A Practical Approach to the Dynamic Financial Control of a Non-Life Insurance Company

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Summary

The author explores a control mechanism for a non-life insurance company. Any discrepancies between assets and anticipated liabilities are compared to the standard deviation of the liabilities. Actuarial financial ratios are developed, and applied to asset switching problems. The method is consistent with the actuarial approach to profitability used in Life Assurance.

Résumé

Une Approche Pratique de Controle Financier Dynamique d'une Compagnie d'Assurance IARD

L'auteur explore un mécanisme de contrôle pour une compagnie d'assurance IARD. Tous les écarts entre les actifs et les engagements prévus sont comparés à l'écart type des engagements. Des rapports financiers actuariels sont développés et appliqués à des problèmes de changement d'actifs. La méthode est consistante avec l'approche actuarielle de la profitabilité utilisée dans l'assurance vie.

1. Introduction

1.1 In UK the legislation requires the Appointed Actuary to report on the "financial condition" of his life assurance company. The phrase is intended to cover the relationship between the assets and the liabilities and it has been interpreted as such by the profession and the authorities.

1.2 The idea is that the management should have as much commercial freedom as possible in a competitive market, whilst a continuous watch is kept on the safety of the policyholders. It is continuous because the company is required to be in a position where the Appointed Actuary could give his certificate at any point of time, not merely at the year end.

1.3 In non-life insurance in UK and in many other countries there is no requirement for actuarial certification but there are regulations concerning a solvency margin e.g. a requirement for a margin between assets and liabilities of 20 per cent of the premiums. This requirement is looked at once a year when the accounts are published. There is no requirement to look at the relative position of assets, although there are often restrictions on investment policy. In some countries there is also some control over premium rates; in UK there is no control other than market forces over premium rates.

2.   An Alternative Approach

2.1   The above method of control is extremely simple but is difficult to justify from any other point of view.   In this paper we describe another method which is also simple, but which can be regarded as a working approximation to the concepts which an actuary would expect to implement professionally.   Because it is an actuarial approach it has the advantage of being useful to management.   Because it is simple and actuarial it could usefully replace the present common method of statutory control described below.

2.2   Because this is being applied to a real (non-) live commercial situation there are some loose ends in the definitions and calculation method.   A discussion of these within management, and with the control authorities when the loose ends become important, is a necessary, realistic and enlightening part of the control strategy;   this is true for both the company management in its commercial activity and for the control authority.

2.3   We will first describe the method overall and then fill in the details.

Let A = the market value of the assets.
Let B = the "anticipated actual" value of the liabilities.

The "anticipated actual" value is a phrase which the author found was being used by some of the Lloyd's underwriters many years ago. It is intended to mean a "best estimate" or a statistical "expected value".

Let S = the standard deviation of L. (The author has found it easier to explain the "mean deviation".)

We calculate
$$N = (A-L)/S$$
as our first interesting measure. It represents the margin of free assets, measured as our unit the variability of the liabilities.

Let the market values of the various main categories of assets, bonds, common stock, property, etc. be A_1, A_2, etc.
$$A_1 + A_2 + ... etc = A.$$

Let us agree on margins M_1, M_2, ... etc to be deducted from A^1, A_2, ... respectively, according to category of asset, which are extremely high.

Let $B_1 = A_1 - M_1$, $B_2 = A_2 - M_2$, ... etc., i.e. the reduced value of the assets.

Let $B = B_1 + B_2 + ... etc.$, i.e. the reduced total value of the assets.

The idea is that B should be a rock bottom value of the assets. Then

$$R = (B - L)/S$$

is our second interesting measure. It represents the margin of free assets in a rock bottom asset situation, again measured using as our unit the variability of the liabilities.

On the assumption that the liabilities side of the company can make available the calculated value of L and S at every point in time, the investments side can be told to invest to the maximum return, provided they calculate R at every point and do not allow it to drop below a certain agreed minimum figure Z.

2.4   If R starts dropping towards Z then, either the investment side must alter its asset mix towards asset with lower margins M_1, ... etc, or the liabilities side must change its volume of business to reduce L, or its underwriting mix to reduce the standard deviation S by writing less variable business, or all actions need to be taken. In practice the first will be the quickest.

3.   Some Details

3.1   Let us consider some of the details.

3.2   The type of margins M_1, etc., which could be applied would
        be e.g. nil for secure deposits, 1/3rd for common stock, a
        yield increase of 4 per cent for government fixed interest
        stock, 5/6ths for property, etc.   Part of the margin is to
        allow for the natural delay in the investment department to
        sell on a falling market, remembering that the terms of
        reference relate to a rock bottom situation.

3.3   A question which is usually asked at this point is whether
        the margins still apply after the assets have dropped in
        value from their present position. The answer is "yes".

3.4   The sorts of values which the author has found in practice
        are:

        For a company which seemed overcapitalised, N = 13,
        R = 10.   For a company which was writing short-tail
        business and holding a conventional solvency margin of a
        typical ratio in the UK market, N = 12, R = 7.   For a non-
        UK motor company which everyone suspected was unsound,
        N = 1, R = 2 or worse, depending on how one interpreted
        the assets.

3.5   An interesting feature of the non-Uk motor company was that S/L, i.e. the relative variability of its liabilities, was larger net of reinsurance than gross.

4.   **Some Loose Ends**

4.1   We can recognise one loose end immediately. Insofar as the predictable cash flow from fixed interest government stock matches reasonably the expected future cash flow required to meet the liabilities, then the investment yield does not matter. This argues for discounted reserves (provisions) in non-life insurance so that the value of the liabilities should move in line with the value of the matching assets. (Most statutory authorities do not accept discounted reserves willingly; it is the tax authorities who want discounted reserves --- or none.)

4.2   Taking this point further, the method implies that there is an agreed asset position which matches the liabilities, towards which the investment department would move as the margins started to bite. In some classes of business, such as domestic property, this is probably true, but in other classes such as earthquake in Japan, it is not at all clear. Investment in Japanese property in areas subject to the earthquakes which are being covered would be perfect matching to ruin.

4.3   A discussion of what could be described as a reasonably matched position in practice would be interesting and useful, inside any particular company and in general. The recognition of the approach of any situation where the loose ends were becoming important, i.e. the measure R was moving towards rock bottom Z uncomfortably fast, would, in itself, concentrate the minds of management wonderfully. It is a subject which needs to be addressed by the actuarial profession if full professional certification is to be given. Some practical balance between commercial, supervisory and professional considerations needs to be found. It, too, will contain some loose ends but they should be smaller ones.

4.4   In one company the author was asked by a member of the board, "Why should I have to hold those margins when I can buy options to cover myself?" This question is left for the student with practical experience of using options available on the market on a continuing basis, and their cost!

4.5   We can point out at this stage that the argument has reached the stage where we are being forced to recognise that convenient phrases such as "the value of the liabilities" and "the value of the assets", are meaningless in themselves; it is only the interrelationship between them which has meaning. (It is like most definitions of risk in investment circles which ignore the liabilities).

5. Estimating The Liabilities

5.1   Within the occasion for which this paper is being written it is not necessary to describe in any great detail a method by which L and S can be calculated. Briefly, the author likes to use the loss ratio. Actuaries are rightly suspicious of the loss ratio as a measure in many circumstances, because the denominator is the premium. However, for this purpose we can summarise the insurance market as a self-regulating mechanism with feedback which prevents the loss ratio from going to zero or infinity, and tends to use the loss ratio as the criterion which it tries to keep within a relatively narrow band.

5.2   The mean and standard deviation of past (ultimate) loss ratios in each category of business can be used to estimate the monetary amount of the mean and standard deviation of each past cohort of business still on the books and running off. In practice it is good enough to assume that the ratio of standard deviation/mean is constant during the run off. It may not be as good an approximation near the end of the tail but then the absolute values are small. For present purposes it can be assumed that all cohorts in all categories of business are independent and variances can be added.

5.3   For some purpose it may be necessary to decide whether to
        accept the company's current estimate of its future
        liabilities or to base an estimate on the mean past loss
        ratio.

6.   **Profitability**

6.1   The use of the standard deviation as a measure of
        variability leads straight into applying the actuarial approach
        to profitability used in life assurance.   As a cohort of new
        business is written, the mean and standard deviation of the
        loss ratios of past cohorts of the same business can be used
        to allocate working solvency capital to that cohort.   In
        principle the opening capital allocation required is:

        K = premium * (mean + h * SD) of past loss ratios-
        (Premium - expenses)

        where h is a cautious number agreed professionally as a
        compromise between commercial considerations and the
        safety of the policyholders.   That is a loose end in the field
        of non-life insurance.

6.2   The opening fund, formed by the sum of the premium net of
        expenses and the allocated capital K, can be carried forward
        with investment interest and gain.   At each stage in the run

off, solvency capital retained for the cohort can be calculated as a constant percentage of the estimated value of the future run-off; the constant will be the same as is used at the beginning of the cohort. The estimated value of the future run-off plus the retained solvency capital form the actuarial reserve, in the traditional sense, at each point in the run-off for that cohort. Any excess of the fund carried forward over the actuarial reserve, i.e. the surplus at that point, can be released to serve as solvency capital for new cohorts of business.

6.3   The cash flow over the period of the run-off of a cohort, formed by the allocation of initial solvency capital K, the income and gains from investment, and the release of surpluses, can be valued at a shareholders' desired risk rate of return. The internal rate of return can also be calculated from a discounted cash flow calculation. Either of these can be used as a measure of profitability both before business is written and during its run-off, and management action can influence the mix of business being written or the terms on which it is being written.

7. Conclusion

7.1   The approach outlined above is fairly simple to implement and to understand by management. It approximates to the concepts which should be used, and would be used in any more sophisticated method with the same aims. It requires management to pay attention to certain criteria over which they have control, expressed in terms which relate to their on-going commercial decisions. Furthermore, when situations start to develop where the approximations and loose ends may become important, then "they" deserve further investigation. "They" applies to the "situation" before the "approximations and loose ends".