National Accounts

HANDLING DISASTER INSURANCE IN THE NATIONAL ACCOUNTS

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HANDLING DISASTER INSURANCE IN THE NATIONAL ACCOUNTS

Introduction

1. Whilst the SNA93 has an annex devoted to the treatment of the flows between insurance companies and policyholders, it is recognised that the treatment could be developed further, particularly when applied to catastrophe insurance. Catastrophe risk is non-life, mainly property, characterised as being low probability but bringing large, potentially huge, losses. Natural disasters are the typical example, but multiple large aviation/marine losses in a short period could be considered catastrophic. Such huge “one-off” losses are not restricted to the property market either – the massive workers’ compensation claims paid following US court rulings on asbestosis liability in the 1980s, and similarly on environmental clean-up, are some of the more well-known examples of casualty mega-losses.

2. For several European NSOs this is a particularly pertinent topic following the extensive property damage caused by the winter storms of 1999/2000, but such mega-losses are sufficiently frequent in a global context to merit the development of specific national accounting guidelines.

3. The main problems faced by national accountants in recording the flows for catastrophe insurance are caused by issues of timing. Catastrophe business is medium to long term not annual – years of big losses are subsidised by other years, i.e. insurers and reinsurers use ‘catch-up’ years to re-establish reserves in preparation for the next catastrophe. So, the basic requirement of insurance that claims can be met from premium income and investment income will be satisfied, but only in a multi-year context – on an annual basis there will be years when claims paid exceed premium income for the year. This is the very nature of catastrophe business – the relationship between premiums and claims would never be expected to be stable from year to year.

4. The SNA treatment of insurance is not well suited to such lumpiness in claims (and underwriting profit) – the calculation of non-life insurance output as the balance of premiums plus premium supplement less claims, leads to negative output in heavy catastrophe years, and possibly overstated output in catch-up years.

5. This paper starts by reviewing the SNA treatment of non-life insurance in the context of catastrophe insurance. It then explores how the insurance industry deals with the uncertainty and lumpiness of catastrophe business, with particular reference to reinsurance and technical reserves, before comparing some of the industry’s own observations about the nature of insurance services with those of the SNA. Finally, the development of ‘alternative risk transfer’ products, in particular catastrophe securities, is raised.

6. While the paper does not provide solutions to the problems in this area, it may provide some insights into the industry which could be useful introductory material for further research. Other recent work in this area includes a workshop at the Brookings Institute on ‘measuring the price and output of

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1 This paper has benefitted from discussions with John Walton.
insurance’ (April 1998), a Eurostat task force looking at ‘price and volume measures for financial intermediation’ (reported in June 2000) and a paper from the Australian Bureau of Statistics on ‘the measurement of non-life insurance output in the Australian national accounts’ at the 1999 OECD National Accounts Meeting (September 1999). The last paper addressed the problems posed by catastrophe losses in particular.

The SNA93 treatment of non-life insurance

7. The SNA93 explains – ‘Typically, insurance enterprises do not make a separate charge for the service of arranging the financial protection or security which insurance is intended to provide. Whenever insurance enterprises do make explicit charges to their policyholders or others, these are treated as payments for services rendered in the normal way. For those services for which no explicit charges are made the value of the services they provide has to be estimated indirectly, however, from the total receivables and payables of insurance enterprises, including the income accruing from the investment of their reserves’.

8. Thus the output of insurance activity, which represents the service provided to policyholders, is calculated separately for life and non-life insurance as:

\[
\text{total actual premiums or contributions earned;}
\]

\[\text{plus }\]

\[
\text{total premium or contribution supplements, i.e. income from investment of insurance technical reserves;}
\]

\[\text{less }\]

\[
\text{claims or benefits due, i.e. claims payable during the period plus changes in reserves against outstanding claims;}
\]

\[\text{less }\]

\[
\text{increases (plus decreases) in actuarial reserves and reserves for with-profits insurance. Most of these reserves relate to life insurance but they may be needed in the case of non-life insurance when claims are paid out as annuities instead of lump sums.}
\]

9. However, since the SNA93 treats actuarial reserves and reserves for with-profits insurance as applicable to life insurance only, the calculation may be simplified in the case of non-life insurance to:

\[
\text{premiums earned}
\]

\[\text{plus }\]

\[
\text{premium supplements}
\]

\[\text{less }\]

\[
\text{claims due}
\]

10. When applied to catastrophe insurance this formulation leads to negative output in heavy loss years, and possibly overstated service values in other years (reflecting catch-up to maintain the balance of net premiums = claims, over the long-term). But, unless the insurance service can be clearly defined, and a market value attached to it, there seems to be little alternative than to develop an improved indirect measure (the question of defining insurance services is discussed later). The Australian approach to

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2 SNA93 - 6.136
3 SNA93 - 6.138, and Annex IV, para. 18
4 SNA93 – 6.138d, and Annex IV, para. 16
5 Except for non-life insurance when claims are paid out as annuities instead of lump sums - SNA93 – 6.138d
6 The measurement of non-life insurance output in the Australian national accounts - Australian Bureau of Statistics - OECD National Accounts Meeting - September 1999

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improving the SNA93 approach in order to avoid negative output is to smooth claims using a five year\(^7\) moving average, thus removing the peaks of large loss years and partially redistributing them across other years. This will inevitably lead to more stable measures of output from year to year, but a consequence of the Australian approach is that gross operating surplus will also be smoothed and will show little relationship to underwriting profit in heavy loss years. One possibility raised at last year’s national accounts meeting when the ABS paper was discussed was to split insurance into catastrophic and regular(non-catastrophic) parts. The regular insurance business would remain in the current accounts with net premiums equal to claims on a year by year basis. The catastrophic insurance might be moved to the capital account and the requirement for annual equality of premiums and claims relaxed.

11. It might be interesting to note that in calculating weights based on household expenditure for the EU harmonised CPIs\(^8\), ‘the weight for insurance should relate to an average expenditure of three to five years. This should lead to better and more stable estimates of the service charge and minimise the risk of negative weights’.

12. A second SNA consequence of the lumpiness of catastrophe claims is that the equality of current transfers of net\(^9\) premiums and claims is not realistic – in catastrophe years claims will be significantly larger than net premiums, but net premiums will be larger in catch-up years. Note that the Australian approach does produce inequality between net premiums and claims since it is actual (unsmoothed) claims which are recorded as current transfers.

**Catastrophe cover**

13. Catastrophes bring huge losses because of the numbers of policyholders affected – catastrophes result in huge increases in the number of claims made to direct insurers. Thus direct insurers protect themselves against mega-losses by a combination of buying reinsurance and by maintaining technical reserves. Annex I gives some background information about the catastrophe insurance market with particular reference to Lloyd’s of London.

**Reinsurance**

14. Reinsurance is the shifting of part or all of the insurance originally written by one insurer to another insurer. Reinsurance is used for several reasons, the most important being:

- to increase underwriting capacity, i.e. to allow a wider spread
- to stabilise profits
- to reduce the level of unearned premium reserve required by law and temporarily raise the policyholders’ surplus, allowing the insurer to write more business
- to provide catastrophe protection

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\(^7\) Ensuring negative output does not result from the calculations is a prime determinant of the length of the moving average chosen.

\(^8\) *The treatment of insurance in the HICP* – paper by Eurostat at the Brookings Institute workshop on measuring insurance output and prices – April 1998

\(^9\) Note that the use of the term ‘net premiums’ might be confused with the industry’s use of ‘net premium income’ to mean net of reinsurance premiums paid out.
15. So, although reinsurance is a vital element of catastrophe protection it is used for other reasons, and for single huge risks (space exploration, liability exposures, industrial/energy risks, etc.). Catastrophe reinsurance generally takes the form of policies which pay out once losses reach a certain level and stop before another threshold or pay a proportion of all losses.

**Technical reserves**

16. Technical provisions, or reserves, are amounts which must be adequate to meet fully the commitments of the insurer to policyholders. They are treated as liabilities of the insurer and assets of the policyholders. For non-life business the technical reserves are comprised of provisions for:

- unearned premiums
- unexpired risks
- claims equalisation
- outstanding claims, including claims incurred but not reported (IBNR)

17. The unearned premium reserve is a liability reserve representing the unearned portion of gross premiums on all outstanding policies at the time of valuation. It is only after policies expire that a premium is fully earned. The SNA discusses the prepayment of premiums in terms of the fact that the policy period does not usually coincide with the accounting period – therefore, at the end of the accounting period, parts of the premiums paid, and thus appearing in the balance sheet, are in fact intended to cover exposure in the subsequent period premiums earned [are] those parts of the premiums that are paid in the current period or the preceding period and that are intended to cover risks outstanding during the current period).

18. For most classes of non-life business it is true that risks do remain outstanding only as far as the following period. But for some classes such as casualty business written on a losses occurring basis, the insurer remains exposed to risk for many years after the policy has expired. In theory, the policyholder continues to receive a service and a portion of the premium remains unearned until all of the risk has expired, but it can be very difficult to assign ratios of earned to unearned premiums for these policies over such a long period. As a result, companies usually deal with unexpired risk in one of two ways – any provision for unexpired risk may be simply included in the unearned premium reserve, or a separate reserve for unexpired risk may be identified (where ‘unexpired’ refers to a period longer than the average policy period).

19. A somewhat different timing issue is presented by some ‘long-tail’ business such as the US casualty (workers’ compensation) policies written on a ‘losses occurring’ basis in the 1960s which gave rise to the huge asbestosis losses of the 1980s. Losses occurring means that the event takes place within the policy period, but there is no restriction on when the claim is made. In the case of asbestosis, people who had worked with asbestos in the 1960s started to file claims in the 1970s and 1980s when the disease manifested itself. The courts ruled that the event triggering liability was the original exposure to asbestos, and that the insurers in the 1960s were liable, not those providing workers’ compensation (employers’ liability) cover at the date of manifestation. Such business is now more often written on a

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11 SNA93 – 11.97
12 The insurer is liable where an event (loss) has occurred during the policy period (e.g. exposure to asbestos) but remains unobserved until a later date (manifestation of asbestosis).
‘claims made’ basis, i.e. the insurer is liable for claims made during the policy period, so that the business is extremely short-tail.

20. However, the SNA93\textsuperscript{13} states that ‘valid claims accepted by insurance enterprises are considered due for payment when the eventuality or accident that gives rise to the claim occurs – however long it takes to settle disputed claims’. Thus SNA93\textsuperscript{14} does not appear to recognise the possibility of non-life risk being unexpired over more than a single period, and does not explicitly include provision for unexpired risk in the technical reserves for non-life insurance. Does this imply that national accounts for the 1960s should be revised in the light of asbestosis losses?

21. Another item not explicitly mentioned in the SNA is the equalisation provision. These are amounts set aside in compliance with legal or administrative requirements\textsuperscript{15} to equalise fluctuations in loss ratios in future years, or to provide for special risks. These would be particularly relevant in connection with catastrophe business. The OECD review of country accounting practices (admittedly produced in 1988), suggested that five OECD countries required reporting of equalisation reserves, but that eight countries also reported separate reserves for disasters/large risks.

22. Reserves for claims outstanding cover the total estimated ultimate cost to an insurer of settling all claims arising from events which have occurred, whether reported or not (i.e., including estimates for losses incurred but not reported – IBNR), less amounts already paid in respect of such claims. Reserves for IBNR are sometimes identified separately, but the SNA does not explicitly include IBNR – ‘reserves against outstanding claims are reserves that insurance enterprises hold in order to cover the amounts they expect to pay out in respect of claims that are not yet settled or claims that may be disputed’\textsuperscript{16}, and ‘the present value of the amounts expected to be paid out in settlement of claims, including disputed claims’.

**Defining insurance services**

23. In its Manual for Insurance Service Statistics, Eurostat states that ‘output (otherwise known as the service charge) is the amount earned by the insurance enterprise, after discharging its obligations to policyholders, which is available to meet its labour and other operating costs, and to provide a profit (operating surplus)’\textsuperscript{18}.

24. The SNA suggests that the value of insurance services need to be estimated indirectly, from the total receivables and payables of insurance enterprises, including the income accruing from the investment of their reserves, but says that ‘the essential function of non-life insurance is to redistribute resources’. In other words insurance companies are viewed as financial intermediaries – accepting premiums, pooling them, investing them, and organising payment to claimants. The companies are seen as managing a fund of pooled premiums on behalf of the policy-holders, and for this reason investment income is recorded as property income for policy-holders. Insurers provide the service of

\textsuperscript{13} SNA93 – 6.138c, and 11.98

\textsuperscript{14} SNA93 – 11.89


\textsuperscript{16} SNA93 – 11.98

\textsuperscript{17} SNA93 – 13.80


\textsuperscript{19} SNA93 – 8.87
maintaining the level of the fund by ensuring that both premium and investment income adequately compensate for payments of claims, which involves:

- Forecasting future claims
- Setting premium rates appropriately
- Making investment decisions, and managing the investments
- Assessing and settling claims
- Administering all policy details

25. In its report on the recording of operating results, the OECD suggests that ‘two activities of insurance companies can be distinguished, namely the insurance activity as such and the management of an investment portfolio derived from the investment of premiums and other income held to meet liabilities to policyholders. In many OECD countries the results of the two activities are separately disclosed to enable the user of the financial statements to assess the company’s performance for each activity’. The nature of ‘the insurance activity as such’ is not discussed.

26. A textbook definition of insurance goes further by describing insurance services as ‘the pooling of fortuitous losses by transfer of such risks to insurers who agree to indemnify insureds for such losses, to provide other pecuniary benefits on their occurrence, or to render services connected with the risk. Pooling…is the spreading of losses incurred by the few over the entire group, so that in the process, average loss is substituted for actual loss. …The use of commercial insurance in a risk management program has certain advantages:

- the firm will be indemnified after a loss occurs
- uncertainty is reduced which permits the firm to lengthen its planning horizon….
- insurers can provide valuable risk management services, such as loss control services, exposure analysis to identify loss exposures, and claims adjusting….
- insurance premiums are income-tax deductible as a business expense’.

27. The inference being that businesses view insurance and reinsurance (for insurance businesses) as methods for managing risk – they are risk reduction, or risk transfer, tools – alternatives to the cost of debt. Annex II gives examples of the industry’s view of the service provided.

28. While not suggesting that the SNA should acknowledge all the aspects of risk management suggested above and in Annex II, perhaps it should go further in recognising some of the aspects of insurance that distinguish it from other forms of financial intermediation, e.g. the provision of services of risk management, rate setting, investment of the reserves, etc.

The future

29. Many of the largest multinational (non-financial) corporations have replaced, to some extent, traditional insurance coverage with self-financed cover. A large proportion of these probably perform this self-insurance via a captive insurance company, many of which are located in the US and Bermuda. Similarly, many insurance companies believe the future lies in the development of non-

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traditional financial insurance, which bridges the gap between insurance (or reinsurance) and the capital markets\textsuperscript{23}. There has been a growth in the use of financial derivatives as well as a convergence and blending with insurance derivatives (securitisation) and financial insurance (insuratisation). In addition to insurance and reinsurance, these tools are being used in an integrated approach to “enterprise risk management”.

30. Turning to catastrophe risks specifically, following the big catastrophe losses in the early 90s, insurers looked to the capital markets to spread risk. Catastrophes can bankrupt whole groups of insurers, but the capital markets are big enough to absorb even the largest losses. Hence the development of insurance-risk securities such as:

- catastrophe (cat) event bonds – the investor puts up an amount at the beginning of the period, relative to their exposure, which is invested in a safe account. The ‘insured’ pays a reinsurance premium which is also invested in the safe account. Should a loss occur, the investor must pay out of the funds in the safe account, including principal. Anything remaining in the fund become the property of the investor at the end of the period. Catastrophe bonds have higher yields than ordinary bonds, but investors lose all or part of the principal in the event of loss.

- catastrophe equity put options (CatEputs) – derivatives giving the insured the right to sell new shares at a fixed price, which the investor promises to buy in the event of a catastrophe, i.e. contingent equity.

And:

- contingent (debt) surplus notes – investors agree to accept the surplus notes when a catastrophe occurs, and the issuer (‘insured’) then repays according to a fixed schedule. This is not a form of risk transfer however, but a way of acquiring funds that may be treated as capital for regulatory purposes.

31. These products look like financial instruments to investors and reinsurance contracts to insurance companies. Investors can invest directly and solely in insurance risk without becoming an insurance company. But the idea that insurance risk might be an asset class could be difficult to accept.

32. Catastrophe securities are currently fairly unimportant ($2bn issued in 1998, $1bn in 1999), but this is partly due to excess capacity in the insurance market resulting in low prices which are unattractive for securities investors. But, catastrophe securities could become much more important in a harder market.

33. How should they be treated in the SNA?

Conclusions and questions for discussion

34. The main problems faced by national accountants in recording the flows for catastrophe insurance are caused by issues of timing. Catastrophe business is medium to long term not annual – the relationship between premiums and claims would never be expected to be stable from year to year. The SNA treatment of insurance is not well suited to such lumpiness in claims (and underwriting profit) – the

\textsuperscript{23} White Papers by Guy Carpenter (subsidiary of Marsh and McLennan Companies) at www.guycarp.com:


The evolving market for catastrophic event risk – August 1998
calculation of non-life insurance output as the balance of premiums plus premium supplement less claims, makes it difficult to calculate output in heavy catastrophe years, and possibly overstated output in catch-up years.

35. There are probably several avenues of investigation to explore. Firstly, assuming it is agreed that the SNA93 output algorithm needs improving in the case of non-life insurance:

- the Australian approach of smoothing claims could be tested with data from other countries, with particular attention to the effects on GOS when compared with published underwriting results, and net premiums and claims
- would it be possible, or useful, to treat catastrophe insurance/losses in a different way to other insurance, and if so how would ‘catastrophe’ be defined for this purpose?
- would it help to broaden the definition of the insurance service by approaching it from the angle of the underwriter (as well as from the view of the policyholder)? i.e. to consider the processes involved in the management of risk – setting premium rates, buying reinsurance or using non-traditional financial insurance, managing the levels of technical reserves (perhaps this could be viewed as a form of self-reinsurance), etc. as well as considering the services which are more obvious to policyholders.
- perhaps the amounts of reinsurance being bought, or the changes in technical reserves (such as equalisation reserves) should form part of the output algorithm? Including changes in technical reserves would bring the non-life algorithm more in line with life, where changes in actuarial reserves are included in the calculation of output. John Walton has started to develop this idea with reference to Eurostat’s accounting recommendations.
- should the SNA93 output algorithm explicitly refer to the treatment of reserves for unexpired risks, IBNR and equalisation (these are likely to be more important in catastrophe insurance than in other non-life areas)?

36. Some more general questions about the treatment of non-life insurance in the SNA:

- should previous years’ accounts be revised to include losses on long-tail casualty contracts written at the time?
- should net premiums, and claims, be recorded as capital transfers in the case of marine, aviation and commercial property? Again, this is an idea currently being considered by both John Walton and Anne Harrison. Are there arguments for treating net premiums and claims as financial flows?

And lastly:

- do insurance financial instruments, such as catastrophe bonds, pose any problems for national accountants?
THE CATASTROPHE INSURANCE MARKET

1. To give an idea of the scale of the flows involved, here are some of the largest losses, due to natural disasters, of the past ten years\(^2\). For 1999 it has been estimated that insured losses from worldwide natural catastrophes exceeded US$25 billion – the second highest annual losses after Hurricane Andrew in 1992.

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
<th>Insured loss (US$million)</th>
<th>Economic loss (US$million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>Hurricane Andrew, USA</td>
<td>17,000</td>
<td>30,000</td>
</tr>
<tr>
<td>1994</td>
<td>Northridge earthquake, USA</td>
<td>15,300</td>
<td>44,000</td>
</tr>
<tr>
<td>1990</td>
<td>European winter storms</td>
<td>10,200</td>
<td>14,800</td>
</tr>
<tr>
<td>1991</td>
<td>Typhoons, Japan</td>
<td>5,200</td>
<td>6,000</td>
</tr>
<tr>
<td>1999</td>
<td>European winter storms</td>
<td>5,000</td>
<td>?</td>
</tr>
</tbody>
</table>

2. Insurers try to write a balanced book of business, i.e. they avoid too much exposure to any particular risk. But even a balanced book is vulnerable to heavy losses following a natural disaster and insurers prepare for this by maintaining reserves and/or passing on some of the exposure by buying reinsurance. Similarly, reinsurers employ a combination of reserves and passing on risk (retrocession). The catastrophe market has something of a cyclical nature, the cycle depending on the frequency and severity of losses. At the risk of over-simplification – premium rates rise following heavy losses, attracting more players into the market which increases competition pushing rates back down until another catastrophe hits. For example, hurricane Andrew (1992) was seen as a mega-catastrophe and forced a sharp upwards turn in rates. But prices have fallen dramatically over recent years as traditional reinsurance markets have become more competitive, so that currently the market is soft, with excess capacity in global insurance and reinsurance markets. As long as primary markets are soft, insurers are happy to retain more risk, rather than show slower growth in net premium income.

3. Reinsurance rates have also been moving down for the past five years, except companies with big losses in specific catastrophes which saw modest rate increases. However there is increasing pressure from regulators and rating agencies to increase limits for greater protection against mega-catastrophes. The retrocession market is currently tight, forcing some insurers to increase their net exposure. In 2000, property reinsurance prices can be expected to stabilise – a “kind and gentle” market turn.

4. The market view is that catastrophe risk pricing sets a rate that covers the chance of loss, expenses, and a profit factor for assuming the risk. But following a large loss, rates will also reflect a desire to re-establish reserves and “make-up “ for poor profits. Probabilistic modeling is increasingly used to determine exposure and analyse coverage options. However, probable maximum losses (PMLs) may

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still be calculated using older deterministic techniques, such as calculating current losses if a previous catastrophe were to recur.

Reinsurance to close

5. ‘Reinsurance to close’ is a requirement of insurers at Lloyd’s of London as a result of the unique system of members’ liability and the corporation’s three year accounting system. An underwriting year is closed after a further 24 months, when it is hoped that all claims will have been notified and settled. This allows the distribution of profits. However, in order to completely close the year, all outstanding liabilities are reinsured into the succeeding year of account of the same syndicate – this is reinsurance to close. The reinsurance to close premium is determined by reference to outstanding liabilities, including claims incurred but not yet reported (IBNR), relating to the closed year and to all previous closed years reinsured therein. In exceptional cases years will remain open until claims are settled satisfactorily, and this is described further under ‘technical reserves’ below.

6. Reinsurance may be placed on a two or three year basis. Typically as the first layer of the main (excess of loss) programme or as a vertical tranche through the whole programme of varying proportions (between 15 and 50%). The top four insurers now place their entire programme or a portion of it on a multiyear basis.

Lloyd’s reserves

7. The Lloyd’s equivalent of technical reserves are premium trust funds, whereby all premiums and other monies received or receivable in connection with underwriting business are held in funds, which may only be used to pay claims, reinsurance premiums, underwriting expenses, etc. Profits from these funds are distributed after three years, once reinsurance to close premiums have been paid to cover all unexpired liability.

8. The second link in Lloyd’s ‘chain of security’ is members’ own funds at Lloyd’s – trust funds in which members’ assets may be held. The assets must be readily realisable, and must exceed a minimum ratio of funds to overall premium limit (capacity). The third link is the other personal wealth of individual members (they have unlimited liability) and additional assets of corporate members. The fourth link is the Central Fund set up to meet liabilities that members can’t meet in full, and financed by annual contributions by members. The Central Fund is itself supported by a five year reinsurance programme.

9. Lloyd’s deals with unexpired risk in somewhat different manner to other insurers. Unexpired risk is passed onto the subsequent year via payment of reinsurance to close premiums. This amounts to an explicit recognition and evaluation of unexpired risk. Where substantial uncertainties affect the assessment of the outstanding liabilities, a year of account might not be closed. In such cases an amount to meet all known and unknown outstanding liabilities is retained at each year end until the year of account is finally closed. Such an account is referred to as a run-off year of account and the balances on each run-off year form part of the technical reserves.
DEFINING INSURANCE SERVICES

1. The following excerpts from papers\(^{25}\) by insurance market analysts give an idea of the industry view of the services they provide:

   i) ‘Reducing the volatility of earnings or cash flow, or pushing back the probability of ruin, are not of value in and of themselves. They usually acquire value only through specific mechanisms that allow the client to reduce expenses, increase earnings, or engage in profitable activities that would otherwise not be possible’.

   ii) ‘Insurance is also seen as more than a risk-transfer mechanism; it provides “real services”, e.g. in loss control or benefits and claims administration. Reinsurance similarly provides real services’ to an insurer expanding into a geographical area or line of business with which it has little experience or expertise……Reinsurance in particular, and substitute risk transfer mechanisms in general can be alternative forms of financing be allowing an insurer to write as if it had more surplus. If the servicing costs of debt exceed the loading elements of the reinsurance, risk transfer can increase the overall profitability. For mutual companies without access together debt or equity markets, reinsurance can become the only viable financing arrangement. Mayers and Smith found that mutual companies do indeed buy more reinsurance then similarly situated stock companies’.

   iii) ‘An insurance solution may provide services not offered by alternative risk-financing mechanisms. There may be regulatory issues standing in the way of positive net present value projects. “Regulatory arbitrage” between insurance and other sectors can result in substantial value, not foreseen in finance theory’.

   iv) ‘Regulations and statutory requirements create surplus strains and financing needs – capital requirements and proportional earning of policy expenses. Regulators are likely to be conservative and increase the need for risk transfer beyond levels dictated by financial theory’.

   v) ‘Insurance provides a faster adjustment of the depreciable basis of property replacement than does self-insurance. It allows the firm to protect other tax benefits – investment tax credits, loss carry-forwards, etc. Insuring depreciated assets can be profitable after tax. If the premium is a deductible expense, then after tax, it could be less than expected losses. If the recovery of a loss is not taxable income, then the expected recovery will exceed the premium, with no offsetting book loss as the lost asset was depreciated’.

\(^{25}\) Papers at the website www.guycarp.com