60,000
C	50,000	10,000	40,000
D	40,000	8,000	32,000

This arrangement of deductibles works in the cedant's favour because it reduces uncertainties in loss ratio fluctuations.

It will therefore influence the price of the cover, which is normally based on the claims cost.

2. DEDUCTUBLE AND RISK ACCUMULATIONS

The possibility of the same event affecting various risks is almost always present, which is why the cedant will take this circumstance into account when fixing the *deductible* in the reinsurance treaty.

However the *deductible*s are fixed, considering the funds available and possible fluctuations in the claims ratio, it is clear that the cedant's predictions could be seriously undermined by the appearance of a claim affecting various risks at the same time.

Wherever there is a possibility of this happening –and as we have said before, such a possibility almost always exists– the *deductible* must therefore be fixed taking into account these circumstances.

2.1. Natural phenomena

Obviously, risk accumulations can arise as a result of natural phenomena, but it also has to be remembered that they can affect risks and policies in different classes of business.

For example, a hurricane can simultaneously affect the fire, motor, engineering and personal accident, and etc.

It is also obvious that they can distort an insurer's results more than any event that affects just one class of risk.

In such cases, it is possible to arrange excess of loss cover on the cedant's retention which will attach when claims affecting various different classes of business, and caused by the same event, exceed a previously agreed total.

2.2. Calculation for each class of business

What is in fact recommended is the following: each of the treaties protecting against accumulations in each class of business should be carefully calculated as regards retention and capacity.

In this way, they will be easier to amend and adjust any deviation from the previous calculation arise.

3. DEDUCTIBLE AND STOP LOSS

For this type of reinsurance, the retention must be fixed taking into account the cedant's acquisition and administration costs, its financial income and the price of reinsurance cover, always taking care to ensure that it is not so low as to produce a profit for the insurer.

The stop loss cover should attach at around and above the point at which the insurer starts to make a loss.

It is therefore very complicated to calculate the retention in classes of business that regularly have small variations in their loss ratio, since the final result is affected by various factors such as changes in interest rates or in administration

costs, as well as possible unusual increases in premium income, which will reduce the amount of expenses or, the opposite –a possible stagnation coinciding with an increase in salaries.

Let us see an **example** of what can happen with a portfolio affected only by minor fluctuations.

Example

To simplify things, we will consider a period of five years and express the figures as percentages of earned premiums:

	Mean value	Maximum value	Minimum value
Loss experience table	75%	90%	68%
Table of expenses	23%	25%	20%
Interest obtained in % of premiums	7%	9%	5%

In this case, the cedant will try to fix its retention at 85%, which, added to an average expense rate of 23%, less an average interest rate of 7%, would result in a loss of 101%

Would the reinsurer accept this level of *deductible*?

Probably not if it allowed for a possible reduction in administration costs or the consequence of higher interest on the cedant's investments.

Any of these factors would lead the cedant to make a profit from the contract.

What would it propose then?

Increase the deductible to 90%, in view of expenses at 20%, which it would be difficult to further reduce, and interest at 9%, which would also be difficult to improve upon.

Calculated in this way, the same claim ratio of 101% would be arrived at, but with little chance of a profit arising for the cedant.

3.1. The insurer's participation in the cover

It is possible that, due to changes in the aforementioned factors, the insurer's figures could end up being positive.

As we know, this is contrary to the spirit of the stop loss, which is why it is usual to make the insurer participate in the cover: the reinsurer would pay only 90% or 95% of claims exceeding the *deductible*, while the cedant would be liable for the remaining 5% or 10%.

4. THE CAPACITY. THE REINSURERS' LIMITS OF LIABILITY

From everything mentioned so far, and as regards the reinsurers' capacity or limits of liability for this type of treaty, we can deduce the following in order to define when the reinsurer has to make payments to the cedant.

4.1. The basic system

Up to a quantity and in excess of the *deductible* of the amount of any claim occurrence.

Example

For example, if the capacity fixed is 100,000 and the deductible is 10,000:

- The reinsurer's liability would be 90,000.

5. THE REINSTATEMENTS

In XL treaties, the reinsurer makes a certain capacity available to the cedant. For each layer, the number of times the cover can be exhausted has to be defined. This replacement of the cover is known as a "reinstatement".

Reinstatement clauses indicate that, in the event of one or more claims absorbing part or all of the cover initially granted for the year, the portion consumed will be replaced, so that full cover will always be available until the number of reinstatements has been exhausted.

Reinstatements may go from none to unlimited and may be free of charge or require an additional premium.

As we have seen, there are two ways of calculating this reinstatement premium:

– *Pro rata temporis:* Proportional to the period of the treaty which still has to run and to the value of the claim which has to be reinstated:

Reinstatement premium

$$\frac{\text{Claim in charge to the XL cover}}{\text{Limit}} \times \frac{\text{No. of days to expiry}}{365} \times \text{Premium} \times \text{\% Reinstatement}$$

– *Pro rata capita:*

Reinstatement premium

$$\frac{\text{Claim in charge to the XL cover}}{\text{Limit}} \times \text{Premium} \times \text{\% Reinstatement}$$

The characteristics of reinstatements are as follows:

– Allows the reinsurer's capacity to be limited

Maximum capacity of the layer for the reinsurer = (1 + number of reinstatements) x Limit

– It is an additional premium which the reinsurer receives when it has to pay a claim under the layer and *whenever it has to give the* cedant *additional capacity*.

Example

Gross Net Premium Income: 20,000,000

Layer 2,000,000 xs 1,000,000

Rate 3%

One reinstatement pro rata as to amount, payable at 50%

1. What is the reinsurance premium and what is the reinsurer's maximum capacity?
2. What is the reinstatement premium if a claim of 2,500,000 occurs?
3. What is the reinstatement premium if a second claim of 1,800,000 occurs?
4. What is the result of this layer for the reinsurer and what capacity does the cedant have available after these two claims?

Answers:

1. Reinsurance premium = 600,000

   Maximum capacity: (1+1) * 2,000,000 = 4,000,000

2. If there is a claim of 2,500,000

   Claim chargeable to the layer = 1,500,000

   (Capacity reinstated by the reinsurer = 1,500,000)

   $$\text{Reinstatement premium} = \frac{1,500,000 * 600,000 * 50\%}{2,000,000} = 225,000$$

3. If there is a claim of 1,800,000

   Claim chargeable to the layer = 800,000

   (Capacity reinstated by the reinsurer is only 500,000 because it had already reinstated 1,500,000 under point 2)

   $$\text{Reinstatement premium} = \frac{500,000 * 600,000 * 50\%}{2,000,000} = 75,000$$

4.

   Reinsurance premium = 600,000 (+)
   Reinstatement premium = 225,000 + 75,000 = 300,000 (+)
   Claim chargeable to the layer = 1,500,000 + 800,000 = 2,300,000 (-)
   Result   −1,400,000

   The cedant still has capacity of

   $$4,000,000 - 1,500,000 - 800,000 = 1,700,000$$

6. THE PREMIUM IN NON-PROPORTIONAL TREATIES: GENERAL

We end the chapter on the subject of the premium.

First of all, it should be said that premium rates or premiums that the reinsurer receives in return for its cover are usually related to the volume of premiums written by the cedant.

6.1. Gross net premium income (GNPI)

In insurance terminology, the letters GNPI (gross net premium income) refer to the volume of premiums written by the cedant, to which the rate required by the reinsurer is applied.

In a non-proportional reinsurance treaty, the premium can be agreed in the following forms:

– *By means of a fixed amount:* This tends to be used in cases where there is limited history of claims statistics.

– *With a fixed premium rate, as a percentage of the subject premium Income.* Fixed premiums, whether as an amount or as a percentage of GNPI, are not used with working covers, except in the upper layers and for catastrophe covers in which the cedant asks the reinsurer to cover excesses of loss where large, less frequent claims are involved.

The disadvantage of fixed premiums is that they do not adapt to variations in the total premiums written by the reinsurer, or to the underwriting conditions reflected in the claims experience, which means that they have to be revised from year to year.

There are two premiums that are used with treaties of this type:

○ Minimum premium: in absolute terms, the minimum premium is the price the cedant will pay for the cover.

○ Deposit premium: sometimes coincides with the minimum premium; this is the amount that the insurer pays as an "advance" to the reinsurer. It usually varies between 80% and 90% of the estimated final premium.

– *Based on a variable premium rate:* this is calculated on the basis of the actual claims experience of the treaty, with a maximum and a minimum rate being set. This is the best way of adjusting the reinsurer's price to any change there may be in the treaty results, especially variations in net premium (which, as we know, corresponds to the gross premium less returns, cancellations and other reinsurance premiums covering the treaty).

This system for agreeing the premium has the advantage that in cases where the cover has not been affected by any claims, the minimum rate guarantees the reinsurer an amount for the risk that it has accepted, and in

cases where a very high claims experience has been suffered, the maximum rate guarantees the cedant cover whatever the claims experience.

An example of a variable premium rate would be the following:

Example

Estimated GNPI: 10,000,000
Retention: 200,000
Excess cover: 1,000,000
Minimum and deposit premium (MDP):   150,000

(Payable in two halves on 1 January and 1 July)

Minimum rate: 2%
Maximum rate: 5%

Resulting from adjustment in accordance with the following formula:

$$100/80 \times BC$$

Where the BC (burning cost) is the following:

$$BC = \frac{\text{Claims in charge to the cover} \times 100}{\text{Total premiums protected}}$$

6.2. Premiums and reserves

The premiums for covering a non-proportional reinsurance are calculated by the reinsurer in such a way that, once the amount of the claims which the cedant has to pay have been covered, plus its acquisition and administration costs, it is left with a surplus to create the necessary reserves for possible variations in claims experience, especially in the face of catastrophe claims, and at the same time obtain a reasonable profit.

6.3. Methods of calculation

Different methods are used to calculate the premium, depending on the type of non-proportional reinsurance that is being arranged: working excess of loss treaty, accumulation or catastrophe cover, stop-loss treaty, etc. We will see these methods later.

6.4. Portfolio and premiums

The type and the size of the portfolio to be reinsured will affect the quotation.

We would point out here that, although technically it would be more appropriate to use earned premiums for the calculation, for greater administrative ease the volume of premiums written is generally used.

7. FACTORS FOR CALCULATING THE PREMIUM. A CALCULATION EXAMPLE

Whatever the method of calculation to be used, the reinsurer will specify and use the following factors.

7.1. The claims experience of the portfolio

This experience is established using the so-called *burning cost* system.

It is calculated on the basis of minimum periods of five years and is expressed as a percentage of the claims which the reinsurer would have had to pay according to the *deductible*s assigned and calculated on the volumes of premiums written in each year. In this way it obtains an approximate average of the claims that will have to be paid in the treaty year, as well as the trend shown by the claims experience.

7.2. The future of the claims experience

It is necessary to predict the existence of various factors which may have an influence on the future of the claims experience already recorded. These factors would include the effects of inflation, changes in legislation, changes in the cedant's underwriting policy, etc.

7.3. Catastrophes

The reinsurer will take into account the possibility of catastrophe claims which may affect the reinsurance cover. For this, it will have to analyse, for example, where a Fire XL is involved, whether this includes natural hazards, in which case it will have to study the geographical area exposed.

At the same time, it will have to know how the cedant's retentions are structured for the individual risks.

7.4. The expenses

It will take account of the different expenses that calculation of these premiums includes, as well as administration and acquisition costs, in order to load the premium rates consistently.

8. SPECIMEN FIRE EXCESS OF LOSS REINSURANCE TREATY

Note that this specimen treaty does not include the conditions that are common to other types of reinsurance treaty (Articles VII and VIII).

FIRE EXCESS OF LOSS REINSURANCE TREATY arranged between ... (hereinafter called "the Reinsured") and (hereinafter called "the Reinsurer").

Article I

a) On each and every ultimate net loss (as defined herein) suffered by the Reinsured and arising from the insurances specified in the Schedule hereto, the Reinsurer shall indemnify the Reinsured in accordance with the excess of loss reinsurance and subject to the limits fixed in the Schedule hereto.

b) The Reinsured shall be the only one authorised to judge what constitutes a single risk, it being understood and accepted that a risk shall be understood to mean all the things or interests in a place indicated by the Reinsured in its books as being subject to retention.

c) The Reinsured accepts that it shall not retain on any risk an amount greater than that indicated in the Schedule.

d) The insurance granted by the Reinsured in which the Reinsured is cited as the Insured, either on its own or jointly with another party or parties, shall not be excluded from this Contract solely because no legal obligation may be derived with respect thereto, given that the Reinsured is the Insured or one of the Insureds.

Article II

a) The term "ultimate net loss" shall be understood to mean the total amount which the Reinsured has actually paid to settle a claim arising out of any risk that may occur during the period stipulated in the Schedule, including legal costs, professional fees and expenses (excluding office expenses and the salaries of employees of the Reinsured) reasonably incurred in connection with the said claim. Any amounts recovered, including those obtained by means of reinsurances which benefit this Contract, shall first be deducted from that amount in order to arrive at the amount of loss hereunder. Any amounts recovered subsequent to the settlement of such ultimate loss of whatever kind shall be deducted as if they had been received prior to the aforesaid settlement, and necessary adjustments to the accounts shall be made immediately. However, nothing in this Article shall be construed to mean that the claimed amounts covered by this contract cannot be recovered until the Reinsured has ascertained the amount of the ultimate net claim, and they shall not be increased in the event that the Reinsured is unable to recover the amounts owed by other Reinsurers for any reason.

Article III

a) The Reinsured shall pay to the Reinsurer the premium as per the net rate indicated in the Schedule, calculated on the net premiums written by the

Reinsured on the insurances covered by this contract. The term "gross net written premiums" shall mean the original gross premiums, net of returns and cancellations, in accordance with the terms and conditions of original insurances and net of premiums paid for reinsurances which arise to the benefit of the contract during each annual period of its validity.

b) Where the gross net premiums are written by the Reinsured in currencies other than those indicated in the Schedule, the Reinsured shall convert the aforementioned gross net written premiums, in order to verify their amount, at the rates of exchange indicated in the Reinsured's books at the end of each annual period of the contract, or, where the contract has been cancelled in any year before the end of the annual period, at the rate of exchange applying on the date of cancellation in the relevant year.

Article IV

a) The Reinsured shall pay to the Reinsurer a deposit premium as indicated in the Schedule hereto.

b) As soon as possible after the end of each annual period of this contract and as specified in the Schedule hereto, but in any case within three months from that date, the Reinsured shall provide the Reinsurer with a statement of the net written premium defined in Article III. The annual premium owed to the Reinsurer under this contract shall be calculated in accordance with Article III and, once the deposit premium already paid in respect of the same period has been included, the adjusted amounts of premiums owed by the Reinsured shall be paid to the Reinsurer at the time when the premium statement is handed over.

c) Premium adjustments shall be confirmed by the Reinsurer within one month of receipt and the adjusted amounts of premiums owed to the Reinsured shall be paid by the Reinsurer upon acknowledgment of receipt.

Article V

a) The Reinsured shall notify the Reinsurer immediately of each claim and shall include details if it is possible that the claim may fall under this contract, and shall send a rough estimate of the probable cost of the claim.

b) The Reinsured shall keep the Reinsurer informed about events likely to affect the cost of any claim covered by this contract and undertakes to cooperate as far as possible with the Reinsurer or its representative in handling and settling the claim.

c) When calculating the Reinsurer's liability under this contract, claims payments made by the Reinsured in accordance with the conditions of the original insurance and adjusted to its limits shall also be binding on the

Reinsurer. The Reinsurer shall also be bound by ex-gratia payments made with its authorisation.

d) The Reinsurer shall remit its share of claims payments within 14 days from the date on which it receives the Reinsured's payment request.

e) The Reinsured shall as soon as possible, and at the latest within three months from the dates indicated in the Schedule, send to the Reinsurer a statement of claims outstanding at the time of receipt of the said statement, specifying the amount payable by the Reinsurer on each claim.

Article VI

Amounts owed by either of the contracting parties which are still outstanding one month from the date on which they were due shall earn interest from the date of expiry of the one-month period of grace. The calculation of interest shall be in line with the rate stated in the Schedule and shall be payable up to the date on which the debtor effects payment, unless the creditor changes or extends the month of the period of grace.

Article IX

The Reinsured undertakes not to make any change to its insurance underwriting and acceptance standards without the Reinsurer's prior authorisation, whenever such change may increase or extend the Reinsurer's liability or risk in those insurances covered hereunder.

CHAPTER 11
NON-PROPORTIONAL REINSURANCE II: QUOTING AN EXCESS OF LOSS COVER

In this chapter the ways of quoting for an excess of loss cover are explained. In other words, we will estimate the price of a layer of XL cover.

Depending on the type of cover (Cat XL or per-risk XL), we will use different methods to quote the layer.

The principal methods of quotation and the calculations will be analysed focusing on the following topics:
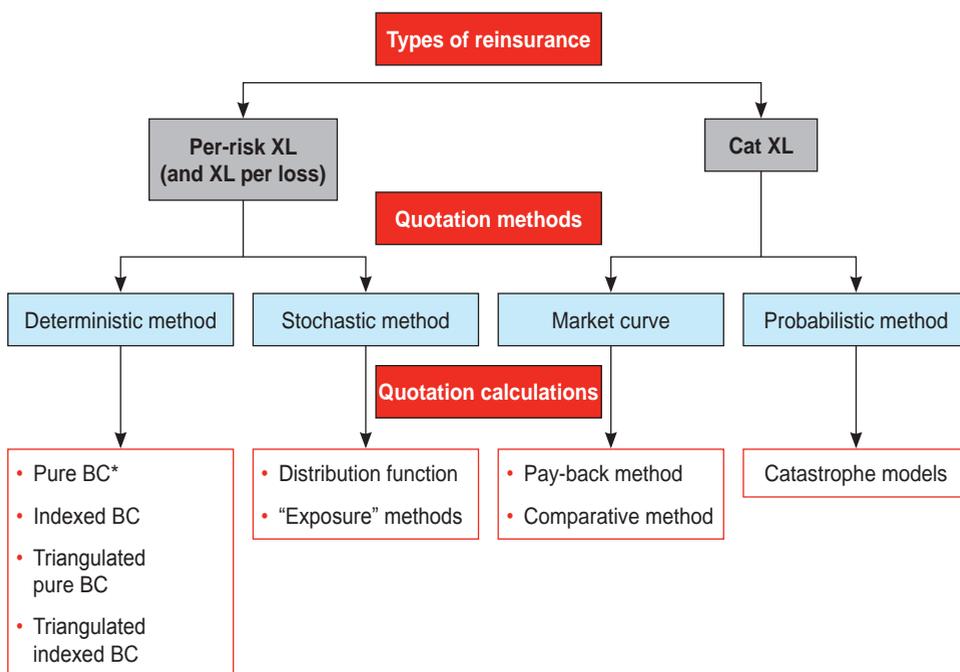
BC = Burning Cost.

In practice, the prices of XL covers also depend on other factors:

- As XL covers are negotiated each year, their price also depends on the available "capacity" in the reinsurance market. The greater the available capacity in the market, the lower the price.

– If the layer we have to quote for has been hit by a very large claim, a surcharge will generally be applied to the price. Similarly, the price of an XL layer which has never been hit by a claim will generally have a certain discount. ■

1. PER-RISK XL: DETERMINISTIC METHODS

These quotation methods involve calculating *the premium necessary for the reinsurer, based on the cedant's experience, by comparing the premium and claims in the past and projecting them to the year of quotation.* There must be sufficient claims experience in order to estimate the burning costs.

1.1. Pure burning cost (PBC)

Calculating the pure burning cost involves comparing the premiums collected by the insurer in previous years, in the class of business to which the reinsurance cover will apply, with the amount of claims that would have been payable by the reinsurer during those years if the same reinsurance as that being applied for had existed in those years. The PBC is the percentage obtained from dividing the claims in charge to the layer by the premiums in the protected portfolio.

The following data is required to calculate the PBC:

– The development of the premium in the protected portfolio and the estimated premium for the year of quotation.

  ○ Short tail: at least 5 years.

  ○ Long tail: at least 10 years.

– The individual claims.

Calculations applicable:

– Calculate the share of the individual claims in the layer.

– Calculation of the PBC per year:

$$\frac{\text{Total of individual claims in charge to the layer in the year}}{\text{Premium for the year}}$$

– Calculation of the overall PBC:

$$\frac{\text{Total of individual claims in charge to the layer for all of the years}}{\text{Premium for all of the years}}$$

Example No. 1

A cedant asks the reinsurer the price (commercial rate) for a 300,000 xs 200,000 layer to protect its Fire portfolio for the year 2010.

The <u>data the cedant provides is</u> the following:

YEAR	PREMIUMS	INDIVIDUAL CLAIMS
2005	8,700,000	150,000
		230,000
		180,000
		290,000
		650,000
2006	9,000,000	250,000
		350,000
		280,000
2007	12,000,000	356,000
		215,000
		322,000
		538,000
2008	12,500,000	325,000
		198,000
		258,000
2009	13,000,000	215,000
		178,000
		359,000
		420,000
		225,000
EPI 2010	15,000,000	

Based on this data, we can calculate the pure burning cost, the commercial rate and the rate on line (ROL).

Example (continued)

YEAR	INDIVIDUAL CLAIMS	CLAIMS IN CHARGE TO THE LAYER	
2005	150,000	0	
	230,000	30,000	
	180,000	0	
	290,000	90,000	
	650,000	300,000	The limit is 300,000!
TOTAL		**420,000**	
2006	250,000	50,000	
	350,000	150,000	
	280,000	80,000	
TOTAL		**280,000**	
2007	356,000	156,000	
	215,000	15,000	
	322,000	122,000	
	538,000	300,000	The limit is 300,000!
TOTAL		**593,000**	
2008	325,000	125,000	
	198,000	0	
	258,000	58,000	
TOTAL		**183,000**	
2009	215,000	15,000	
	178,000	0	
	359,000	159,000	
	420,000	220,000	
	225,000	25,000	
TOTAL		**419,000**	

Example (continued)

CALCULATION OF THE PURE BURNING COST

YEAR	CLAIM IN CHARGE TO THE LAYER	PREMIUMS	PBC
2005	420,000	8,700,000	4.83%
2006	280,000	9,000,000	3.11%
2007	593,000	12,000,000	4.94%
2008	183,000	12,500,000	1.46%
2009	419,000	13,000,000	3.22%
TOTAL	1,895,000	55,200,000	3.43%

Technical rate:	3.43%				
Commercial rate:	3.43	X	1.25	=	4.29%
EPI 2010	15,000,000				
Expected premium	643,500				
ROL	215%				
Pay back	0.466				

Naturally, if we remove or add an underwriting year to the calculation of the PBC, we will obtain a different result.

In order to simplify our calculations, the commercial rate is just the burning cost increased by 25%.

This loading could be divided up as follows:

	Pure premium (burning cost or other methods)
+	Safety margin loading for deviation of the loss
=	**Risk premium**
+	Reinsurer's expenses
+	Reinsurer's profit
=	**Commercial rate**

1.2. Indexed burning cost (IBC)

As already stated, in the PBC calculation it is a case of looking for the amount of claims that would have been payable by the reinsurer during those years if reinsurance cover of the type expected to be arranged had been in force over those years.

But if those claims had happened today, they would probably have been more expensive simply due to inflation. For example, for a Fire cover, the cost of rebuilding would be a good indicator of inflation.

Legal or regulatory changes or medical costs inflation can also oblige the reinsurer to "update" past claims with a superimposed inflation.

In the same way, we can revalue the premium due to inflation and to changes in the original rates.

This updating of claims and the premium will be done in two stages:

Calculate the adjustment factors for updating the premium and claims:

$$\text{Adjustment factor (year i)} = \frac{\text{Index (year of quotation)}}{\text{Index (year i)}}$$

Index the premiums and past claims:

Indexed premium (year i) = Adjustment factor (year i) x Premium (year i)

Indexed claim (year i) = Adjustment factor (year i) x Individual claim (year i)

Once the premium and claims have been indexed, we follow the same steps as those already taken in the PBC calculation.

The adjustment factor may of course be different for the premium and claims.

Example No. 2

A cedant asks its reinsurer the price (commercial rate) for a 300,000 xs 200,000 layer to protect its Fire portfolio for the year 2010.

The data that the cedant provides is the same as in Example 1.

Here we also have inflation. To simplify the exercise, we will apply the same adjustment factors to the premiums and to claims:

Example (continued)

<div align="center">

Inflation index

2005	100.00
2006	103.00
2007	105.58
2008	108.75
2009	112.23
2010	*114.47* *(Estimate)*

</div>

The calculation of the adjustment factors is as follows:

<div align="center">

Adjustment factors

2005	1.1447	(= 114.47/100)
2006	1.1114	(= 114.47/103)
2007	1.0842	(= 114.47/105.58)
2008	1.0526	(= 114.47/108.75)
2009	1.0200	(= 114.47/112.23)
2010	1.0000	(= 114.47/114.47)

</div>

For example, we will increase the premium and the claims in the 2006 underwriting year by 11.14% to update them to the 2010 year of quotation.

The calculation of the premium indexing is as follows:

	PREMIUMS	ADJUSTMENT FACTORS	INDEXED PREMIUMS
2005	8,700,000	1.1447	9,958,890
2006	9,000,000	1.1113	10,001,700
2007	12,000,000	1.0842	13,010,400
2008	12,500,000	1.0526	13,157,500
2009	13,000,000	1.0200	13,260,000

Example (continued)

Calculation of the indexed claims and the part of the claim chargeable to the layer:

YEAR	INDIVIDUAL CLAIMS	Adjustment factor	INDEXED CLAIMS	INDEXED CLAIMS IN CHARGE TO TO THE LAYER
2005	150,000	1.1447	171,705	0
	230,000	1.1447	263,281	63,281
	180,000	1.1447	206,046	6,046
	290,000	1.1447	331,963	131,963
	650,000	1.1447	744,055	300,000
				501,290
2006	250,000	1.1113	277,825	77,825
	350,000	1.1113	388,955	188,955
	280,000	1.1113	311,164	111,164
				377,944
2007	356,000	1.0842	385,975	185,975
	215,000	1.0842	233,103	33,103
	322,000	1.0842	349,112	149,112
	538,000	1.0842	583,300	300,000
				668,191
2008	325,000	1.0526	342,095	142,095
	198,000	1.0526	208,415	8,415
	258,000	1.0526	271,571	71,571
				222,081
2009	215,000	1.0200	219,300	19,300
	178,000	1.0200	181,560	0
	359,000	1.0200	366,180	166,180
	420,000	1.0200	428,400	228,400
	225,000	1.0200	229,500	29,500
				443,380

Example

<u>CALCULATION OF THE INDEXED BURNING COST</u>

YEAR	CLAIM FOR THE LAYER	PREMIUMS	IBC
2005	501,290	9,958,890	5.03%
2006	377,944	10,001,700	3.78%
2007	668,191	13,010,400	5.14%
2008	222,081	13,157,500	1.69%
2009	443,380	13,260,000	3.34%
TOTAL	2,212,885	59,388,490	3.73%
Technical rate:	3.73%		
Commercial rate:	3.73%	X	1.25
Commercial rate:	4.66%		
EPI 2010	15,000,000		
Expected premium	699,000		
ROL	233%		

The indexed burning cost will generally be higher than the pure burning cost.

If we compare exercise 1 with 2:

PBC = 3.43% < IBC = 3.73%.

1.3. Triangulated pure burning cost (TPBC)

In long-tail business, claims are settled in a period of several years from when they occurred. They generally involve loss and damage caused to third parties that are determined by the legal authorities.

Why is it so complicated to establish the amount of a claim?

1. Difficulty of assessing losses:

   a) Medical: It is necessary to wait for victims' disabilities to consolidate in order to be able to ascertain the damage or injury and the help needed.

   b) Liability: In some cases, the liability of the person causing the accident may have to be determined by a legal body. It may take years for the Insured's degree of liability to be known.

2. Inadequate reserves for very large claims:

a) The company's structure and organisation may slow down the estimation for very large claims.

b) Having qualified staff –doctors and lawyers, for example– enables better estimation of claims from the outset.

When there is any development in FGU (from ground up) claims, there is also development of the same claims chargeable to the XL layer. Of course, if a claim from the ground up is "volatile", it will be even more volatile where it exceeds a retention.

Example

Examples of development of individual claims for the **same underwriting year: 2005 and 4 years of development**.

	At 31.12.2006	At 31.12.2007	At 31.12.2008	At 31.12.2009
Claim 1	1,000,000	1,300,000	1,500,000	1,800,000
Claim 2	2,000,000	2,000,000	1,452,324	1,452,324
Claim 3	–	1,000,000	4,000,000	4,200,000

If the layer is 3,500,000 xs 1,500,000

	At 31.12.2006	At 31.12.2007	At 31.12.2008	At 31.12.2009
Claim 1	0	0	0	300,000
Claim 2	500,000	500,000	0	0
Claim 3	–	0	2,500,000	2,700,000
TOTAL	**500,000**	**500,000**	**2,500,000**	**3,000,000**

In order to be able to quote for layers covering long-tail business, we need the cedant to provide the development of the individual claims. The cedant's payments and the reserve for each claim will also allow us to calculate the speed of payment and the financial return on the reserve.

Here we will confine ourselves to calculating the technical part, not the financial part.

In order to quote, we will follow the following steps:

1. Calculate the individual claims in charge to the layer per underwriting year (UY) and per development year (DY).

2. Add the individual claims in the layer per underwriting year and per **development** year.

3. Triangulate the claims experience using the "chain ladder" method in order to estimate a value for the last development year. This is probably the most popular method for extrapolating, because of its simplicity and the fact that it appears to work almost without hypothesis

	DY 1	DY 2	DY 3	DY 4	DY 5	DY 6	Ultimate
UY 2004	■	■ ■	■				
UY 2005	■	■ ■	■				
UY 2006	■	■ ■	■				
UY 2007	■	■ ■	■				
UY 2008	■	■					
UY 2009	■	■ ■					

UY = Underwriting year.
DY = Development year.

$$\frac{\text{Total}}{\text{Total}} = \text{Age-to-age (ATA) factor to go from DY 1 => DY 2}$$

$$\frac{\text{Total}}{\text{Total}} = \text{Age-to-age (ATA) factor to go from DY 2 => DY 3}$$

Valuation of DY2 for UY 2009 = $\dfrac{\text{Total}}{\text{Total}}$ X valuation of DY1 for UY 2009

Valuation of DY3 for UY 2009 = $\dfrac{\text{Total}}{\text{Total}}$ X valuation of DY2 for UY 2009

Valuation of DY3 for UY 2008 = $\dfrac{\text{Total}}{\text{Total}}$ X valuation of DY2 for UY 2008

Extrapolate up to the final development year.

4.

$$\text{Calculation of the ultimate BC per underwriting year} = \frac{\text{Total of individual claims in charge to the layer developed by year}}{\text{Premium per year}}$$

5.

$$\text{Calculation of overall ultimate BC} = \frac{\text{Total of individual claims in charge to the layer developed for all the years}}{\text{Premium per year}}$$

There are many ways of triangulating the claims in charge to the layer. Here we will confine ourselves to describing the three main ones, of which we will use only the first:

1. Chain-ladder method: triangulation of claims as illustrated above.

2. Cape Cod method: triangulation of claims, taking account of the development of the premium.

3. Bornhuetter-Ferguson method: triangulation of claims, taking account of the premium and the initial claim ratios.

Comments:

1. Payments or the claims frequency (number of claims which exceed the retention) can also be triangulated.

2. Problem with the last age-to-age factor: the last ATA factor (in our example, from development year 5 to 6) is the one that has the most influence, even though it is only based on the development of a single underwriting year. In some cases, we will be obliged to change it manually.

3. Problem: if at the time of triangulation the valuation of DY1 for the UY 2009 is equal to 0, its ultimate valuation will be equal to 0.

Example No. 3

A cedant asks its reinsurer the price for the 1,500,000 xs 1,000,000 layer to protect its Motor Third Party Liability portfolio for the year 2010.

Information given by the cedant:

YEAR	Premiums	
2005	550,000,000	
2006	570,000,000	
2007	664,000,000	
2008	770,000,000	
2009	900,000,000	
EPI 2010	1,000,000,000	(Estimate)

Claims

YEAR		12.2005	12.2006	12.2007	12.2008	12.2009
2005	Claim 1	1,700,000	1,700,000	1,700,000	1,700,000	1,800,000
	Claim 2	1,200,000	1,500,000	1,850,000	1,850,000	1,850,000
	Claim 3	0	1,500,000	1,500,000	1,800,000	1,800,000
2006	Claim 4		1,310,000	1,310,000	1,310,000	1,310,000
	Claim 5		1,100,000	1,100,000	1,100,000	680,000
	Claim 6		2,500,000	3,000,000	3,000,000	3,000,000
2007	Claim 7			1,500,000	1,500,000	1,600,000
	Claim 8			1,400,000	2,000,000	2,500,000
	Claim 9			1,400,000	2,800,000	2,800,000
2008	Claim 10				2,500,000	2,500,000
	Claim 11				1,550,000	1,550,000
	Claim 12				1,800,000	2,000,000
2009	Claim 13					1,250,000
	Claim 14					2,500,000
	Claim 15					2,300,000

Example (continued)

1. We can calculate the claims in charge to the layer:

Claims chargeable to the layer

YEAR		12.2005	12.2006	12.2007	12.2008	12.2009
2005	Claim 1	700,000	700,000	700,000	700,000	800,000
	Claim 2	200,000	500,000	850,000	850,000	850,000
	Claim 3	0	500,000	500,000	800,000	800,000
Total		900,000	1,700,000	2,050,000	2,350,000	2,450,000
2006	Claim 4		310,000	310,000	310,000	310,000
	Claim 5		100,000	100,000	100,000	0
	Claim 6		1,500,000	1,500,000	1,500,000	1,500,000
Total			1,910,000	1,910,000	1,910,000	1,810,000
2007	Claim 7			500,000	500,000	600,000
	Claim 8			400,000	1,000,000	1,500,000
	Claim 9			400,000	1,500,000	1,500,000
Total				1,300,000	3,000,000	3,600,000
2008	Claim 10				1,500,000	1,500,000
	Claim 11				550,000	550,000
	Claim 12				800,000	1,000,000
Total					2,850,000	3,050,000
2009	Claim 13					250,000
	Claim 14					1,500,000
	Claim 15					1,300,000
Total						3,050,000

2. Construction of the triangle:

UY	DY 1	DY 2	DY 3	DY 4	DY 5
2005	900,000	1,700,000	2,050,000	2,350,000	2,450,000
2006	1,910,000	1,910,000	1,910,000	1,810,000	
2007	1,300,000	3,000,000	3,600,000		
2008	2,850,000	3,050,000			
2009	3,050,000				

Example (continued)

3. Estimation of ATA factors:

ATA calculation

From DY 1	to DY 2	From DY 2	to DY 3
900,000	1,700,000	1,700,000	2,050,000
1,910,000	1,910,000	1,910,000	1,910,000
1,300,000	3,000,000	3,000,000	3,600,000
2,850,000	3,050,000	6,610,000	7,560,000
6,960,000	9,660,000		

From DY 1 to DY 2	9,660,000	:	6,960,000	=	1.3879
From DY 2 to DY 3	7,560,000	:	6,610,000	=	1.1437
From DY 3 to DY 4	4,160,000	:	3,960,000	=	1.0505
From DY 4 to DY 5	2,450,000	:	2,350,000	=	1.0426

4. Triangulation of the claims in the layer using the Chain Ladder method:

UY	DY 1	DY 2	DY 3	DY 4	DY 5
2005	900,000	1,700,000	2,050,000	2,350,000	2,450,000
2006	1,910,000	1,910,000	1,910,000	1,810,000	*1,887,021*
2007	1,300,000	3,000,000	3,600,000	*3,781,818*	*3,942,747*
2008	2,850,000	3,050,000	*3,488,351*	*3,664,530*	*3,820,468*
2009	3,050,000	*4,233,190*	*4,841,591*	*5,086,115*	*5,302,546*
ATA	**1.3879**	**1.1437**	**1.0505**	**1.0426**	

5. Calculation of the triangulated pure burning cost:

YEAR	Premiums	Developed claims	TPBC	
2005	550,000,000	2,450,000	0.45%	
2006	570,000,000	1,887,021	0.33%	
2007	664,000,000	3,942,747	0.59%	
2008	770,000,000	3,820,468	0.50%	
2009	900,000,000	5,302,546	0.59%	
Total	3,454,000,000	17,402,781	0.50%	
Commercial rate		0.63%	(0.50% x 1.25)	
EPI 2010	1,000,000,000			
Premium	6,300,000			
ROL	420%			

1.4. Triangulated indexed burning cost (TIBC)

The TIBC combines the indexation of premiums and claims with the triangulation of claims using the Chain Ladder method.

1. Calculate the adjustment factors.

2. Index the premiums and historical claims.

3. Calculate the indexed individual claims in charge to the layer.

4. Add together the individual claims in charge to the layer per underwriting year and per development year.

5. Triangulate the indexed claim ratio using the Chain Ladder method.

6. Calculation of the ultimate indexed BC per underwriting year.

7. Calculation of the overall ultimate indexed BC.

2. PER-RISK XL: STOCHASTIC METHODS

In this section we will look at two different ways of estimating a price:

1. Quotation based on adjustment with a distribution function.

2. Quotation based on exposure.

2.1. Quotation based on adjustment to a distribution function

In order to estimate the risk premium for a layer, we can calculate:

The value of the expected claim (above a certain retention) multiplied by ...

The expected frequency of claims above the retention.

Each of these concepts can be defined by a distribution function:

$$\boxed{\text{Expected BC} = \underline{\text{Expected claim amount}} \times \underline{\text{Expected number of claims}}}$$

Pareto (PO,α): $P(X > x) = (PO/x)^{\alpha}$
Weibull
Gamma
…

Poisson (λ): $P(N = n) = \dfrac{e^{-\lambda} . \lambda^{n}}{n!}$
Negative binomial
…
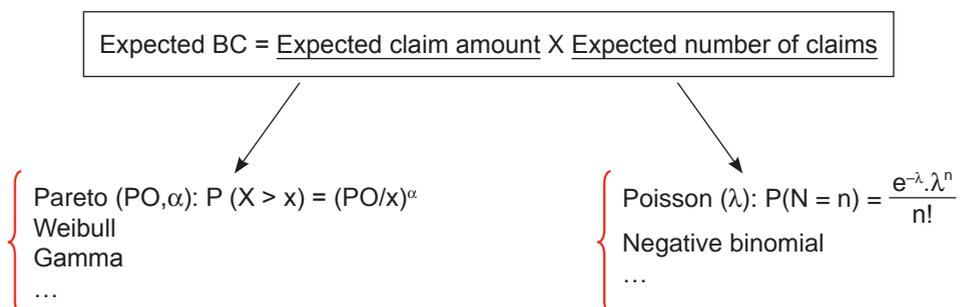
Where:

OP: Observation point at which claims experience does exist.
α: Alpha: Pareto parameter (normally >1)

$$\alpha = \frac{n}{\Sigma \; Ln \; X_i - (n * Ln \; (PO))}$$

P(X>x) = Probability of having a claim bigger than x.
n = Number of claims
λ: Lambda: Claim frequency
We can illustrate the theory by means of a simple example:

Example No. 1

Calculate the price of the following XL protection: 2,500,000 xs 2,500,000.

We have the following premium and claims:

	Premiums
2003	15,000,000
2004	16,000,000
2005	17,000,000
2006	18,000,000
2007	19,000,000
2008	20,000,000
2009	21,000,000
EPI (2010)	22,000,000

Individual claims for an amount greater than 500,000 (for the period 2003-2009)

2003	1,400,000
2003	800,000
2003	650,000
2003	900,000
2004	1,000,000
2004	520,000
2005	540,000
2007	700,000
2008	2,500,000
2009	600,000
2009	1,100,000

Here we see that the highest claim is 2,500,000. The PBC for the 2,500,000 xs 2,500,000 layer is then 0%.

Observation point

The observation point is the basis on which claims experience exists.

The observation point has to be less than or equal to the deductible.

Based on the above large claims, we can estimate a certain "behaviour" of the claims and will apply that "behaviour" to the layer that has no claims experience.

In our example, the observation point will be 500,000. We have 11 claims higher than this base.

Pareto

We can adjust the observed claims to a Pareto distribution.

Graph 1: Pareto adjustment.
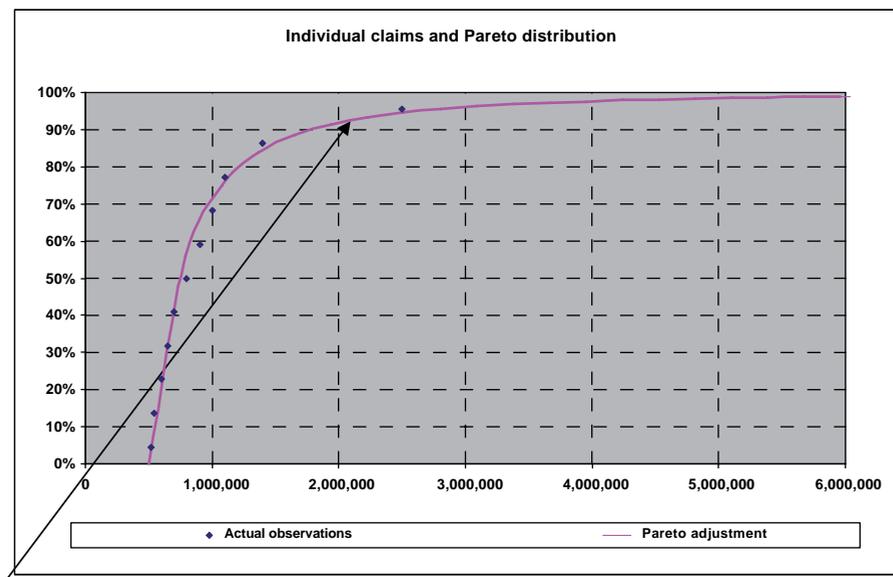
Above 2,500,000, the Pareto distribution gives us a probability of having a claim in excess of 2,500,000. (100% - 95% = 5%)

Poisson

In the same way, we can adjust the claims frequency to the Poisson distribution.

The Poisson distribution is a discrete probability distribution. It expresses the probability of a number of claims occurring in a fixed time interval if those claims are independent of time.

For the seven years of claims experience, we have:

Number of claims (n)	Absolute frequency (number of years)	Relative frequency	Poisson (Lambda=1.921)
0	1	0.143	0.1465
1	3	0.429	0.2814
2	2	0.286	0.2702
3	0	0	0.1730
4	1	0.143	0.0831
5	0	0	0.0319
6	0	0	0.0102
7	0	0	0.0028
8	0	0	0.0007
9	0	0	0.0001
10	0	0	0.0000
	7	1	1.0000

Graph 2:
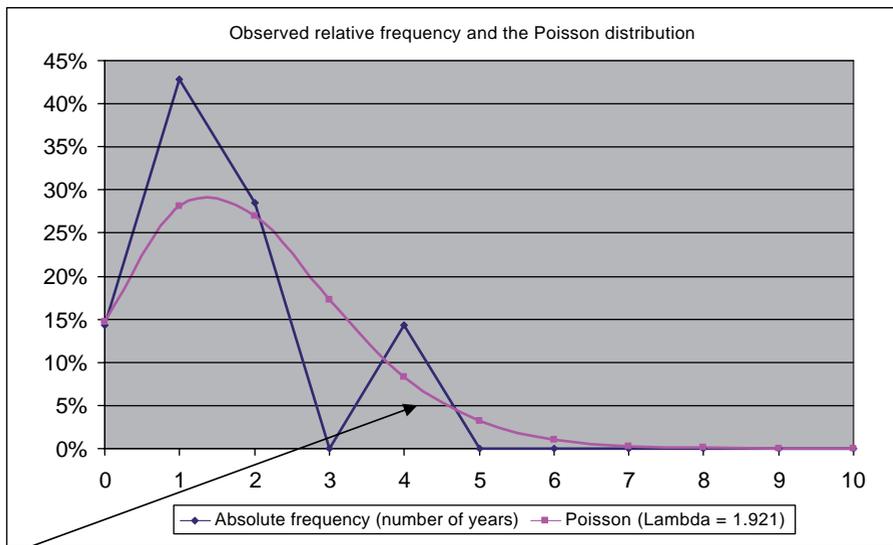
Although there have never been more than 4 claims in any one year, the Poisson distribution gives us a probability of having a claims frequency of more than 4 claims per year.

Choosing distribution functions for the claim amount (Pareto, Weibull, Gamma, etc.) and for the number of claims (Poisson, negative binomial) allows us to estimate a probability of occurrence (of an amount or number of claims) above what is observed. In this way we can calculate the "cost" for any layer.

Poisson-Pareto multiplication

Multiplying the distribution functions with each other in order to determine the distribution function of the cost is only possible for calculating algorithms (Panjer, Fast Fourier Transform, etc.) or for simulations.

Graphically, this will give us the distribution function of the cost for larger claims at the observation point.

Graph 3:
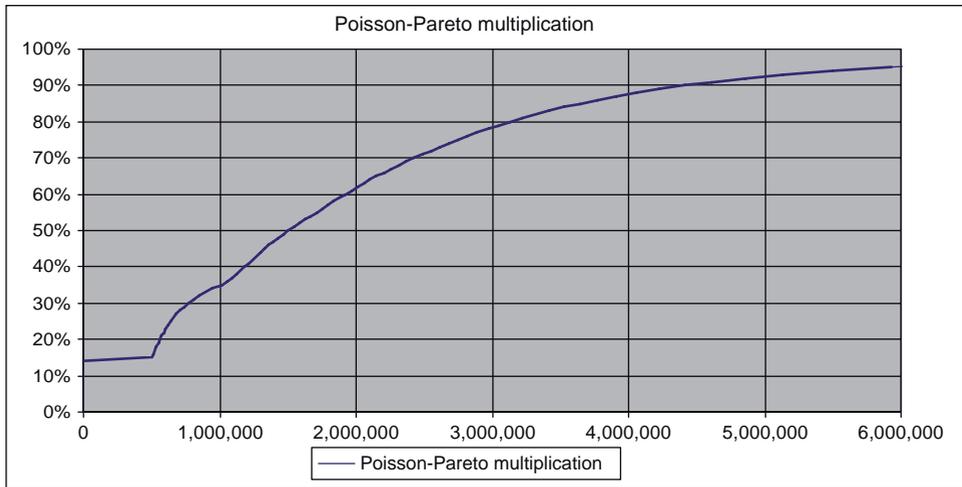
Distribution of the cost in charge to the layer

We can easily calculate the average cost of the layer, but we need powerful software to calculate the cost distribution function of the following layer.

Graph 4:
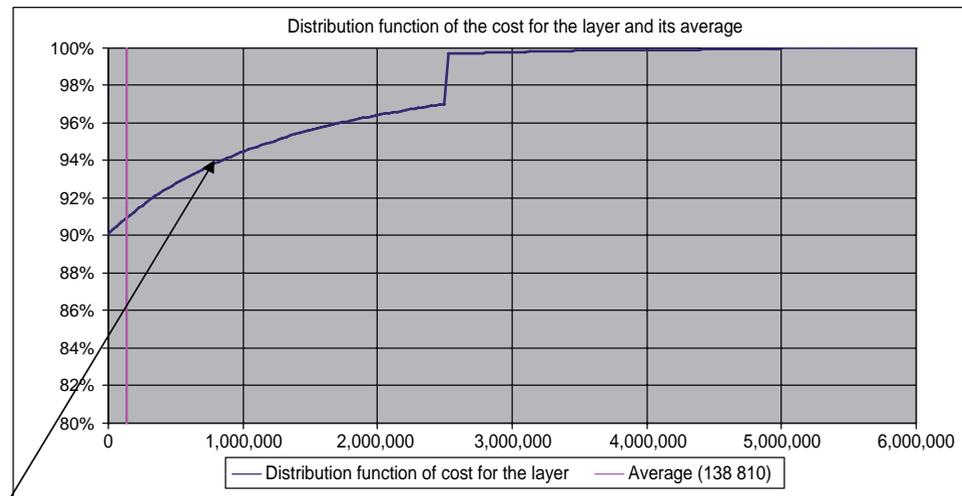
We have a 5.5% probability (= 100% - 94.5%) of the cost for the layer being more than 1,000,000.

Here, in order to calculate the average, we have to follow the following steps:

1. Decide on an observation point (OP): 500,000 (Must be less than or equal to the deductible for the layer).

2. Calculate Alpha:

Calculate Ln for an FGU claim going through the observation point (OP).

Year	Claim	Calculated Ln
2003	1,000,000	14.15
2003	800,000	13.59
2003	650,000	13.38
2003	900,000	13.71
2004	1,000,000	13.82
2004	520,000	13.16
2005	540,000	13.20
2007	700,000	13.46
2008	2,500,000	14.73
2009	600,000	13.30
2009	1,100,000	13.91
Total		**150.42**

Number of claims above OP=11

Ln of PO 13.12236338

$$\text{Alpha} = \frac{11}{150.42 - 144.3459972} = 1.810$$

3. Lambda at OP = Average frequency at OP = Number of claims exceeding the OP for the year of quotation

$$\text{Lambda at OP} = \frac{\text{No. of claims exceeding the OP} * \text{EPI (2010)}}{\text{Total premium from underwriting years}} = \frac{11 * 22,000,000}{126,000,000} = 1.921$$

4. Probability of claim frequency above x:

Lambda at 2,500,000 = $\left|\dfrac{OP}{x}\right|^{Alpha}$ *   Lambda at PO = $\left|\dfrac{500{,}000}{2{,}500{,}000}\right|^{1.810}$ * 1.9210 = 0.104

Lambda at 5,000,000 = $\left|\dfrac{OP}{x}\right|^{Alpha}$ *   Lambda at PO = $\left|\dfrac{500{,}000}{5{,}000{,}000}\right|^{1.810}$ * 1.9210 = 0.030

5. Probability of expected claim amount above x:

$$A\,2{,}500{,}000 = \frac{x}{(Alpha-1)} = \frac{2{,}500{,}000}{0.810} = 3{,}084{,}654.40$$

$$A\,5{,}000{,}000 = \frac{x}{(Alpha-1)} = \frac{5{,}000{,}000}{0.810} = 6{,}169{,}308.80$$

6. Expected claims above x = (4) * (5)

$$A\,2{,}500{,}000 = 321{,}568.98$$

$$A\,5{,}000{,}000 = 183{,}358.19$$

7. Expected claims for the layer = 321,568.98 – 183,358.19 = 138,210.80

8. Expected BC for the layer: $\dfrac{138{,}210.80}{22{,}000{,}000}$ = 0,628%

2.2. Quotation based on exposure

All the methods we have seen so far are based on historical claims experience.

A quotation based on exposure is based on:

1. The insurance company's current portfolio profile.
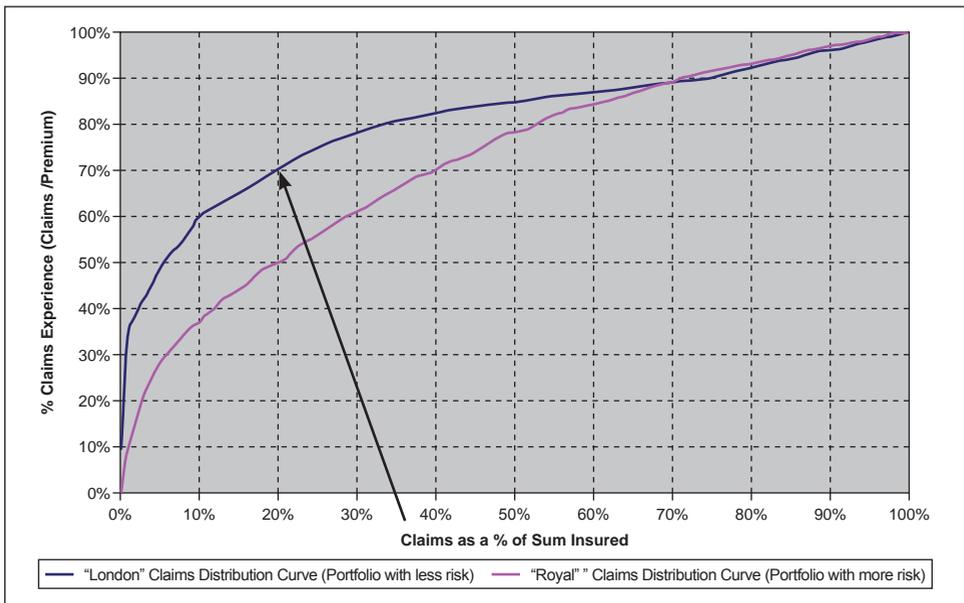
2. A distribution curve of market claims.

The distribution curve for claims has been estimated by means of a market or sector survey, taking account of two claim elements: the probability of claims and the claim in relation to the total sum insured.

Thanks to this market survey, claim distribution curves were generated.

Distribution curve of "London" claims

Claims incurred/Sum insured	London %								
1.0%	32.5	21.0	71.0	41.0	82.6	61.0	87.2	81.0	92.4
2.0%	37.5	22.0	72.0	42.0	82.8	62.0	87.4	82.0	92.8
3.0%	40.0	23.0	73.0	43.0	83.0	63.0	87.6	83.0	93.2
4.0%	45.0	24.0	74.0	44.0	83.3	64.0	87.8	84.0	93.6
5.0%	50.0	25.0	75.0	45.0	83.6	65.0	88.0	85.0	94.0
6.0%	52.0	26.0	75.6	46.0	83.9	66.0	88.2	86.0	94.4
7.0%	54.0	27.0	76.3	47.0	84.2	67.0	88.4	87.0	94.8
8.0%	56.0	28.0	76.7	48.0	84.5	68.0	88.6	88.0	95.2
9.0%	58.0	29.0	77.5	49.0	84.7	69.0	88.8	89.0	95.6
10.0%	60.0	30.0	78.1	50.0	85.0	70.0	89.0	90.0	96.0
11.0%	61.0	31.0	78.8	51.0	85.2	71.0	89.2	91.0	96.4
12.0%	62.0	32.0	79.4	52.0	85.4	72.0	89.4	92.0	96.8
13.0%	63.0	33.0	80.0	53.0	85.6	73.0	89.6	93.0	97.2
14.0%	64.0	34.0	80.2	54.0	85.8	74.0	89.8	94.0	97.6
15.0%	65.0	35.0	80.6	55.0	86.0	75.0	90.0	95.0	98.0
16.0%	66.0	36.0	80.9	56.0	86.2	76.0	90.4	96.0	98.4
17.0%	67.0	37.0	81.2	57.0	86.4	77.0	90.8	97.0	98.8
18.0%	68.0	38.0	81.5	58.0	86.6	78.0	91.2	98.0	99.2
19.0%	69.0	39.0	81.9	59.0	86.8	79.0	91.6	99.0	99.6
20.0%	70.0	40.0	82.2	60.0	87.0	80.0	92.0	100.0	100.0

Attached in graphic form are two distribution curves of well -known claims: London and Royal.

% Claims Experience (Claims /Premium) — *Claims as a % of Sum Insured*

"London" Claims Distribution Curve (Portfolio with less risk)   "Royal" " Claims Distribution Curve (Portfolio with more risk)

The distribution curve of the claims in the lower risk portfolio shows that, if there is a claim, we have a 70% probability of having a claim amounting to less than 20% of the sum insured.

In other words, if there is a claim, we have a 30% probability (100% - 70%) of having a claim costing more than 20% of the sum insured.

The cost of claims with a sum insured of between 40% and 60% (i.e. 20% xs 40%) amounts to 5% of claims (= 87% – 82%). In other words, a reinsurance premium of 5% of the original risk premium (without commission, etc.)

Example No. 2

Risk A with a sum insured of 250 million.

Original risk premium = 300,000

Reinsurance protection = 100m xs 50m

1. Calculate the reinsurance protection as a percentage of the sum insured:

$$\frac{100m \ xs \ 50m}{250m} => 40\% \ xs \ 20\%.$$

This corresponds to protection going from 20% to 60% in the graphic.

2. Calculate the probability of claim for this layer:

$$87\% – 70\% = 17\%$$

This also corresponds to the premium rate needed for the XL protection. We will call this the "XL premium rate".

3. Calculate the reinsurance premium = 17% * 300,000 = 51,000

Example No. 3

If we add a further risk B for the same 100m xs 50m protection:

A risk with a sum insured of 100 million.

Original risk premium = 100,000

Using the lower risk London claims exposure curve:

1. Calculate the reinsurance protection as a percentage of the sum insured:

The risk can only affect the layer up to 100m; the protection is 50m xs 50m.

$$50\% \ xs \ 50\%.$$

This corresponds to protection that goes from 50% to 100% on the graph.

2. Calculate the probability of claims for this layer:

$$XL \ premium \ rate: 100\% – 85\% = 15\%$$

3. Calculate the reinsurance premium = 15% * 100,000 = 15,000

4. Calculate the reinsurance rate for the risks A and B: (Examples 2 and 3)

$$\text{Reinsurance rate} = \frac{(51,000 + 15,000)}{(300,000 + 100,000)} = 16{,}50\%$$

What we have just done for two risks, we could apply to a company's portfolio profile.

Example No. 4:

Calculate the technical rate based on exposure, using the "London" claims distribution curve.

PROGRAMME   **65,000**   **XS**   **15,000**

EPI 2010:   **200,000**

PORTFOLIO PROFILE

Sum insured bands		Number of policies	Risk premium	Total sum insured
0	10,000	5,500	25,000	30,000,000
10,000	30,000	7,000	35,000	145,500,000
30,000	50,000	4,500	38,000	185,000,000
50,000	75,000	3,000	30,000	220,000,000
75,000	100,000	1,000	10,000	90,000,000
0	100,000	21,000	138,000	670,500,000

The first step would be to calculate the average sum insured for each sum insured band.

Bands	Sum insured bands		Number of policies	Risk premium	Total sum insured	Average sum insured
1)	0	10,000	5,500	25,000	30,000,000	**5,455**
2)	10,000	30,000	7,000	35,000	145,500,000	**20,786**
3)	30,000	50,000	4,500	38,000	185,000,000	**41,111**
4)	50,000	75,000	3,000	30,000	220,000,000	**73,333**
5)	75,000	100,000	1,000	10,000	90,000,000	**90,000**
	0	100,000	21,000	138,000	670,500,000	**230,685**

Example No. 4 (continued)

The risks in sum insured band (1) do not affect the retention of the XL protection. The average sum insured (5,455) is less than the retention (15,000).

Band (2)

Average SI	20,786		
Protection	65,000	xs	15,000
Protects	5,786	xs	15,000

The risk with a sum insured of 20,786 could only affect the layer up to 20,786 => The protection is 5,786 xs 15,000.

Protection/SI	27.84%	xs	72.16%
That is to say from	72.16%	to	100.00%
XL premium rate of	89.40%	to	100.00%
XL premium rate	10.60%		
Risk premium (bands (2))			35,000
Reinsurance premium required			3,710

Band (3)

Average SI	41,111		
Protection	65,000	xs	15,000
Protects	26,111	xs	15,000
Protection / SI	63.51%	xs	36.49%
That is to say from	36.49%	to	100.00%
XL premium rate of	80.88%	to	100,00%
XL premium rate	19.12%		
Risk premium (bands (3))			38,000
Reinsurance premium required			7,266

Band (4)

Average SI	73,333		
Protection	65,000	xs	15,000
Protects	58,333	xs	15,000
Protection / SI	79.55%	xs	20.45%
That is to say from	20.45%	to	100.00%
XL premium rate of	70.00%	to	100.00%
XL premium rate	30.00%		
Risk premium (bands (4))			30,000
Reinsurance premium required			9,000

Example No. 4 (continued)

Band (5)

Average SI	90,000		
Protection	65,000	xs	15,000
Protects	65,000	xs	15,000
Protection / SI	72.22%	xs	16.67%
That is to say from	16.67%	to	88.89%
XL premium rate of	66.00%	to	95.20%
XL premium rate	29.20%		
Risk premium (bands (5))			10,000
Reinsurance premium required			2,920

Reinsurance premium required

Band (1)	0
Band (2)	3,710
Band (3)	7,266
Band (4)	9,000
Band (5)	2,920
Total reinsurance premium	22,896
Technical rate: 22,896/138,000 = 16.59%	

Characteristics:

- The more sum insured bands we have, the more "adjusted" our quotation will be.

- Choose the exposure curve. (If there is one. Reinsurance companies generally have exposure curves only for the Property lines of business.)

- If the cedant does not provide its portfolio profile as a PML (probable maximum loss), we cannot calculate the BC based on exposure, because the claims distribution curves are based on the sum insured.

- The cedant provides the commercial premium (and not the risk premium). One way of correcting this effect is to consider the claims ratio (LR) for the class of business in order to estimate the risk premium.

Conclusion for the quotation of a per-risk XL

The quotation models give us a range of calculations and results for a single layer:

Based on burning cost

Based on Pareto distribution

Based on exposure

The first two methods will also give us different results if we change our basis of observation: number of underwriting years, change in observation point, etc.

Here, the underwriter's role is to choose the method he or she considers most appropriate for estimating the price.

3. QUOTING FOR A CAT XL COVER: PAY-BACK METHOD AND COMPARATIVE METHOD

In the case of natural hazards such as earthquakes, cyclones and floodings, or major political risks such as terrorism, it is much more difficult to assess these extreme catastrophe events using statistical information. The high number of risks that can be affected by an event presents a much higher potential for damage, and these major events can occur with long return periods ranging from several years to centuries. Claims from previous years will therefore rarely represent a basis which is wholly representative of the risk exposure.

The return period of a catastrophe event is the average period of time in which the phenomenon can be expected to recur, for a specific magnitude and geographical area, and is inversely proportional to the frequency with which the event actually occurs.

An event with specific characteristics will have a return period of 1,000 years when it corresponds to an occurrence frequency of once every thousand years, or a probability of occurrence of 0.1%. This never means that such an event will not happen again for another 1,000 years, but that we will have one event of this kind on average every 1,000 years.

For the insurer, it is very important to assess the potential of infrequent events correctly in order to avoid incorrect assessments. In the insurance industry, various methods specific to catastrophes are used to carry out a realistic assessment of the risk.

3.1. Pay-back method

This method of quoting for non-proportional reinsurance cover in respect of catastrophe risks is based on the intensity of the risks:

– The Modified Mercalli scale for earthquakes

– The Saffir-Simpson scale for hurricanes

For each point on the scale used, a probable maximum loss (PML) and a return period (RP) are defined.

> Pure Premium = Sum Insured * (∑ (XL Expenses * Probability of Occurrence))

This method is based on rough estimates for rating.

The table of damage and frequencies is actually very imprecise. In fact, the deviations between frequencies are too large.

We can therefore also add a safety margin loading which corresponds to the following formula:

> Loading for safety margin = 10% * (Pure premium * Limit)$^{1/2}$

And as we have seen previously:

> Risk premium = Pure premium + Loading for safety margins

This method could be extended to all the areas in which the cedant is exposed.

We could extend this study by having a PML for each type of construction.

Example No. 1

EPI: 30,000,000

Aggregate accumulations (sum insured) in the control zone: 500,000,000

We have the following table for the control zone:

Intensity (Modified Mercalli)	VI	VII	VIII	IX	X
PML	1.0%	5.0%	10%	20%	35%
Return period (years):	7	33	92	250	500

Determine the price for the following layer: 45,000,000 xs 30,000,000

Layer in % of aggregate accumulations: 9% xs 6%

This means that an earthquake of at least intensity VIII is needed to affect the protection (i.e. for the PML to exceed the deductible).

Intensity (Modified Mercalli)	VI	VII	VIII	IX	X
XL loadings	0%	0%	4%	9%	9%
Probability of occurrence	1/7 = 14.29%	1/3 = 3.03%	1/92 = 1.09%	1/250 = 0.40%	1/500 = 0.20%

Pure premium = 500m * (4% * 1,09% + 9% * 0,4% + 9% * 0,2%)

        = 500m * 0.0975%

        = 487,500

Example No. 1 (continued)

Loading for safety margin = 10% * (487,500 * 45,000,000)1/2 = 468,375

Risk premium = 487,500 + 468,375 = 955,875

Technical rate = 955,875/30,000,000 = 3.186%

3.2. Comparative method

The prices of Cat XL covers can be based on a comparison of the rate on line and the layers with respect to the protected sum insured.

The comparison will be made thanks to two elements:

– The rate on line (ROL) is the price of the layer as a function of its capacity.

$$ROL = \frac{Rate * EPI}{Limit\ for\ the\ layer} = \frac{Rate * EPI}{Limit\ of\ the\ layer}$$

– The layer expressed as a function of the aggregate accumulations covered by the cedant will be calculated using the mid-point layer, i.e.:

$$Mid\text{-}point\ layer = \frac{Retention + (Limit/2)}{Aggregate\ accumulations}$$

Example No. 2

Two cedants each have one layer.

Company A

EPI	50,000,000	
Aggregate	50,000,000,000	

Layers		Rate
1st layer	**5,000,000 xs 5,000,000**	0.70%

Company B

EPI	20,000,000	
Aggregate	25,000,000,000	

Layers		Rate
1st layer	**2,500,000 xs 2,500,000**	0.70%

At first sight, the retentions and the limits are different, but if we look at the layers in terms of their respective aggregate accumulations, the two layers start at 0.0001 of the aggregate accumulations and end at 0.0002.

The mid-point layers expressed in terms of aggregate accumulations are equal for companies A and B: 0.00015.

The rates for the two layers are the same but, if we express the price in terms of capacity, i.e. the ROL, company A's layer is better paid than company B's (ROL = 7% (>5.6%)).

Example No. 2 (continued)

We calculate:

Company A

Retention/ Aggregate	(Retention + Limit)/ Aggregate	Mid-point layer	ROL
0.00010	0.00020	0.00015	7.00%

Company B

Retention/ Aggregate	(Retention + Limit)/ Aggregate	Mid-point layer	ROL
0.00010	0.00020	0.00015	5.60%

Example No. 3

Compare the Cat XL protection of companies A and B. Which is the best (or better) paid protection?

Company A

EPI   50,000,000

Aggregate   50,000,000,000

We calculate:

Layers				Rate		Mid-point layer	ROL
1st layer	5,000,000	xs	5,000,000	0.70%		0.00015	7.00%
2nd layer	10,000,000	xs	10,000,000	0.55%		0.00030	2.75%
3rd layer	15,000,000	xs	20,000,000	0.40%		0.00055	1.33%
Total	30,000,000	xs	5,000,000	1.65%			

Company B

EPI   20,000,000

Aggregate   25,000,000,000

We calculate:

Layers				Rate		Mid-point layer	ROL
1st layer	2,500,000	xs	2,500,000	0.70%		0.00015	5.60%
2nd layer	7,500,000	xs	5,000,000	0.60%		0.00035	1.60%
3rd layer	7,500,000	xs	12,500,000	0.40%		0.00065	1.07%
Total	17,500,000	xs	2,500,000	1.70%			

Example No. 3 (continued)

On a graph we can produce a curve for each company:

ROL as a function of the mid-point layer
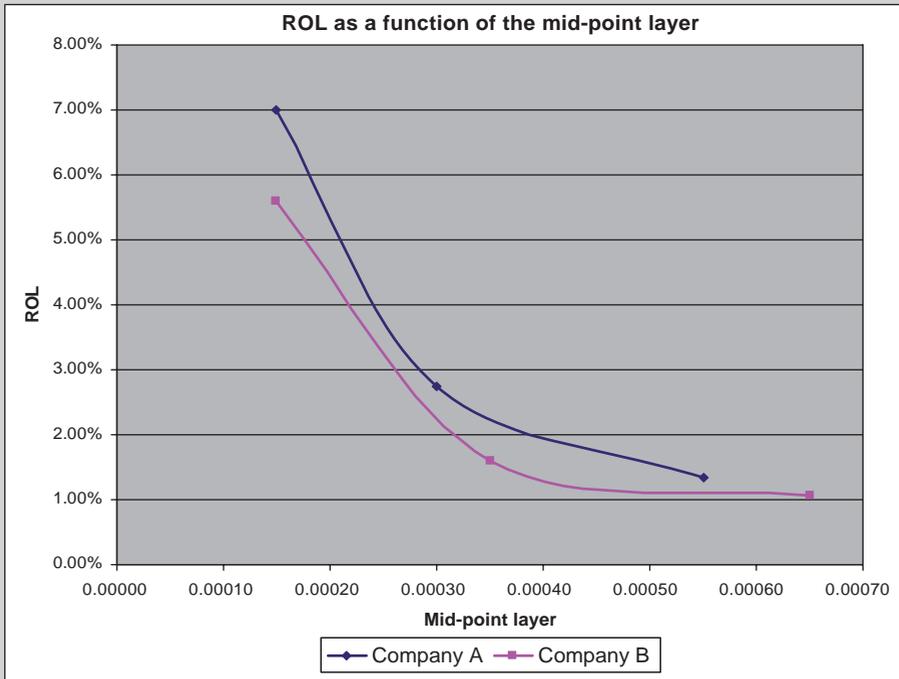
The vertical axis represents the price of the layer expressed as ROL.

The horizontal axis represents the mid-point layer.

The ROL reduces if the mid-points of the cover of each of the treaties move towards higher exposures.

The highest ROL is the point (or the curve); the best paid is the layer (or the programme).

In this case, Company A pays more for its Cat XL than Company B.

Characteristics:

▪ The layers have to be comparable:

1. The perils covered must be the same.

2. The location or geographical spread of the risks in each cedant's portfolio must be relatively identical.

3. The types of risks in the protected portfolio must be relatively similar.

   The relative weight of industrial, commercial, simple or agricultural risks must be the same.

▪ Making a comparison between cedants helps us to place our capacity at the best price. But it does not help us know whether the price is adequate or not.

4. CATASTROPHE MODELS

4.1. Basics of a catastrophe model

The simplest option for estimating a portfolio's potential loss as a result of catastrophe events is to simulate an individual assumption or natural catastrophe scenario from which contrasting information is available (historic event), or on which a series of hypotheses is established (100% of claims, for example). This form of analysis is called *deterministic or scenario-based modelling* and is generally linked to major historic reference events in the market, against which the values currently insured are compared (as-if analysis).

For example, windstorm "Lothar" in 1999 was a reference in the French market. In the years which followed, cedants estimated this windstorm applied to their new aggregate accumulations.

Its main drawback is that, although it allows us to assess a specific scenario which is potentially catastrophic, we are not taking account of all the potential events that could also occur, which means that we will not be able to establish the average claims behaviour of the portfolio under consideration. We will only be basing on a single possible event, and any decision taken on the basis of this type of analysis involves considerable uncertainty.

Instead of considering just one event or scenario, it is more appropriate to take *probabilistic models* as a basis, as this will simulate all the possible events that might be expected within a sufficiently large period of time (from thousands to tens of thousands of years).

The result (output) is a representative list of potential events, which is to say one that faithfully reflects the potential risk involved for a specific peril and region.

From this Event Set, it will be possible to deduce the relationship between a potential claim and its frequency, thereby making it possible to assess not only the amount of the claims expected due to an event but also the behaviour of the portfolio's claims ratio, with both averages and extremes.
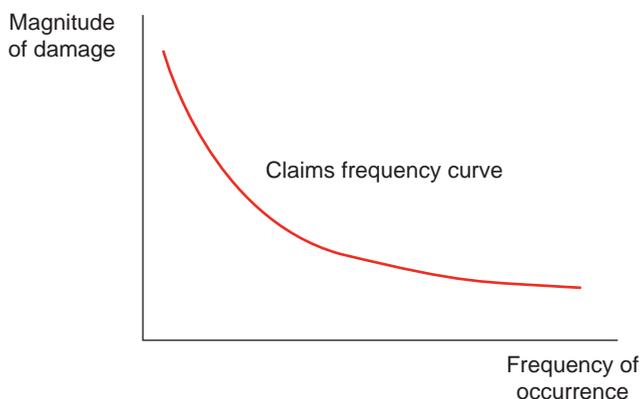
An insurer's or reinsurer's risk assessment will depend on a series of basic factors that make up the four modules of which the catastrophe models are composed.

These basic modules are quantified separately and then processed and combined in the model:

✓ Exposure module
✓ Hazard module
✓ Vulnerability module
✓ Financial module

## 4.2. Exposure module: distribution of aggregate accumulations

Under this section, data on insured portfolios exposed to the catastrophe risk are recorded, and for which modelling is carried out. In order to quantify the financial damage from risks, it is necessary to know their geographical location, i.e. where the risk is situated, so as to be able to assign a hazard level with respect to the natural phenomenon in the model. It is also necessary to specify the true distribution of the value of the insured property, i.e. building, contents, loss of profits.

Correct recording of the whole insured portfolio by the insurance companies (accumulation control) becomes an essential prerequisite for carrying out the modelling of portfolios and obtaining reliable results.

For this recording and homogenisation of accumulation control in the insurance field, there are standardised norms (CRESTA, UNICEDE, post codes, geographical latitude and longitude coordinates) which are used by all insurers and are understandable by the models.

Nowadays, CRESTA zoning (www.cresta.org) forms an insurance industry world standard for the geographical zoning of insured property within each country. However, the technical advances applied to models allow increasingly more specific data to be used, thereby helping to determine the exact location of the risks written by insurance companies and allowing the uncertainty in the results obtained to be reduced.

For example, if in accordance with the following illustration, we wished to model the CRESTA Zone 1 portfolio in order to analyse the risk of flooding, the results obtained would differ considerably if we coded the risks jointly at **CRESTA Zone 1** level, or separately according to their relevant post codes (**CP101, CP102** and **CP103**), since the hazard level that the model assigns to each of these codes will be different.
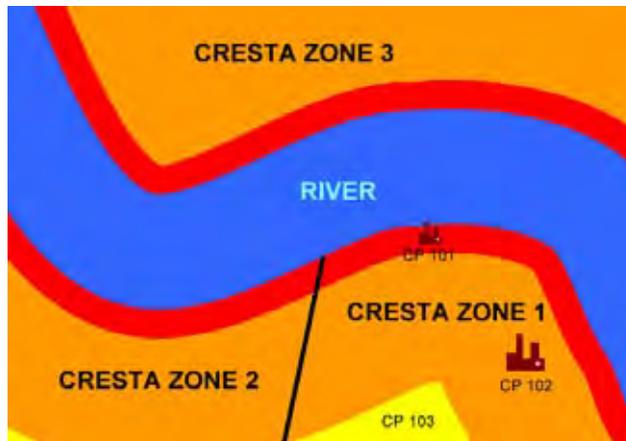
4.3. Hazard module: frequency and intensity of natural phenomena

The Hazard module is defined by the spatial distribution, frequency and intensity of events. In order to quantify these parameters, catalogues of historically recorded actual events together with scientific knowledge of the physical characteristics of the analyzed natural phenomenon are taken into consideration.

Catalogues of historical events form the basis of this module: the more records of events there are, and the more complete, the greater will be the probability of better reflecting the level of hazard that exists. Unfortunately, on many occasions (it varies depending on the hazard and the geographical zone analysed) there are no reliable, comparable data records covering even 100 years of experience.
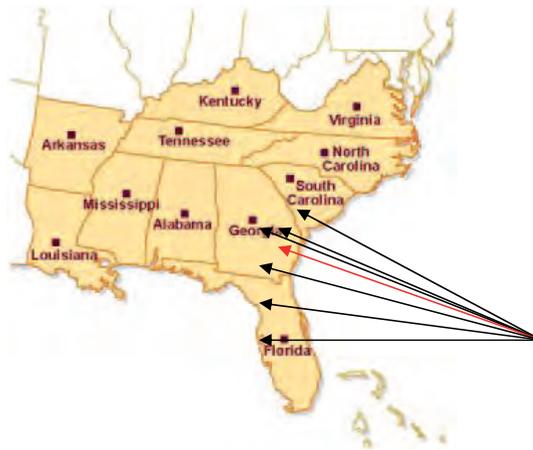
In order to carry out a realistic assessment of the risk, it is therefore necessary to simulate a representative selection of all potential events in the Hazard module. For that, it is necessary to expand the list of historical events by applying scientific knowledge on the origin and dynamics of the natural hazard being analysed. From the historical events, thousands of other possible events are generated which are known as *stochastic* events. These will be created from the original events by varying some of their physical characteristics which define their behaviour.

These artificial or stochastic events have never occurred before but, from a scientific point of view, there is no reason why they could not arise. The so-called *event set* will have to adjust its characteristics to the catalogue of historical events as faithfully as possible.

This event set is very complex to produce, but it presents substantial advantages compared with the analysis of single scenarios, since:

- It accurately reflects the probability of separate regions being affected by one and the same event (correlation between regions).

- It clearly reflects the frequency of events of a specific intensity.

- It enables the amount of the annual claims experience to be estimated.

- It can be revised to take account of variations in a region's level of hazard according to the period (e.g. temporary influence of the El Niño phenomenon and the multi-decade Atlantic oscillation) as regards the frequency and intensity of hurricanes in the Atlantic.

- It enables the improvement of valuation and acceleration of response when a new event which has recently occurred shares similarities with some stochastic event.

At the same time, within this module we have to be able to assign an intensity to each of the stochastic events in the set.

The intensity of a natural disaster depends on numerous factors and, depending on the point of view from which it is approached, could be defined in different ways. It is reasonable to choose as the measure of intensity a variable or parameter that describes correctly the physical characteristics of an event in a specific geographical area of analysis and at the same time presents the highest possible relation to the damage recorded by that event for that level of intensity.

In probabilistic models, different parameters are considered for describing the intensity of events and these vary depending on the natural hazard being analysed. Thus, for earthquakes, we take into account measures of intensity such as the modified Mercalli scale (MMI) or the maximum ground acceleration; for cyclonic storms we will use measures such as central atmospheric pressure, maximum gusts and sustained wind speeds; in the case of flooding,

the determining parameters for intensity would be the maximum water level (volume), the speed of flow, the duration of the flooding, etc.

In general, the intensity of natural phenomena diminishes as we move away from the event's focus or epicentre. This reduction in intensity also has to be reflected in the model and is taken into account by incorporating another series of factors. For example, factors which, in the case of an earthquake, reflect the attenuation of the seismic wave as one moves away from the epicentre and, depending on the type of soil and subsoil, influence the transmission of the energy produced by the earthquake.

The spatial extent of the relevant catastrophe event, known as the *event footprint*, indicates the estimated spatial intensity and damage potential of these stochastic events.

Seismic Hazard Map

HEAR COAST OF AISEN. CHILE

Source: USGS.
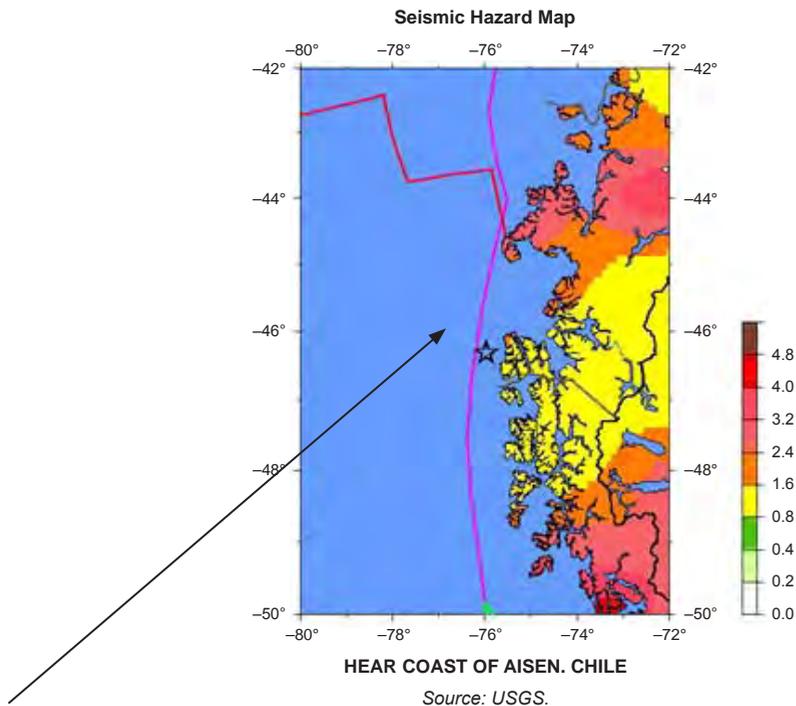
Earthquake: Its epicentre and arc of intensity. Due to the composition of the ground, the zone close to the epicentre is less affected than some zones further away.

## 4.4. Vulnerability module: magnitude of the damage

After a catastrophe event, it can happen that, despite being equal in intensity to another previous event, the magnitude of the damage varies substantially. Buildings can suffer different degrees of damage, depending on the type of

construction, their age and their height. The damage also varies considerably, depending on the type of occupancy and the building's contents.

The mean damage expected in relation to the value of the portfolio or insured property (*mean damage ratio* or MDR) and also the coefficient of variation (CV) (variation in the damage observed around its mean) will depend on both the intensity and specific characteristics of the event and on the characteristics of the property insured.

The aim of this vulnerability model (damage potential) is to determine the mean damage and variation around it for each of the different items of property forming the subject of the insurance cover and for each of the events that could occur, with their corresponding intensities.

In this module, vulnerability curves are used which express the relationship between an event's intensity and its potential damage. In order to produce these vulnerability curves, studies are used which are drawn up from old and recent historical events; each time a major event happens, measurements are carried out to ascertain what has gone wrong and why. Other major sources of information for preparing these curves are engineering knowledge and scientific tests (wind tunnels, material strength tests) carried out on the different items of insured property in order to study their resistance to damage-causing factors (wind speeds, flood levels, a structure's spectral acceleration in the event of an earthquake) during natural events.

Vulnerability curve of residential risks in reinforced concrete
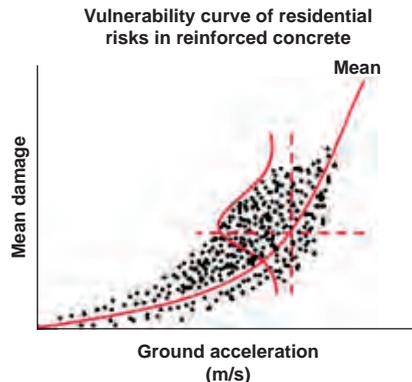
It is not possible to carry out studies that include all the individual characteristics of each insured object; items of insured property are therefore usually grouped into different classes of risk for which a generic vulnerability curve is used. Thus, for example, service businesses form a class of risks with the same vulnerability curve.

Sub-categories are also developed which include differences in vulnerability within the same type of risks. These can be derived from differences in the type of construction, material used, containment, age of the buildings, type and form of roofs, height of buildings, type of occupancy, or other factors.

Not only are there substantial differences in vulnerability between the various classes of insurance (Liability, Motor, etc.) but also between different risk segments (private individuals, businesses, industries, etc.) and coverages (buildings, contents, loss of profits). This fragmentation and differentiation of the insured business portfolio will have to be reflected by means of differentiated individual vulnerability curves.

4.5. Financial module: allocation of losses and event loss table (ELT)

The financial module has the task of allocating losses among all the economic agents participating in the risk (insured, insurer/coinsurer, reinsurers, etc.). At the same time, it also allows us to assess the risk incurred for each location or insured risk, groups of risks and entire business portfolios.

The input data required for this module are:

– Exposure to the natural hazard being modelled, as well as the conditions of insurance (introduced in the Exposure module).

– Mean damage ratio (MDR) and coefficient of variation (CV) of each cover and of each risk accepted in our portfolio for each of the modelled stochastic events that produce a loss (MDR and CV generated from the Vulnerability module).

– The probability of occurrence of each event which could potentially cause a claim for our portfolio, and also the coefficient of correlation between the different risks in the portfolio which are liable to have claims, for each stochastic event modelled (generated in the Hazard module).

The output from this module will be an event loss table (ELT), which is just a list of claims expected for each of the events modelled and for each economic agent or financial perspective that we may wish to analyse. There will be as many financial perspectives as there are agents participating in the risk, which means that we will be able to determine the expected claims for each of them.

Through these ELTs we will be able to generate the statistical data (pure premium, standard deviation, probability of a layer being triggered or used up, etc.) that will allow us to quantify the risk incurred by each participating economic agent, as well as the exceedance probability curves and the return periods of the different levels of potential claims.

In the catastrophe modules, in order to take account of the uncertainty associated with the claims modelled, we use probability functions so that we can include this uncertainty in our calculations.

But where does this uncertainty come from? As far as models are concerned, there are different sources of uncertainty:

– We could define *primary uncertainty* as uncertainty about what events will happen and what intensity they will have. This is the uncertainty about the probability of occurrence of an event and its associated claim.

– We define *secondary uncertainty* as the uncertainty associated with the amount of the claim associated with an event, assuming that this has occurred, measured through the event's standard deviation.

– Finally, uncertainty also exists regarding the parameters that define the events.

These factors cause uncertainty about the claims associated with each event modelled in the ELT. In the Financial module we can include part of this uncertainty in our calculations.

The graph that follows shows the different elements of uncertainty in the face of a specific event. The economic conditions of the risk (maximum loss, limit and deductible) are represented by the blue areas.

– The expected mean claim for this event E(x) would be symbolised by the red line. For this specific event, we can see that the risk will suffer an average loss greater than the retention but within the limit of cover.

– The blue curve on the right-hand side represents the density function of the event. This is calculated from the probability distribution functions that have been defined in the model in accordance with the characteristic parameters of each event – the coefficient of variation and standard deviation of the losses.
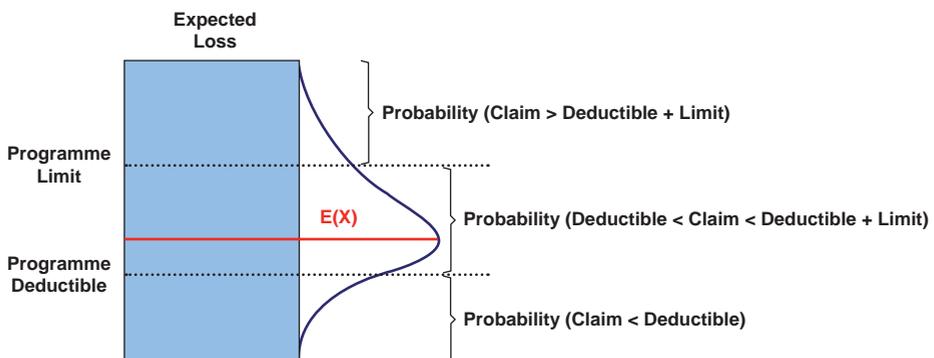
There is, however, a probability that the expected claim event will be larger or smaller than the mean (within the density function) or may also have a different mean claim. By incorporating the uncertainty, we are taking account of the probability of being in each one of these calculation scenarios for each event.

Exceedance probability curves (EP curves)

These are accumulated probability distributions which indicate the probability of a portfolio's claims experience exceeding a certain claim threshold.
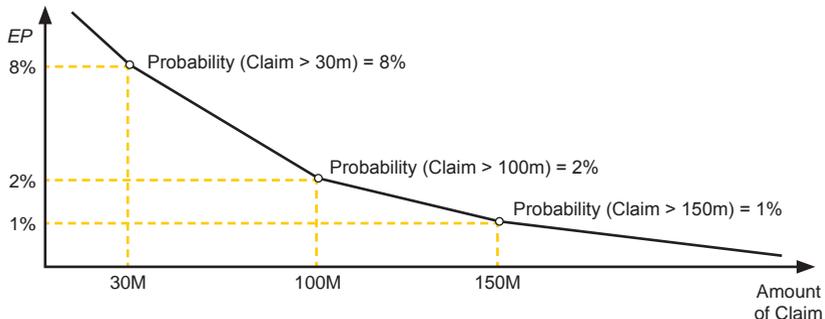
There are two types of curves (amongst many others) which are of considerable interest when it comes to quantifying the risk with respect to claims caused by natural disasters. These are the ones expressing the probability of a specific portfolio's claim threshold being exceeded by the occurrence of a single event (occurrence exceedance probability (OEP) curve), or by the occurrence of multiple events in the year (aggregate exceedance probability (AEP) curve).

In the OEP curve we only take into account the maximum event expected in a year, while in the AEP curve we take into account all the events that may happen in a year. When considering all the events that have occurred during a year, the area below the AEP curve will be equivalent to the pure premium for this portfolio with respect to the risk modelled. Depending on whether we are analysing high-, medium- or low-frequency hazards, the difference between the AEP and OEP curves will be greater due to the existence of more or less events.

EP curves are obtained using the parameters of the events found in the event loss table (ELT), which the Financial module produces as its output; with these parameters we can define:

– Frequency distribution of the number of events to be expected in a year: the frequency distribution function is usually defined through a Poisson distribution function, in which the parameter *lambda* (average number of events) will be equal to the sum of the probability of occurrence of each of the events in the ELT which causes a loss.

– Intensity distribution of the size of an event, given that the event has occurred. This will generally be defined using continuous distribution functions and includes the contribution of the intensity distributions of each of the events in the ELT causing a loss.

Return period

This is just the expression, in years, of a specific level of probability within the exceedance curve. It is a percentile of the exceedance curve and can be expressed both on the basis of a single occurrence (OEP) and on the basis of multiple occurrences (AEP).

The return period equivalent to a level of claims is calculated as the inverse of the exceedance probability of that level of claims on the exceedance curve used. Thus, if the probability of a claim exceeding 150 million in a single occurrence was 1% for the natural hazard modelled, we would say that a claim of 150 million had a return period of 100 years (= 1/0.01).

The return period concept used in the insurance industry is also used in other sectors. In finance, one speaks of *value at risk* (VAR) as a measure of risk, this being the equivalent of the return period.

The return period is a very useful measure for quantifying the risk. However, this risk measure presents a problem: being a simple point on the claim distribution curve, it does not offer us any kind of information about how claims behave in the tail of this distribution. For example, faced with different portfolios presenting the same level of expected claims in a specific return period or percentile, we could not identify which of them represented a higher risk.

In the example in the graph shown below, portfolios A, B and C are represented, together with their corresponding exceedance curves, which are almost identical, as they bear the same claims experience for almost all the points on the curve. For example, A, B and C present the same level of claims for 1% of the exceedance probability. For bigger return periods, however, portfolio C has a greater potential claim than B and A (C is more volatile).
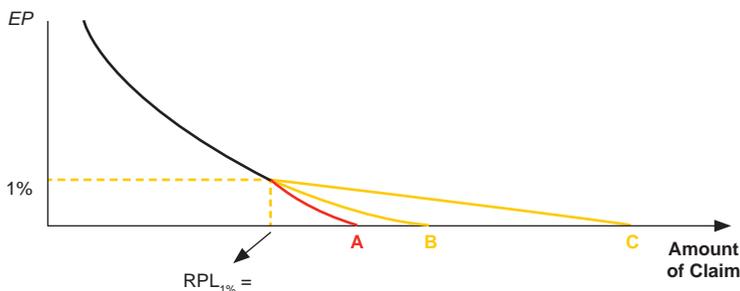
However, we have previously mentioned the existence of other curves, such as conditional exceedance probability (CEP) curves, by means of which we would indeed be taking account of the behaviour of the claims in the tail of the distribution.

As we have seen, catastrophe models offer a practical solution to the problem we were initially faced with on how to quantify the risk written by insurance companies when faced with natural perils of this kind on which we do not have

sufficient information and which are not as frequent or as easy to assess as other mass risks making up insurance portfolios.

4.6. Example of portfolio modelling

Let us look at an example of a model, using the portfolio modelling of damage caused by winter storms in France:

Depending on the aggregates supplied by the cedant, once these have been analysed and the necessary hypotheses applied in order to complete the information provided with market data, enabling a better understanding of the risk being analysed, the distribution of sums insured per CRESTA zone would be as follows:

Residential portfolio

The CRESTA zones coloured red would be the ones in which there was a major concentration of sums insured. This portfolio shows a large concentration along the coast of Finistère (Brittany) and the English Channel, as well as in the CRESTA zones bordering Paris. Given the distribution of sums insured and given that extra-tropical storms or European winter storms usually come in from the Atlantic, this portfolio would be relatively exposed. Once the Exposure data had been introduced, the Hazard, Vulnerability and Financial modules would come into play.

Within the model, the set of stochastic events generated in the Hazard module is used, to which we apply the level of damage that has been established for

each storm in the Vulnerability module according to the exposure entered, where it is located and its characteristics (types of risks making up the portfolio, types of construction, occupancy and other factors considered).

The Financial module will allocate claims among the different economic agents once we enter the characteristics of the treaties protecting this portfolio. The result obtained would be:

Exceedance Probability	Return Period	Residential Portfolio, France (EUR) Total Claim AEP	Residential Portfolio, France (EUR) Total Claim OEP
0.01%	10,000	38,838,917	37,641,064
0.02%	5,000	33,893,672	32,769,030
0.10%	1,000	23,032,756	22,069,035
0.20%	500	18,454,509	17,554,092
0.40%	**250**	**13,993,757**	**13,150,051**
0.50%	200	12,604,808	11,773,706
1.00%	**100**	**8,673,164**	**7,898,003**
2.00%	50	5,659,240	4,974,187
4.00%	25	3,479,971	2,886,636
10.00%	10	1,667,516	1,214,849
20.00%	5	880,145	510,067
50.00%	2	379,695	141,148

Pure Premium (or E(X) or also, Average Annual Loss (AAL)	841,234
Standard Deviation	1,843,418
Coefficient of Variation	2.19

If we look at the exceedance curves, we can see how the expected loss caused by a single event (OEP) for a return period of 100 years would be greater than or equal to €7,898,003, or, to put it another way, we would have a 1% probability of having a claim equal to or greater than that amount due to a single event.

If we look at the multiple occurrences curve (AEP) we see that, for a probability of 1% (return period of 100 years), the expected claims experience for this portfolio would be greater than or equal to €8,673,164 (due to one or more events).

The pure premium or loss expectancy E(X) is calculated as the sum of the claims amounts expected for each storm in the ELT, multiplied by the probability of occurrence of each of the stochastic storms that have produced a claim. This information is available in the event loss table (ELT).

$$\sum_{i=1}^{N} \textbf{Prob (i) x X (i)}$$

i = Event i

Prob (i) = Probability of occurrence of storm i

X (i) = Expected claim associated with storm i

E(X) = Mean expected claim

N = Number of events causing a claim

Standard deviation attempts to measure the possible deviation in the amount of the expected loss about its mean, giving the following calculation:

$$\sqrt{\frac{[(X (i) - E(X)]^2}{N}}$$

The coefficient of variation (CV) gives us a measure of the portfolio's volatility. It is calculated by dividing the standard deviation between the pure premium or E(X). It measures the possible deviation that there could be in the expected loss in relation to its mean. The greater the CV, the greater will be the volatility of the portfolio being analysed.

If we wanted to assess a specific programme, we would enter it in the Financial module. In our example, we consider valuing two layers as detailed below:

Name	Limit	Retention	Premium	ROL
1st layer	3,000,000	4,000,000	630,000	21.00%
2nd layer	3,000,000	7,000,000	270,000	9,00%

The results that the model produces for the reinsurance programme, in accordance with its perception of the risk, would be as follows:

The premium that would have to be collected for each layer would be the pure premium for each layer, plus a loading for its respective associated uncertainty. In order to include this uncertainty we will apply a percentage of the specific standard deviation of each layer. This percentage will vary depending on the peril analysed and also on other considerations taken into account by the experienced underwriter.

The rate on line (ROL) – expressed as a percentage – is the price to be paid for the capacity provided in each layer. This is calculated by dividing the premium for the layer by the layer's limit of capacity.

Depending on the results obtained and the reinsurer's risk appetite, the first layer would be well paid, as it will be remunerated in accordance with the price in the model (including loading on the standard deviation). The second layer does not seem so attractive, however, if we take into account the results of the model; technically the price proposed would not be acceptable, as it differs considerably from the potential risk that exists.

Exceedance Probability	Return Period	Residential Portfolio, France (EUR) Total Loss OEP	Cat XL 1st layer (EUR) Claim for the Layer OEP	Cat XL 2nd layer (EUR) Claim for the Layer OEP
0.01%	10,000	37,641,064	3,000,000	3,000,000
0.02%	5,000	32,769,030	3,000,000	3,000,000
0.10%	1,000	22,069,035	3,000,000	3,000,000
0.20%	500	17,554,092	3,000,000	3,000,000
0.40%	**250**	**13,150,051**	**3,000,000**	**3,000,000**
0.50%	200	11,773,706	3,000,000	3,000,000
1.00%	**100**	**7,898,033**	**3,000,000**	**896,416**
2.00%	50	4,974,187	973,950	0
4.00%	25	2,886,636	0	0
10.00%	10	1,214,849	0	0
20.00%	5	510,067	0	0
50.00%	2	141,148	0	0

Pure Premium or E(X)		841,234	54,825	27,321
Standard Deviation		1,843,418	378,643	272,209
Coefficient of Variation		2.19	6.91	9.96
Pure Premium/Limit			1.83%	0.91%
(Pure Premium +1.5*SD)/Limit			20.76%	14.52%
Treaty Premium			630,000	270,000
Prob. of Layer being triggered			2.68%	1.21%
Prob. of Layer being exhausted			1.21%	0.67%

Rate on Line / Price			21.00%	9.00%

We can see that the first layer (3m xs 4m) would have a 2.68% probability of being triggered, which is the same as saying that there is a 2.68% probability of us reaching a claims experience equal to or greater than 4 million. This level of claims would correspond to a return period of 37 years (1/0.0268).

The probability of the 2nd layer (3m xs 7m) being triggered is equal to that of the preceding layer being exhausted and would be 1.21%. Finally, the probability of this 2nd layer being exhausted, and with it the whole of the reinsurance programme under consideration, is 0.67%.

The suggested reinsurance programme would expose capacity of 6 million in all (3 million per layer). It is relatively exposed, as the capacity provided would be exhausted with a return period of 148 years (1/probability of 2nd layer being exhausted (0.67%)).

In this way we will be able to assess whether or not it may be of interest to write this treaty, depending on the level of risk, how much will be paid for covering the risk, the marginal contribution of the risk to the rest of the portfolio, and any other considerations one may wish to include.

189. *An introduction to Reinsurance.* 2013

188. *El control interno y la responsabilidad penal en la mediación de seguros.* 2013

187. *Una Introducción al gobierno corporativo en la industria aseguradora en América Latina.* 2013

186. *Mortalidad de jóvenes en accidentes de tráfico. 2012185.*

185. *Las reclamaciones derivadas de accidentes de circulación por carretera transfronterizos.* 2012

184. *Efecto disuasorio del tipo de contrato sobre el fraude.* 2012

183. *Claves del Seguro Español: una aproximación a la Historia del Seguro en España.* 2012

182. *La responsabilidad civil del asegurador de asistencia sanitaria.* 2012

181. *Colaboración en el contrato de Reaseguro.* 2012

180. *Origen, situación actual y futuro del seguro de Protección Jurídica.* 2012

179. *Experiencias de microseguros en Colombia, Perú y Brasil. Modelo socio agente.* 2012

178. *El agente de seguros y su Responsabilidad Civil.* 2012

177. *Riesgo operacional en el marco de Solvencia II.* 2012

176. *Un siglo de seguros marítimos barceloneses en el comercio con América. (1770-1870).* 2012

175. *El seguro de Caución.* 2012

174. *La contabilidad de los corredores de seguros y los planes y fondos de pensiones.* 2012

173. *El seguro de Vida en América Latina.* 2011

172. *Gerencia de riesgos sostenibles y Responsabilidad Social Empresarial en la entidad aseguradora.* 2011

171. *Investigaciones en Seguros y Gerencia de Riesgos*. 2011

170. *Introdução ao Resseguro*. 2011

169. *La salud y su aseguramiento en Argentina, Chile, Colombia y España*. 2011

168. *Diferencias de sexo en conductas de riesgo y tasa de mortalidad diferencial entre hombres y mujeres*. 2011

167. *Movilización y rescate de los compromisos por pensiones garantizados mediante contrato de seguros*. 2011

166. *Embedded Value aplicado al ramo No Vida*. 2011

165. *Las sociedades cautivas de Reaseguro*. 2011

164. *Daños del amianto: litigación, aseguramiento de riesgos,y fondos de compensación*. 2011

163. *El riesgo de tipo de interés: experiencia española y Solvencia II.* 2011

162. *I Congreso sobre las Nuevas Tecnologías y sus repercusiones en el Seguro: Internet, Biotecnología y Nanotecnología*. 2011

161. *La incertidumbre bioactuarial en el riesgo de la longevidad. Reflexiones bioéticas.* 2011

160. *Actividad aseguradora y defensa de la competencia. La exención antitrust del sector asegurador.* 2011

159. *Estudio empírico sobre la tributación de los seguros de vida*. 2010

158. *Métodos estocásticos de estimación de las provisiones técnicas en el marco de Solvencia II.* 2010

157. *Introducción al Reaseguro* (Introduction to Reinsurance) (in Spanish). 2010

156. *Encuentro Internacional sobre la Historia del Seguro (International Meeting on the History of Insurance) (contributions in English, French and Spanish)*. 2010

155. *Los sistemas de salud en Latinoamérica y el papel del seguro privado* (Healthcare systems in Latin America and the role of private insurance) (in Spanish). 2010

154. *El Seguro de Crédito en Chile* (Credit insurance in Chile) (in Spanish). 2010

153. *El análisis financiero dinámico como herramienta para el desarrollo de modelos internos en el marco de Solvencia II* (Dynamic financial analysis as a tool for developing internal models within the framework of Solvency II) (in Spanish). 2010

152. *Características sociodemográficas de las personas con doble cobertura sanitaria. Un estudio empírico* (Sociodemographic characteristics of persons with double health cover. An empirical study). 2010

151. *Solidaridad impropia y seguro de Responsabilidad Civil* (Inappropriate solidarity and third-party liability insurance) (in Spanish). 2010

150. *La prevención del blanqueo de capitales en las entidades aseguradoras, las gestoras y los corredores de seguros* (The prevention of money laundering in insurance companies, insurance management companies and insurance brokers) (in Spanish). 2010

149. *Fondos de aseguramiento agropecuario y rural: la experiencia mexicana en el mutualismo agropecuario y sus organizaciones superiores* (Agricultural and rural insurance funds: the Mexican experience of agricultural mutuals and their superior organisations) (in Spanish). 2010

148. *Avaliação das Provisões de Sinistro sob o Enfoque das Novas Regras de Solvência do Brasil* (Valuation of claims reserves under Brazil's new solvency regulations) (in Portuguese). 2010

147. *El principio de igualdad sexual en el Seguro de Salud: análisis actuarial de su impacto y alcance* (The principle of sexual equality in health insurance: actuarial analysis of its impact and scope) (in Spanish). 2010

146. *Investigaciones históricas sobre el Seguro español* (Historical research on Spanish insurance) (in Spanish). 2010

145. *Perspectivas y análisis económico de la futura reforma del sistema español de valoración del daño corporal* (Perspectives and economic analysis of the future reform of the Spanish system for assessing bodily injury) (in Spanish). 2009

144. *Contabilidad y Análisis de Cuentas Anuales de Entidades Aseguradoras (Plan contable 24 de julio de 2008)* (Accounting and analysis of insurance companies' annual accounts (Chart of accounts 24 July 2008)) (in Spanish). 2009

143. *Mudanças Climáticas e Análise de Risco da Indústria de Petróleo no Litoral Brasileiro* (Climate change and risk analysis of the oil industry on the Brazilian coast) (in Portuguese). 2009

142. *Bases técnicas dinámicas del Seguro de Dependencia en España. Una aproximación en campo discreto* (Dynamic technical basis of long-term care insurance in Spain. A discrete-field approximation) (in Spanish). 2009

141. *Transferencia Alternativa de Riesgos en el Seguro de Vida: Titulización de Riesgos Aseguradores* (Alternative risk transfer in Life insurance. Securitisation of insurance risks) (in Spanish). 2009

140. *Riesgo de negocio ante asegurados con múltiples contratos* (Business risk in the case of Insureds with multiple contracts) (in Spanish). 2009

139. *Optimización económica del Reaseguro cedido: modelos de decisión* (Economic optimisation of ceded reinsurance: decision models) (in Spanish). 2009

138. *Inversiones en el Seguro de Vida en la actualidad y perspectivas de futuro* (Investments in Life insurance currently and future prospects) (in Spanish). 2009

137. *El Seguro de Vida en España. Factores que influyen en su progreso* (Life insurance in Spain. Factors affecting its progress) (in Spanish). 2009

136. *Investigaciones en Seguros y Gestión de Riesgos* (Insurance and risk management research) (in Spanish). RIESGO 2009.

135. *Análisis e interpretación de la gestión del fondo de maniobra en entidades aseguradoras de incendio y lucro cesante en grandes riesgos industriales* (Analysis and interpretation of management of the working capital in companies that insure fire and loss of profits for large industrial risks) (in Spanish). 2009

134. *Gestión integral de Riesgos Corporativos como fuente de ventaja competitiva: cultura positiva del riesgo y reorganización estructural* (Integrated management of corporate risks as a source of competitive advantage: positive culture of risk and structural reorganisation) (in Spanish). 2009

133. *La designación de la pareja de hecho como beneficiaria en los seguros de vida* (Designation of unmarried partners as beneficiaries in life insurance) (in Spanish). 2009

132. *Aproximación a la Responsabilidad Social de la empresa: reflexiones y propuesta de un modelo* (Approach to the social responsibility of companies: thoughts and proposal for a model) (in Spanish). 2009

131. *La cobertura pública en el seguro de crédito a la exportación en España: cuestiones prácticas-jurídicas* (Public cover in export credit insurance in Spain: questions of legal practice) (in Spanish). 2009

130. *La mediación en seguros privados: análisis de un complejo proceso de cambio legislativo* (Mediation in private insurance: analysis of a complex process of legislative change) (in Spanish). 2009

129. *Temas relevantes del Derecho de Seguros contemporáneo* (Relevant issues in contemporary insurance law) (in Spanish). 2009

128. *Cuestiones sobre la cláusula cut through. Transferencia y reconstrucción* (Questions on the cut-through clause. Transfer and reconstruction) (in Spanish). 2008

127. *La responsabilidad derivada de la utilización de organismos genéticamente modificados y la redistribución del riesgo a través del seguro* (Liability arising from the use of genetically modified organisms and the spreading of risk through insurance) (in Spanish). 2008

126. *Ponencias de las Jornadas Internacionales sobre Catástrofes Naturales* (Papers from the International Conference on Natural Disasters) (contributions in Spanish and English). 2008

125. *La seguridad jurídica de las tecnologías de la información en el sector asegurador* (The legal security of information technologies in the insurance sector) (in Spanish). 2008

124. *Predicción de tablas de mortalidad dinámicas mediante un procedimiento bootstrap* (Predicting dynamic mortality tables by means of a bootstrap procedure) (in Spanish). 2008

123. *Las compañías aseguradoras en los procesos penal y contencioso-administrativo* (Insurance companies in criminal and judicial-review proceedings) (in Spanish). 2008

122. *Factores de riesgo y cálculo de primas mediante técnicas de aprendizaje* (Risk factors and calculation of premiums using learning techniques) (in Spanish). 2008

121. *La solicitud de seguro en la Ley 50/1980, de 8 de octubre, de Contrato de Seguro* (The insurance application in Law 50/1980 of 8 October concerning insurance contracts) (in Spanish). 2008

120. *Propuestas para un sistema de cobertura de enfermedades catastróficas en Argentina* (Proposals for a system for covering catastrophic diseases in Argentina) (in Spanish). 2008

119. *Análisis del riesgo en seguros en el marco de Solvencia II: Técnicas estadísticas avanzadas Monte Carlo y Bootstrapping* (Insurance risk analysis as part of Solvency II: Monte Carlo and bootstrapping advanced statistical techniques) (in Spanish). 2008

118. *Los planes de pensiones y los planes de previsión asegurados: su inclusión en el caudal hereditario* (Insured pension plans and employee benefit plans: their inclusion in a deceased's estate) (in Spanish). 2007

117. *Evolução de resultados técnicos e financeiros no mercado segurador ibero-americano* (Development of technical and financial results in the Latin American insurance market) (in Portuguese). 2007

116. *Análisis de la Ley 26/2006 de Mediación de Seguros y Reaseguros Privados* (Analysis of Law 26/2006 on Private Insurance and Reinsurance Mediation) (in Spanish). 2007

115. *Sistemas de cofinanciación de la dependencia: seguro privado frente a hipoteca inversa* (Systems for co-financing long-term care: private insurance as against equity release) (in Spanish). 2007

114. *El sector asegurador ante el cambio climático: riesgos y oportunidades* (The insurance sector in the face of climate change: risks and opportunities) (in Spanish). 2007

113. *Responsabilidade social empresarial no mercado de seguros brasileiro: influências culturais e implicações relacionais* (Corporate social responsibility in the Brazilian insurance market: cultural influences and relational implications) (in Portuguese). 2007

112. *Contabilidad y análisis de cuentas anuales de entidades aseguradoras* (Accounting and analysis of insurance companies' annual accounts) (in Spanish). 2007

111. *Fundamentos actuariales de primas y reservas de fianzas* (Actuarial fundamentals for bond premiums and reserves) (in Spanish). 2007

110. *El Fair Value de las provisiones técnicas de los seguros de Vida* (The fair value of technical provisions in Life insurance) (in Spanish). 2007

109. *El Seguro como instrumento de gestión de los M.E.R. (Materiales Específicados de Riesgo)* (Insurance as a management tool for SRMs (specified risk materials)) (in Spanish). 2006

108. *Mercados de absorción de riesgos* (Risk-bearing markets) (in Spanish). 2006

107. *La exteriorización de los compromisos por pensiones en la negociación colectiva* (The outsourcing of pension liabilities through collective bargaining) (in Spanish). 2006

106. *La utilización de datos médicos y genéticos en el ámbito de las compañías aseguradoras* (The use of medical and genetic data in insurance companies) (in Spanish). 2006

105. *Los seguros contra incendios forestales y su aplicación en Galicia* (Forest fire insurance and its use in Galicia) (in Spanish). 2006

104. *Fiscalidad del seguro en América Latina* (Taxation of insurance in Latin America) (in Spanish). 2006

103. Las NIC y su relación con el Plan Contable de Entidades Aseguradoras (International Accounting Standards and their relation to the Chart of Accounts for Insurance Companies) (in Spanish). 2006

102. *Naturaleza jurídica del Seguro de Asistencia en Viaje* (Legal nature of travel insurance) (in Spanish). 2006

101. *El Seguro de Automóviles en Iberoamérica* (Motor insurance in Latin America) (in Spanish). 2006

100. *El nuevo perfil productivo y los seguros agropecuarios en Argentina* (The new production profile and agricultural insurance in Argentina) (in Spanish). 2006

99. *Modelos alternativos de transferencia y financiación de riesgos "ART": situación actual y perspectivas futuras* (Alternative risk transfer (ART) and financing models: current situation and future outlook) (in Spanish). 2005

98. *Disciplina de mercado en la industria de seguros en América Latina* (Market discipline in the insurance industry in Latin America) (in Spanish). 2005

97. *Aplicación de métodos de inteligencia artificial para el análisis de la solvencia en entidades aseguradoras* (Use of artificial intelligence methods for analysing insurance companies' solvency) (in Spanish). 2005

96. *El Sistema ABC-ABM: su aplicación en las entidades aseguradoras* (The ABC/ABM system: its application in insurance companies) (in Spanish). 2005

95. *Papel del docente universitario: ¿enseñar o ayudar a aprender?* (Role of the university lecturer: to teach or help to learn?) (in Spanish). 2005

94. *La renovación del Pacto de Toledo y la reforma del sistema de pensiones: ¿es suficiente el pacto político?* (Renewal of the 'Pacto de Toledo' agreement and reform of the pension system: is political agreement sufficient?) (in Spanish). 2005

92. *Medición de la esperanza de vida residual según niveles de dependencia en España y costes de cuidados de larga duración* (Measuring remaining life expectancy according to levels of dependence in Spain and costs of long-term care) (in Spanish). 2005

91. *Problemática de la reforma de la Ley de Contrato de Seguro* (Problems with reform of the Insurance Contract Act) (in Spanish). 2005

90. *Centros de atención telefónica del sector asegurador* (Call centres in the insurance sector) (in Spanish). 2005

89. *Mercados aseguradores en el área mediterránea y cooperación para su desarrollo* (Insurance markets in the Mediterranean area and cooperation for their development) (in Spanish). 2005

88. *Análisis multivariante aplicado a la selección de factores de riesgo en la tarificación* (Multivariate analysis applied to the selection of risk factors in rating) (in Spanish). 2004

87. *Dependencia en el modelo individual, aplicación al riesgo de crédito* (Dependendence on the individual model, applied to the credit risk) (in Spanish) 2004

86. *El margen de solvencia de las entidades aseguradoras en Iberoamérica* (The solvency margin of insurance companies in Latin America) (in Spanish). 2004

85. *La matriz valor-fidelidad en el análisis de los asegurados en el ramo del automóvil* (The value/loyalty matrix in the analysis of insureds in the Motor class of business) (in Spanish). 2004

84. *Estudio de la estructura de una cartera de pólizas y de la eficacia de un Bonus-Malus* (Study of the structure of a portfolio of policies and the effectiveness of a bonus-malus system) (in Spanish). 2004

83. *La teoría del valor extremo: fundamentos y aplicación al seguro, ramo de responsabilidad civil autos* (The extreme value theory: fundamentals and application to motor third-party liability insurance) (in Spanish). 2004

81. *El Seguro de Dependencia: una visión general* (Long-term care insurance: a general view) (in Spanish). 2004

80. *Los planes y fondos de pensiones en el contexto europeo: la necesidad de una armonización* (Pension plans and funds in the European context: the need for harmonisation) (in Spanish). 2004

79. *La actividad de las compañías aseguradoras de vida en el marco de la gestión integral de activos y pasivos* (The activity of life insurance companies within the framework of the integrated management of assets and liabilities) (in Spanish). 2003

78. *Nuevas perspectivas de la educación universitaria a distancia* (New perspectives on open university education) (in Spanish). 2003

77. *El coste de los riesgos en la empresa española: 2001* (The cost of risks in the Spanish corporation: 2001) (in Spanish).

76. *La incorporación de los sistemas privados de pensiones en las pequeñas y medianas empresas* (The incorporation of private pension schemes in small and medium-sized businesses) (in Spanish). 2003

75. *Incidencia de la nueva Ley de Enjuiciamiento Civil en los procesos de responsabilidad civil derivada del uso de vehículos a motor* (Impact of the new Code of Civil Procedure on third-party liability proceedings arising from the use of motor vehicles) (in Spanish). 2002

74. *Estructuras de propiedad, organización y canales de distribución de las empresas aseguradoras en el mercado español* (Ownership structures, organisation and distribution channels of insurance companies in the Spanish market) (in Spanish). 2002

73. *Financiación del capital-riesgo mediante el seguro* (Financing risk capital by means of insurance) (in Spanish). 2002

72. *Análisis del proceso de exteriorización de los compromisos por pensiones* (Analysis of the process of outsourcing pension liabilities) (in Spanish). 2002

71. *Gestión de activos y pasivos en la cartera de un fondo de pensiones* (Management of assets and liabilities in a pension fund portfolio) (in Spanish). 2002

70. *El cuadro de mando integral para las entidades aseguradoras* (The balanced scorecard for insurance companies) (in Spanish). 2002

69. *Provisiones para prestaciones a la luz del Reglamento de Ordenación y Supervisión de los Seguros Privados; métodos estadísticos de cálculo* (Provisions for outstanding claims in the light of the Rules on the Regulation and Supervision of Private Insurance; statistical methods of calculation) (in Spanish). 2002

68. *Los seguros de crédito y de caución en Iberoamérica* (Credit and bond insurance in Latin America) (in Spanish). 2001

67. *Gestión directiva en la internacionalización de la empresa* (Leadership management in the internationalisation of companies) (in Spanish). 2001

65. *Ética empresarial y globalización* (Business ethics and globalisation) (in Spanish). 2001

64. *Fundamentos técnicos de la regulación del margen de solvencia* (Technical basis of regulation of the solvency margin) (in Spanish). 2001

63. *Análisis de la repercusión fiscal del seguro de vida y los planes de pensiones. Instrumentos de previsión social individual y empresarial* (Analysis of the tax implications of life insurance and pension plans. Instruments of individual and company social provision) (in Spanish). 2001

62. *Seguridad Social: temas generales y régimen de clases pasivas del Estado* (Social security: general topics and civil service pensioners' regime) (in Spanish). 2001

61. *Sistemas Bonus-Malus generalizados con inclusión de los costes de los siniestros* (Generalised bonus-malus systems, including claims costs) (in Spanish). 2001

60. *Análisis técnico y económico del conjunto de las empresas aseguradoras de la Unión Europea* (Technical and economic analysis of all insurance companies in the European Union) (in Spanish). 2001

59. *Estudio sobre el euro y el seguro* (Study on the euro and insurance) (in Spanish). 2000

58. *Problemática contable de las operaciones de reaseguro* (Accounting problems in reinsurance operations) (in Spanish). 2000

56. *Análisis económico y estadístico de los factores determinantes de la demanda de los seguros privados en España* (Economic and statistical analysis of the factors determining the demand for private insurance in Spain) (in Spanish). 2000

54. *El corredor de reaseguros y su legislación específica en América y Europa* (Reinsurance brokers and their specific legislation in America and Europe) (in Spanish). 2000

53. *Habilidades directivas: estudio de sesgo de género en instrumentos de evaluación* (Leadership skills: study of gender bias in assessment tools) (in Spanish). 2000

52. *La estructura financiera de las entidades de seguros, S.A.* (The financial structure of joint-stock insurance companies) (in Spanish) 2000

51. *Seguridades y riesgos del joven en los grupos de edad* (Safety and risks of youth according to age groups) (in Spanish). 2000

50. *Mixturas de distribuciones: aplicación a las variables más relevantes que modelan la siniestralidad en la empresa aseguradora* (Mixtures of distributions: application to the most relevant variables modelling an insurance company's claims experience) (in Spanish). 1999

49. *Solvencia y estabilidad financiera en la empresa de seguros: metodología y evaluación empírica mediante análisis multivariante* (Solvency and financial stability in insurance companies: methodology and empirical assessment using multivariate analysis) (in Spanish). 1999

48. *Matemática Actuarial no vida con Maple V* (Non-Life actuarial mathematics with Maple V) (in Spanish). 1999

47. *El fraude en el Seguro de Automóvil: cómo detectarlo* (Motor insurance fraud and how to detect it) (in Spanish). 1999

46. *Evolución y predicción de las tablas de mortalidad dinámicas para la población española* (Development and prediction of dynamic mortality tables for the Spanish population) (in Spanish). 1999

45. *Los Impuestos en una economía global* (Taxes in a global economy) (in Spanish). 1999

42. *La Responsabilidad Civil por contaminación del entorno y su aseguramiento* (Liability for environmental pollution and its insurance) (in Spanish). 1998

41. *De Maastricht a Amsterdam: un paso más en la integración europea* (From Maastricht to Amsterdam: one more step towards European integration) (in Spanish). 1998

Nº Especial. Informe sobre el Mercado Español de Seguros 1997 Fundación MAPFRE Estudios (Special Issue. Report on the Spanish insurance market, 1997. Mapfre Foundation Studies) (in Spanish)

39. *Perspectiva histórica de los documentos estadístico-contables del órgano de control: aspectos jurídicos, formalización y explotación* (Historical perspective of the supervisory body's statistical accounting documents: legal aspects, formalisation and use) (in Spanish). 1997

38. *Legislación y estadísticas del mercado de seguros en la comunidad iberoamericana* (Legislation and statistics of the insurance market in the Latin American community) (in Spanish). 1997

37. *La responsabilidad civil por accidente de circulación. Puntual comparación de los derechos francés y español* (Liability for road accidents. Point-by-point comparison of French and Spanish law) (in Spanish). 1997

36. *Cláusulas limitativas de los derechos de los asegurados y cláusulas delimitadoras del riesgo cubierto: las cláusulas de limitación temporal de la cobertura en el Seguro de Responsabilidad Civil* (Clauses limiting the rights of insureds and clauses defining the risk covered: the time-limitation clauses of cover in third party liability insurance) (in Spanish). 1997

35. *El control de riesgos en fraudes informáticos* (Risk control in the area of computer fraud) (in Spanish) 1997

34. *El coste de los riesgos en la empresa española: 1995* (The cost of risks in Spanish companies in 1995) (in Spanish)

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