ASIR — A User's View

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1. Introduction

1.1. The starting premise of this presentation is that direct insurers accept the need for a model of some type or other to help them make decisions which affect the course of their business. It is possible of course that these decisions are negative ones of no action. The potential applications for such decision support models have been amply described by Mr. Galitz. There is a wide potential range of applications and different users or potential users of ASIR will have different priorities. However, as with a lot of planning in the insurance world there is a process of adaptive control at work and the use to which such models as ASIR are put will vary with experience and the passage of time.

1.2. ASIR is a tool which supports the decision process. There are other or similar tools which could provide support and the thrust of this paper is that the flexibility offered by ASIR makes it more comprehensive than these other models and that it is in the interest of the industry to have a generally accepted model of this nature as a means of communication for the encouragement of a healthy operating environment.

2. Design and purpose of the model

2.1. Decision support models can vary from traditional back of the envelope type calculations to computer models of varying degrees of sophistication.

The insurer is concerned with how a course of action may affect the shape of the emerging accounts, and his model should be designed to this end. Three of the problems which will be met are :

- i) getting a consistent and realistic set of assumptions ;
- ii) the actual arithmetic of a complex series of inter-actions ;
- iii) allowing in an appropriate manner for the randomness of the insurance process.

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2.2. Covering the first of these problems, ASIR goes some way towards facilitating mutually consistent assumptions, but still leaves a large area open for the model user to research and check. In particular ASIR has not been designed to take into account the competitive market aspects of insurance. As a company puts in promotional effort or reduces, in relative terms, its premium rates, that company writes a greater volume of business. There are models which, at least in theory, can indicate market size and variation in market share resulting from pricing and promotional decisions by a company and its competitors. ASIR is not such a model, but it can be considered as complementary. It has to rely on input which anticipates or utilises the result of a marketing model. However, it may be possible to make ASIR work in reverse, so that the results of using ASIR indicate the change in market share required for a suggested decision to be worthwhile.

2.3. The second and third points may be considered using the concepts as described by Mr. Galitz.

2.4. Accounting or empirical :

An accounting model, depending as it does on factual relationships, can be more easily accepted by management and better understood. However it can be no better than the data which is fed in. Getting sufficiently good data is a crucial area of concern.

2.5. Descriptive or optimising :

In terms of acceptance and credibility, there is little to be said in favour of an optimising model. Certainly not before a thorough understanding of a descriptive model exists.

2.6. Deterministic or stochastic :

This can hardly be divorced from the simple v/complex issue.

- i) A deterministic model is essential to get a perspective of the accounts if the expected happens. One has to chart the waters linking profitability, solvency, growth, reserving basis, dividend policy and capital requirement before looking at the effect of waves in the water.
- ii) The results of a single-shot simulation require interpretation in terms of departure from the expected.
- iii) Running a model in deterministic mode can help establish confidence in the results.
- iv) Choice is not really between deterministic or stochastic, it should be between deterministic or deterministic and stochastic.

ASIR, through its zero variance option, can provide this for output in both deterministic and stochastic mode.

2.7. Simple or complex

This can in many ways be regarded as the major question underlying the construction of any model and relates to the volume of data required and the number of relationships to be defined, not to the method of capturing the data. The sheer length of the list of questions asked in setting up ASIR might be considered initially off-putting. A simple model can often be unrealistic. In such cases it can always be shown

that there is an underlying assumption which is not valid, and the effects of these underlying invalidities are significant. However simple models can be realistic where the underlying invalidities do not produce a significant distortion in the results. Having said this, it may be difficult to determine what the underlying assumptions are as they are often not explicit. These simple models are useful both in the communication of concepts and in the time spent in designing a model. As in the deterministic or stochastic issue, simple and complex models can feed off each other. A simple model can be used as a more comprehensible tool of communication, but the extent of its validity requires checking from time to time by using the more complex model.

3. Development from a simple model

3.1. In its simplest form, a direct insurer can look at financial aspects of its operation by using back of the envelope type calculations using as a basis a model of the following shape :

Underwriting profit

- + Investment income on technical reserves
- + Investment income on free reserves
- Tax
- = Net operating profit
- Dividends
- = Retained profit
- + Free Reserve at start of period
- = Free Reserves at end of period

3.2. One starts by defining a number of rules of thumb linking these items and turnover, i.e. written premiums.

For instance :

- underwriting profit could be set as a percentage of premiums ;
- technical reserves could be set as a constant proportion of premiums, and the investment return thereon could be a specified percentage.

3.3. A typical series of inputs for such a model would be :

- i) initial premium and premium growth rates ;
- ii) a profit margin ;
- iii) initial solvency ratio ;
- iv) an investment rate of return ;
- v) a technical reserves to premium ratio ;
- vi) a tax rate ;
- vii) a dividend distribution percentage (of premiums or of free reserves).

3.4. One can then explore the effects of different growth patterns, profit margins, etc., on solvency, or of different solvency margins on growth.

Repetition of calculations of this type soon gets a bit tedious. One soon gets to the stage where a simple program on a programmable calculator, or a micro is written to reduce the tedium. The Visicalc type software package available on many micros might be of substantial help in this area. However the model, even though it may be on a computer, is still no more than a back of the envelope type calculation.

3.5. The next stage is to start exploring some of the rules of thumb, which may not be valid and could introduce significant error into the results. For instance, the assumption that technical reserves are proportional to premiums may be considered as too sweeping an assumption. A more suitable formula could be established using a claim run-off pattern and inflation rates. The simplicity of the back of the envelope type calculations evaporates as the assumptions are refined. The envelope back disappears, and a micro or equivalent is essential.

3.6. Still in a deterministic mode, an insurer could introduce the following refinements :

- i) the introduction of a few of the major time lags in addition to the lag between occurrence and payment of a claim ;
- ii) a split of underwriting profit into its constituent parts. One such method requires the input of claim ratios and expense ratios ;
- iii) a further split of claim ratios into average exposures, claim frequency and average amounts ;
- iv) a further split of expense ratios between fixed costs and those variable and related to exposure and claims ;
- v) refinement of the investment assumptions with a choice of investments with different yields and a choice of decision rule for investment of fresh monies (It may be noted that rules which require constant portfolio mixes often prove to be one of the more awkward practical assumptions to be built into a model).

By the time these refinements have been built into the model, we are out of the realms of Visicalc. We are still within the realm of the micro, but the effort of program writing is beginning to be consumptive of time.

3.7. The model developed so far can be used to demonstrate a number of features and relationships. It requires a fair volume of input but is still a long way from producing results that look like a specific direct insurers portfolio. Models on the lines described above produce generalisations only. The model so far described is thus still some way from a representation of a particular insurer.

3.8. In particular the model described above makes no allowance for reinsurance. Reinsurance can be considered as a partial alternative to capital, with the greater the effective reinsurance protection the smaller the free reserves. It is at this stage, when the modeller is concerned with resources or with reinsurance that, apart from quota share reinsurance, a model has to be switched into stochastic mode. The model then makes some allowance for the risk nature of the insurance process and for demonstrations of the potential variance about the expected.

3.9. To provide a stochastic mode for the model, the modeller has to introduce a statistical probability distribution for the claim process. This could apply to claim

ratios, claim frequencies or claim amounts. In each instance, the choice of a suitable function which adequately describes the pattern of potential variation about the expected value is one of the more delicate and time consuming areas of modelling work. Moreover it is an area where the data available for describing distributions is less than voluminous. A number of possible functions to describe these patterns have been suggested and the ASIR program gives the user a choice of various functions. A model along similar lines could still be set up on a micro, but at this stage a company requires to be more than a little conversant with statistical techniques.

3.10. Using micros in this fashion can duplicate ASIR up to a point. After that point there is a danger of reinventing the wheel and, in fact, ending up with a model remarkably similar to ASIR. Up to a certain point, it is possible to argue that a company should set up and write its own program for a model which can concentrate on issues of specific interest to that company. One result or by-product of this process may be that, in the building of the model, consultations or discussions take place within the company. As a result of this process of consultation and involvement, both management and the model builder may know what the model is about and can interpret the results of the model runs, which possibly reflect quirks of the models rather than reality.

4. Application of ASIR

4.1. The modelling process described above takes time and money and an expertise which is not always available. At the end of the day such a model may still not adequately take into account features such as :

- i) reinsurance, where there is not only the complexity of wanting a number of simulations in a stochastic mode but also of inputting and investigating the effects of a variety of reinsurance arrangements. These arrangements may consist of several treaties operating simultaneously, with retention of deposits and stability clauses further adding to the complexity, or
- ii) the situation where a direct insurer in practice transacts business in a number of risk groups each with different risk characteristics but which may be viewed in aggregate and subject to common reinsurance arrangements, or
- iii) the situation where a direct insurer may operate in different territories, again possibly subject to common reinsurance arrangements but with the added complexity of exchange profits and asset mis-matches, or
- iv) the situation where a direct insurer may be part of a group with common reinsurance or with "internal reinsurance arrangements" helping to produce a more accountable definition of profit for each profit centre.

4.2. These points bring out a major feature of ASIR in its ability to present a consolidated picture. It may be possible to tailor ones own programs to model a particular problem in a particular class. Building a suite of programs which starts to consolidate individual tailor made programs can get very time consuming. ASIR allows

for the consolidation and hopefully does not unnecessarily restrict investigations based on sub-models.

4.3. Bearing in mind that a model must be seen to be credible and that its credibility can best be recognised in the first place by showing results that are readily accepted and can be explained from first principles, a sensible way into the dual simple model / complex model described earlier would be to set up a model deliberately kept as simple as possible, e.g. a model for one company and one risk group.

4.4. Mr. Galitz has previously stated that the ASIR-userinterface is “user friendly”, and indeed it is, provided there has been sufficient advance preparation of the data. As always, collection of suitable data is a major problem.

4.5. Looking at this simple one company one risk group ASIR model, the sort of simplifying assumptions that one begins with are to assume that most time lags are zero, that expenses are a fixed proportion of premium income and that investments are on deposit. This would leave the researcher free to look at, for instance, the following features :

- i) the claim process ;
- ii) the implied premium rating decision ;
- iii) the effect of reinsurance ;
- iv) the initial model conditions.

4.6. The data required for the claim process requires a split of the group claims into large claims and small claims, quoting a mean and standard deviation for both. To most direct insurers this splitting of claims is not a natural process and raises such questions as the choice of a dividing point between large and small. A model which depends on such “ obscure ” parameters might face a credibility gap in its acceptance, even if in statistical terms the results are acceptable. However, this verification process itself may take some considerable time. For this reason it was suggested that insurers might find input parameters which reflected more readily available and understandable data such as an actual banded distribution of claim payment amount. This innovation has just been introduced and, together with the other innovations, should make ASIR a more obvious, and therefore more credible, tool.

4.7. The implied premium rating decision is one area where management can take a positive decision which changes the shape of the accounts. Given that the model is “ driven ” by claims and expense patterns which, apart from commission and similar items, are not derived from premiums, ASIR allows the researcher to follow through various rules. At the moment these rules are a choice between premium increasing at a rate derived from the inflation rate for the last three years or on an experience rating basis. Some offices might feel that they would like to see further options, such as premium dependent on expectations of inflation.

4.8. The appropriateness of any model to explore the effect of reinsurance is restricted in one way or another. At one extreme a model could be set up based on individual policies and claims generated on a random basis for each risk. However, the expense of this and the problems of choosing appropriate risk parameters put some

large question marks around this procedure. On the other hand, too simple a model will not provide an adequate representation of the reinsurance process. ASIR steers a middle course. There is little problem in modelling quota share arrangements. Excess of loss on any one risk and stop losses can also be handled adequately. Catastrophe excess of loss may also be brought into ASIR but this would involve some manoeuvring and requires further research. There is provision for surplus arrangements, but as always this is the most awkward of all reinsurances to model. Further research is required in this area to see how easily the model can accommodate the arrangements that are found in practice, in particular, one has to consider the introduction of tables of limits, bandings of sum insured and distributions of claims amounts by sum insured. On the other hand it may be possible to use ASIR in its current form to give equivalent results.

4.9. The benefits of ASIR and similar models are increased if a balance sheet can be produced by the model which bears a resemblance to an insurer's actual balance sheet. An insurer's claim reserves are a function of business volumes and mixes written in previous years. The first field test version of ASIR made no allowance for the input of a specific starting reserve with specified run off. Instead it produced a result which had to be interpreted with care until the initial distortion had disappeared or the starting figures had been fiddled to give a realistic starting point. The version of ASIR which has just been introduced has changed the initialisation procedure and the result should be the facility for an insurer to set up balance sheet positions which are more recognisably its own.

5. Conclusion

5.1. ASIR has reached a stage in its development where it may be of use to insurers in respect of the various sub-models contained therein and the possibility of consolidating sub-models and different risk categories. However, the maximum benefits of a model of this sort can be secured once it has gained a more universal acceptance of what it can do and what it can't do. Gaining acceptance for a model of this complexity must itself be a long drawn out procedure. There is a natural reluctance of any user to have complete confidence either in the model, or to correctly interpret the model, unless he thoroughly understands the model. If the user has not built the model, then he must test it and keep on testing as he uses different features. The problem is that this testing procedure costs, both in terms of time and money. I would suggest that there are areas where there is common ground for research of ASIR between companies. This is a slightly different statement than saying that insurers will tend to use ASIR in the same way, for I believe that discussions with insurers have shown that this is not so. It is saying that companies have common problems in getting data on to ASIR and gaining acceptance for ASIR as a practical and economically efficient tool.

5.2. It is in this area that there can be common research with insurers sharing results. There is good reason for companies to share in the results in that a sufficiently accurate representation of the workings of an insurance company will provide a more

effective means of communicating the risk aspects of insurance than are available at present, and that this may help insurers or regulators to do things that are sensible.

5.3. There are several possibilities to achieve this common ground. One possibility is to have funded research into the practical problems of getting live data into a suitable format for ASIR and testing that in turn ASIR produces a suitable representation of this data. This research would need to be undertaken or controlled by insurers who would be close to the data sources and could direct the research to practical ends. In this respect the insurers could be based in a number of different territories or, for administrative convenience, be based in one territory. Another possibility, which can be complementary as well as an alternative, is to form an ASIR users group as both a discussion forum and a clearing house to prevent unnecessary duplication of effort.

5.4. Possible areas for research of this nature would include :

- i) a description of the routine necessary for extracting data relating to a given risk group and the steps necessary to test that it is accurately represented by the model ;
- ii) the way in which such a routine might be varied to fit the different characteristics of risk groups ;
- iii) the possibility of building up a library of files for common use. Even if a company may have slightly different parameters than those on a common file, it may be more efficient to edit an existing file or to undertake initial research using such common files as first approximations ;
- iv) research into aspects of the model which require some further development, such as its treatment of surplus reinsurance ;
- v) the possibility of improving the efficiency of the model or to reduce the cost, e.g. of a large number of simulation runs.

The idea of a library of files is not too far removed from the concept of standard tables in life insurance. A company may have strong or light mortality, but the existence of a standard reference provides a base for the modelling process. I believe that the industry has much to gain by a move in this direction.