THE ASSESSMENT OF SOLVENCY

COLIN M. STEWART (U.K.)

Introduction

Effectively, a non-life insurance concern may be considered to be solvent if the supervisory authorities of the country or countries in which it operates allow it to continue operating. It is of no avail to claim that, by some other criterion, the concern may be considered to be solvent; it is by reference to the controls imposed by supervisory authorities that the concern must operate. For this reason, it is apposite to consider the principles of solvency assessment in the context of the financial statements and other documents generally available to supervisory authorities, as distinct from the theoretical mathematical concepts underlying insurance operation.

The primary purpose of supervision is to make sure that a concern does not enter into obligations which it will be unable to fulfil. It is thus essentially a dynamic standard, not a static one having regard only to the business already accepted, but the first requirement is nevertheless to test the concern's finances in relation to the business already on the books. If this test is passed, then at least it is known that the concern will not be depending upon profits from new business and renewals to help to meet the cost of its present liabilities.

This raises the question of what controls might be applied to new business. The two main types of control possible are on the extent of selection of risks permitted, and on the premiums to be charged, but while it may be feasible for such controls to be applied to the home portfolio of a particular class, for example motor vehicle insurance, it is difficult to envisage the operation of such controls internationally in, for example, the marine, aviation and transit class. It is necessary, therefore, to proceed on the basis that premium rating and the selection of risks remains in the hands of the underwriters, and that a supervisory authority has to continue to rely, as regards future business, on an impression gained from the success or otherwise of the past year or years' results. Effectively, therefore, the approach will be the same as in life assurance, where new business can usually be assumed to be self-supporting, and solvency tested

by comparing the assets and the liabilities in respect of the business currently in force. But there is one difference, and that lies in the variability in the underwriting results, from one year to another, in short-term insurance. It is therefore arguable that a test of solvency in non-life insurance should have regard not only to the business already on the books, but also perhaps to a further year's new business which, even though correctly rated, might nevertheless show a loss.

Thus the criterion would be that the insurance concern should have sufficient free assets to enable it to meet not only its present obligations, but also to eliminate any likelihood that, while the authorities were applying their tests, the concern would in the meantime have passed to a position of being unable to meet its obligations. This is the same criterion as is implied by the mathematics of risk theory except that, in the infinite time case, the latter assumes a continuous flow of new business without the intervention of a supervisory authority and thus imposes a somewhat higher standard than is strictly necessary in practice.

Legislation in the United Kingdom

Under the section of the Companies Act 1967 dealing with the margin of solvency for general business "an insurance company ... which carries on general business, shall be deemed .... to be unable to pay its debts if .... the value of its assets does not exceed the amount of its liabilities by .... the relevant amount ...." The relevant amount is 10 per cent of the previous year's premiums (net of reinsurance ceded) plus a further 10 per cent of the first £ 2,500,000 of such premiums. The minimum solvency margin for small concerns is £ 50,000.

Apart from the sundry creditors and debtors customarily appearing in an insurance concern's balance sheet, for the main part the liabilities referred to are the "technical reserves" in respect of claims outstanding, claims incurred but not reported, and unexpired risks (usually represented in whole or in part by unearned premiums); and the assets are the tangible assets in the form of cash, deposits, realizable investments, and money due from brokers and agents. If the policyholders' expectations are to be met, therefore, the margin of solvency must be sufficient to cover any fall in value

of the assets, any underestimation of the technical reserves, plus presumably any further losses in respect of new business and renewals before remedial action can be taken.

The Common Market approach

The Common Market countries are following a similar line in assessing the margin of solvency required for general business. The percentages currently favoured are a little different from the 20%/10% U.K. formula, and are applied to the year's gross premiums (or alternatively to the year's claims), but the approach is a similar pragmatic one to that currently in use in the U.K. For neither formula are the contingencies explicitly stated in which solvency is thought to be ensured with a given degree of probability. At one stage in the derivation of the Common Market formula a definition of its effectiveness in terms of three standard deviations above the mean cost of claims was attempted, but was subsequently abandoned.

Deficiencies of present formulae for solvency margins

It will be apparent that a scientifically assessed margin of solvency for any given concern should be tailored to cover random fluctuations in the frequency of claim and in the mean claim amount during the unexpired risk period (and during any subsequent period the solvency margin is intended to cover) and random fluctuations in the estimated amounts for which claims outstanding will ultimately be settled. Claims incurred but not reported can be bracketed with one of these main groups for practical convenience; as their number is not known, they are more akin to the reserve for unexpired risks. Thus the solvency margin should logically be calculated in two parts; one related to the reserve for claims outstanding, for which the number of claims is known but not the amounts for which they will be settled; and the other related to the period for which neither the number nor the amount of claims is known. The latter period would be typically 6 months if restricted to the unexpired risks, but 18 months if, say, one year's new business were also to be taken into account.

As regards the first part of such a calculation, the reserve for claims outstanding does not bear the same relationship to a year's premiums for all classes of insurance, or even for the same class of

insurance in all countries, so it would be fortuitous if the present formulae gave the same degree of safety for companies operating in different classes of insurance in different markets. As regards the second part of the calculation, relation to a year's premiums is not entirely unsuitable, but it is unlikely that the variations in claim frequency and amount are even approximately the same in all classes of insurance and in all markets, so it is far from certain that the percentage to be applied to a year's premiums (or claims) should be the same for all.

This is not to say that either of the formulae mentioned above is wholly unsuitable for the purpose to which it is put, or intended to be put. What it means in practice is that, instead of applying a formula with several parameters which produces for any given concern a known ruin probability of p per 1,000, we apply a single formula which gives a ruin probability ranging between extreme values of x per 1,000 for concerns selling insurance class A in country B and y per 1,000 for concerns selling insurance class C in country D. The extreme values x and y are, however, still unknown. The precise percentages adopted in the present formulae are not wholly arbitrary, but result from an empirical approach to the problem of solvency testing which, let it be said, is unlikely ever to be operated entirely by mechanical statistical methods. Nevertheless, there is scope for the pendulum to swing a very long way from the empirical towards the statistical so that supervisory authorities would know rather more than they do at present about the degree of safety implicit in their methods of supervision.

ASTIN and overall solvency

The mathematical studies published in the ASTIN Bulletin and elsewhere are generally written from the point of view of the insurer who alone can have access to all the data necessary for a full statistical treatment of the insurance operation, from risk selection and premium rating to overall solvency assessment. The supervisory authorities, on the other hand, see only the published documents plus such other material as is available to them on their visits to the concern. In the U.K. the supervisory authorities do *not* in the normal course visit the concern at all, but rely on the accounts, balance sheet and on certain new broad analyses of the

frequency of claim and the speed of settlement of claims. The hypothesis is that by examination of these statistics of a concern's insurance operations the authorities will be able to test solvency and to notice any concern which may be getting into difficulties before the situation has deteriorated too far.

There is a gap to be bridged between the very detailed theoretical statistical treatises which have characterised the ASTIN Bulletin, and the more superficial aggregate analyses on which supervisory authorities must work if they are to remain outside the operation of insurance business. The two are, of course, not in conflict in any way; indeed they are as complementary to one another as are the seen and unseen parts of an iceberg. Although they look at a concern's insurance operations from very different view points, the same concepts of stochastic variation of frequency and amount of claim are applicable, and the data to be recorded are basically the same.

The paper by Beard in Vol. V, Part II, of the Bulletin described how statistics of claim notification and settlement in motor vehicle insurance could be classified in order that the patterns disclosed could be used to indicate the technical reserves which should be held and the size of the additional safety margin necessary to ensure solvency with a given degree of probability. Similar classifications of numbers and amounts of claim by year of notification (or year of origin) and year of settlement for classes of insurance other than motor vehicle have not been available for examination, but they will be for U.K. concerns in future. It will take some time for patterns of settlement to emerge and for the extent of annual variations in frequency of claims to be measured but, as the new body of statistical information is built up, so the supervisory authorities will be in a better position to verify the reserves for outstanding claims and for unexpired risks estimated by the concerns themselves, and in a better position to judge whether the present formula for determining the solvency margin is good enough or whether it should be changed in some respect.

As mentioned earlier, insurance operations are in practice never so straightforward that routine mechanical statistical analyses can be applied which will determine the degree of solvency in great detail. Nevertheless, the position is not so hopeless as some observers make out when they say that, if the results are so variable from

year to year that the mean cannot be easily identified, then statistical methods are not suitable. On the contrary, the greater the variability in the results from year to year, the more important it is to record the statistics in order to find out as best we can the size of the risk that the concern will, one year, be ruined by an adverse fluctuation in experience, and to make sure that the concern holds adequate reserves to make this risk a minimal one.

The prognosis for the U.K. is that the extent of variations in the results for different classes of insurance in different markets will become better known in future and, what is more pertinent, the extent of the variations in the aggregate results for each concern whatever its size and the composition of its business. This should show how a suitable formula may be designed for assessing the solvency margin appropriate in any set of circumstances.

Assets

Usually little attention is paid to the assets side of the equation when solvency is being discussed, probably because it is less easy to determine for the assets than for the liabilities a scientific basis for assessing the size of possible fluctuations in value. Nevertheless, the matter can be discussed rationally if we consider the frequency with which it might be necessary to resort to the solvency margin to cover a fall in asset values, rather than the amount by which the value is likely to fall.

Suppose that, for a particular insurer, an addition to the technical reserves of a given percentage ensured that they would be adequate with the following degree of probability:

Addition	*Probability of adequacy*
18 per cent	999 years out of 1000
12 per cent	98 years out of 100
6 per cent	84 years out of 100

Suppose that this concern had free assets amounting to 18 per cent of its technical reserves. Then we know that in 98 years out of 100 the free reserves would also be adequate to cover a fall in the value of the assets of at least 6 per cent. The probability that the remaining 2 years out of 100 would be years in which the assets happened to be depreciated to such an extent as to render the

concern insolvent overall would be relatively small, so that the 18 per cent free reserves held would clearly provide a substantial guarantee against possible fluctuations both in the total cost of claims and in the value of the corresponding assets. Bearing in mind that part of the assets will be in a form not liable to a fall in market value, and that the solvency margin may be designed to cover a certain amount of new business as well as the technical reserves to which the assets correspond, it may be said that a solvency margin calculated to be adequate to cover all but the most extreme variations on the liabilities side simultaneously provides also a substantial safeguard against possible fluctuations in asset values. Looked at in this way, the problem of allowing for fluctuations in asset values becomes much more manageable than if treated in isolation. This is not to say that the answer will be the same for all countries, or even for all concerns in a given country, because the nature of the investment loss to be guarded against and the probability of its happening are likely to be different.

Conclusion

An insurance concern is considered to be solvent when the supervisory authorities of the countries in which it operates allow it to continue in operation. The authorities will satisfy themselves as to the values of the assets and liabilities, and make sure that the former exceeds the latter by a specified amount, usually a percentage of a year's premiums or claims. There is no logical scientific basis for the size of a solvency margin calculated in this way, nor are the contingencies explicitly stated in which solvency is considered to be ensured with a given degree of probability. The way to progress towards a more rational basis of solvency assessment is, it is suggested, by the full recording of data of the numbers and amounts of claims for each concern. The same data as are important to the concern itself for its detailed operations are, in the aggregate, significant in the assessment of its overall solvency. The concepts of stochastic variation of frequency and amount of claims, which are the basis of most detailed ASTIN studies, are equally applicable to the assessment of solvency in the aggregate, but their application can be more straightforward than lay readers of the ASTIN Bulletin might suppose.