

PART TWO – THE FINANCIAL IMPACT

EARTHQUAKES

CATASTROPHE RESERVES & TAX ISSUES

Tax policies in the United States and worldwide are critical elements in the discussion of an appropriate fiscal response to the earthquake question. In the US, for example, an insurer writing a one-year earthquake policy and sustaining no losses would be expected to pay tax on the entire premium paid (less expenses), limiting the ability to establish catastrophe reserves.

The treatment of reserves for tax purposes varies widely from country to country. In the UK, a reserve for reported claims is generally allowed as long as the reserve is provided in the published accounts. INBR claims are also acceptable. Such reserves, however, must be based on a reasonably precise evaluation using the syndicate's own experience.

In the USA, the Tax Reform Act of 1986, prompted by the US budget deficit problem, curtailed two advantages that insurance companies were able to utilise in the past – unearned premiums and unpaid losses. Since 1986, 20% of a company's unearned premium at the end of the year must be included as income. The government also requires insurance companies to estimate its future claims attributable to losses incurred and discount those losses based on payout patterns in the future. California is, however, presently considering long-term earthquake insurance policy.

In France, the law requires all insurance contracts concerning fire or other risks to cover for natural catastrophe risk. Reserves, are generally tax deductible as an "equalisation reserve".

In Germany, there is little demand for insurance protection against earthquakes. In Sweden, there are no specific rules for establishing casualty insurance reserves.

In Japan and Canada, catastrophe reserves can be established for earthquakes. The rules apply to unpaid claims, including IBNR losses. In New Zealand, reserve deductions are allowed for unearned premium income and IBNR losses.

R E I N S U R A N C E

Major doubts exist about the the capacity available to cope with a "megaloss" in, for example, the New Madrid area or in Los Angeles, especially if more inhabitants than at present should elect to protect themselves against shake damage as well as fire.

Sometimes, insurers do not know the amount of insurance coverage provided in a particular area. Despite technological advances, portfolios are often not split into separate building types, design groups, height groups, age groups and usage groups. Furthermore, risks may not be broken down into different subsoil areas. Some companies, however, can and do control this on a detailed level such as post codes.

In most businesses, increasing the price increases the sellers' willingness to sell the product. This is not always true with catastrophe insurance or reinsurance. The difficulties involved in measuring earthquake reinsurance capacity include :

1. The risk portion of any premium is derived from the expected loss multiplied by the annual frequency of the loss. In the catastrophe area, the observation period for extreme events is clearly too short for the calculation of relative frequencies. Was the San Francisco earthquake a one in a 100 year event, or one in a 500 year? Had it not occurred, should it not be considered in the "expected loss" figure?
2. The second concern is the adequacy of the California zoning system with respect to reinsurance. Zonal boundaries have been forced to match political boundaries rather than seismic boundaries. California may be the best practically zoned state in the US but the system renders PML estimates meaningless to a reinsurer. [Munkhammar, Earthquake Conference, Hawaii, 1989].

A recognised means of quantifying risk is to look at the sums-insured. Also, primary insurance companies should record by postcode each risk so that data on a post code by postcode basis can be gathered on gross, reinsured and net exposure. It is important to note that most reinsurers do not even have a zoning system for earthquake areas outside California, let alone comprehensive postcode zoning.

CAPACITY

200 US Reinsurers
200 Lloyds' syndicates handling US Reinsurance
+ 100 Lloyd's "fringe market" companies
500
x2
1,000 Assume double 500 to pick up the rest of the worldwide reinsurance
market
+ 2000 no. of US insurance companies (inc. those not writing Californian
business)
3000
x \$1,000,000 Assume \$1m retentions. (Almost two-thirds of
\$3 billion companies will be small).

If beyond \$3 billion, reinsurance is retrocessional, then a \$60 billion loss
looks like being uncollectable.

[Webb, Earthquake Conference, Hawaii, 1989]

RATES

As has already been shown, predicting loss amounts due to earthquakes over a finite time span is very difficult. There is, therefore, a chance that rates, whilst being adequate in the long term, might not be sufficient in the short-term to maintain the solvency of an insurance company/syndicate.

Along with market conditions, the following factors are involved in the calculation of earthquake rates :

Because of economies-of-scale, expenses tend to become a smaller portion of the rate as the amount insured increases. However, with a relatively fixed amount of reserves, increasing the size of any specific risk increases the loss fluctuations expected. Thus, a prudent underwriter will apply a surcharge to reflect this decrease in loss predictability.

As a consequence of the wide variations of loss levels which will occur with the peril of an earthquake, it is extremely important that a final earthquake rate structure be validated and modified, if necessary, by performing a "ruin analysis". This involves generating many time histories of loss patterns and syndicate capacity in order to estimate the probability that at some time the losses exceed the syndicate's capacity. This analysis encompasses the syndicate's insurance marketing plan, the capacity and how they will respond to losses of varying sizes.

Those developing rates need the most comprehensive catalogue of known fault systems. They also need to take provisions for "seismogenic source zones" to account for regions where earthquakes may occur on faults not currently mapped.

LOCATION The location of a property at risk is a key factor because it governs how frequently the property may be subjected to earthquakes, the level of shaking anticipated, the potential for ground failure or other hazards and the portfolio, or aggregate risk that would result from any single earthquake. Obviously, any spread in risk underwritten only occurs when two locations are sufficiently distant from each other not to be affected by the same earthquake.

An important decision the underwriter must face is the degree of precision of which the location of a risk will be specified. Selection of zones ultimately

used for quoting premiums must consider the availability of detailed location data in the marketplace that a company does business and the degree of automation in the company's underwriting offices.

Building failure estimates may be gauged by comparing structural response and structural capacity. Damage estimates can then be evaluated, in terms of repair and replacement costs. This calculation may be done on a deterministic basis or may involve fragility curves which express the probability of failure at a given load level, reflecting the uncertainty in structural capacity.

Inspections involved in the process of rating are costly and, therefore, syndicates involved in earthquake insurance should expect to retain high proportions of their portfolios for several renewals or have some other way of meeting this cost.

EARTHQUAKE "PROBABLE MAXIMUM LOSS" ESTIMATES

Insufficient data ensures that methods for answering the question "what is my exposure to loss?" are in their infancy. Available data is, however, improving and the model overleaf is an example of one method of estimating the PML for earthquakes, given an earthquake of a particular magnitude.

A US Geological Survey Paper (1360), published in 1985, sets out a model for predicting the intensities of earthquakes of particular magnitude over a specific region. Thus, one can develop a table for a particular region, setting out how a region would be effected by earthquakes of varying magnitude.