

A CHANGE AGENDA FOR RESERVING

REPORT OF THE GENERAL INSURANCE RESERVING ISSUES TASKFORCE (GRIT)

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ABSTRACT

Reserving is important to our profession as it is a core activity for actuaries. The members of the General Insurance Reserving Issues Taskforce (GRIT) have been considering how actuaries can improve the way in which we do reserving in general insurance. We gathered our thoughts and recommendations together in a Consultation Paper which has been discussed widely in the profession. We are very grateful to everyone who shared their views and comments with us, particularly those who gave us written feedback. We have considered carefully all the feedback we received and adapted our final report in response to this.

Given the scope and importance of our remit, it is perhaps not surprising that this is not a short paper. We hope that Section 1 provides a reasonable summary.

Generally, our view is that there are many things on which our profession should focus. However, it is also important to remind ourselves of the positive items of feedback which we heard from our stakeholders. In addition to many suggestions for things to do better, we consistently heard the message that actuaries play an extremely valuable role in general insurance.

This is a major testimony to the progress which the actuarial profession has made in recent years in its ability to contribute to the general insurance industry. Perhaps it is because of this progress that now is an appropriate time for us, as a profession, to take a hard look at what we do in reserving, and ask ourselves whether there are any things which we could do differently. We hope that GRIT's report will facilitate this debate.

GRIT's recommendations fall under the following key themes:

- Providing more transparency to our reserving methods and helping our stakeholders have more insight into the key reserving assumptions and decisions.
- Providing more information on uncertainty in our reserve estimates. In particular, we recommend that actuaries provide a quantitative indication of the range of outcomes for future claim payments, and that our profession defines a common vocabulary for communicating uncertainty.
- Understanding better the business we are reserving. We suggest a range of analyses and activities for doing this.
- Applying our standard actuarial reserving methods more consistently. We identify a list of specific areas where we believe that there is scope for improvement. Also, we believe that the actuarial training syllabus should be extended, and this leads to consideration of whether a more specialised general insurance actuarial qualification is needed.
- Understanding the implications of the underwriting cycle, which, we believe, influences the behaviour of claims development in a way that our reserving models do not currently capture. We suggest what we believe may be the foundations of a potentially more cycle proof methodology, but this is an area which we believe will require much more research.

- Helping actuaries understand how behaviour can affect the reserve estimation process, particularly in the face of uncertainty. We make various suggestions in this area, including helping actuaries manage pressure from third parties.

We are convinced that for our profession to implement these suggestions, it will require a concerted change management strategy and set of actions to embed changes into the way actuaries work. We believe that this will include:

- increasing the level of debate and research in the profession on claims reserving;
- a broader communication programme with the general insurance industry, covering, amongst other things, uncertainty and data quality;
- a sub-group of the GI Board with a specific focus on reserving, responsible for implementing GRIT's recommendations and dealing with new issues as they arise; and
- our profession resolving the conflicting pressures which will arise out of the extra work required for reserving by the GRIT recommendations.

There is one specific item where we have not made a recommendation. It has been suggested to us that many of the standard reserving methods in common use, such as the chain ladder, are not sophisticated, and that more sophisticated mathematical and statistical methods should be a priority. We do not agree with this. Whereas, in the longer term, this might be an important issue for our profession, we believe that the current focus for actuaries should be in the areas set out in this paper, such as understanding the business better.

GRIT believes that the issues which we have identified are important for the future of our profession and the contribution which we can make to the general insurance industry.

KEYWORDS

General Insurance; Reserves; Best Estimate; Ranges; Communicating Uncertainty; Understanding the Business; Improving our Methods; Reserving Cycle; Behavioural Issues

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1. OVERVIEW AND SUMMARY OF RECOMMENDATIONS

1.1 *Introduction*

1.1.1 GRIT is the General Insurance Reserving Issues Taskforce of the Institute of Actuaries. GRIT's terms of reference are both wide-ranging and specific.

1.1.2 The terms of reference are wide-ranging in that they ask us what the actuarial profession should do to reduce the chances of reserve run-off surpluses and deficiencies in the future. Also, they ask us to consider how the profession should react to the press debate on how well actuaries have done at reserving. So, as well as asking how actuaries could make reserving more accurate, they also raise the question of how actuaries can give the rest of the world a better perception of what we do.

1.1.3 Discharging this part of our Terms of Reference means considering how well actuaries execute reserving methodology, but other things influence the ‘accuracy’ of the reserves calculated by actuaries, such as how well actuaries understand the business being reserved, how this understanding can be enhanced, and the pressures which actuaries experience, particularly in the soft cycle. We have therefore also considered these issues in this paper. In addition, we have considered the fact that companies do not always book actuarial estimates, so that published reserves may not be comparable to the actuarial ones.

1.1.4 Moreover, reserves are uncertain, which means that there will always be run-off surpluses and deficiencies. We believe that in some cases the actuary has been blamed for run-off deficiencies which have arisen because of the uncertainty inherent in the business, which is there no matter how good a job the actuary does. However, although the actuary may have done a perfectly competent job in calculating the reserve point estimate, we do wonder whether actuaries, management and shareholders focus enough on uncertainty in reserving. If our stakeholders do not understand the uncertainty in the reserves, then it is not surprising that they are unhappy when the adverse run-off is more than they expect. So, uncertainty has been a significant area of attention for GRIT.

1.1.5 Taking all these points into consideration, GRIT has interpreted its brief as one of stepping back and taking a strategic view on what we, as actuaries, need to change to be better at reserving, and what we need to do to improve the communication of the reserves we calculate.

1.1.6 Our terms of reference are also very specific, as they ask GRIT how the profession should respond to the observations of the Reserve Cycle Working Party.

1.1.7 One of the key findings of the research done by that Working Party suggests that the claim development profile lengthens in the soft part of the underwriting cycle. Most actuarial methods, indeed virtually all of those in common use, do not allow for this. If true, it means that our existing inventory of methods will underestimate reserves during the trough of the underwriting cycle. This is clearly a critical issue for the actuarial profession, and we have devoted a considerable part of GRIT’s activities to this specific and important technical item.

1.1.8 There are three important points we want to make here at the start of our paper.

1.1.9 The first is that reserving is a core product for actuaries. However, our perception is that in recent years reserving has become the poor relation and considered less exciting than other work which actuaries do, such as pricing and capital.

1.1.10 This is misguided. Reserving is the key process whereby the financial health and profitability of an underwriting organisation are determined. It is also an important component of the pricing process.

Reserving should be seen as exciting, rewarding and ‘the place to be’ for actuaries. The list of issues which GRIT has identified which need to be addressed by the profession are substantial and stimulating. They require significant resources from our profession; they need to be tackled with vigour and enthusiasm and to be championed at the highest levels in our profession. We believe that every actuary who focuses time and effort in reserving will find the rewards exciting, challenging and commercially extremely relevant.

1.1.11 The second point is as follows. In the rest of this paper is a catalogue of things which GRIT thinks actuaries should do differently and a list of things which our stakeholders think we should do differently; but, lest actuaries become despondent at these lists for change, we want to include here one piece of feedback which we heard from our stakeholders and which does not appear elsewhere in this report. Despite everything, we consistently heard our stakeholders say that actuaries play an extremely valuable role in general insurance. Two memorable comments were:

- ‘actuaries are indispensable’; and
- ‘if actuaries did not exist we would have to invent them’.

The challenge for our profession is to help our stakeholders and strengthen our brand even more by addressing the issues which follow in this paper.

1.1.12 The third point is that this paper sets out GRIT’s views on various issues facing the actuarial profession in the field of reserving, and how GRIT believes that the profession should respond to these. It should not be regarded as a statement of best practice at the current time for actuaries in non-life insurance.

1.2 *What GRIT has done*

Here we describe briefly how the GRIT Taskforce went about its job. GRIT’s key activities have been the following:

- (1) *Consulted with stakeholders.* We have met with users of actuarial reserving services to understand what they think of what actuaries do. We met with CEOs and FDs of insurance operations, rating agencies, investment analysts, and regulators both in the United Kingdom and abroad.
- (2) *Brainstormed issues.* In our early meetings, we invested time thinking creatively to identify the things that could help actuaries produce ‘better’ estimates of reserves, and also to identify the things which would help our stakeholders understand better the issues being dealt with in the reserving process.
- (3) *Communicated with our membership.* We appreciate the importance to our profession of the issues GRIT is considering and the recommendations we make. We have attached a high priority to obtaining information from our membership, and communicating and consulting. Our consultation process included the following:

- questionnaire: e-questionnaire issued to all non-life actuaries in autumn 2004;
- GIRO (2004) presentation, and workshop feedback sessions;
- GRIT session at Current Issues update seminar in June 2005;
- consultation meeting at Staple Inn on 18 July 2005;
- consultation GIRO paper available on website from July 2005;
- GIRO (2005) presentation and workshop feedback sessions; and
- final paper — GRIT's final report is this sessional paper.

Also, GRIT has reported to the General Insurance Board (GIB) on a regular basis throughout.

- (4) *Worked via separate workstreams.* In view of the spread of issues which we have covered in GRIT, we organised ourselves into separate workstreams, with one GRIT member being responsible for each. These workstreams were:
- consulting our stakeholders;
 - consulting with our membership;
 - applying existing methods more consistently;
 - understanding the business better;
 - helping actuaries manage and communicate uncertainty better;
 - improving our methods;
 - behavioural issues and third party influence; and
 - measuring the past.

Although GRIT members individually led specific workstreams, this final draft paper represents our collective views, and is broadly supported by all members of the Taskforce.

1.3 *Scope of GRIT's Thinking*

1.3.1 When carrying out our work, we found it useful to make a distinction between:

- the work which an actuary does to form his or her view on the actuarial reserves — we call this the 'actuarial assessment'; and
- the particular figure which the actuary selects as the appropriate estimate given the specifics of the particular project — we call this the 'selection for purpose'. The 'selection for purpose' will depend, amongst other things, on the purpose for which the estimate is being used and the materiality threshold which is appropriate.

1.3.2 GRIT considered only the 'actuarial assessment'. So we have focused on the core underlying process without getting bogged down in the specific criteria which determine the estimate selected in any particular project.

1.3.3 Also, we should probably include here a definition of what GRIT means by ‘reserves’. We hesitate to be too precise on this, as, given the complexity of the wide spectrum of general insurance contracts, we run the risk of creating a definition which breaks down somewhere in some particular set of complex circumstances. However, generally by reserves we mean estimates of unpaid claims, including allowance for other associated items such as future premiums.

1.3.4 References to GN12 in this paper are the version in force as at 30 June 2005.

1.3.5 In March 2005 the Final Report of the Morris Review of the Actuarial Profession was published, and the question arises of how much GRIT has been influenced by the conclusions and the recommendations contained therein. GRIT constructed its work programme before the conclusions from Morris (either draft or final) were available, but we did review this against the Morris conclusions as they emerged. Some of the issues identified by Morris, such as regulation of the actuarial profession, are outside the scope of GRIT. However two themes of Morris are relevant to GRIT, namely that actuaries:

- may have over focused on seeing the world just through their eyes, and not those of their stakeholders; and
- need to focus on clear communication which conveys the information and advice users typically need.

Many of the issues we considered come under these headings. We did review our agenda and action plan following Morris, but did not see the need to change what we planned to do. We hope that we were not complacent in making this judgement.

1.3.6 The following sections of the paper set out the work and conclusions of each workstream. In some areas the workstreams overlap, but we have not sought to remove these areas of overlap, as to have done so would have made the individual sections incomplete. Also, we have generally attached appendices relevant to a workstream as an appendix to that section of our report. This is with the exception of the ‘Understanding the Business Better’ workstream, where some of the material has been presented as an appendix to our entire report.

1.3.7 Our overall conclusions and recommendations are summarised below in the rest of this Executive Summary. To avoid repetition in this Overview they are not structured by workstream, but are gathered together under the following headings:

- What can we learn from the past?
- Communicating reality in an unambiguous way.
- Understanding the business better.
- More consistency in the application of existing methods.
- Identifying where our reserving methods need to be enhanced.

- Behavioural issues and third party influences.
- Implementation.

1.4 *Our Conclusions: what can we Learn from the Past?*

1.4.1 The results of our membership-wide survey suggest that most of our members believe that the reserving performance of actuaries has been at least adequate, which differs from the views of our stakeholders and the press. GRIT debated whether the run off of actuarial best estimates could in future be tracked to enable us to be better informed about actuarial performance. However, we could not agree on a mechanism which overcame issues of client confidentiality and potential disclosure in a litigation scenario. This issue could be reconsidered by the GIB in future, in order to look at ways which might assist in understanding actuarial performance and educating stakeholders and the public with regard to the uncertainty in reserve estimates.

1.4.2 The view of the smaller sample of actuaries polled by GRIT (in the ‘Measuring the Past’ workstream) is that companies can and do book amounts in their accounts which are different from the actuarial best estimate. So, we cannot look at industry-wide reserve movements — or even movements in reported reserves for an individual company — and assume that they represent movements in actuarial best estimates.

1.4.3 Statistical analysis of the relationship between profitability and reserve strengthening suggests that there is indeed a link, with companies strengthening reserves in profitable times, and vice versa. However, it is not clear whether this reserve strengthening is due to:

- companies being forced to strengthen reserves because they were established at too low a level during the previous soft market; or
- companies taking the opportunity of profitable times to put money aside and increase the prudence in the reserves.

GRIT’s view is that there is probably an element of both. Probably the important point to note is that industry reserve ‘deterioration’ may not always be due to previous under reserving, and vice versa.

1.4.4 The views of the smaller sample of actuaries polled by GRIT differed on the causes of reserve deterioration:

- ‘Company’ actuaries thought that the most important reasons were companies deliberately booking amounts different from the actuarial best estimates, and external factors such as Ogden subsequently affecting claim payout.
- ‘London Market’ actuaries saw the main reasons for reserve movements as actuarial best estimates being ‘insufficiently robust’, for example being overly influenced by underwriters. Some, but not all, of this group thought that systematic estimation errors have also contributed to reserve movements.

1.5 *Our Conclusions: Communicating Reality in an Unambiguous Way*

1.5.1 Actuaries should understand and accept that the purpose of an actuarial reserve assessment includes constructing a framework for evaluating reserves which enables non-actuaries (e.g. directors, management and underwriters) to form their own views on both the key assumptions and the level of reserves. Although not the main reason for this recommendation, this would be consistent with the regulatory regime for life insurance, under which the responsibility for setting the balance sheet provisions lies with the board and senior management on the basis of proper advice (usually from an actuary). The implications of this are wide ranging; for example, the criteria for what is a 'good' method of estimating reserves includes the ease with which it can be communicated to and understood by other insurance professionals.

1.5.2 An actuary should be required to show a numerical measure of uncertainty in any formal report wherever a point estimate of reserves is supplied. This must describe the uncertainty in outcome rather than a range for the best estimate (although there is no reason why an actuary cannot also communicate a range of best estimates if he or she feels it is appropriate). This requirement should be introduced via GN12. We recommend that the profession targets 2007 for the implementation of this.

1.5.3 The ways in which uncertainty can be disclosed, given the current state of actuarial techniques, are discussed in Section 6. GRIT commissioned a GIRO working party to investigate the methods currently available to quantify reserve uncertainty, which submitted its paper to the 2005 GIRO conference. More research needs to be done on the topic of quantifying uncertainty, and we recommend that the profession commissions research in this area.

1.5.4 Actuarial reports need to disclose more information on the key drivers of uncertainty, to help communicate to non-actuaries both the uncertainty itself and why it exists.

1.5.5 The profession urgently needs to agree on a common vocabulary for uncertainty, including, for example, a definition of the phrase 'best estimate'. Some suggestions are included in our paper. This terminology needs to be communicated to other insurance professionals. Although we think it unlikely that our profession will want to depart from the objective of estimating a mean, we believe that it might be worth investigating alternatives, such as a median. Assuming that the mean is the measure which is agreed on, we believe that there is a need to create a consensus view in our profession on the adjustments (if any) required, in practice, to the standard methods to meet this objective.

1.5.6 In addition to the issue of uncertainty, our stakeholders believe that, as a profession, we need to improve our communication generally. This is not a new issue for our profession, and we believe that it is outside the scope of GRIT to make specific recommendations in this area. However, we

do recommend the recent paper on communicating in pensions — ‘Mind the Gap’ by Laura Brown & Neil Warmby — which discusses in an appealing way some of the basics of clear communication.

1.5.7 The profession should consider undertaking a broader communication programme within the general insurance industry:

- to encourage a common understanding of uncertainty within the industry; and
- to facilitate a debate on how to improve data quality available to support reserving, both claims data and pricing information. Many actuaries, and many of our stakeholders, think that this is weak.

1.6 *Our Conclusions: Understanding the Business Better*

1.6.1 GRIT believes that considerable improvements can be readily made to the reserve estimation process through actuaries understanding better the constitution and commercial issues surrounding the business making up each reserving class. We make some significant and specific suggestions for diagnostics and techniques which actuaries could use as part of their standard procedures for reserving work. However, we do appreciate that a balance will need to be struck between the value of the enhanced understanding generated vrs the extra work involved in carrying them out.

1.6.2 The suggestions focus on improving the homogeneity of the classes to be reserved, by seeking to identify sub-groups of policies with similar development characteristics, but with sufficient mass to form a credible reserving class in their own right. Having more classes consisting of policies with more uniform characteristics should allow the actuary to observe more consistent origin year (underwriting year, accident year) development factors. The enhanced consistency of the historical development factors should enable better curve fitting and estimation techniques for selecting development factors, tail factors and initial expected loss ratios when projecting each origin year to ultimate.

1.6.3 Section 5 also discusses methods for identifying outlying and atypical policies which should be removed from the main database and reserved separately. The section focuses only on what we consider to be the high priority ‘Key’ drivers, whilst leaving, in descending order of importance, the ‘Helpful’ and ‘Handy to have’ drivers to be discussed in Appendix B. We hope that all three lists will be useful checklists for actuaries of matters which could be pertinent during the reserving process.

1.6.4 Section 5 discusses London Market (LM) business separately from Personal Lines (PL) business, and covers issues common to both sectors wherever possible. The U.K. Commercial Lines section discusses only those issues which are distinct to itself and are different from either LM or PL business.

1.6.5 The London Market section covers:

- policy database diagnostics.

- claims database diagnostics;
- major open risks;
- underwriting;
- claims management;
- reinsurance; and
- processing and data integrity.

1.6.6 The Personal Lines section follows a similar theme in respect of the following classes:

- motor;
- household;
- creditor and warranty; and
- travel.

1.6.7 The terms and conditions of the business are important for understanding what has been written; but keeping track of changes to terms and conditions is always difficult. Wherever possible in the list of points given we have appended the rubric [T&C] to highlight where changes in terms and conditions, for example changes to policy periods, can be observed and measured. Changes to other influential policy clauses cannot be readily observed unless specifically coded within the policy header database.

1.6.8 As some changes in coverage can be significant, such as moving from occurrence to claims made policies, we recommend that the profession, if possible in conjunction with other market bodies, commissions an inventory of terms and conditions for selected lines of business. These can then be tracked and monitored against changes in market practice and made available to all interested actuaries. This will help actuaries be aware of changes in terms and conditions and their potential impact on reserves.

1.7 Our Conclusions: More Consistency in the Application of Existing Methods

1.7.1 GRIT believes that there is room for improvement and a need for greater consistency in the way actuaries apply common reserving methods. These are described in detail in our report. In summary the key points are:

- Less mechanical application of chain ladder methods, and more use of judgement in the selection of development factors.
- In the Bornhuetter-Ferguson (BF) methodology:
 - more rigour in the selection of initial expected loss ratios and justifying the basis of that selection in formal reports;
 - more discipline in the timing of when the BF methodology gets dropped for earlier years; and
 - making sure rate indices fully capture the impact of a softening market.

- More discipline on the selection of tail factors by reference to various measures, such as the overall shape of the development pattern, and, where relevant, external benchmarks.
- The importance of the selection of appropriate data grouping (possibly including by type of claim) for reserve projection, and not just using the data groupings which are readily available. In some situations it can also help to separate the consideration of new claims notifications from the development of previously notified claims.
- Using paid and incurred projections to identify changes in the underlying business and/or claims process, rather than automatically taking an average of the two results.
- Beware of excluding exceptional events, but then making no allowance for larger than expected large losses in the reserves. This applies both in the projections generally and also when deriving initial expected loss ratios.
- More focus on diagnostics and/or hindsight testing for assessing the quality of fit and/or appropriateness of the reserving model, rather than blindly using a particular model when the underlying assumptions of the model might be incorrect.
- More use of simple diagnostic measures to aid the understanding of the underlying business and the assessment of the reasonableness of reserve estimates.
- The importance of considering whether any aspects of past and likely future claims inflation mean that the methods used are inappropriate or need an explicit adjustment for inflation.
- The importance of understanding the underlying claims handling and case reserving process and the effect that these may have on the validity and consistency of data.
- The methodology for estimating reinsurance recoveries needs to be sufficiently sophisticated. Simple gross to net ratios are often not appropriate.
- More is not necessarily better. Conducting reserve exercises on a more frequent basis than annually can be very useful, or even essential. However, when there are many segmentations of the business, projections using (for example) quarterly development factors can sometimes make it more difficult to identify bigger picture trends, and, with anchoring bias, can make it more difficult for the actuary to respond to a deteriorating underwriting environment. The actuary should consider whether, in addition to (say) quarterly projections, it is also useful to review projections based on longer (e.g. annual) reporting periods.

1.7.2 There is overwhelming pressure towards improved controls over, and documentation of, the reserving process, from sources such as the

Sarbanes-Oxley section 404 legislation in the United States of America. The topic of documentation of reserving work is being covered in more detail by the U.K. actuarial profession's Guidance Notes Working Party.

1.7.3 The actuary should always take steps to test the reasonableness of the data supplied. We have referred in the report to a U.S. Standard of Practice on Data Quality. This contains guidance material on the responsibilities of the actuary which may be useful for the U.K. profession to consider.

1.7.4 The actuarial training syllabus (and possibly CPD programme and material) should be extended to include more on:

- practical issues associated with applying common reserving methods;
- the underlying insurance contracts and different types of insurance; and
- how terms and conditions can change and affect the liabilities of the insurance contracts (note that we also suggest that the profession needs to carry out the research to identify and monitor changes in terms and conditions).

1.7.5 This extension of the demands on general insurance actuarial training could lead to consideration of whether a more specialised general insurance actuarial qualification is needed.

1.7.6 For exposure modelling, we recommend that the profession should set up a process for keeping an inventory of all those areas where exposure-based reserving is being applied for market level issues, to provide a base level of consistent information for actuaries working with these issues.

1.7.7 GN12 should be clarified on how much of a calculation trail should be included in an actuarial report. We note that an attempt has been made to address this issue in the exposure draft of the revised guidance note.

1.8 *Our Conclusions: Identifying where our Reserving Methods need to be Enhanced*

1.8.1 More sophisticated mathematical and statistical methodology need not be a priority for actuaries at this stage. Rather, the focus for enhancement and research should be in the following areas:

- better business understanding and adapting the actuarial methodology in the light of what has been learnt;
- allowing for the underwriting cycle;
- more focus on analysing and investigating the historic fit of the reserving model used and more use of diagnostics;
- whether extreme value theory has a role to play in reserving;
- practically, which methods do well in which circumstances;
- more focus on data quality; and
- reserving methodologies better linked into the underlying exposures written and also external events or trends such as stock market movements

or weather events. However, this will be limited by the industry's understanding of its exposures.

1.8.2 The underwriting cycle is associated with features and instabilities on which actuaries may not have focused sufficiently. These are:

- lengthening of the claim development profile in the soft market; and
- rate indices failing to capture the degree of rate softening.

In combination these can cause a 'perfect storm' of a disaster. Worsening experience is hidden by the longer tail, compounded by inadequate initial loss ratios, with the consequence that actual loss ratios can deteriorate drastically in consecutive years, but be undetected by the reserving process.

1.8.3 The claim development profile appears to be correlated to the premium profile.

1.8.4 The overall actuarial reserving approach needs to take into account the features associated with the underwriting cycle:

- We could not find any research currently being carried out on the effects of the underwriting cycle on traditional reserving methods or how to deal with them.
- We suggest what we believe may be the foundations of a potentially more cycle robust methodology, based on potential 'cycle invariance' of curve fitting methodology.
- More research needs to be carried out to enhance our understanding of the drivers of the reserving cycle and actuarial methods for dealing with the underwriting cycle. The profession should facilitate this.

1.8.5 We suggest that GN12 should be extended to include a requirement that formal reserve reports comment on how the effects of the cycle have been addressed.

1.8.6 We recommend that consideration be given to researching techniques which would enable reserving to be based on classes which are not fully credible, and also the benefits and issues of basing reserving on data broken down by type of claim rather than by policy type (e.g. segmenting by personal injury and property damage claims rather than by third party and comprehensive coverage).

1.9 *Our Conclusions: Behavioural Issues and Third Party Influences*

1.9.1 Research shows that overconfidence is greatest for difficult tasks with low predictability which lack fast clear feedback — reserving! Actuaries need to be more aware of the fallibility in human behaviour of anchoring, prospect theory, framing and overconfidence. The profession should consider developing a wider study on how individual behaviour can affect the reserve estimation process. Consideration should be given to introducing this into the profession's education or professionalism course.

1.9.2 The profession should consider support systems available to actuaries facing pressure, for example ‘buddy systems’.

1.9.3 Actuaries should have a discussion with the accounting profession to enhance each profession’s understanding of the issues involved in estimating reserves and selecting a figure for the financial statements. (This is the one exception we have allowed ourselves to the rule that GRIT is focusing on ‘actuarial assessment’ rather than on ‘selection for purpose’.)

1.9.4 The actuarial training should be expanded to cover more detail on the key insurance processes — underwriting, wordings, loss adjustment, claims handling, etc. (including better understanding of the underlying business processes, e.g. broker production chain). This could lead to consideration of whether a more specialised non-life actuarial qualification is needed.

1.9.5 The professionalism course should be reviewed and extended to cover dealing with pressure from non-actuaries, possibly through role playing.

1.9.6 The Morris report has highlighted the need for the profession to share the experience of dealing with ethical issues through ‘real life’ case studies. There appears to be a lack of readiness to share experiences, and the profession needs to identify ways of overcoming this.

1.9.7 During any reserve review, the actuary should discuss the key issues with relevant individuals, wherever possible. It is likely that claims issues are better discussed with the claims director and underwriting issues with senior underwriters, rather than relying on one individual for the company view on all matters. Often individuals in a company hold different views or have different interests regarding the likely outturn of an issue, and it is extremely important for the actuary to get a balanced view.

1.9.8 Where significant judgements have to be made, the actuary should usually look for evidence beyond discussion with underwriters, particularly where these are reducing reserves in a soft market.

1.9.9 As required by GN12, all significant changes between current and prior estimates should be clearly communicated. An explanation should also be provided detailing how the current methodology and assumptions have been adjusted to reflect these issues.

1.9.10 There needs, in any case, to be a greater focus in actuarial work on the reporting and analysis of surpluses and deficits arising from prior years’ reserves.

1.9.11 We believe that it can be instructive to appreciate how far out reserve estimates can be compared with the ultimate outturn. This understanding should be helpful when considering the variability of reserve estimates, since, in our experience, there is in reality significantly greater variability than is often indicated by statistical techniques based solely on the observed historical data at the time of estimating reserves. Irrespective of whether some formal system of monitoring the run-off of reserves proves to

be practicable, we encourage all actuaries to make efforts to monitor privately, for their own purposes, the run-off of their own reserve estimates.

1.10 Our Conclusions: Implementation

1.10.1 Implementation of GRIT's recommendations will require more than just agreement by the GIB to the GRIT report. It will require a change in management strategy and concerted actions to embed changes into the ways actuaries work. In particular, we believe that this will include:

- (1) strengthening the training and educational material as regards claims reserving; and
- (2) increasing the level of debate and research in the profession on claims reserving. This should be supported by a strategically focused research agenda sponsored by the profession.

1.10.2 GRIT's recommendations will lead to more work being done by actuaries when carrying out reserving. This will have resource implications for both our profession and the insurance industry. It therefore needs to be managed and possibly phased.

1.10.3 There needs to be a continued focus on reserving. Reserving is critically important to GI actuaries. In order to provide a focus and impetus for implementing GRIT's recommendations, and dealing with new issues as they arise, we recommend that consideration be given to creating a continuing subgroup of the GIB with the responsibility of overseeing all reserving issues on behalf of the GIB. This could be some new form of committee, for example a General Insurance Reserving Board, or possibly a continuation of GRIT.

1.10.4 The Casualty Actuarial Society (CAS) is also looking at the issues which GRIT has been considering, and it is important that the profession and CAS keep in touch and coordinate as actuaries have a global brand.

2. CREATING GRIT'S WORK PROGRAMME

2.1 Introduction

2.1.1 GRIT's terms of reference are set out in Appendix C. They ask us to consider:

- (1) Any improvements that could be made to reserving techniques or best practices to reduce the possibility of material run-off surpluses or deficits.
- (2) What issues are raised for the U.K. profession by the ongoing debate raised by S&P?
- (3) The actions which the Profession should take in relation to the observations made in the Reserving Cycle Working Party paper presented at GIRO 2003.

- (4) What additional work is needed by the profession in relation to consideration of reserving best practices?

2.1.2 Our first objective was to decide what needed to be done to achieve the objectives set out in our terms of reference, and a large part of GRIT's early work was spent brainstorming the best way of responding to these. As well as drawing on the combined experience of the Taskforce members, we also considered what additional research we could do to help us to identify the right set of actions for GRIT to research. This section describes the thought processes which we went through and the GRIT work streams we identified.

2.2 *Consulting with our Stakeholders*

2.2.1 At an early stage we identified that, as well as drawing on the views and experience of GRIT members and the views of the actuarial profession, it was important for us to consult with non-actuaries — our stakeholders — i.e. the customers, for actuarial reserve estimates.

2.2.2 So, we set in motion a process of meeting with a range of representative stakeholders to ask for and listen to their views of how actuaries carry out the reserving process. We met with CEOs and FDs of insurance operations, rating agencies, investment analysts and regulators, both in the U.K. and abroad.

2.2.3 We labelled this workstream 'Consulting our Stakeholders', and the feedback we heard is described in that section below. However, there was one specific item of feedback which is so important that it led to a specific GRIT workstream: this is the topic of uncertainty.

2.2.4 From the consultation with our stakeholders, GRIT concluded that we as actuaries are not communicating the uncertainty in our reserve estimates sufficiently clearly. We heard comments where our stakeholders were unhappy that actual outturn exceeded the actuarial reserve estimate, but hardly ever did we hear this deficiency put in the context of expected uncertainty. Based on this feedback, GRIT believes that it is important that actuaries give their stakeholders an indication of the likely uncertainty in the actuarial estimates — i.e. how different could the actual outturn be. This is discussed further below in the section 'Helping Actuaries Manage & Communicate Uncertainty Better'.

2.3 *Consulting with our Membership*

2.3.1 As well as hearing the views of our stakeholders, GRIT felt it extremely important to hear the views and opinions of actuaries working in reserving.

2.3.2 We have tried to consult as widely as possible, including:

- (1) GIRO 2004 — presentation and workshop feedback sessions;
- (2) GRIT session at Current Issues update seminar in May 2005;

- (3) consultation meeting at Staple Inn on July 18, 2005;
- (4) consultation paper available on the Institute's website; and
- (5) GIRO 2005 — presentation and workshop feedback sessions.

2.3.3 In addition, we felt it important to obtain consistent structured information from our membership on a number of key items, and to do this we specifically designed and issued a questionnaire during October 2004. A summary of the questionnaire and results are set out in Appendix A.

2.4 Learning from the Past

2.4.1 GRIT obviously wanted to see what we could learn from the past — how 'accurate' had actuaries' reserve estimates been and, where there had been material runoff surpluses or deficits, what had caused these? However, this is not easy to do. We found it difficult to identify any readily available data which authoritatively show the runoff performance of actuarial reserve estimates. The reserve run off of company data is available from published FSA returns, but it is not clear on the extent to which company reported reserve data reflect underlying actuarial estimates.

2.4.2 So, we could not find any readily available data which told us how 'accurate' actuarial estimates have been. We were also not able to find any data on the issues or items which have caused actuaries particular difficulty with reserving.

2.4.3 Overall, therefore, we identified the need to carry out research to see if we could quantify the reserve surpluses or deficiencies which have historically emerged from actuarial estimates, and to identify any areas which have caused particular difficulty to actuaries. We called this the 'Measuring The Past' workstream.

2.4.4 Ideally, we would have liked to have completed this research before deciding on GRIT's work programme. However, it was not practical to wait for this to be available, and so our approach has been to identify the work programme for GRIT based on other information, and review the appropriateness of this as the results of the 'Measuring The Past' workstream became available.

2.5 Applying Existing Reserving Methods more Consistently

2.5.1 GRIT spent some time discussing existing actuarial reserving methods, and how they are currently used in practice. Our view is that there could be more documentation on best practice in the practical application of these methods, in particular focusing on the pitfalls which can arise in practice. As well as potentially improving the consistency with which these methods are applied, we believe that this would also increase the likelihood of the various methodologies being applied in an appropriate and relevant way by all actuaries.

2.5.2 Therefore we created a workstream called 'Applying Existing

Methods More Consistently’, with the objective of creating a checklist of issues and best practice items which arise in the practical application of existing reserving methods.

2.6 *Enhancing our Methodology*

2.6.1 One of the issues which GRIT considered is the sophistication of existing actuarial reserving methods. It can be argued that the methods in common use (typically paid and incurred chain ladders and average claim cost methods) are mathematically not sophisticated. This raises the question of whether methods based on more sophisticated mathematical or statistical techniques would help actuaries produce more ‘accurate’ results.

2.6.2 GRIT’s view is that the development of more sophisticated mathematical reserving techniques need not be a priority at this stage. The main reason for this is that the key requirement is currently to help actuaries understand better the business which they are trying to reserve. Without this enhanced understanding more sophisticated methods are likely to add no value, and indeed could be misleading in their apparent spurious accuracy.

2.6.3 Moreover, given that changes often take place in the business being reserved, a straightforward and transparent methodology can often be preferable to a complex black box approach. This is because it is easier for the actuary to understand how a well understood method reacts to the changes, and adjust the results accordingly, and easier for stakeholders to understand.

2.6.4 Overall, therefore, GRIT’s view is that more sophisticated mathematical methodology, *per se*, is not a priority at this stage. Rather, the focus should be on understanding the business better, and adapting the reserving methodology to the issues most relevant to a specific class of business. This could include the following:

- Allowing for the reserving cycle, as suggested in Section 7. This is an area which we believe needs immediate and urgent research, and which also falls directly into GRIT’s terms of reference. We have therefore created a specific GRIT workstream focusing specifically on this issue, which we have called ‘Improving our Methods’.
- Understanding the business better, using, for example, the techniques set out in Section 5, and adapting the reserving methods being applied to respond to any specific features identified.
- Analysing and investigating the historic fit of the reserving model used, to help to identify changes in the business and potential areas for adjusting the results. This would also include comparing the results of different methods (e.g. paid and incurred chain ladders), and where these are different, understanding the reasons why and selecting or adapting the methodology as appropriate. As a general point, GRIT considers that the need is for more sophisticated diagnostics to help the actuary to identify trends and discontinuities in the data, rather than more sophisticated

mathematical or statistical methods. This paper makes a number of suggestions for enhancing diagnostics, but GRIT believes that diagnostics should be an area of future research for our profession.

- Improving the quality of the data available to support the reserving process.
- Considering whether the actuarial estimates should incorporate specific assumptions on future inflation. In the U.K., until recent years, inflation had been falling consistently over a long period. In these circumstances, implicitly projecting past inflation into the future might be expected to over estimate rather than under-estimate inflation, and possibly be a margin for prudence. In the current economic climate this may no longer be the case.

2.6.5 Finally, we would not want anyone to infer from the above that GRIT is not supportive of research and development into new reserving methods. Indeed, GRIT believes that research in this area should be a high priority for the profession in future. For example:

- (1) GRIT believes that it would be beneficial for the actuarial profession to investigate reserving methodologies linking more directly into the underlying exposures written. This is done in some cases now, typically ‘special’ claim areas where the past is not expected to be a good guide to the future, e.g. asbestos. GRIT believes that it would be beneficial if these exposure methods could be extended into mainstream business reserving. However, the non-life insurance industry is still developing its understanding of exposures and rating thereof, so it is likely that there are limits on how quickly actuaries can develop these sorts of reserving techniques.
- (2) Elsewhere in our paper we discuss the underestimation which can arise when large claims are excluded from the historic data, as it can be difficult to include sufficient allowance in the reserves for future large surprises. GRIT believes that it would be useful to research whether extreme value theory can be applied in this area.
- (3) More generally, we believe it would be valuable to the profession if there were regular research aimed at investigating how the various reserving methods perform in practice, including, for example, which methods appear to do best in which circumstances.

2.7 Understanding the Business Better

2.7.1 Actuarial methods are typically based on identifying trends from the past, and applying them to forecast the future. However, the business is always changing, and the actuary must be alert to those changes which will make the future different to the past, and be ready to adjust these reserving methods accordingly.

2.7.2 Actuarial methods are usually applied to data at an aggregate

level, e.g. triangles of paid or incurred claims for a particular category of business. This tends to result in the focus of the actuary being at a high level, and potentially not close enough to the detail of the business to identify all of the changes which could make the future different to the past.

2.7.3 Traditionally, the actuary will seek to identify changes in the business which are important to the reserving methodology by discussion with the underwriter, claims staff, etc. However, GRIT's view is that the role of the actuary in general insurance may now be sufficiently mature that a more structured process of understanding the business should form an integral part of the actuarial methodology.

2.7.4 Accordingly, we have created a GRIT workstream called 'Understanding the Business Better', which is focused on identifying processes which could be incorporated into actuarial reserving projects to help the actuary understand the business better and identify changes and trends.

2.8 *Managing Uncertainty*

2.8.1 The uncertainty in reserve estimates will always be there, and the only issue is how big it is. The consultation with our stakeholders strongly suggests that actuaries need to do more to communicate the uncertainty in our reserve estimates. This is reinforced by the questionnaire of our membership, where 73% of actuaries replied that they did not: "believe the typical users of actuarial claims reserves have a sufficient understanding of the uncertainty inherent in any claims reserves projection."

2.8.2 GRIT has therefore created a workstream to focus on this issue, called 'Helping Actuaries Manage and Communicate Uncertainty Better'.

2.9 *Behaviour and Managing Pressure*

2.9.1 The actuary's reserve estimates are often commercially critical and sensitive, as they can have a major impact on the reported financial results of an insurance operation. This means that the actuary's results, if unwelcome, can come under very significant challenge which can result in significant pressure on the actuary. GRIT also believes that the combination of significant commercial consequences coupled with potentially large uncertainty is a difficult cocktail of issues which can have implications for actuaries' own behaviour, and how this might change at different times in the underwriting cycle.

2.9.2 We would like to emphasise that GRIT has no evidence that any actuary has been influenced in his advice on reserve levels just because the conclusions are unpalatable.

2.9.3 However, the combination of pressures described above could, if they are not recognised and understood, potentially sway an actuary's judgement and subliminally affect his judgement of the appropriate reserve levels. It is with this objective that we identified the work stream

‘Behavioural Issues and Third Party Influence’. Our hope is that the items discussed in this section will help the actuary to understand the circumstances when the pressure is building up and provide some tools for responding to it in a way which prevents it affecting the actuarial judgements.

2.10 *Scope of GRIT’s Work and Conclusions*

2.10.1 When we were discussing what actuaries do in reserving, and what they should do differently, the discussion invariably focused around specific applications, such as producing an estimate for incorporation in financial statements, or producing a regulatory reserve opinion. Not surprisingly, in many cases we found that the actuarial approach was influenced by the purpose of the specific application.

2.10.2 It would clearly be impractical for GRIT to produce a set of recommendations which covered all the potential applications of actuarial reserve estimates. Instead, we have focused on the core underlying actuarial processes, without getting bogged down in the specific issues which arise in any particular application.

2.10.3 Therefore, we have made a distinction between:

- (1) *The ‘Actuarial Assessment’*. This covers the tools, process, understanding and methodology which the actuary uses to form his view of the reserves. It is independent of the purpose of the actuarial assessment, but will underpin the conclusions finally drawn by the actuary.
- (2) *The ‘Selection for Purpose’*. This is the process by which the actuary selects the appropriate estimate, given the specifics of the particular project. It will depend, amongst other things, on the purpose for which the estimate is being used and the materiality threshold which is appropriate.

GRIT has focused only on the ‘actuarial assessment’.

2.10.4 In passing, we would make the observation that in some cases the rules applying to the ‘selection for purpose’ are not prescribed by actuaries. In particular, the criteria for selecting reserves for financial statements are determined by the accounting, not the actuarial, profession. We mention this particular point, as it has been put to us that the reserve deterioration in reported financial statements is inexorably entwined with the terms of reference supplied to GRIT, and that GRIT should include in its work consideration of how reserves are established for ‘audit’ purposes. For the reasons set out above, GRIT has not done this, but has restricted itself to the ‘actuarial assessment’ part of the reserving process.

2.10.5 Also, we should include here what GRIT means by ‘reserves’. We appreciate that, for example, actuaries and accountants can use the word ‘reserves’ to mean different things. As this is a paper by actuaries for actuaries, we use the word in its common actuarial meaning, as it is given to us in our terms of reference. However, we hesitate to be too precise in

defining ‘reserves’, as, given the complexity of the wide spectrum of general insurance contracts, we run the risk of creating a definition which might break down somewhere in some particular set of complex circumstances. Generally, by reserves we mean estimates of unpaid claims, including allowance for other associated items such as allocated claims handling expenses, future premiums, future commission payable or receivable, etc.

3. CONSULTING OUR STAKEHOLDERS

3.1 *Introduction*

3.1.1 This section describes the GRIT workstream ‘Consulting our Stakeholders’. This involved meeting with business leaders in the insurance industry, to discuss their perception of the work which actuaries do in reserving. The meetings were typically with CEOs, CFOs, rating agencies and investment analysts. We also met with regulators, both in the U.K. and abroad.

3.1.2 The meetings were held in the second half of 2004, and, as such, represent the perceptions of our interviewees at that time. All the meetings were held on a confidential basis, and in order to respect this we have not reported here isolated comments from any one person. Instead, we discuss in this paper the common themes which we heard, which will hopefully enable us to focus on the key issues for our profession, at least as far as our stakeholders are concerned.

3.1.3 In our meetings, we consistently heard the following four themes:

- (1) Actuaries need to communicate the uncertainty in their reserve estimates in actuarial reports. (Most people we spoke to were aware of, had seen, and seemed to have read actuarial reports.)
- (2) Actuaries should communicate the key assumptions and reserve drivers underlying the actuarial methodology.
- (3) Our stakeholders do not understand actuarial methods.
- (4) Actuaries are poor at communicating.

We discuss each of these below.

3.1.4 On a slightly separate topic, in the course of our activities we also heard comments from actuaries relating specifically to the disclosure required in actuarial reports by GN12. This has an impact on the information which we provide to our stakeholders, and so it is also discussed in this section of our report.

3.2 *Communicating Uncertainty in the Reserve Estimates*

3.2.1 One of the views which we heard most strongly and consistently was that actuaries need to communicate the uncertainty in their estimates. Some comments made to us are:

- (1) “Actuaries should provide some form of range for their results.”
- (2) “Actuaries fail to communicate the uncertainty in their estimates.”
- (3) “Would find it helpful to have some form of sensitivity analysis. Can you show a range of reserving adequacy?”
- (4) “Actuaries should start communicating the risks and uncertainty in the reserves in a consistent way.”

3.2.2 This observation by our stakeholders is not surprising. Indeed, GRIT identified the need to communicate the uncertainty in our reserve estimates in its early brainstorming, before the stakeholder consultation took place. The thinking behind this was that, for the recipient of actuarial advice to fully understand what he is hearing and decide how to act on it, he needs to know two things — the selected point estimate, and also the potential error in this. A reserve of 100 with a swing of + or –10 is a very different animal to a reserve of 100 with a swing of + or –80. Unless we communicate this likely volatility, then we are not describing reality to our stakeholders in a clear way.

3.2.3 It was interesting to hear this point made by our stakeholders as well, and this reinforces its importance. Informal polls, both at the GRIT breakout sessions in GIRO October 2004 and at other smaller gatherings, and the feedback to our Consultation Paper, have shown strong support amongst actuaries for communicating a quantitative measure of uncertainty in some way or other. Although there are some actuaries who do not support this, it appears to us that they are a minority.

3.2.4 So, the feedback which we have from actuaries suggests that most of us believe that our stakeholders are being reasonable in their request to have more information about the uncertainty in the estimates we provide.

3.2.5 However, we also observed that some of our stakeholders appeared to view uncertainty differently to the way actuaries do, and potentially use a different terminology to describe uncertainty. Examples are:

- (1) Some stakeholders believe that the phrase ‘best estimate’ means an amount that will be ‘enough’ to pay the claims, as opposed to the mean of a distribution.
- (2) Some stakeholders believe that deterioration means that the original reserve estimate must have been wrong, rather than seeing it as just one realisation from a distribution which happened to be above the mean.

3.2.6 This difference in understanding may be because actuaries have not focused on communicating uncertainty in the past. However it also may be that our stakeholders, who possibly have a less technical training in the details of uncertainty, are not as familiar with some of the concepts as are actuaries. Accordingly, if we do choose to present estimates of uncertainty, then we need to be careful that this is done in a way which is intuitively comprehensible to non-actuaries. Those stakeholders with whom we discussed

this point expressed a strong preference for being told the range of potential outcomes. This is an intuitively straightforward concept and is obviously directly relevant for tracking and forecasting the actual outturn of claim costs.

3.2.7 GRIT accordingly set up a workstream specifically looking at uncertainty, and the communication thereof, which forms a significant part of this report.

3.2.8 The work done by the GRIT uncertainty workstream focused on the actuarial methodology and the conclusions which actuaries report. In addition, in order to make our efforts fully effective, there may also be a need for the profession to undertake a broader information campaign (such as sponsored seminars, or press articles) to encourage or to reinforce a common understanding of uncertainty within the general insurance industry.

3.2.9 This broader communication campaign could also deal with points raised in subsequent sections, including:

- explaining actuarial methods; and
- communicating what the reader of an actuarial report (in future, once GRIT recommendations have been implemented) should expect to see in the report, and how it can be interpreted.

3.2.10 It may also be worth noting here that some of our stakeholders felt that ultimately it was wrong to blame actuaries for what may be regarded as excessive uncertainty in reserving. They felt that the practices and procedures which have become standard in the industry, particularly regarding the quality of data, are the root cause of this. This is also a topic which could be addressed in an Institute seminar, although it would clearly need to be handled with some sensitivity.

3.3 *Communicating the Key Assumptions and Reserve Drivers*

3.3.1 Virtually all the stakeholders we spoke to said that they found it hard to understand the key assumptions used in the actuarial reserving process, and also found it hard to understand the key drivers which would determine the actual outcome of claims costs. Two particular comments stand out:

- “Actuaries do not make it easy to identify the key assumptions and drivers.”
- “There is lots of leeway in the methodology, and it is very hard for management to understand what has been done.”

3.3.2 The message to all of us is that, as actuaries, we have to do more to identify and to communicate the key assumptions underlying our reserve estimates, in order to give our stakeholders the insight and understanding which they require.

3.3.3 However, this raises a much broader issue which has at its heart the question: “What is the purpose of an actuarial reserve assessment?” There are potentially two answers to this:

- (1) *Answer 1* — to communicate the actuary’s independent reserve assessment, i.e. to tell the world what the actuary thinks the liabilities will cost.
- (2) *Answer 2* — to construct a framework for evaluating the reserves which enables both actuaries and non-actuaries (e.g. management) to form a view on the reserves, by allowing everyone to incorporate their views on the key assumptions.

3.3.4 It is possible that many actuaries would view Answer 1 as the answer which represents the current state of affairs, but it is a state of affairs with which many of our stakeholders are clearly frustrated.

3.3.5 Moreover, looking to the future this may be the high risk answer for our profession. Given the current state of our art, we as actuaries are not able to give a ‘correct’ answer for reserves, as we do not know with precision what the claims will cost, and our stakeholders have observed this from our reserving track record. So, unless we can improve our methodology to be more accurate, continuing to claim that our sole role is to provide Answer 1 may position actuaries to carry on providing ‘wrong’ answers in the future.

3.3.6 The challenge is whether actuaries should in future focus on providing Answer 2 rather than Answer 1. Answer 2 is potentially more valuable, as it:

- (1) enables sharing of the critical assumptions and allows a broader range of views to be incorporated in reserving decisions;
- (2) still enables actuaries to provide a useful role which they are fully equipped to carry out; and
- (3) is less risky, in that the actuary is not solely taking responsibility for selecting the reserve estimate from a range of potentially uncertain outcomes.

3.3.7 We believe that this choice — potentially characterised as transparency versus technical sophistication — is critical for our profession and the contribution which it can make to the general insurance industry in future. We believe that this is a strategic issue, and we must decide which is the right way forward. Once this decision has been made it will have a strategic influence on the way actuarial methodology evolves, and the way actuaries present themselves to our stakeholders.

3.3.8 An example of the importance of the answer to this question is the criteria we set for deciding whether a method is ‘good’ or not. If Answer 1, then a ‘good’ method is one which is technically excellent; but if Answer 2, then a ‘good’ method may be one which is more transparent and easier to communicate.

3.3.9 Although not the main reason for this recommendation, it would be consistent with the regulatory regime for life insurance, under which the responsibility for setting reserves lies with the board and senior management on the basis of proper advice (usually from an actuary). Also, in the risk-based FSA regulatory regime for general insurance, senior management needs to have an understanding of the uncertainties in the reserves and the corresponding key loss drivers, and, as a profession, it is important that we respond to this by providing sufficient insight into the reserving assumptions.

3.3.10 Of course, the ideal and possibly most practical solution is both Answer 1 and Answer 2 to provide transparency to non-actuaries on the reserves and the issues affecting them, and to combine this with an actuarial view of the appropriate point estimate and uncertainty therein.

3.3.11 Overall, from what we have heard from our stakeholders, a key challenge facing us as actuaries is providing more insight and understanding to our stakeholders on reserves — the key assumptions, the key sensitivities, and the key factors which will drive the cost of claims as they are paid.

3.4 *Explaining the Actuarial Methodology*

3.4.1 Many of our stakeholders said they do not understand actuarial methods, and regarded them as a black box into which they could not penetrate. We did not encounter any hostility towards this state of affairs — rather it was communicated as an observation on the world as they see it.

3.4.2 Accompanying this lack of understanding of actuarial methods, or perhaps because of it, were doubts about the usefulness and quality of the methods. In the absence of knowledge about the methods themselves, some of our stakeholders judged the quality of our methods by how well they had performed. The perceived track record of reserve deteriorations was cited by some as *prima facie* evidence that the methods could not be very good, because they had not in the past given the ‘right’ answer.

3.4.3 So, if as a profession we do embrace the concept of providing more insight, we will need to include in this explaining how our methods work and making them more transparent to non-actuaries.

3.5 *What did you Say? What did you Mean?*

3.5.1 The other point which we heard loudly and clearly from our stakeholders is that (at least in their view) actuaries are not good at communicating. This is not a new issue for our profession, and we believe that it is outside the scope of GRIT to make specific recommendations in this area. So, we do no more than pass on the observation that this is an area where our stakeholders feel that we need to improve significantly.

3.5.2 However in passing, we do recommend the recent paper on communicating in pensions — ‘Mind the Gap’ by Laura Brown & Neil

Warmby — which discusses in an appealing way some of the basics of clear communication.

3.6 *Comments from Actuaries: Requirements of GN12*

3.6.1 During the course of its work GRIT has consulted with and received comments from members of the profession. One comment which has been made more than once is that many actuarial reports do not contain sufficient information to enable the reader to see a complete calculation trail. Without this it is difficult for another actuary to fully understand issues, methodology, key assumptions, and key sensitivities underlying the calculation of the reserves.

3.6.2 GRIT has not carried out a review or survey of actuarial reports, and therefore is not in a position to form its own view on this topic.

3.6.3 However, it does appear that GN12 is possibly ambiguous on this point. GN12 contains the following requirements:

- “The report should ... give sufficient information to allow another experienced actuary to form an opinion on the appropriateness of the actuary’s key judgements and, together with the files, be sufficient to allow any other suitably experienced actuary to reproduce the results without access to the actuary” (Paragraph 3.1, the last bullet).
- “the report should ... discuss the key assumptions made including those as to the legal and claims environment” (Paragraph 5.1).

3.6.4 As they stand, these words do not require that a complete calculation trail be included in the actuarial report. However, the point made to us is that the spirit of GN12 is that another actuary should be able to understand from the report “what the original actuary has done”. The concern is that often this is not possible given the way actuarial reports are currently written, and that without access to the complete calculation trail it is not possible to fully understand the work underlying the report.

3.6.5 However, the counter concern is that including the full detail would obscure the wood for the trees and make the report less accessible to non-actuaries. Arguably, it would be a retrograde step, and degrade the quality of actuarial communication with non-actuaries. GRIT recommends that:

- GIB considers whether or not an actuarial report should set out a full calculation trail. We acknowledge that there are arguments both in favour and against this, and we believe that it would be helpful if these are identified and debated in the profession before coming to a conclusion one way or the other. A compromise solution might be to require the full actuarial calculation trail to be included in an electronic version on CD accompanying the report. This would leave the narrative report itself free to focus on communicating key issues, assumptions and uncertainties.

- GN12 is then amended to set out more clearly than currently the requirements which have been decided.

4. APPLYING EXISTING METHODS MORE CONSISTENTLY

4.1 *Introduction*

4.1.1 In this section we consider issues relating to the application of the methods most commonly used for reserving by U.K. actuaries. The GRIT survey confirmed that the vast majority of actuaries use link ratio/chain-ladder methods, even if other methods are used alongside these.

4.1.2 We have not covered reserving for latent claim liabilities, such as asbestos and pollution or exposure-based methods in general in this paper.

4.1.3 Based on the combined experience of the members of GRIT, there is room for improvement and a need for greater consistency within the actuarial community in the application of the common reserving methods.

4.1.4 We initially discuss in this section possible reasons for this, connected with the education and training of actuaries; we then comment on some issues which we have observed in the application of the methods commonly in use. It is not within the scope of GRIT, however, to write a textbook on reserving, and this paper does not purport to provide comprehensive reserving training material. At the end of the section we have included some simple worked examples in relation to two reserving issues — Bornhuetter-Ferguson expected loss ratios and tail factors.

4.2 *Education and Training*

4.2.1 An important question is whether the current U.K. education and training system prepares actuaries sufficiently for practical reserving. By education system, we refer, not only to the formal examinations, but also to the practical training available at conferences and other CPD events.

4.2.2 The current syllabus for U.K. actuarial examinations covers general insurance reserving in subjects CT6, ST3 and SA3. Chapter 10 of CT6 (run-off triangles) explains the concept of development factors (link ratios), the basic and inflation-adjusted chain ladder, average cost per claim and the Bornhuetter-Ferguson methods. One rather odd feature is that the impression is given that chain ladder/link ratio methods are applied only to paid claims, rather than to incurred (reported) claims.

4.2.3 There are brief references to examining how well the chain ladder model fits the actual data, and to adjusting development factors to take account of circumstances which might invalidate the assumptions underlying the chain ladder method. In the main, however, this chapter explains the basic arithmetic underlying the methods.

4.2.4 In SA3 and ST3 there is very little additional material on loss reserving. The list of suggested reading for SA3, however, includes material

which covers some of the practical issues encountered when applying the common methods in practice. An example of this is George Maher's 1995 paper on 'Loss Reserves in the London Market', which, amongst other issues, discusses and gives an example of the selection of initial expected loss ratios for the Bornhuetter-Ferguson method.

4.2.5 In general, however, the overall impression created by the core reading is that a mechanical application of the basic methods such as chain ladder will be sufficient in many situations. We do not believe this to be the case!

4.2.6 Another important area in which the core reading appears deficient is the lack of emphasis on the need to gain a good understanding of the underlying business to which the reserving data relate. This is in terms of the characteristics of the classes of business and/or types of liabilities, the various factors which can distort the data triangles for which adjustment needs to be made, and changes in the characteristics of the business such as terms and conditions.

4.2.7 In summary, the following areas do not appear to be addressed (sufficiently) within the syllabus:

- practical issues associated with the application of common reserving methods;
- the underlying insurance contracts and different types of insurance; and
- how changes in terms and conditions of the underlying contracts affect the reserving process.

4.2.8 The second point is particularly evident by contrast with the syllabus of the Casualty Actuarial Society, which includes extensive material on insurance contracts. We recommend that consideration be given to the inclusion of more educational material on insurance contracts, possibly in liaison with the CAS and/or the CII or IRM.

4.2.9 The GI Education & Continuing Professional Development Committee is, we understand, currently reviewing the examination syllabus. We recommend that this review gives serious consideration to the inclusion of more material on the practice of reserving, given the high profile and importance that this area has in the work of GI actuaries.

4.2.10 It is appreciated that the U.K. education system also covers life, pensions and investment and that the inclusion of more GI material will be difficult. On the other hand, there is a risk that the U.K. is producing qualified GI actuaries who are not sufficiently knowledgeable in the underlying business, and not well prepared for the practical challenges of reserving. We anticipate that an extension of the demands on GI actuarial education may lead to consideration of whether a more specialised GI actuarial qualification is needed.

4.2.11 An alternative to extending the examination syllabus is to provide more basic CPD options in GI reserving. Again, the contrast with

the CAS is marked, in that at the annual CAS loss reserving conferences there are basic and intermediate tracks which provide workshops to extend training beyond the examination syllabus. There are obviously differences of scale and structure compared with North America, but we believe that something along these lines is worthy of consideration.

4.2.12 In the current absence of much specific training in reserving, some employers provide specific training courses for their actuarial students. Such facilities are not readily available to all students, however, and this contributes to the perception by GRIT members of a lack of consistency in the standard of reserving, even when common approaches are being used.

4.3 *Specific Reserving Issues*

We felt that it would be helpful to illustrate our concerns on reserving by reference to a number of common situations in which GRIT members have observed inconsistent approaches. As previously noted, this is not intended to be a comprehensive textbook on the subject.

4.4 *Chain Ladder/Link Ratio Methods*

4.4.1 A general observation is that these methods should not, in our view, be applied mechanically. The intention should be to use the available information to aid in the selection of appropriate claims development patterns which appear sensible. It is tempting, when faced with a large number of classes to project, to use a default selection (for example, volume-weighted last three years), but this can be dangerous. Any trends will not be identified, and anomalous and volatile selections can emerge.

4.4.2 Instead, the triangle of link ratios should be examined to see if any trends, discontinuities or anomalies are apparent which might invalidate the key assumptions underlying the link ratio/chain ladder method. Mack & Venter have shown that three assumptions regarding the chain ladder must hold if the claims process is to produce optimal estimates under a least squares criterion:

- for a given accident/underwriting year, the expected value of losses in the next development period is proportional to the cumulative losses emerged to date;
- the accident/underwriting years are independent; and
- the variance of the next development period's losses is the product of the prior development period losses and an (unknown) variance term that varies by development year but not by accident/underwriting year.

4.4.3 Another potentially useful approach is to apply the selected model several times with successive diagonals removed. If there is a trend in the resulting series of ultimate claims estimates by accident/underwriting year, then there may be a feature of the experience which means that an unadjusted application of the model is inappropriate.

4.4.4 Where the assumptions in ¶4.4.2 are clearly invalid, or trends or discontinuities are identified, the reason for these should be sought and appropriate adjustments made. For example, the nature of the underlying business may be changing towards a longer development pattern, or particular accident/underwriting years or blocks of years may be developing differently.

4.4.5 In such cases we suggest that the selection of factors for particular periods should be adjusted to allow for these features. A criticism which may be made of this approach is that it can introduce too much subjectivity into the reserving process. We consider, however, that no one statistical method can possibly cater for all the changing features which underlie the claims development process. Subjectivity is inevitable, and in our opinion it is preferable to apply judgement in a transparent manner than to project reserves mechanically in a blind fashion.

4.4.6 Mechanical methods can also result in the automatic selection of incremental link factors which exhibit strange and unlikely patterns, such as erratic increases and decreases. We would normally recommend smoothing the factors to avoid such features, unless there is a genuine feature of the underlying claims process which is likely to explain an unusual pattern.

4.4.7 Other common pitfalls in applying a mechanical approach are:

- assuming homogeneity in a classification of business without confirming that the underlying business in each class has not changed materially over time; and
- failing to investigate the reasons for unusual movements in the historical data and when appropriate adjusting the factor selection to allow for these.

4.5 *Bornhuetter-Ferguson*

4.5.1 The Bornhuetter-Ferguson method is commonly used by U.K. actuaries, usually in situations where claims development for the more recent accident/underwriting years is immature. It is an example of a credibility weighted average between an (immature) claims projection by chain ladder/link ratio methods and a prior expectation of ultimate claims from a measure such as an expected loss ratio. The essence of the method, however, can be applied to other measures which are being projected, such as the ultimate number of claims (using expected claims frequency) or large personal injury claims amounts (where the actual identification of claims can be slow and variable from year to year).

4.5.2 The classical application of the Bornhuetter-Ferguson method is covered relatively briefly in the U.K. actuarial examination syllabus in subject C6.

4.5.3 In our opinion the idea behind the generic method is a good one, and it is not surprising that it is much used. We do have concerns, however,

that it is prone to misuse, and have seen several examples where this misuse has led to significant systemic reserve underestimation.

4.5.4 The most difficult and sensitive assumption is the choice of initial (a priori) expected loss ratios (ELRs). We note that the CAS has also identified this issue as one where more guidance for actuaries is needed, and there is a CAS working party on this issue.

4.5.5 Most actuaries responding to the GRIT survey indicated that they selected expected loss ratios by reference to emerging ultimate loss ratios (ULRs) on more mature years, adjusted by premium rate and claims cost inflation changes. This is quite encouraging, since some GRIT members have seen examples where the initial selection of expected loss ratios has been kept unchanged despite strong evidence that these were consistently underestimating the emerging loss ratios on relatively mature years.

4.5.6 A simplistic description of a typical application of Bornhuetter-Ferguson may be summarised as follows:

- (1) latest underwriting/accident year ELR based on plan, underwriters' view, pricing basis — it is however essential that the actuary confirms that this is reasonable in comparison with previous years' results or other indicators;
- (2) previous year ELR based on immediately prior years' ULR (or ELR), adjusted for rate/inflation/changes in terms and conditions;
- (3) older years' ELRs derived as in (2); and
- (4) mature years' ELRs based on chain ladder/link ratio projections.

4.5.7 There are several critical decisions even in this simplistic description, each of which requires judgement by the actuary:

- Is the latest year ELR automatically based on plan, or the pricing basis? If the account is new or has been substantially rewritten, there may be little option for the actuary (except perhaps using an appropriate benchmark based on a similar account or market data) — but see below for comments on seeking evidence. If the account is essentially similar business to previous years, then much more attention should be paid to the emerging loss ratios on prior years.
- Should ELRs for prior years be maintained at their initial level when conducting a subsequent reserve review? There is a school of thought which says that this is the theoretically correct approach as it is an unbiased estimate, but practical experience indicates that this can lead to major problems. We recommend that the emerging loss experience should be used to adjust prior year ELRs.
- When should the ELR for prior years move away from plan or the pricing basis? Again, our view is that emerging loss experience (if credible) should be used as soon as possible.
- How should the more mature ULRs be used in determining a 'base' ELR for an immature year? For an account with reasonably consistent

loss experience from year to year, the immediately prior year may be the most suitable base year. Where there is more volatility in loss ratios, an average over several previous years may be more appropriate. The extreme situation is a ‘catastrophe’ type account, where many years’ experience (or perhaps market loss ratios, if available) may be appropriate. Some approaches more commonly used in North America, such as the Cape Cod method, deal with this issue in a more formal, systematic manner.

- A common pitfall in selecting a base ELR from the experience of the past is to remove large or extreme events that have affected individual years, and then to omit to make some allowance for the likelihood that such events will occur again in the future.
- When should the Bornhuetter-Ferguson method be dropped for earlier years? Essentially, when the chain ladder projection becomes sufficiently reliable. This is a matter of judgement; to ensure consistency across classes some actuaries apply a rule of thumb that, if the factor to ultimate is less than a constant ratio, a chain ladder should be used.

4.5.8 Another critical area is the adjustment to the previous years’ loss ratio experience, in particular the adjustment for premium rate changes or underwriting terms and condition changes. We consider that this is an area where a more robust and formal approach by actuaries to seeking confirmatory evidence of rate changes and the effect of terms and conditions changes is desirable. We recognise the practical difficulties of this, particularly in areas such as the London Market, but an over reliance on anecdotal information (‘rates are up by 25%’) is, in our experience, very dangerous. We recommend that the formal guidance for actuaries requiring them to obtain evidence in support of rate changes and the effect of terms and conditions changes be tightened. For formal reporting on loss reserves we recommend that this evidence be included in the report.

4.5.9 Conversely, we have seen examples where link ratio/chain ladder methods have been applied without considering the use of Bornhuetter-Ferguson type adjustments for the later (immature) years. In our view this places too much credibility on the claims experience to date.

4.6 *Tail Factors*

4.6.1 By ‘tail factors’ we mean the selection of development factors towards the end of the period of development for which historical data are available (where typically data are sparse), as well as the tail selection for the period beyond the extent of available history. This important aspect of reserving is not covered at all in the current examination syllabus, yet it can have a very significant influence on reserve estimates.

4.6.2 There are several possible approaches to this issue. There is a CAS working party looking at this issue, and we expect that this will contain some

useful material for U.K. actuaries. We have restricted our comments to some general observations on the key judgements.

4.6.3 This is an example of an area where, as previously mentioned in this section, a mechanical chain ladder approach can be dangerous. A judgement has to be made as to the reliability of the (typically sparse) data in the tail. It often contains a few high data observations amongst a series of factors close to one. Ignoring such observations totally (for example, using averages excluding high and low factors) can be inappropriate. An illustration of this is a gross of reinsurance paid chain ladder on a motor or liability account, where inherent in the business is that a few very large claims will be settled in the tail, at stages of development which can vary by a number of years.

4.6.4 Averaging across a number of development years can assist in such situations. The aim should be to select a claims development pattern for the later development factors which appears sensible given the past experience and the pattern of earlier, more reliable, development factors. Fitting curves to the observed development data or average link ratios can be helpful, but again a mechanistic approach can be dangerous.

4.6.5 Reference to ‘benchmarks’ can be helpful in the selection of tail factors. These may be from market data or from similar portfolios where more data are available. In all cases it is necessary for the actuary to consider carefully whether the benchmark is relevant to the account being reserved. This may involve a qualitative consideration of the type of business, but could include some comparison with actual emerging experience.

4.6.6 A useful reasonableness check can be made by comparing the implied reserve estimates for older years with the notified outstanding case reserves. If a material redundancy or deficiency is implied, a judgement has to be made on whether this is appropriate.

4.7 *Categorisation of Business*

4.7.1 In Section 5 on ‘Understanding the Business Better’, we discuss the importance of gaining an appreciation of the underlying features of the business. This should help in deciding on an appropriate categorisation for reserving purposes.

4.7.2 There is the usual judgement to be made as to how far it is possible to go towards homogeneous data, whilst avoiding the lack of credibility associated with sparse data.

4.7.3 We have seen examples of inappropriate judgements in either direction. An easy trap to fall into is to be guided totally by the desire by company management for results at an ever finer level of detail (product, scheme, distribution channel, even individual broker). This can go far beyond the desire for reasonable homogeneity, and it also makes the process of reserving very time consuming, which can lead to insufficient analysis of the data and an overly mechanical approach. At the other extreme, aggregating

claim types where there has clearly been a change of mix is equally fraught with difficulties.

4.7.4 We offer no easy solutions for these issues, but emphasise the importance of thinking about the selection of categories rather than being guided solely by prior practice or the ready availability of data.

4.8 *Paid or Incurred Projections?*

4.8.1 We suggest that best practice in most situations for chain ladder projections remains that these should be conducted on both paid and incurred bases. This can reveal features of claims reserves which would be missed if, as seems to have become common practice by some actuaries, only incurred projections are carried out. In particular, paid projections can help identify changes or inconsistencies in the strength of case reserves, a common cause of difficulties in reserve estimation.

4.8.2 Paid claims developments will of course be less mature than incurred claims, and it is important to give due consideration to the selection of appropriate paid claim tail factors, as previously discussed. In our experience, the phenomenon of paid claim projections apparently producing consistently lower reserve estimates than incurred claim projections on motor or liability classes is often explained by the selection of paid claim tail factors which are too low, being unduly influenced by sparse observations in the tail of the historical development or by the selection of a tail which is too 'flat'. In the other direction, we have also seen situations in which the reason for lower paid claim projections is that case reserves have not been revised and contain genuine redundancies.

4.9 *Large Claims*

4.9.1 A general observation on the treatment of large losses is that care needs to be taken when stripping out 'exceptional events' and reserving separately for them. The remaining claims reserves need to make sufficient allowance for the possible emergence of future 'surprises' which are in fact inherent in the underlying business. Reference was made to this feature in the paragraphs of this section on Bornhuetter-Ferguson ELRs. A prime example of this issue is the reserving for U.S. casualty over recent years.

4.9.2 Reserving at an early stage of development for catastrophe losses such as windstorms and earthquakes takes us into the territory of exposure-based reserving which, as previously indicated, we have decided is best addressed in detail in another paper. Once claims experience starts to emerge, the development pattern of similar catastrophes in the past may assist the actuary in refining initial estimates. We would however urge caution in applying mechanical curve-fitting approaches at an early stage of development, without considering the exposure.

4.9.3 Curve fitting can be helpful for more mature losses, particularly where the inwards reinsurance/retrocession exposure is limited or non-

existent. We hope that the issues faced in the past of reserving for LMX spiral losses are mainly behind us!

4.9.4 Individual large losses are a very important and sensitive feature of reserving for motor (and liability) accounts. Trends in U.K. personal injury claims are very different from those for damage claims. There is quite a wide variety in the market in the standards of case reserving for large personal injury claims, and it is important for the actuary to understand the particular circumstances of the insurer, which may lead to the strength of case reserves varying by size.

4.9.5 Often the largest losses take some years before they are recognised as being very large, as information on the circumstances of the claimant and the extent of injury emerges. When reserving at an early stage of development, a credibility-based approach can be useful, by considering actual notified claims experience, but also the likely eventual total cost of large claims above a certain size across the whole portfolio. The latter may be based on more mature years, or on market data if available.

4.9.6 A decision needs to be taken for large losses as to whether these should be capped at a certain level in the data, with the excess over the cap being projected separately, or removed totally. In either case, it may also be appropriate to index the large loss limit definition from year to year, to avoid distortions caused by inflation.

4.10 *Diagnostics*

4.10.1 This is an aspect of the reserving process which is, in our experience, often neglected. By diagnostics we mean both the review of various simple analytical ratios and the application of more formal techniques identifying the goodness of fit of the chain ladder/link ratio model. The latter were mentioned earlier in this section.

4.10.2 We have found that simple ratios or analytics can be very useful, both in identifying features of the development and as reasonableness tests for the results of reserving exercises. Some examples are:

- *Paid to incurred ratios.* In situations where both paid and incurred projections are carried out, the review of a triangle of cumulative paid claims divided by cumulative incurred claims can be a very good indicator of a change in case reserving strength or a change in claims settlement practice. We regard this as a standard approach which should be conducted as a matter of routine — and it is interesting to note that this test (and variations such as outstanding to incurred) have been included for many years in the guidance to auditors of U.K. insurance companies.
- *Average outstanding case estimate.* The review of this triangle can also assist in testing for changes in the strength of case reserves.
- *Trends in implied ultimate loss ratios/claims costs.* This may seem an obvious point, but we have seen reserve reviews which have focused

purely on the ultimate claim amounts and have ignored a consideration of whether the implied trends in ultimate loss ratios by underwriting or accident years make sense in the context of underlying market conditions. Even if premium information is unavailable, the trend in the claims cost per unit of exposure is helpful.

- *Settlement rates.* In situations where information on claims numbers is used in reserving, other ratios become useful as tests of the stability or otherwise of the claims handling process, for example, a triangulation of settled claims divided by reported claims.
- *Average cost per claim.* Where ultimate claims numbers can be projected, the trend in implied ultimate average claim cost can be used as a reasonableness test, even if a chain ladder approach on total claims costs is the main reserving method applied.

4.11 *Inflation*

In a relatively stable inflationary environment, the implicit assumption in the basic chain ladder model that future inflation will be in line with average historical inflation rates may be sufficient. Where this condition does not apply, an allowance will need to be made by adjusting historic data or other methods. Some methods attempt to make an explicit calculation of historical inflation rates from the actual data. In our experience caution needs to be exercised with the use of such methods, and it should be confirmed that the implied inflation rates are reasonable in the light of the economic and claims background. Sometimes there is an element of spurious accuracy.

4.12 *Outwards Reinsurance*

4.12.1 Some net of reinsurance reserve projections are made purely using net of reinsurance data. This can be dangerous, as the implicit assumption is that the future reinsurance will behave like the past. A preferable approach can be to project reinsurance separately by applying the actual reinsurance programme to projected future claims. This may not be feasible or practical in all circumstances, however, either because of the complexity of the reinsurance programme (although to ignore this is also dangerous!) or because gross projections would be required to, for example, simulate the workings of an excess of loss programme on the basis of sparse data.

4.12.2 An alternative approach is to analyse the trend in reinsurance to gross ratios for items such as premiums, paid, incurred and outstanding claims, in order to select reinsurance IBNR ratios. This approach should be accompanied by an understanding of any changes in the reinsurance programme and how this might affect these ratios.

4.13 *Selection between Results of Different Methods*

4.13.1 It is normal practice to review the results of several different

methods before deciding on the most appropriate selection of results. Even when considering solely the common methods considered in this section of our paper, there is still a choice to be made. As noted above, the BF method (or some other approach giving weighting to an exposure — based estimate) is likely to be appropriate for years where claims development is immature. For very old years where there are very few claims outstanding it may be appropriate to assume that the case estimates are correct (i.e. no IBNER) unless there is good evidence that these consistently either over or understate future payments.

4.13.2 For intermediate years, it is usually appropriate to select some blend of paid and incurred chain ladders, with less mature years giving more weight to incurred projections.

4.13.3 Where different methods give very different results, this should cause the actuary to attempt to understand the reasons for the differences. The factors selected may be inappropriate, or there might be an underlying feature or trend which is only highlighted by one method.

4.14 *Quarterly or Annual Projections?*

4.14.1 It is increasingly likely that reserve estimates will be required quarterly for management reporting purposes. This does not mean, however, that projections using solely quarterly development factors are necessarily the best approach. In our experience, projections using quarterly factors are sometimes carried out mechanically, because of the significant increase in the number of factor selections required. It is also more easy to lose sight of the overall shape of the claims development, and hence more difficult to select tail factors.

4.14.2 When quarterly development factors are used, we suggest the following approach. This is to select annual development factors from the end of the financial year, but use the quarterly development data to select appropriate adjustment factors to obtain cumulative development factors at intermediate stages, such as nine months, 21 months, 33 months, etc. For later development factors where the annual incremental factors are small, it will probably suffice to interpolate between the relevant annual factors. A compromise approach worth considering is to use half-yearly factors.

4.14.3 The need to conduct quarterly reserve reviews introduces several other issues. Notably, there is a tendency to speed up a process which can be time consuming, to start from the previous quarter's ultimate claims projection and then only revise the estimate if claims development differs materially from expectations. Alternatively, some organisations use the previous estimate as one of the methods to which weight is given in an averaging process. Whilst a pragmatic approach is inevitable, there is a danger that reserve estimates are in this way 'pegged' to an inappropriate previous estimate. In this context the comments made about the 'anchoring'

phenomenon in the section on ‘Behavioural issues and third party influence’ are very relevant. We have seen instances where an estimate of ultimate claims made some years ago is still having a significant influence on the current estimate, despite being clearly inappropriate in view of subsequent claims development.

4.15 *Underwriting to Accident Year Conversion*

4.15.1 This is a common issue for London Market organisations and/or reinsurers, and one where different approaches are used. In essence, the choice is between applying conversion factors or averaging between underwriting year factors to derive accident year factors, and collecting accident year data to derive the relevant estimates.

4.15.2 Both approaches have merit, and perhaps the best approach, given sufficient time, is to use both and compare the results. Currently in the London Market the first option is typically used, but an accident year basis can give quite different results. There is an obvious need for consistency of assumptions when producing results on both underwriting and accident year basis. The likely use of BF introduces particular issues here in connection with the consistency of expected loss ratios on two different bases.

4.16 *Documentation Standards*

4.16.1 This topic perhaps merits a whole paper or guidance note on its own. There is an overwhelming pressure towards a general improvement in the level and standard of documentation of reserving exercises. This is driven by a number of influences including:

- a general move towards greater transparency and accountability in business decisions;
- a desire on the behalf of management (in part driven by regulation) for greater controls over all aspects of business — in insurance companies this definitely includes reserving;
- the Sarbanes-Oxley Section 404 legislation in the U.S.A., requiring a very high level of control and supporting documentation of company’s activities; and
- recognition by the actuarial community that this is an area where there is room for improvement.

4.16.2 The current actuarial guidance for general insurance actuaries is currently being revised, so we have restricted our comments in this paper to a few points:

- Best practice for ‘formal’ reporting should include appropriate documentation to enable another actuary to assess the reasonableness of the methods and assumptions used in a reserving exercise. This has implications including the need to show the data and key assumptions such as development factors, BF loss ratios and method selection.

- As previously noted, we consider that appropriate evidence should be obtained and cited for key assumptions such as rating changes or portfolio changes.

4.17 *Data*

4.17.1 The actuary conducting a review of general insurance reserves often faces difficulties with data in terms of availability, reliability and consistency with that provided for previous reviews. This can sometimes lead to additional uncertainty or, in the extreme, to the actuary being unable to complete an assignment.

Other data issues include:

- the extent to which the actuary is able to rely without verification on data provided by others;
- the extent to which reasonableness tests of the data are required to be conducted; and
- the practical limitations to possible enhancements to imperfect or inadequate data caused by time and/or cost constraints.

4.17.2 None of these issues is unique to general insurance, but data deficiencies are certainly commonplace in this area.

4.17.3 The current guidance for general insurance actuaries already makes mention of some or all of the above issues, but we recommend that those responsible for revising U.K. professional guidance notes refer to the revised (December 2004) version of the North American Actuarial Standards Board's Actuarial Standard of Practice (ASOP) Number 23 on 'Data Quality'. We note that this ASOP applies to all practice areas of actuarial work.

4.17.4 ASOP 23 includes some useful material which seeks to clarify the responsibilities of the actuary in:

- selection of data;
- reliance on data supplied by others;
- reviewing data;
- using data; and
- making appropriate disclosures on data quality.

4.18 *Worked Examples*

Worked examples and commentary follow in the next few pages illustrating some of the points discussed in this section.

Table 4.1. Selection of Bornhuetter-Ferguson expected loss ratios

Scenario 1a. U.S. Casualty — INAPPROPRIATE SELECTIONS not reflecting emerging experience on more mature years, or rate reduction

Year	Ultimate premium	Incurred	CDF	ICL ultimate	ICL ULR	IBF ULR	Selected ULR	Selected basis	BF ELR	Rate index	Claims index	ICL ULR 2000 rebased
1995	10,000	7,000	1.01	7,070	70.7%		70.7%	ICL		100	100	128.9%
1996	11,000	8,000	1.02	8,160	74.2%		74.2%	ICL		105	105	135.3%
1997	12,000	8,000	1.03	8,240	68.7%		68.7%	ICL		100	110	113.6%
1998	15,000	16,000	1.06	16,960	113.1%		113.1%	ICL		80	116	142.5%
1999	16,000	15,000	1.12	16,800	105.0%		105.0%	ICL		70	122	110.3%
2000	17,000	16,000	1.24	19,840	116.7%	110.6%	110.6%	IBF	85.0%	70	128	
2001	20,000	15,000	1.48	22,200	111.0%	102.6%	102.6%	IBF	85.0%	80	134	
2002	30,000	16,000	1.96	31,360	104.5%	95.0%	95.0%	IBF	85.0%	90	141	
2003	35,000	12,000	2.92	35,040	100.1%	90.2%	90.2%	IBF	85.0%	110	148	
2004	40,000	10,000	4.84	48,400	121.0%	92.4%	92.4%	IBF	85.0%	115	155	

Scenario 1b. U.S. Casualty same data; 2000 ELR = average 1995-99 rebased; 2001-2004 rolled forward from 2000 ELR

Year	Ultimate premium	Incurred	CDF	ICL ultimate	ICL ULR	IBF ULR	Selected ULR	Selected basis	BF ELR	Rate index	Claims index	ICL ULR 2000 rebased
1995	10,000	7,000	1.01	7,070	70.7%		70.7%	ICL		100	100	128.9%
1996	11,000	8,000	1.02	8,160	74.2%		74.2%	ICL		105	105	135.3%
1997	12,000	8,000	1.03	8,240	68.7%		68.7%	ICL		100	110	113.6%
1998	15,000	16,000	1.06	16,960	113.1%		113.1%	ICL		80	116	142.5%
1999	16,000	15,000	1.12	16,800	105.0%		105.0%	ICL		70	122	110.3%
2000	17,000	16,000	1.24	19,840	116.7%	118.5%	118.5%	IBF	126.1%	70	128	
2001	20,000	15,000	1.48	22,200	111.0%	112.6%	112.6%	IBF	115.8%	80	134	
2002	30,000	16,000	1.96	31,360	104.5%	106.3%	106.3%	IBF	108.1%	90	141	
2003	35,000	12,000	2.92	35,040	100.1%	95.4%	95.4%	IBF	92.9%	110	148	
2004	40,000	10,000	4.84	48,400	121.0%	99.0%	99.0%	IBF	93.3%	115	155	

Table 4.1 (continued).

Scenario 1c. U.S. Casualty same data; 2000 ELR = average 1995-99 rebased; 2001-2004 rolled forward from preceding year's ELR												
Year	Ultimate premium	Incurred	CDF	ICL ultimate	ICL ULR	IBF ULR	Selected ULR	Selected basis	BF ELR	Rate index	Claims index	ICL ULR 2000 rebased
1995	10,000	7,000	1.01	7,070	70.7%		70.7%	ICL		100	100	128.9%
1996	11,000	8,000	1.02	8,160	74.2%		74.2%	ICL		105	105	135.3%
1997	12,000	8,000	1.03	8,240	68.7%		68.7%	ICL		100	110	113.6%
1998	15,000	16,000	1.06	16,960	113.1%		113.1%	ICL		80	116	142.5%
1999	16,000	15,000	1.12	16,800	105.0%		105.0%	ICL		70	122	110.3%
2000	17,000	16,000	1.24	19,840	116.7%	118.5%	118.5%	IBF	126.1%	70	128	
2001	20,000	15,000	1.48	22,200	111.0%	110.3%	110.3%	IBF	108.9%	80	134	
2002	30,000	16,000	1.96	31,360	104.5%	103.8%	103.8%	IBF	103.0%	90	141	
2003	35,000	12,000	2.92	35,040	100.1%	92.9%	92.9%	IBF	89.1%	110	148	
2004	40,000	10,000	4.84	48,400	121.0%	99.0%	99.0%	IBF	93.3%	115	155	

Scenario 2a. U.K. Direct Motor — Apparent trend in ULRs on mature years: ELRs based on most recent mature year (2002)												
Year	Ultimate premium	Incurred	CDF	ICL ultimate	ICL ULR	IBF ULR	Selected ULR	Selected basis	BF ELR	Rate index	Claims index	
1995	10,000	7,000	1.00	7,000	70.0%		70.0%	ICL		100	100	
1996	10,000	7,500	1.00	7,500	75.0%		75.0%	ICL		95	105	
1997	10,000	8,000	1.00	8,000	80.0%		80.0%	ICL		90	110	
1998	10,000	9,000	1.00	9,000	90.0%		90.0%	ICL		90	116	
1999	10,000	9,500	1.00	9,500	95.0%		95.0%	ICL		90	122	
2000	11,000	9,000	1.01	9,090	82.6%		82.6%	ICL		110	128	
2001	13,000	9,500	1.03	9,785	75.3%		75.3%	ICL		130	134	
2002	15,000	9,000	1.10	9,900	66.0%		66.0%	ICL		145	141	
2003	16,000	7,000	1.40	9,800	61.3%	62.9%	62.9%	IBF	67.0%	150	148	
2004	17,000	4,000	2.50	10,000	58.8%	68.7%	68.7%	IBF	75.4%	140	155	

Table 4.1 (continued).

Scenario 2b. U.K. Direct Motor same data; 2003 ELR based on most recent mature year (2002); 2004 based on 2003 ULR

Year	Ultimate premium	Incurred	CDF	ICL ultimate	ICL ULR	IBF ULR	Selected ULR	Selected basis	BF ELR	Rate index	Claims index
1995	10,000	7,000	1.00	7,000	70.0%		70.0%	ICL		100	100
1996	10,000	7,500	1.00	7,500	75.0%		75.0%	ICL		95	105
1997	10,000	8,000	1.00	8,000	80.0%		80.0%	ICL		90	110
1998	10,000	9,000	1.00	9,000	90.0%		90.0%	ICL		90	116
1999	10,000	9,500	1.00	9,500	95.0%		95.0%	ICL		90	122
2000	11,000	9,000	1.01	9,090	82.6%		82.6%	ICL		110	128
2001	13,000	9,500	1.03	9,785	75.3%		75.3%	ICL		130	134
2002	15,000	9,000	1.10	9,900	66.0%		66.0%	ICL		145	141
2003	16,000	7,000	1.40	9,800	61.3%	62.9%	62.9%	IBF	67.0%	150	148
2004	17,000	4,000	2.50	10,000	58.8%	66.0%	66.0%	IBF	70.8%	140	155

Scenario 3. Short-tailed Catastrophe account; 2004 ELR based on 9 year average rebased ULRs

Year	Ultimate premium	Incurred	CDF	ICL ultimate	ICL ULR	IBF ULR	Selected ULR	Selected basis	BF ELR	Rate index	Claims index	ICL ULR 2004 rebased
1995	10,000	2,000	1.00	2,000	20.0%		20.0%	ICL		100	100	22.2%
1996	10,000	4,000	1.00	4,000	40.0%		40.0%	ICL		95	105	40.1%
1997	10,000	1,500	1.00	1,500	15.0%		15.0%	ICL		90	110	13.6%
1998	9,000	5,000	1.00	5,000	55.6%		55.6%	ICL		90	116	47.9%
1999	9,000	3,000	1.00	3,000	33.3%		33.3%	ICL		90	122	27.3%
2000	8,000	25,000	1.00	25,000	312.5%		312.5%	ICL		110	128	298.5%
2001	13,000	7,000	1.00	7,000	53.8%		53.8%	ICL		130	134	57.9%
2002	14,000	9,000	1.00	9,000	64.3%		64.3%	ICL		145	141	73.4%
2003	13,000	5,000	1.05	5,250	40.4%	46.8%	40.4%	ICL		150	148	45.4%
2004	11,000	2,000	1.70	3,400	30.9%		46.8%	IBF	69.6%	140	155	

4.19 *Worked Example: Selection of Bornhuetter-Ferguson Expected Loss Ratios — Comments*

4.19.1 The examples shown are intended to be illustrative of some of the main issues, and have been deliberately simplified. The data are fictional. The rate indices shown can be taken to be inclusive of the effects of any changes in terms and conditions. It may also be assumed that there have been no significant changes in the composition of the account — in practice this is unlikely to be realistic. Terminology: ICL is incurred chain ladder, CDF is cumulative development factor, IBF is incurred Bornhuetter-Ferguson, ULR is ultimate loss ratio, ELR is expected loss ratio.

4.19.2 *Scenario 1* is a U.S. casualty account. From the chain ladder ULRs for reasonably mature years (1995 to 99), results appear quite volatile. In Scenario 1a, the ELR for all immature years has been taken as a long-term average of historical performance. Scenarios 1b and 1c demonstrate that this is inappropriate, as the emerging experience and the effect of rate changes have not been reflected. There is no one correct way of allowing for these features, and 1b and 1c are but two possibilities. In 1b all the ELRs are based on the experience of 1995 to 99, adjusted for rate change and claims inflation. In 1c the ELRs also allow for the emerging experience on the later years, by basing them on the immediately preceding year's ULR. 1c might not be appropriate if the claims experience on the later years was clearly abnormal.

4.19.3 *Scenario 2* is a large direct personal or commercial account, perhaps U.K. Motor, which has been very stable in its mix over the years. Being shorter tailed than Scenario 1, it is probably only necessary to use the B-F method for the last two years. The trend in the ULRs seems quite consistent and follows the rate changes quite closely. It therefore seems reasonable to base the ELR for 2003 solely on the 2002 ULR rather than a longer-term average. In Scenario 2a the ELR for 2004 is also derived from the 2002 ULR, whereas in Scenario 2b it is based on the 2003 ULR. This illustrates the important effect of the judgement on the method of ELR selection. Note that the ULR for 2004 in 2b is nearly three points lower than in 2a.

4.19.4 *Scenario 3* is a 'catastrophe' type account, which is susceptible to the occasional very bad year — perhaps a windstorm. It is a very short-tailed account, and EF need only be used for the latest year. The ELR needs to make allowance for the possible occurrence of an exceptional event — we have assumed that there is still unearned exposure. The option shown is where the ELR has been based on the rate/inflation adjusted average of all the past years. In practice a judgement would have to be made as to whether a nine-year period is appropriate for this average.

4.20 *Selection of Tail Factors — Comments*

4.20.1 We have shown a few very simple examples to illustrate some common issues which are encountered in practice.

Table 4.2. Selection of tail factors from sparse data

Example 1. Selection of tail factors (e.g. liability account)

	Ultimate premium	Incremental paid development factors							
		12-24	24-36	36-48	48-60	60-72	72-84	84-96	96-Ult
1997	3,000	2.00	2.50	1.00	1.10	1.14	1.00	1.01	
1998	5,000	5.00	1.50	2.00	1.30	1.06	1.02		
1999	6,000	8.00	2.00	1.20	1.15	1.12			
2000	10,000	3.00	1.40	1.60	1.25				
2001	15,000	6.00	1.80	1.40					
2002	25,000	9.00	2.00						
2003	30,000	3.00							
Volume-weighted five-year average									
		4.00	1.80	1.40	1.20	1.10	1.01	1.01	1.00
Selection reflecting pattern/benchmarks									
		4.00	1.80	1.40	1.20	1.10	1.06	1.03	1.05

Example 2. Smoothing anomalous patterns

	Incremental factors							
	12-24	24-36	36-48	48-60	60-72	72-84	84-96	96-Ult
Volume-weighted five-year average								
	1.80	1.15	1.02	1.08	1.05	1.01	1.02	
Possible smoothing								
	1.80	1.15	1.07	1.05	1.03	1.02	1.01	1.03

Example 3. The dangers of excluding high and low factors

	Incremental incurred factors								
	12-24	24-36	36-48	48-60	60-72	72-84	84-96	96-108	108-120
1995	2.00	1.10	1.02	1.01	0.99	1.00	1.00	1.00	1.00
1996	2.20	1.30	1.06	1.00	1.00	1.03	1.02	1.01	
1997	2.50	1.20	1.04	0.99	1.03	0.99	1.00		
1998	1.70	1.10	1.05	1.00	1.00	1.00			
1999	1.90	1.15	1.02	1.01	1.01				
2000	2.50	1.10	1.12	1.06					
2001	1.80	1.20	1.03						
2002	1.50	1.10							
2003	2.10								
five-year average ex high/low									
	1.93	1.12	1.04	1.00	1.00	1.00	1.00	1.01	1.00
five-year average									
	1.96	1.13	1.05	1.01	1.01	1.01	1.01	1.01	1.00

4.20.2 Example 1 shows how it is necessary to avoid placing too much reliance on sparse data observations in the tail. Using a mechanical selection is dangerous, and in this case will significantly understate the tail. When selecting the last few factors and the factor from the end of the triangle to ultimate it is advisable to consider:

- the pattern shown by the previous development factors, and the likely overall shape of the tail in relation to this; and/or
- if available, suitable benchmarks from other accounts or market data. Curve fitting can help, but should not be applied mechanically as many curves can be fitted to the few data points available.

4.20.3 Example 2 is a very simplistic situation where the development factors show an erratic (increasing and decreasing) pattern. It is most unlikely that this can be a real feature of the claims process, and smoothing of the factors should be considered. In this case the factors from months 36 to 96 have been smoothed taking into account the product of the incremental factors in this period. Clearly there are many ways to smooth the pattern, and judgement needs to be exercised, considering the nature of the account, benchmarks, etc.

4.20.4 Example 3 shows the dangers of a mechanical selection of averages excluding high and low factors. A prime example of this is a motor account where the movements on a few large personal injury claims have a significant effect on the tail. A few of these claims may prove to be much worse injuries than realised and will deteriorate, leading to high development factors. There may not be an equivalent and compensating large saving effect, so it is important to reflect this systemic feature. In this case, an average using simple factors would have led to cumulative factors about 0.05 higher from month 36. This is a relatively large difference (five points on the loss ratio).

5. UNDERSTANDING THE BUSINESS BETTER

5.1 *Introduction*

5.1.1 This section and its corresponding appendix sets out many suggestions of analyses which would enhance the actuary's understanding of the business. Whereas GRIT believes that these analyses are all potentially useful, we are also conscious of the extra work involved in carrying out the analyses. In practice, the actuary would need to evaluate which of these analyses would be useful and cost effective and plan a work programme accordingly.

5.1.2 Standard reserving methods, such as the chain ladder and Bornheutter-Ferguson, assume that the triangular premium/claim data are homogeneous across the selected underwriting/accident periods. Should the policy terms, conditions, policy structure, claims reserving philosophy, etc., change during the selected underwriting/accident periods the precept of homogeneity can be seriously compromised. Only by understanding the

historical changes to the policy terms, conditions, policy structure, data processing, etc., can the actuary determine whether he/she can improve the homogeneity of the data by partitioning the class triangles still further, whilst at all times maintaining statistically credible datasets.

5.1.3 The section focuses only on what we consider to be the high priority ‘Key’ drivers whilst leaving, in descending order of importance, the ‘Helpful’ and ‘Handy to have’ drivers discussed in Appendix B. These priorities will vary depending on the syndicate/company and the actual nature of the classes of business written. At all times the actuary should be aware not to dissect the account into too many sub-sets, as this could make the reserving process too burdensome and potentially meaningless. Nevertheless, the processes should help to identify the atypical policy (or policies) which needs to be removed from the reserving class and evaluated separately. Hopefully, the analyses can be used to direct management away from loss making accounts, thereby adding further value to the reserving exercise.

5.1.4 The points raised in this section are not exhaustive and are not meant to be prescriptive. They should be used as guidelines to identify the principal features which drive an account. It is important to stress that the actuary can never be expected to carry out all of the suggested diagnostics or investigations, but only those which he/she believes are pertinent to the business classes being analysed. In addition, the actuary must consider the significance of the claims reserve in the context of the total business and the purpose for which the results are to be used.

5.1.5 The first part of this section focuses on issues affecting London Market (LM) business, the second part on issues relevant to personal lines (PL) business and the last part discusses issues affecting U.K. commercial lines with reference to the LM and PL parts. Understanding the business better applies equally to the recent ICA requirements and to all other areas of actuarial work.

5.1.6 It is a pre-requisite for any reserve study that the underwriting statistics reconcile with the audited accounts.

5.2 *London Market (LM)*

5.2.1 The London Market is famous for being innovative, inventive and writing risks which can vary and change materially year on year, depending upon the cost benefit and risk appetite of the insured and the presentation and packaging by the broker. London Market underwriters are generally reliant on business being presented to them by the major brokers. Consequently, the structure of a risk, the terms and conditions and the premiums are influenced in a soft market and, to a lesser extent, in a hard market by the broker and/or the insured/reinsured. It is common for the structure and composition of seemingly similar business to vary materially year by year.

5.2.2 The purpose of this section on London Market business is to assist the actuary to produce meaningful premium and claim diagnostics at the

start of the reserving exercise. After reviewing such diagnostics, the actuary should be better equipped to ask meaningful questions of management and the underwriters, thereby gaining a better understanding of how the business should be reserved by class, sub-class and whether certain policies or claims should be extracted and reserved separately.

5.3 *Policy Database Diagnostics (LM)*

5.3.1 By interrogating the policy database useful observations can be made of whether the data are reasonably homogeneous. When the data are not homogeneous the actuary should consider further sub-division of the data and, where necessary, remove and project separately the heterogeneous parts. The residual homogeneous parts can then be projected using traditional methods.

5.3.2 Where data exist, the following policy database diagnostics should assist the actuary understand more about the fundamentals of the business written. The term [T&C] indicates where diagnostics can reveal changes in policy terms and conditions. In most of the commentary that follows the origin year term ‘underwriting year’ is inter-changeable with ‘accident year’.

Table 5.1. Policy database diagnostics (LM)

Policy — key	Commentary
(1) Average policy period weighted by premium volume by underwriting year together with outlying percentiles and/or extreme values [T&C].	During a soft market there is a tendency for an increasing proportion of policies to be written on a multi-year basis. It is important to identify these multi-year policies, as they will elongate and distort the development pattern of claim exposures. It is also important to understand how multi-year policies are accounted for within the statistics. One accounting convention is to have all claims and premiums attaching to the inception underwriting year, whilst another accounting convention is to set up individual policy years for each year within the multi-year period. In the former case, multi-year policies will have a far longer development profile than standard annual policies, and the inclusion of large multi-year policies in the statistics will distort the development of the more standard underlying business. Therefore high worth multi-year policies should be removed and reviewed separately. A premium volume chart showing the average and percentile spread of the policy periods such as the ‘Type 1’, as shown in Figure 5.1 below will easily reveal the existence and influence of multi-year policies.

Table 5.1 (continued).

Policy — key	Commentary
(2) Territory mix (by primary source if possible) by underwriting year based upon gross written or signed or projected premiums.	For homogeneity, the mix by territory should be reasonably consistent year on year. If this is not the case, consider whether it is meaningful to extract the business from certain territories for separate projection. The Figure 5.2 chart shown below will rapidly identify whether the mix has been consistent or inconsistent over time.
(3) Unusual growth in premium volumes.	Unusual premium growth might imply a changing mix in business. Any material new sources of business should be studied and understood before automatically assuming that their development will exhibit similar characteristics to pre-existing business.
(4) Loss attachment mix (risks attaching, losses occurring during, claims made) by underwriting year based upon gross written or signed or projected premiums [T&C].	For homogeneity, the loss attachment mix should be consistent year by year. If this is not observed, consider separating the data by major attachment type. Take particular note if the proportion of risks attaching to policies is increasing, as these will have longer claims development than losses occurring during and claims made policies.
(5) For non-proportional contracts (after making due allowance for horizontal back ups and top and drops) check that the layers of coverage are mutually exclusive.	Diagrams similar to Figure 5.3 will rapidly identify whether policy periods overlap (shown in grey) or whether suspicious inception dates, expiry dates, attachment points and limits exist. Where the layering data appear to be erroneous, questions need to be raised with management before one can automatically accept the data for reserving purposes. Figure 5.3 also shows how risks were historically written. In the example given, the business for the first two and last two policy years was written at the working to medium layers, whilst for the intervening years it was written at much higher layers. The higher layer business will probably experience a much longer development period than business written at lower layers. Such a chart can

Table 5.1 (continued).

Policy — key	Commentary
	sometimes explain why certain underwriting years have different development profiles to other years.
(6) Currency mix by underwriting year based upon gross written or signed or projected premiums.	A chart similar to Figure 5.2 will reveal the consistency of currency mix by year and identify any material changes. If it is observed that there have been material changes in the proportion of certain currencies over the years, it might be advisable to reserve separately the business in currencies with the most influence.
(7) Percentage of business led by policy count and premium volume.	A chart similar to Figure 5.2 will reveal whether the proportion of business led is consistent year on year. Should there be major differences by year, it may be advisable to reserve the lead versus non-lead business separately. Non-lead business has a tendency to be longer tailed than lead business.
(8) Proportion of policies with aggregate deductible features.	A chart similar to Figure 5.2 showing the proportion of policies with aggregate deductibles will reveal their existence and the extent to which they might influence the pace of emergence of claims. Should the proportion of policies with large deductibles increase over time this could cause the loss development to slow down. In a hard market there is a tendency for the volume of self-insurance and aggregate deductibles to increase.

5.4 *Claims Database Diagnostics (LM)*

Understanding the underlying claims data that drive the claim statistics will assist in the separation and sub analysis of those sections that require individual consideration. It will also help identify areas of significant loss activity that warrant full and detailed analysis.

Table 5.2. Claims database diagnostics (LM)

Claims — key	Commentary
(1) Currency proportions of the incurred claims by underwriting year.	A chart similar to Figure 5.2 will reveal the consistency of mix by currency of incurred claims. An

Table 5.2 (continued).

Claims — key	Commentary
	inconsistent blend may indicate that certain currency groups need to be projected separately.
(2) Currency incurred loss ratios by underwriting year.	A barchart similar to Figure 5.4 will reveal whether certain currencies generate markedly different incurred loss ratios. It may be possible to improve the homogeneity of the data by projecting the dominant currency business separately. (If possible apply benchmark claim incurred to ultimate development patterns to produce indicative ultimate loss ratios comparisons.)
(3) Proportion of closed (including commuted) versus live claims by number and incurred amount by under-writing year.	Should the proportion of closed claims be high, it might be advisable to project the live business separately.
(4) Review the change in historical incurred losses of individual large closed claims (and separately for open claims).	Significant increases in individual incurred loss amounts on closure will expose the inadequacy of historical case reserves and the potential need for an IBNER reserve in respect of open claims. The converse is also true.
(5) Speed of claims settlement.	Remove the influence of any non-standard events such as commutations or standstill agreements which artificially accelerate payments, otherwise an automatic projection of paid trends could give misleading results. If the speed of settlement still looks odd, conduct further investigations to understand the underlying causes before deciding upon the best approach to estimating future payment development.

A Change Agenda for Reserving
Policy Term by Underwriting Year

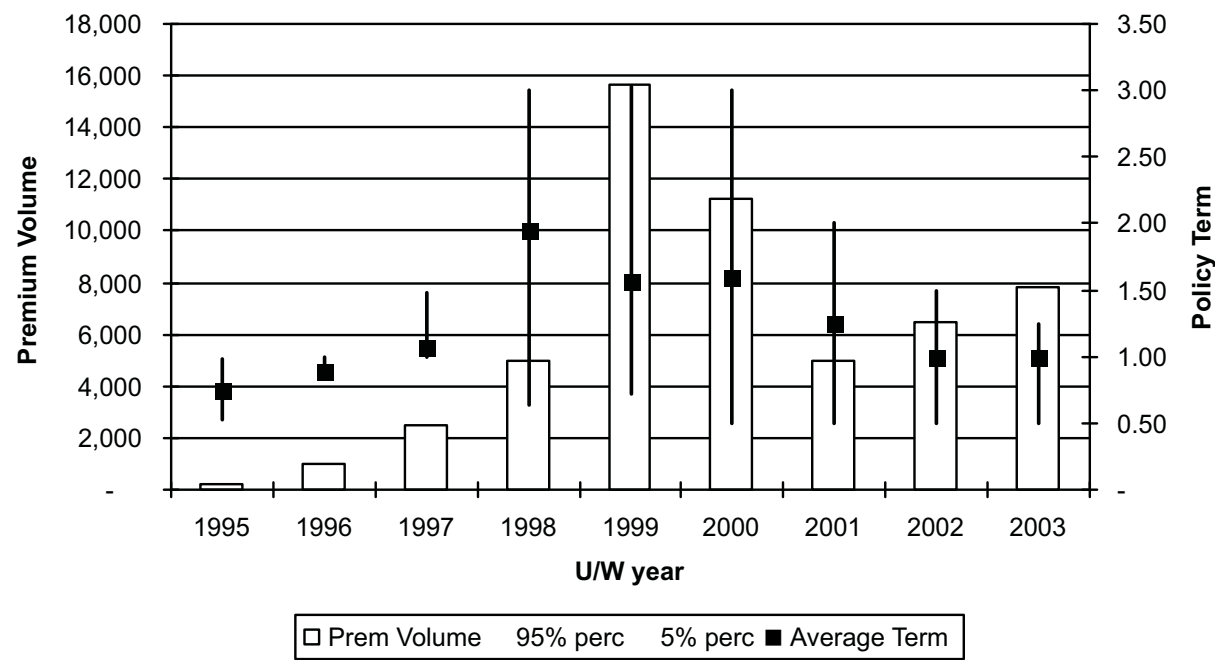


Figure 5.1. Policy term by underwriting year — Type 1 chart

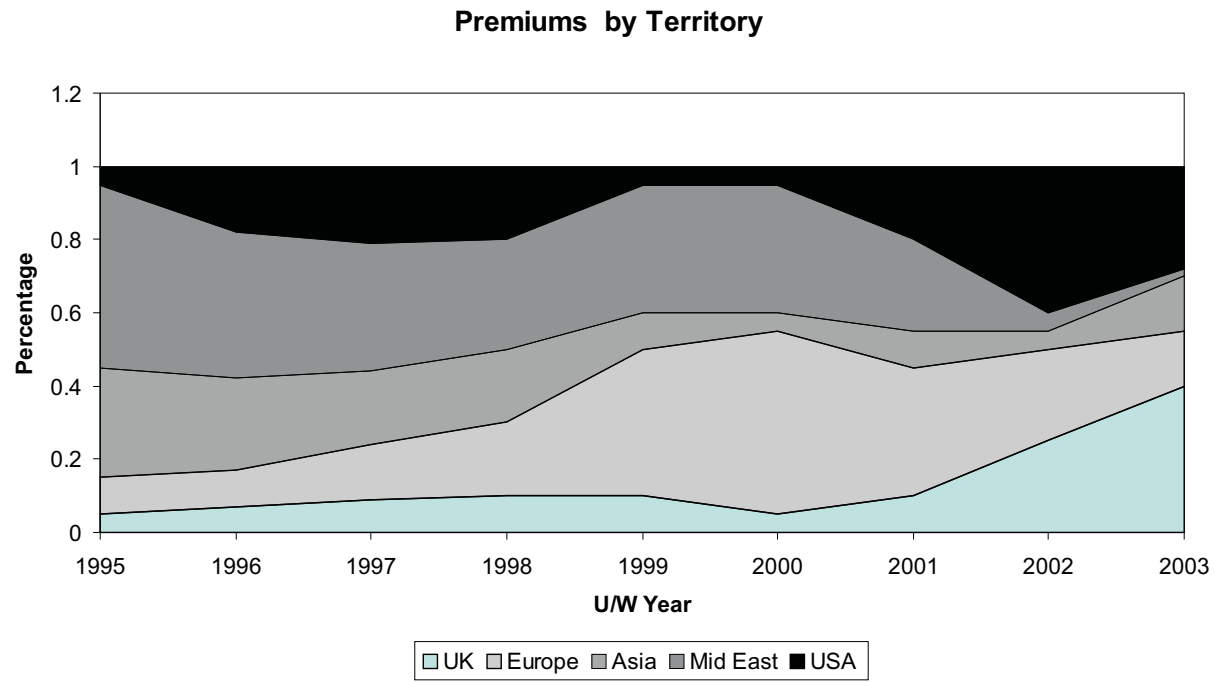


Figure 5.2. Premiums by territory — Type 2 chart

Insurer 1

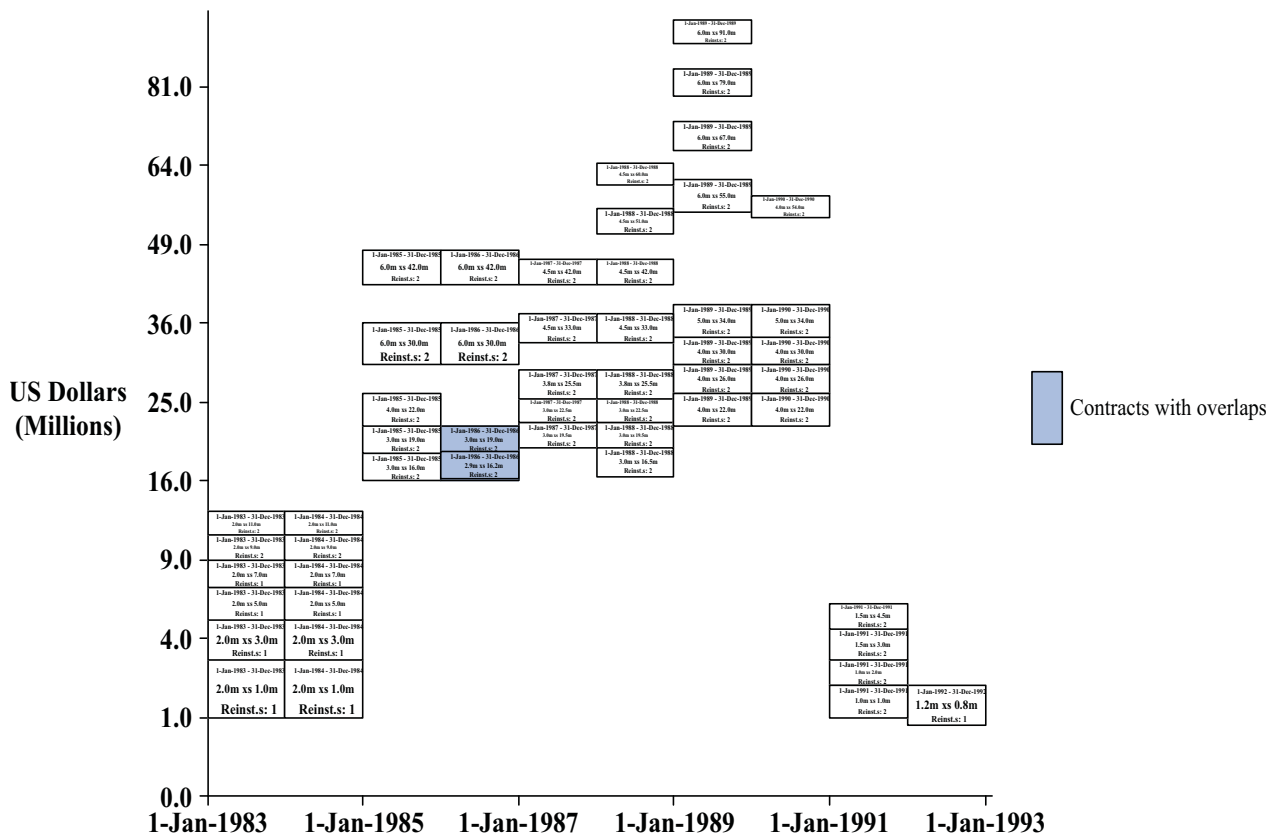


Figure 5.3. Inwards assumed reinsurance layers by year

Incurred Loss Ratios by Currency

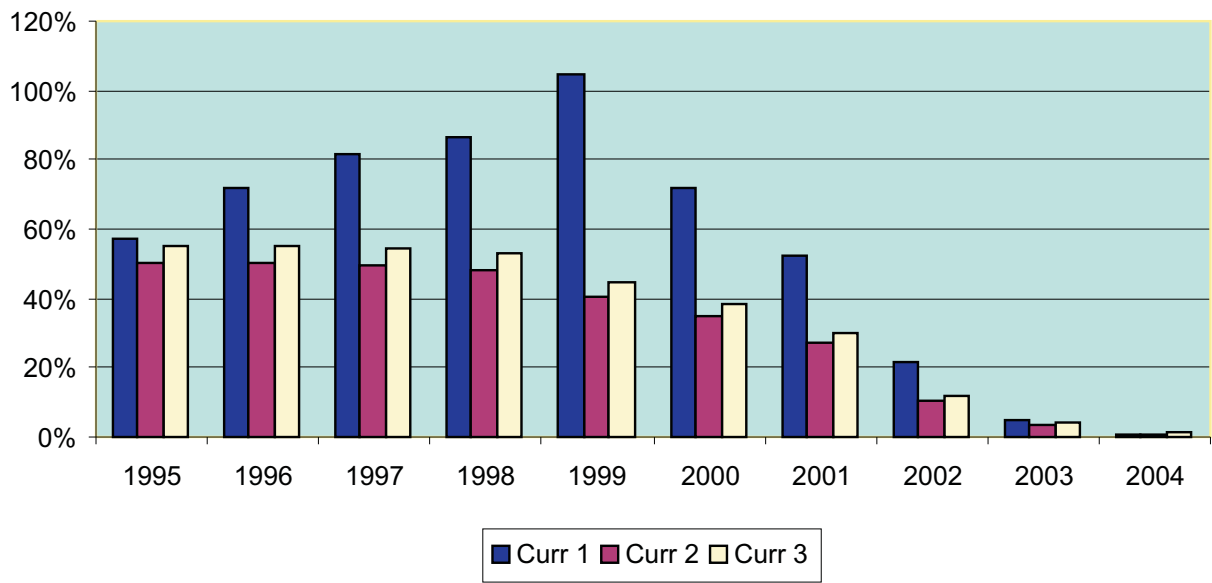


Figure 5.4. Incurred loss ratios by currency — Type 3 chart

5.5 *Major Open Risks (LM) — with Emphasis on Policies Recently Written*

For recently underwritten risks which are significant by virtue of premium size and/or loss exposure, it is important to independently assess how profitable they might be, given that their outcome will materially influence the outcome of the entire class. The analysis suggested below will give the actuary a fuller understanding of the underwriting process and pricing techniques used. Inevitably such analysis will promote meaningful discussions with the underwriter and management.

Table 5.3. Major open risks (LM)

Major risks — key	Commentary
(1) List the largest policies by potential aggregate loss exposure or by current or ultimate estimated premiums.	This will identify the subset of policies which could be considered for individual review. For each selected large risk, review the placement information, in conjunction with any subsequent loss development or exposures, and evaluate the expected profitability of each selected risk.
(2) Assess the credibility and adequacy of the pricing methods and their key assumptions.	This will enable the actuary to form an independent view of how profitable or otherwise certain large risks are expected to be. A positive outcome will enhance one's confidence in the underwriter's ability.

5.6 *Underwriting (LM)*

Critical questions can be raised with the underwriter and management where there appear to be material changes in business source and mix, changes to policy terms and conditions, changes in pricing techniques, etc. The following underwriting checklist should provide a valuable insight into the quality of the business that has been written.

Table 5.4. Underwriting checklist approach

Underwriting — key	Commentary
(1) Catastrophe dependency with other classes (classic example being WTC where dependency was evident across many	The actuary should try to anticipate major loss events which could trigger multi-loss types across several classes at the same time.

Table 5.4 (continued).

Underwriting — key	Commentary
classes — property, casualty, business interruption, personal accident, life, aviation hull, aviation liability).	
(2) Catastrophe disaster scenarios within the pricing methodology.	If possible, the actuary should attempt to satisfy himself that the assumptions made in respect of catastrophe scenarios are appropriate.
(3) Writing for gross profits or net profits.	Heavy dependency on reinsurance could lead to future collection problems, and due allowance should be made for the associated credit risk. The extreme case is fronting. Writing and pricing the business for gross profits is usually preferable.
(4) Dependence on reinsurance.	See above.
(5) Exposure measures used to evaluate a risk (e.g. salary or wage roll for EL, turnover for PL).	Check that these are accurate and have been processed in a consistent and meaningful manner.
(6) Financial impact of ongoing legal processes, mediations, arbitrations and commutations.	Obtain underwriter's opinion.
(7) Management appetite for reducing market share, but maintaining profit.	Management wanting to maintain market share in a soft market normally leads to higher loss ratios during the soft years.
(8) Pricing methods and the key assumptions.	Review for reasonableness.
(9) Profit targets by line/within line — primary versus excess.	Review for reasonableness.
(10) Changes in case law and legislation which will affect emerging loss experience (such as Ogden, the Woolf reforms,	The answers to these questions enable the actuary to adjust his expectation of loss emergence and/or loss latency.

Table 5.4 (continued).

Underwriting — key	Commentary
recent changes in the U.K. which allow doctors to be paid a fee for reporting personal injury cases to solicitors, tort reform in respect of U.S. asbestos claims, etc.).	
(11) Recent changes in the standard terms and conditions [T&C].	Try to ascertain how and what their effect might be on the expected emergence and timing of future premium and loss experience.
(12) Recent exclusion clauses [T&C].	Try to ascertain their expected impact (with supporting quantitative analysis where possible) on loss experience.
(13) Underwriting attitude to managing the downside in a soft market.	Maintaining market share could cause loss ratios to increase, whilst writing for profit may reduce premium volumes.
(14) U/W manual, latest and historical versions.	An historical comparison of premium rates per unit of exposure will track changes over the most recent years. There should be close correlation with the underwriting cycle, whereby rates during the hard years are higher than those in the soft years.
(15) Susceptibility to claims latency.	Should the business be susceptible to latent claims e.g. industrial deafness, RSI, asbestos in respect of EL, obesity claims from food manufacturers, etc. it would be advisable to establish either an implicit or an explicit latent claims margin.

5.7 *Claims Management (LM)*

A general awareness of matters and issues which can influence the emergence of claims will assist the actuary make more informed assumptions and allowances.

Table 5.5. Claims management investigations

Claims management — key	Commentary
(1) Adequacy of claim files and their documentation.	Well documented claims files will enhance the actuary's confidence and understanding of the syndicate's/company's claims reporting and claims control procedures; the converse is also true.
(2) Current claims processing delays and their financial impact.	Increases in the claims processing delays will lengthen the tail (and reduce any implicit reserve margin).
(3) Current disputes, mediations, arbitrations and court cases (such as the Silverstein decision of two events for the WTC).	The actuary should discuss each major dispute, mediation, current arbitration and court cases, and ascertain, with the help of management, appropriate exposures and win factors in each case.
(4) Details of fronted claims.	For fronted business appropriate gross reserves should be established, together with an appropriate credit reserve to accommodate the possibility that a proportion of the fronted business might not ultimately be fully reimbursed by the reinsurers.
(5) List of most worrying claims.	Where there are large influential claims with uncertain outcomes, it is advisable to separately reserve such claims in conjunction with reviewing the management's assumptions on issues such as liability, quantum and win factors.
(6) Reservation of rights directive and how they are recorded.	In some financially significant legal disputes management might decide to reserve its rights by not recognising the existence of certain policies and consequently not processing premium or claim transactions. The actuary should be aware of all such cases, and consider whether it is appropriate to qualify his/her reserve opinion.

5.8 *Reinsurance (LM)*

To appreciate the financial protection afforded by reinsurance the following matters should be useful.

Table 5.6. Reinsurance investigations

Reinsurance — key	Commentary
(1) Structure of current and past programmes (see Figure 5.5 for a single underwriting year).	This will show the general philosophy of the reinsurance programme and readily show differences in philosophy year on year.
(2) Details of facultative reinsurance by inwards policy.	An interrogation of the policy and claims data should indicate the extent of either facultative XL or facultative quota share reinsurance per contract.
(3) Details of surplus reinsurance by inwards policy.	The policy header data should reveal those policies ceded to the various surplus treaties.
(4) Structure and current financials for a specific XL programme (Figures 5.5 to 5.7).	Figures 5.6 to 5.7 illustrate the loss burn and cover remaining within an XL programme respectively for an individual year and for all years put together.
(5) Details of class and whole account quota share reinsurances.	Identify whether or not the quota share reinsurers have the benefit of prior excess of loss protection. If not, the retained business after quota share could be subject to further excess of loss protection.
(6) Details of funds withheld.	Particularly with regard to older business, loss funds withheld, on which interest is typically paid at 1% per quarter, were established at amounts typically 100% of cases outstanding loss reserves. These loss funds withheld impact the cash flow because the loss element of the cash flow equates to paid losses plus the change in loss funds withheld less

Table 5.6 (continued).

Reinsurance — key	Commentary
	the interest payable on the loss funds withheld. One cannot simply extrapolate the expected paid losses to generate the cash flow on quota share reinsurance where loss funds withheld exist. Also be aware of the impact of the premium funds withheld element.
(7) Details of letters of credit.	In recent years, letters of credit are used as security instead of funds withheld.
(8) Details of trust funds.	Sometimes monies are held in trust as a substitute for other securities, such as letters of credit or loss funds withheld.
(9) Current age debtor listing by reinsurer.	This will identify those reinsurers which are late or reluctant to pay. This information should be noted and reflected in the bad debt factor applied to each such reinsurer.
(10) Current and potential areas of reinsurance exhaustion.	This will show where additional net reserves might be required to allow for loss development in excess of available reinsurance.
(11) Current and potential disputes and their financial impact.	Appropriate win factors, in combination with a credit risk factor, should be considered for each reinsurance dispute.
(12) Details of reinsurances with drop down features.	Additional cover might be available from higher layer covers with drop down features.
(13) Impact of any financial reinsurances such as time & distance, spread loss, stop loss or finite risk reinsurances.	The processing and accounting treatment of each major financial reinsurance should be understood before attempting to allocate the gross reserves to such covers.

Table 5.6 (continued).

Reinsurance — key	Commentary
(14) Information on all internal reinsurance arrangements.	Any inter-company reinsurance arrangements should be recognised and understood.
(15) List of reinsurers in liquidation, provisional liquidation, scheme of arrangement or run-off.	An appropriate bad debt provisions should be made for each such reinsurer.

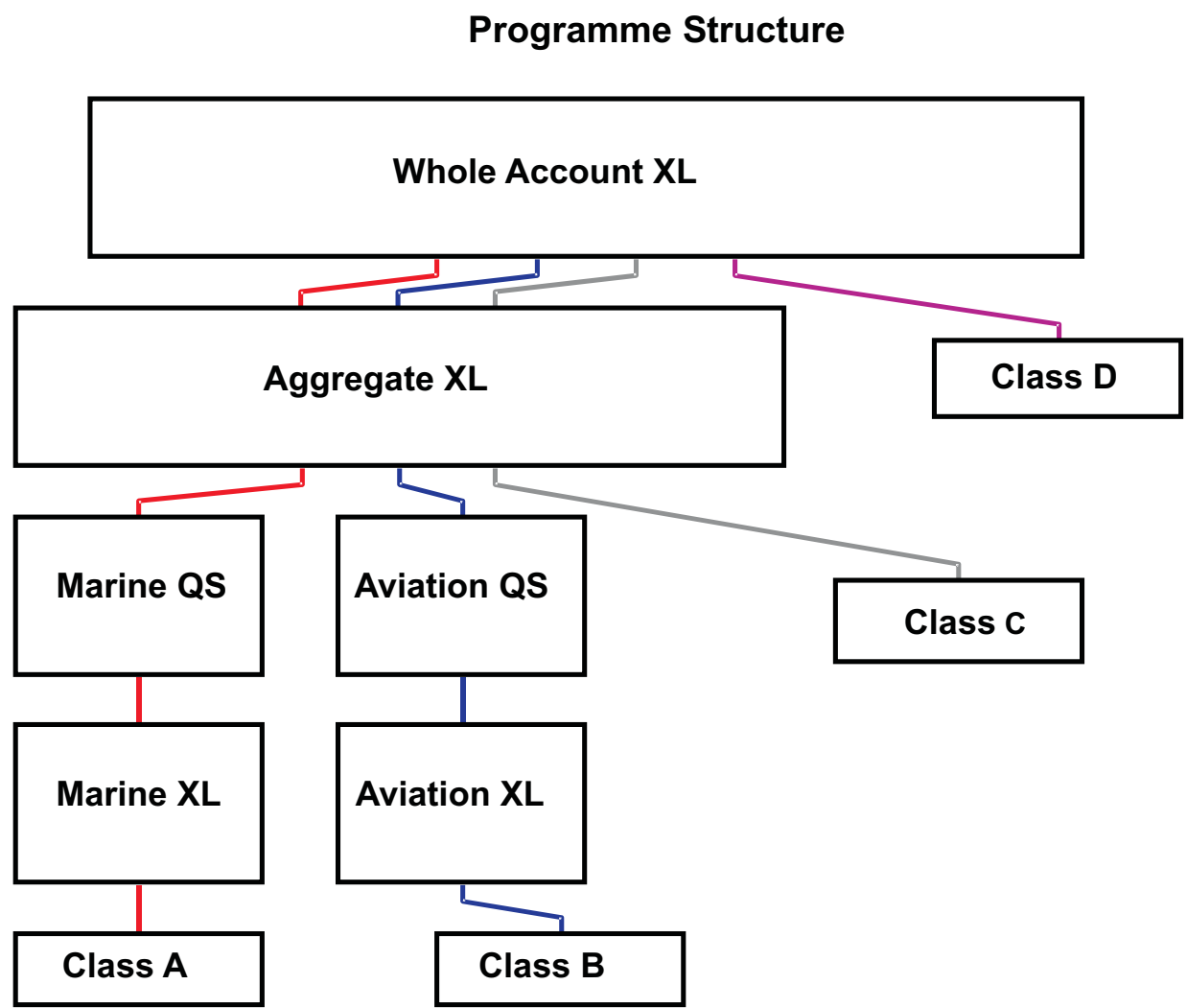


Figure 5.5. Reinsurance programme structure

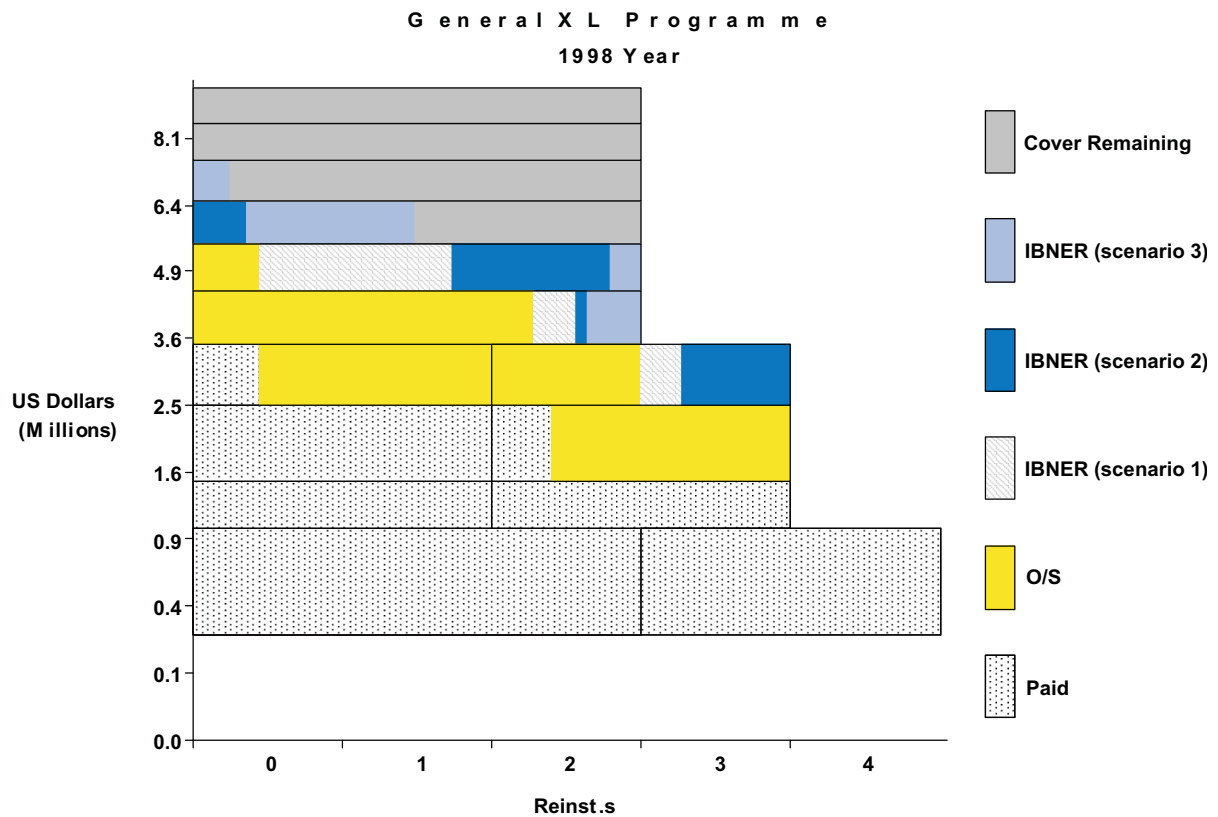


Figure 5.6. Reinsurance programme utilisation — one year

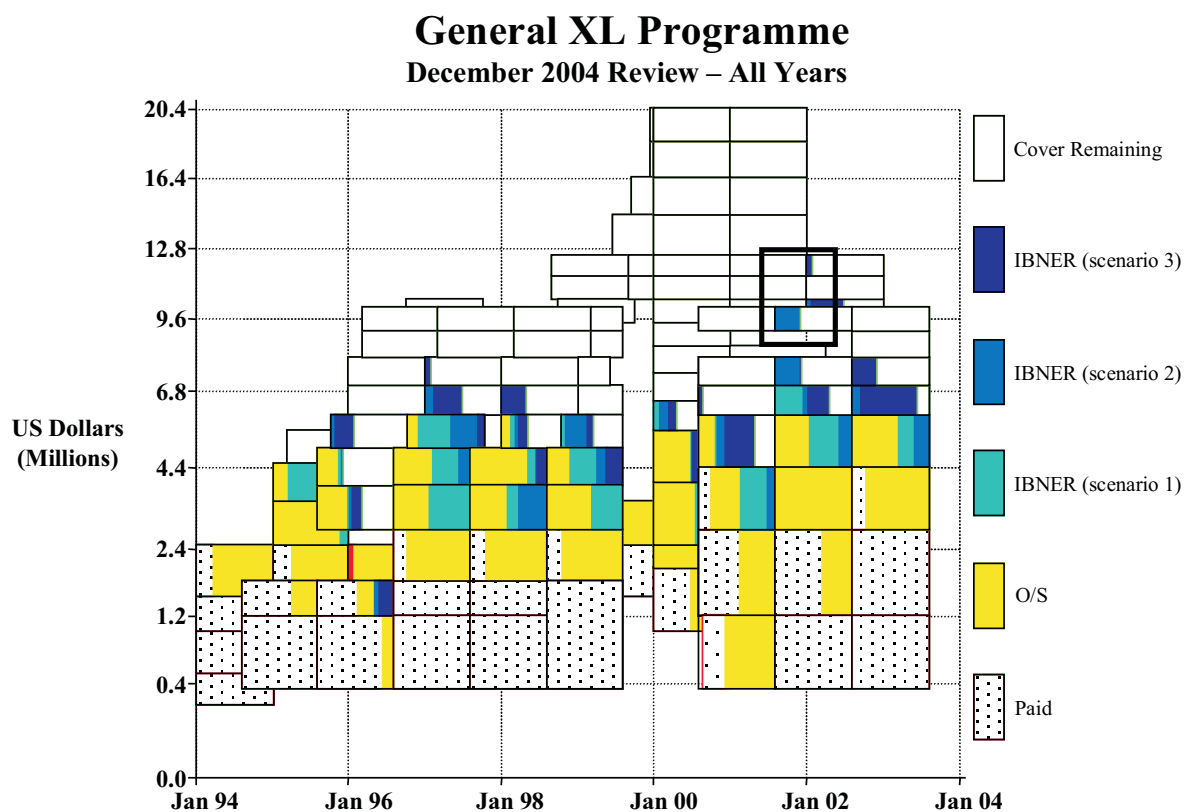


Figure 5.7. Reinsurance programme utilisation — many years

5.9 *Personal Lines (PL)*

5.9.1 The business written by personal lines insurers is far more homogeneous than, say, in the London Market, in that the policies are written on a much more standardised basis, with little or no difference in cover between policies of the same class. Where there are differences in covers (such as comprehensive and non-comprehensive motor insurance), these differences are known and obvious.

5.9.2 In addition, claims development usually is much more stable than for London Market business, because of the larger numbers of risks written. Although to some extent this makes actuarial projections ‘simpler’, there is a much greater demand from management to have a precise measure of liabilities, both from the point of view of setting claims reserves, but also for feeding into the pricing process on lines of business that typically have small margins. Data should be divided into as many homogenous sub-divisions as possible, in order that standard actuarial methods can derive the best projections possible. The purpose of this section is to outline a guideline data request for personal lines business. This list is not meant to be prescriptive, and the actuary will need to spend some time understanding any changes to the business and claims environment that will affect the data derived.

5.9.3 This section is sub-divided by major types of personal lines insurance, namely:

- motor;
- household;
- creditor and warranty; and
- travel.

Much focus is placed on the first of these sections, namely motor, and subsequent sections consider the key differences with other lines of business. The data guidelines only relate to establishing claims reserves. Other technical reserves, such as unearned premium reserves and additional unexpired risk reserves, are not considered in this paper.

5.10 *Motor*

Consideration should be given as to the significance of the volume of non-comprehensive business written. If information by claim type is available, and the non-comprehensive book is small, then it may be sufficient to model by combined cover; otherwise comprehensive and non-comprehensive business should be modelled separately. Equally, if significant volumes of commercial motor (such as commercial vehicles or fleets) are written, these should be analysed separately, especially if there are significant changes in volumes written between years.

5.11 *Data Requirements*

Table 5.7 provides a guideline of major policy and claims information which should be sought for motor business.

5.12 *Policy Data — Motor*

Table 5.7. Policy data — motor

Policy — key	Commentary
(1) Earned exposure by accident period.	Accident period should be consistent with that available for claims (non-annual periods such as quarterly or even monthly may be appropriate, but care needs to be taken with claims projections on this basis — see Section 4.14).
(2) Earned premium by accident period.	Origins should be consistent with that available for claims (non-annual periods such as quarterly or even monthly may be appropriate, but care needs to be taken with claims projections on this basis — see Section 4.14).

5.13 *Claims Data — Motor*

Table 5.8. Claims data — motor

Claims — key	Commentary
(1) Triangles of payments, incurred claims, reported numbers and settled numbers.	Non-annual periods such as quarterly or even monthly may be appropriate, but care needs to be taken with claims projections on this basis — see Section 4.14.
(2) Split claims between different claim types, including: <ul style="list-style-type: none"> — accidental damage gross of non-reinsurance recoveries; — accidental damage non-reinsurance recoveries; — fire/theft; — windscreen; — third party property damage; and — injury. 	As a minimum, claims should be split into injury and non-injury claims.

Table 5.8 (continued).

Claims — key	Commentary
(3) Consider using non-annual origin period, particularly for non-injury claims.	Growing or shrinking books of business can have a material impact on the development of short-tailed claims; using non-annual origin periods can reduce the heterogeneity caused.
(4) Details of individual large claims, including: <ul style="list-style-type: none"> — accident date; — underwriting date; — status; — closed date if closed; and — monthly development of paid and incurred. 	Essential for using any method that either removes or caps large claims from the main triangles. Also essential for estimating reinsurance recoveries. Use a large claims definition which means that no claims are missing if any indexation of claims is applied, and such that all historic reinsurance excess points are encompassed.
(5) Understanding of claims inflation.	By type (injury, non-injury) understand, if possible, the influence of different sources of past inflation, i.e. economic, social, legal, medical, compliance with new regulations, etc. Realistic future claims inflation assumptions are critical in methods which explicitly project the future number and future value of anticipated claims.

5.14 *Reinsurance — Motor*

Table 5.9. Reinsurance — motor

Reinsurance — key	Commentary
(1) Basis of writing (risks attaching or LOD).	Motor reinsurance contracts tend to be written on a simple basis. If contracts are written on a risks attaching basis, this may require claims to be allocated back from an accident period basis to underwriting period.

Table 5.9 (continued).

Reinsurance — key	Commentary
(2) Excess of loss points for each historic treaty.	See LM comments.
(3) Existence of any partially placed layers.	Be aware of partially placed and commuted reinsurance contracts so as to avoid overstatement of recoveries.
(4) Quota share details.	See LM comments.
(5) Aggregate deductible details.	See LM comments.
(6) Details of indexation clauses.	Allow for current and future inflationary index adjustments to the layer amounts and attachment points prior to presenting individual gross claims to the programme.

5.15 *Household*

5.15.1 Liability claims are much less of an issue for household business, but do still exist, and so data should be extracted from them. Large (non-liability) claims exist on household business as well, but do not have a significantly different development from regular claims, and so it may not be necessary to consider them separately.

5.15.2 Consideration should be given as to the split between buildings, contents and joint policies, and whether it is necessary to model them separately.

5.16 *Data Requirements*

Table 5.10 identifies the main data requirement differences between motor and household business.

Table 5.10. Data requirement differences, household versus motor

Claims — key	Commentary
Split claims between different claim types, including: — catastrophe claims; — subsidence claims; — liability claims; and — other claims.	Subsidence and liability claims will tend to have longer developments than other claims, and so ideally should be modelled separately. Catastrophe claims may require different techniques to be applied, particularly if the catastrophe occurs near the end of the reporting period.

5.17 *Creditor and Extended Warranty*

5.17.1 These classes are considered separately because of the difference in term of the policies. In addition, the risk tends to be less uniform over the duration of the policy, with significant differences in the earnings patterns. Although triangle-based methods can be used and can give sensible results, some consideration must be given to the effect of these differences.

5.17.2 In addition, for creditor insurance there can be quite significant differences in policy conditions between policies, such as maximum benefit terms, and so consideration should be given as to how these are best treated.

5.17.3 Note that, for monthly creditor policies the issues of non-uniform risks over the duration of the policy is not relevant, and so these can usually be modelled using the more traditional triangle-based methods.

5.17.4 For extended warranty business, consideration should be given as to whether brown and white goods should be modelled separately, as well as the issue of splitting policies by term.

Table 5.11. Data requirements, creditor and extended warranty: claims

Claims — key	Commentary
<p>(1) For creditor, split claims between different benefit types, including:</p> <ul style="list-style-type: none"> — accident; — sickness; — unemployment; and — other benefits. 	<p>These claims often have different benefit terms, and so should be modelled separately. Also, prevailing economic conditions will have a different effect on the frequency and duration of these types of claims.</p>
<p>(2) For creditor, split claim numbers into notified claims, pending claims and accepted claims.</p>	<p>There is very often a period of investigation required before a claim is accepted and payments start. It is worthwhile considering the extent of these pending claims as the acceptance rate is reasonably predictable.</p>
<p>(3) For creditor, consider modelling using a decrement approach for claims in payment, taking into account the duration into the policy which the claim is incepted, the maximum benefit term, and time to end of policy term.</p>	<p>This is akin to modelling critical illness claims in life assurance.</p>

Table 5.11 (continued).

Claims — key	Commentary
(4) For extended warranty, consider the duration into the policy.	The duration into the term of the policy will affect the risk, firstly because the risk of breakdown will change with age, and secondly the manufacturers warranty will usually cover the first period of the policy.
(5) For extended warranty, consider whether it is possible to identify separately new/nearly new/used goods.	Each type will have different claims patterns.
(6) For extended warranty, consider the business source.	Goods purchased from the supplier/shop directly may have a different claims experience to those acquired by post or via the internet.

5.18 *Data Requirements*

Table 5.12. Data requirements, creditor and extended warranty: policy

Policy — key	Commentary
(1) Earned exposure split by underwriting period and accident period.	Need to allow for policy cancellations in the calculation.
(2) Earned premium split by underwriting period and accident period.	Consistent with earned exposure.

5.19 *Travel*

The main consideration with travel insurance is whether it is necessary to split between single-trip policies and multi-trip. Consideration should also be given to whether U.S. exposures should be analysed separately.

5.20 *U.K. Commercial Lines Business (CL)*

5.20.1 ‘U.K. commercial lines’ insurance covers a very wide spectrum. At one end sit policies sold to the owners of small vans, which may be treated in the same way as personal lines covers. At the other end, U.K. commercial lines insurance can be indistinguishable from London Market business. The actuary responsible for U.K. commercial lines business

therefore needs to decide at what point in that spectrum to place the business with which he/she is faced.

5.20.2 For the purposes of this document, a mid-point is taken and 'U.K. commercial lines' is defined to be:

- motor, public and products liability, employers liability, property and business interruption, personal accident, business travel, D&O and PI covers;
- sold by brokers based in the U.K. or direct by U.K. insurers to the client;
- sold to U.K. businesses, whether sole traders, partnerships or limited companies, or to charities, clubs, government bodies or other organisations; and
- for risks primarily domiciled in the U.K.

The first test should be how closely the book being reserved accords with this definition.

5.20.3 These risks will be relatively homogeneous in terms of coverage offered and size. Data volumes should be such that traditional projection techniques will be reasonably reliable. However, all cover types will be subject to large claim or catastrophe exposure, and it is very important to recognise and allow for such events — or their absence.

5.20.4 Data availability or volume, or the need to group different covers for reporting, may necessitate grouping in less homogeneous reserving classes than might otherwise be desirable. Covers are often sold as a package (e.g. a policy encompassing property damage, business interruption, employers' liability, public liability and products liability for a shop) rather than as separate policies; the extent to which this is relevant to the book being reserved should be understood. If the relative proportion of each type of cover is fairly stable this may not be a problem.

5.20.5 One may want to segment by policy size as well as by cover type (e.g. SME property — small EML — is less exposed to large losses than larger risks). One may also want to segment by trade type (e.g. a haulage fleet of lorries is much more exposed to large losses, material damage as well as liability, than a fleet of cars).

5.20.6 It is very likely that a U.K. commercial lines book will contain an element of London Market exposure, or policies sold by London Market brokers. The amount of this exposure should be ascertained, and the actuary needs to decide whether to extract it and analyse it separately.

5.20.7 The issues raised above for London Market business and personal lines business are the starting point for U.K. commercial lines. The discussion that follows aims to highlight where suggestions offered for LM and PL are not relevant or need to be supplemented.

5.21 *Comments on LM Market from a CL Point of View*

In general any points relating to assumed reinsurance business are unlikely to be relevant. As always, this assumption needs to be tested.

5.22 *Policy Database*

5.22.1 The default assumption may be that business is annual, located in the U.K., without policy limits (other than per loss limits), on a losses occurring basis, without layers and denominated in GBP. However, these assumptions should always be tested.

5.22.2 A London Market operation, where coinsured and aggregate deductible policies are frequent, should have computer systems which make the operation of this sort of business easy. However, a U.K. commercial lines insurer, faced with a handful of these policies per year, may have off-system and *ad hoc* adjustments to cope with them. The actuary needs to ensure that such adjustments are well understood and incorporated appropriately into the data to be analysed.

5.23 *Claims Database*

Assume that all claims are GBP, unless otherwise known.

5.24 *Major Risks*

It is unlikely that any single risk will affect the book significantly, at least net of reinsurance. However, this assumption needs to be checked.

5.25 *Underwriting, Claims Management, Reinsurance*

All the issues discussed for LM business are important to U.K. commercial lines business.

5.26 *Comments on PL Document from CL Point of View*

5.26.1 Whilst exposure data will be relevant for motor policies, they will not generally be homogeneous enough for other lines of business.

5.26.2 Rate strength information is key on new business and renewals (which have different rate strengths), and needs to be matched to origin period used — i.e. earned premiums for accident years. An estimate of annual claims inflation is also key. One can then use rate strength and claim inflation information to adjust prior year loss ratios to provide an initial estimate for the current year loss ratio.

5.27 *General Issues on Processing and Data Integrity (All Business)*

The reserving actuary should be aware of the Table 5.13 general issues.

Table 5.13. General issues on processing and data integrity

General — key	Commentary
(1) Reconciliation of underwriting statistics with the audited accounts.	This is a pre-requisite for any reserve review.

Table 5.13 (continued).

General — key	Commentary
(2) Details and issues concerning fronting arrangements.	The actuary should recognise all fronting arrangements, so that appropriate gross, bad debt and net reserve provisions can be estimated.
(3) Manual data not captured by current system.	Sometimes, for historical or other reasons, business has not been entered into the database. Such business must be identified and reserved separately.
(4) Processing backlog in claims reporting.	Provided that the claims backlog is material and abnormal, allowance should be made for its calendar year impact.
(5) Processing backlogs in premiums.	Same as above.

6. HELPING ACTUARIES MANAGE AND COMMUNICATE UNCERTAINTY BETTER

6.1 *Structure of Section 6*

This section is set out under the following headings:

Issues for the Profession on the subject of uncertainty in reserving (6.2):

- stakeholder feedback;
- feedback from the profession;
- interplay with auditors;
- interplay with reserving risk capital in ICAs;
- IFRS implications; and
- the world after Morris.

What is meant by uncertainty in reserving (6.3):

- introduction;
- parameter versus process; and
- uncertainty by class or whole and diversification impact.

Sources or causes of uncertainty (6.4):

- use of past data;
- use of ‘soft’ information;

- modelling and parameters; and
- predicting the future and process.

Quantifying uncertainty in reserving (6.5):

- parameter and process uncertainty ranges;
- current methodology and practice; and
- future guidance and methodology.

Communicating uncertainty in reserving (6.6):

- current practice — examples and observations;
- consistency with GN12 — scope and purpose;
- desirable degree of communication and disclosure;
- should quantification be mandatory? and
- problems in communication.

A common vocabulary for uncertainty in reserving (6.7):

- challenges in achieving a common vocabulary; and
- example definitions of terms.

Recommendations (6.8):

- common vocabulary;
- compulsory quantification; and
- suggested amendments to GN12:
 - examples of communication of uncertainty quantification; and
 - the ultimate goal?

A Note on Best Estimates (6.9).

6.2 Issues for the Profession on the Subject of Uncertainty in Reserving

6.2.1 Stakeholder feedback

6.2.1.1 Two key issues have arisen from the feedback from our profession's stakeholders. These can be summarised as:

- understanding and usage of the phrase 'best estimate'; and
- understanding of ranges.

6.2.1.2 The vocabulary which we and our insurance co-workers use may be confusing and misleading around the area of reserve uncertainty. Some stakeholders believe that a best estimate includes some adjustment for uncertainty in that it 'should be enough to pay the claims', whereas actuaries may be using the phrase best estimate to refer to a 'mean of the possible outcomes', or, arguably more typically, a value a little below the mean, resulting from the exclusion of any loading for the more remote potential events, such as an emergence of new types of latent claim, for example. The stakeholders may implicitly be believing that the best estimate is actually 'the

mean loaded with a prudential margin to cover a degree of uncertainty'. This is notwithstanding regular statements to the contrary.

6.2.1.3 Further, some stakeholders believe that if the actuary's reserve estimate is not sufficiently close to the eventual outcome then the actuary necessarily 'made a mistake' in calculating the reserve estimate. They may believe that 'sufficiently close' here could be quantified by using the actuary's 'range of reasonable best estimates', for example.

6.2.1.4 This GRIT workstream will seek to move us forward so that we can improve the quality and usefulness of our communication with our stakeholders around the area of reserve uncertainty.

6.2.2 *Feedback from the profession*

This theme has been repeated in our survey of GI actuaries. We found that 74% of the respondents thought that the users of claims reserving work do not have a sufficient understanding of the uncertainty in the estimates. Further, the respondents expressed concerns over data quality and over the general understanding of the term 'best estimate'.

6.2.3 *Interplay with auditors*

6.2.3.1 The interplay between actuaries and auditors has increased significantly over the last few years. The auditors are often carrying out an extensive review of the actuaries' reserving work, and wish to understand the actuaries' estimates and views on uncertainty in the context of the accountants' vocabulary and the position of the auditor.

6.2.3.2 There is no specific professional guidance for how actuaries should relate to auditors (although there is professional guidance for auditors in the use of experts), and there is sometimes confusion over the degree of responsibility for identifying data concerns and highlighting key or 'fundamental' uncertainty.

6.2.3.3 We seek here to revisit the words in GN12 on reserve uncertainty in the context of the scope and purpose of the actuaries' work, and illustrate how the actuary's use of standard vocabulary and enhanced disclosure can provide greater clarity.

6.2.4 *Interplay with reserving risk capital in ICAs*

6.2.4.1 The time spent by the profession looking at reserving uncertainty has increased significantly in the last two years as a result of the need to calculate reserving risk capital for ICA purposes. The use and sophistication of models has increased, and it seems likely that there will be continued emphasis on and development in this area over the years to come.

6.2.4.2 While the reserving risk typically quantified in the ICA context looks at extreme events, it is fairly typical that actuaries and others have modelled, or reviewed by scenario testing, other less extreme parts of the

claims outcome distribution in the course of their work. It is therefore timely that the profession should consider making better use of this available information about reserving uncertainty in our communications to stakeholders when we report on reserving exercises.

6.2.5 *IFRS implications*

6.2.5.1 The introduction of International Financial Reporting Standards (IFRS) has enhanced the emphasis on uncertainty of reserve estimates in insurers' accounts. The actuarial profession has a significant role to play in ensuring consistency in the assessment of uncertainty.

6.2.5.2 Under IFRS Phase 1, which went live in January 2005, general insurers are required to disclose much more information than previously on the liabilities arising from insurance contracts. According to IFRS4 Insurance Contracts: "An insurer shall disclose information that helps users to understand the amount, timing and uncertainty of cash flows from insurance contracts." In addition, under certain circumstances such as acquisitions, disclosure of fair value is required. This emphasis is likely to be heightened in IFRS Phase 2, which is due to go live in 2007/8. The current proposals include discounting of liabilities and the addition of risk margins. The assessment of risk margins is likely to require an assessment of the distribution of ultimate liabilities.

6.2.6 *The world after Morris*

The role of the professional in modern financial services is one increasingly exposed to public scrutiny and to litigation. There have been a succession of insurance company failures, and it is likely that, following the Morris review, the reserving work of the general insurance actuary will be subject to much greater review and scrutiny than before. It is therefore critical that we take this opportunity to think ahead to an ideal objective for reserving reporting, and think about what steps we need to take, as a profession, to get there.

6.3 *What is meant by Uncertainty in Reserving*

6.3.1 *Introduction*

6.3.1.1 This workstream is dealing with the fact that actuaries are asked to calculate ultimate claims estimates when the outcome of the ultimate claims is uncertain. We often refer to reserve uncertainty, although the reserve itself is a (known) value from among the possible outcomes which have been selected by an actuary or an insurance entity officer for some informal or formal reporting purpose. There are various issues which affect the way in which a reserve may be selected for a particular purpose, but the issue which we are addressing here is dealing with and communicating the uncertainty in the eventual outcome itself, and how this compares with the actuary's estimate or range.

6.3.1.2 The fact that different actuaries use phrases like ‘best estimate’ to mean different things is problematic for the profession to achieve clarity in describing and explaining uncertainty. So, in order to make progress in communication of uncertainty, we need to make progress on the consistent use of vocabulary more generally.

6.3.2 *Parameter versus process*

6.3.2.1 In statistical modelling one can define various types of uncertainty: stochastic (or process) uncertainty, model uncertainty and parameter uncertainty. For the purposes of this paper we will group together model and parameter uncertainty, and refer to the amalgam as parameter uncertainty. Parameter uncertainty includes the uncertainty of interpreting data from the past to generate and parameterise a suitable predictive model. There will be sample error, which reduces with the relative size of the data sample. The data may be unreliable and may include actual errors. The choice of model may not be a good fit — for example there may be heterogeneity in the data which has not been eliminated.

6.3.2.2 The parameter uncertainty is therefore the statistical risk that the correct application of sensible methods and calculations will not accurately reflect the underlying distribution of possible ultimate claims outcomes, as a result of a combination of data errors, sample errors and an inappropriate fit of models. This definition of parameter uncertainty also includes the differences in best estimate between two reasonable actuaries using the same data, and allows for their different judgements in responding to features of the data in their modelling and parameterisation.

6.3.2.3 On the assumption that the phrase ‘best estimate’ means the actuary’s best view of the mean or expected value of the eventual outcome (possibly excluding certain remote contingencies), then a range described as ‘a range of reasonable best estimates’ can be thought of as a range which illustrates the parameter uncertainty (alone).

6.3.2.4 The second main type of uncertainty we will call process uncertainty. It is sometimes referred to as stochastic uncertainty. Whereas parameter uncertainty is all about past data, process uncertainty is about the fact that the future outcome will itself be uncertain. Even if the parameter uncertainty were zero, there would still be a range of possible outcomes, exactly defined by the actuary’s model. As such the actuary could make statements about percentile events by reading off the distribution implied by his model.

6.3.2.5 When an actuary produces ‘a range of reasonable outcomes implied by his model’ he is illustrating the process uncertainty (alone). If an actuary refers to a range of reasonable outcomes, and has talked about issues of parameter uncertainty and process uncertainty, then the range he provides should allow for both types of uncertainty.

6.3.2.6 This subtle distinction may not be made by some of our

stakeholders, as is evidenced by the feedback which we have received. Some stakeholders believe that, if the actuary's reserve estimate is not close to the eventual outcome, then the actuary necessarily 'made a mistake' in calculating the reserve estimate. This implies that the stakeholder has some understanding of parameter uncertainty — but believes that a competent actuary can eliminate it completely. It also implies that the stakeholder has no understanding of process uncertainty at all.

6.3.3 Uncertainty by class or whole and diversification impact

To add further difficulty, actuaries typically try to model data grouped into homogeneous classes. It is likely that any measures of uncertainty will also be carried out by class, which means that any attempt at producing an overall measure of uncertainty for the total will require some adjustment for the diversification effect, and so will require some view to be taken about correlations. This can be non-trivial, and there may be a great deal of uncertainty as to the correlation matrix, and this uncertainty around diversification also needs to be communicated.

6.4 Sources or Causes of Uncertainty

6.4.1 Use of past data

6.4.1.1 There is the uncertainty arising from the insurance exposure, randomness of event timing, severity and frequency, reporting and settlement process, inflation and court award trends, and how the relevant data are processed and transferred. This can vary significantly by class of business, territory and distribution channel. Arguably, most actuaries, underwriting and insurance specialists are aware of and understand this cause of uncertainty to various degrees. Most actuarial uncertainty modelling techniques are focussed on this area of uncertainty. Whilst we cannot eliminate this uncertainty, a careful approach can help to reduce it.

6.4.1.2 There are often issues around data reliability and completeness. Moreover, historical data may at times not be reliable and complete. There are some techniques which help an actuary to make use of partial data with a limited degree of reliability, so as to improve the overall quality of the model parameterisation.

6.4.1.3 Currently actuaries tend to carry out certain reasonableness checks on data, such as comparing totals with published accounts and comparing historical diagonals with previous data sets, but often make it clear that they have relied on the data as provided, and have not audited it. This probably means that any uncertainty quantification which the actuary has given has not allowed for the general uncertainty surrounding data accuracy.

6.4.1.4 Given the increased scrutiny of the reserving work of general insurance actuaries and the increasing interaction with auditors, it is

important for us as a profession to clarify the roles and responsibilities of auditors and actuaries around the subject of data quality.

6.4.2 *Use of 'soft' information*

6.4.2.1 Secondly, there is the area of the reliability of the assertions of insurance professionals about various issues on which the actuary may need to take a view. For example:

- An underwriter may assert that his underwriting is superior to the market in general, and so it is appropriate to adopt a prior loss ratio below the market norm.
- An underwriter may claim to have increased rates by 20% net of changes in terms and conditions and claims inflation.
- An underwriter may claim that the book only has short tail risks in it.
- A claims manager may claim that the case reserve philosophy has been changed and that case reserves, whilst previously tending to be inadequate, are now all expected to generate significant redundancies on settlement.
- A lawyer may argue that the entity has a very strong defence case in a certain insurance or reinsurance contract dispute.

6.4.2.2 The extent to which these assertions are well founded may materially affect the actuary's best estimate. The actuary, in some cases, may be able to test the statements made to see whether any evidence can be found to corroborate them. Sometimes there may be limited tests available. These assertions and the uncertainty around their full validity are a source of uncertainty which can be difficult for the actuary to communicate and to quantify.

6.4.2.3 The actuary cannot eliminate this area of uncertainty from his work, but it can be reduced by him acquiring a greater understanding of the business included in the portfolio in question.

6.4.3 *Modelling and parameters*

6.4.3.1 As we have seen from the survey, the majority of actuaries make regular use of variations on the chain ladder and Bornhuetter Ferguson (BF) reserving methods. The boot strapping method, for example, may deal with uncertainty in the chain ladder model predictions, in both parameter and process, to some extent.

6.4.3.2 The implicit assumption of the BF method is that the prior loss ratio is a more reliable guide to the future outcome than the chain ladder result. Where the prior loss ratio has been derived in part or in large relying on assertions from the underwriter, then use of the BF implies that the actuary believes that the underwriter's assertions are more reliable than his modelling, allowing for the volatility of early development. This may well often be true, but it is as well to remember to review this test of credibility. Indeed, if one is to quantify uncertainty in BF estimates, then one may need

to apply a range of possible prior loss ratios. The ‘width’ of such ranges will be related to the perceived reliability of the underwriter’s assertions and other assumptions underlying the choice of prior loss ratio.

6.4.4 Predicting the future and process

6.4.4.1 The future will be just one ‘stochastic model run’ from a distribution of infinite possibility. These random variables include the unknown frequency, severity and timing of insurance events and the unknown delays in reporting and settlement. These issues might be dealt with by bootstrapping types of uncertainty measurement.

6.4.4.2 Other aspects of the uncertainty of the future include unknown changes in secular trends, inflation, interest rates, outcomes of specific disputes or court cases and the emergence of major new claims types not previously envisaged.

6.5 Quantifying Uncertainty in Reserving

6.5.1 Parameter and process uncertainty ranges

6.5.1.1 When quantifying uncertainty, care needs to be given to thinking about both parameter and process uncertainty. A range of reasonable best estimates only allows for parameter uncertainty, and so does not provide the recipient with any guidance about the uncertainty arising from future random events. Conversely, a modelled distribution from a specific model may not include any allowance for parameter uncertainty, unless specifically adjusted.

6.5.1.2 Different types of ranges may be useful in different contexts and for different purposes.

6.5.2 Current methodology and practice

6.5.2.1 From the information which we have currently gathered, less than 40% of actuaries make use of stochastic reserving techniques. Modelled ranges are most commonly calculated using variations on bootstrapping methods. Many ranges are estimated judgementally, with actuaries providing explicit quantification of the impact of certain contingent events. For some types of reserving, for example asbestos, there are recognised bases which can be applied.

6.5.2.2 The general consensus is that methods for quantifying uncertainty are not well understood, well developed or very widely used.

6.5.2.3 GRIT commissioned a working party which looked at various aspects of quantifying uncertainty, and this reported to GIRO in October 2005.

6.6 Communicating Uncertainty in Reserving

6.6.1 Current practice — examples and observations

6.6.1.1 We have carried out a brief survey of how the issue of

uncertainty is dealt with in current actuarial practice. We have gathered together typical wordings from the reports of some of the major actuarial consultants in the U.K., and we have grouped these into three categories as follows:

- best estimate:
- uncertainty; and
- reserve ranges.

6.6.1.2 For each of these categories we set out below a collection of typical wordings and provide some observations.

6.6.1.3 Some typical report wordings which refer to or define the phrase ‘best estimate’:

- (1) “... best estimates in that they contain no allowance or margin for prudence or optimism. It may be appropriate to include some margin for purposes such as solvency.”
- (2) “... represent the expected value of the distribution of possible outcomes of the unpaid liabilities.”
- (3) “... in the sense that they are not deliberately biased upwards or downwards. They do not necessarily represent a mid point of the range of possible outcomes, as the potential for adverse movement generally exceeds the potential for favourable movement. These estimates do not include any margins.”
- (4) “Our estimates are best estimates and do not contain any margins for prudence or optimism. ... Our best estimates are intended to represent the expected value of the estimated distribution of possible outcomes, although this definition is difficult to apply in practice. This means that an actual outcome in excess of best estimate should be expected to occur with a probability of approximately 50%. If ABC requires this probability to be lower, then they need to hold reserves in excess of best estimate.”
- (5) “The estimates given in the report are central estimates in the sense that they represent our best estimate of the liability for outstanding claims, with no deliberate bias towards either over or under-statement. They are, however, uncertain and the amount which eventually turns out to have been required to provide for the liability may be more or less than the central estimate.”
- (6) “... best estimate basis and hence are intended to be approximately equal to the mean or expected outcome. There will be an approximately even chance that the actual outcome will be above or below the best estimates.”

6.6.1.4 Observations on these wordings for best estimate are:

- Common themes arising in the description of a best estimate are the use of phrases such as ‘do not contain any margins for optimism or prudence’

and ‘no deliberate bias towards over or under statement’.

- Most, although not all (see the first example), draw the reader’s attention, to some extent, at least, to uncertainty when the best estimate is described.
- In many cases, it is highlighted that the amount which eventually turns out to be required may be more or less than the best estimate, perhaps significantly so.
- However, only in very few cases is it explicitly stated how often we might expect the best estimate to be exceeded. In fact, in only one of the examples above is it actually clearly stated that, if a reserve is required which will be sufficient more than 50% of the time, an amount in excess of the best estimate must be held.
- Some reports indicate that the best estimate is above the median, due to skewness, while others indicate that the best estimate is (approximately) equal to the median, having 50% chance of being exceeded.
- In two of the examples above the best estimate was referred to as a ‘mean’ or the ‘expected value of the distribution of possible outcomes’. In both of these examples the reports also separately drew attention to the fact that no allowance was made for factors not apparent in the data, e.g. latent claims. However, this fact was not addressed in the discussion of the best estimate, i.e. the reader was not warned that if this fact was taken into consideration, the best estimate may actually be a figure slightly less than the definition used. Some of the examples do, however, indicate that there is greater potential for adverse development than favourable development.
- In one case, the term ‘central estimate’ was used in place of ‘best estimate’, which may cause confusion amongst some readers.

6.6.1.5 Below are some examples of phraseology used to describe uncertainty in a range of reports:

- (1) “In evaluating whether the reserves are reasonable it is necessary to project premiums, claims and claim handling expenses. None of these will develop exactly as projected and they may vary significantly from the projections. Further, in most classes of business, the scope for adverse development exceeds the scope for favourable development. In particular, although we have made what we believe to be reasonable allowance for the risk of adverse development, we have not anticipated the emergence of major new types or classes of claim.”
- (2) “There is a range of possible outcomes, and the eventual outcome will almost certainly differ from any particular projection made. This uncertainty is increased beyond the level normally associated with such business by the short time the company has been in existence”
- (3) “There is a limitation on the accuracy of these estimates in that there is an inherent uncertainty in any estimate of claim reserves. This is due

to the fact that the ultimate liability for claims is subject to the outcome of events yet to occur, for example, the likelihood of claimants bringing suit, the size of court awards, changes in the standards of liability and the attitudes of claimants towards settlements of their claims ... it should be recognised that future claim emergence will deviate, perhaps materially, from our estimates.”

- (4) “The recommendations made in this report are based on estimates of future claims liabilities. When reading this report it should be borne in mind that uncertainty is inherent in these estimates as they rely on assumptions about future events, claims and their costs.”
- (5) “It must be borne in mind when reading this report that there is always uncertainty in the estimation of future claims and their associated costs, as this involves making assumptions about future events which are themselves uncertain.”
- (6) “... there is uncertainty associated with the eventual claim amounts, and the eventual outcome will almost certainly differ from projections. For some claim types within the portfolio this uncertainty is significant.”
- (7) “It should be noted that the development of insurance claims to their ultimate outcome is subject to a considerable amount of uncertainty and that deviations from our estimates are normal and to be expected.”
- (8) “In any estimation of reserves, the inherent uncertainty of future factors that may affect the results and the inherent volatility of the data mean that the true future claims are likely to differ from those estimated. They may be higher or lower than expected and could be materially so.”
- (9) “The projection of ultimate claim and claim adjustment expense reserves are estimates of future events, the outcomes of which are unknown at this time. Considerable uncertainty and variability are inherent in the estimation of claim and claim adjustment expense reserves. As a result, it is possible that actual experience may be different than the estimates promulgated in this report and such difference may be material. As such we cannot guarantee that future experience will be as expected in this report or recorded by the company.”
- (10) “These assumptions have been made on the basis of reasonable estimates. However, actual future experience is likely to differ from these assumptions, due to random fluctuations, changes in the operating environment and other factors. Such variations in experience could have a significant effect on the results and conclusions in this report.”
- (11) “These factors [various], together with the high level of volatility in the past claim development of the bodily injury claims, could result in the actual future claims being significantly different from our figures which are best estimates without any margins for prudence or optimism. In our experience, there is a reasonable chance that the eventual outcome

could differ from our estimate of reserves across all classes by up to 10%, which in statistical terms represents approximately one and a half standard errors. There is also the possibility of a wider difference.”

- (12) “The uncertainty is either inherent or external and may take the following forms
- The projection model may not match the actual claim process.
 - Past claim fluctuations create uncertainty in estimating the model parameters.
 - Undetected errors in the data may result in errors in estimating the model parameters.
 - Selection of model parameters is judgemental and therefore subject to actuarial bias.
 - Future economic and environmental conditions may be different to those assumed.
 - Future claims fluctuations will result in uncertainty in projected payments, even if the model and its parameters were perfect.”
- (13) “Some areas of the account have small volumes of premiums and claims. This means that there is less data on which to base our review and the available data may be less stable than for larger parts of the account. This leads to increased uncertainty in the estimates relative to the size of the account.”
- (14) “In evaluating whether the reserves are reasonable it is necessary to project future premiums, claims and claim handling expense payments. None of these will develop exactly as projected and they may vary significantly from the projections. Further, in most classes of business, the scope for adverse development exceeds the scope for favourable development. In particular, although we have made what we believe to be a reasonable allowance for the risk of adverse development, we have not anticipated the emergence of major new claim types or classes of claims.”

6.6.1.6 Observations on these comments on uncertainty follow:

- Most examples are clear about process uncertainty and its various causes. Fewer focus on parameter uncertainty and some fail to mention it at all.
- Two of the examples discuss both types of uncertainty and the distinction between the types is made fairly clear.
- The phrase ‘inherent uncertainty’ is sometimes unclear.
- Very few examples of sources of parameter uncertainty appear to be given. Example (12) is the exception to this, where a wider range of sources of uncertainty are discussed.
- Only one example tries to quantify the uncertainty, although the quantification given is described as typical, based on experience rather than a specific calculations in the case in point.

6.6.1.7 Some additional examples and observations on parameter uncertainty follow below. In the vast majority of cases, it is specifically stated that uncertainty is increased by the fact that no allowance has been made for factors that are not apparent in the data. For example:

- “We have made no allowance for factors that are not apparent in the data provided, such as unexpected exposures. These factors, together with the volatility in the past development, could result in the actual claims being significantly above or below our best estimates.”
- “Our analysis does not anticipate any extraordinary changes in the legal, social or economic environments that could affect the ultimate outcome of claims, or the emergence of claims from causes not currently recognised in the historical data. Such extraordinary changes or claim emergence may impact the level of required reserves in ways that are not presently quantifiable. Thus, while we believe our reserve estimates are reasonable given the information currently available, it must be recognised that actual emergence of claims could deviate, perhaps significantly, from our estimates and the amounts recorded by the company.”

In other cases, we do not link the exclusion of new types of claim with the uncertainty in the eventual outcome. For example:

- “No allowance has been made for the extraordinary future emergence of new classes of loss or types of losses not sufficiently represented in the historical data or which are not yet quantifiable.”

6.6.1.8 Some examples of typical report wordings on reserve ranges are:

- (1) “The ‘lower’ estimates and ‘higher’ estimates have been derived using alternative assumptions regarding the possible future development. These ‘lower’ and ‘higher’ estimates may be considered as optimistic and pessimistic relative to the ‘central’ estimate and are intended to give a very broad indication, based upon the information provided to us, of the level of uncertainty which currently surrounds the estimation of ultimate claims and reserves. The actual ultimate claims may fall outside this range, perhaps significantly. Consequently, the ‘lower’ and ‘higher’ estimates should not be regarded as absolute minimum and maximum values for the reserves.”
- (2) “... we have estimated the upper end of a range at a 75% confidence level (CL) for gross and net reserves. ... The 75% CL implies that there is a 75% chance that the actual total future claims payable (less future premiums receivable) will be below the reserve and a 25% chance that they will exceed the reserve. This gives a measure of the uncertainty surrounding our gross and net reserve estimates. The eventual outcome may well fall outside this range. We have not allowed for any extraordinary changes to the legal and socio-economic situation that may impact the cost of future claims and premiums.”

- (3) “As stated earlier, we have estimated reserve levels that we believe will not be exceeded by the actual future claims 75% and 90% of the time. There is no guarantee that actual future claims will not exceed these reserves; indeed they are expected to do so in 1-in-4 and 1-in-10 cases respectively.”
- (4) “... a high estimate referred to as a ‘75% confidence’ and a higher estimate referred to as ‘90% confidence’. The 75% and 90% estimates are not derived strictly from stochastic techniques that allow the assignment of probabilities. Instead, the values are selected to subjectively reflect our view of the one-in-four and one in ten upward development potential and any stochastic analysis that we have carried out.”

6.6.1.9 Observations on these comments on reserve ranges are:

- In many of the examples it is not clear as to what type of uncertainty the range refers, e.g. if it was done using a bootstrapping approach, it probably refers to both process and parameter uncertainty.
- Sometimes the range is defined in statistical terms and sometimes not.

6.6.2 *Consistency with GN12 — scope and purpose*

6.6.2.1 There are already certain requirements in GN12 concerning communication (mainly Section 4) around reserving uncertainty, although it could be debated whether these are always followed as thoroughly as they could be.

6.6.2.2 GN12 requires the actuary to state and be mindful of the scope and purpose of his work, as follows: “To the extent that it is feasible to do so, the actuary should indicate in the report”:

- the degree of uncertainty surrounding the estimates; and
- sensitivities to changes in key assumptions.

6.6.2.3 There is no obligation to quantify the uncertainty or sensitivity if, in the actuary’s opinion, this would not assist the recipient.

6.6.2.4 Point estimates are acceptable, but the actuary must highlight specific issues which significantly increase the uncertainty beyond the norm.

6.6.2.5 So, it is arguably already a requirement of GN12 to provide a quantification of the uncertainty if the actuary believes that this will assist the recipient.

6.6.2.6 Let us consider two different possible scopes and purposes of an actuary’s work.

6.6.2.7 *Scenario 1.* An actuary has been asked by the board of a company to provide an independent reserve review for a company as at a year end date, to provide professional guidance to the board in considering the level of reserves which they will chose to book in their accounts.

6.6.2.8 In this context the actuary may consider that it would be helpful to his recipients, in view of the scope and purpose of his work, to provide a

range of reasonable best estimates. Such a range, only covering parameter uncertainty, would represent the actuary's best view of a range of best estimates which could be produced by reasonable actuaries in possession of the same facts and data and under the same scope and purpose that he is under. Therefore, such a range would be very useful to his recipients, as it would help them to weigh this particular actuary's judgement in the context of other potential reasonable judgements of a best estimate. Arguably, therefore, GN12 already requires such quantification in these circumstances.

6.6.2.9 *Scenario 2.* An actuary has been asked to carry out an independent reserve review of a potential acquisition target, for the purpose of assisting the potential buyer in considering the required level of reserves. He has also been asked to consider the risk to the buyer of adverse ultimate claims outcomes and to produce a reasonable range to illustrate this risk.

6.6.2.10 In this context the actuary must produce a range which includes both parameter uncertainty and process uncertainty. As such, a range of reasonable best estimates is not suitable for this purpose. He must provide a range of reasonable outcomes.

6.6.2.11 These examples are based on GN12 as it currently stands, and yet we are clearly not complying as fully with this standard as we could, and so could arguably do with clarifying the requirements under GN12 in this regard.

6.6.2.12 There are a number of examples where actuaries have referred to best estimate as a mean, and given a range of reasonable best estimates, and have talked about how the range captures uncertainty in the eventual outcome. This is illogical, and implies a lack of understanding of the distinction between parameter uncertainty and process uncertainty. Greater clarity and care is required in this area, and it is to be hoped that a common vocabulary would go some way to assisting the profession in this area.

6.6.3 *Desirable degree of communication and disclosure*

6.6.3.1 GN12 already requires:

- (1) indication of degree of uncertainty;
- (2) indication of sensitivity of results to key assumptions;
- (3) highlighting of abnormally high uncertainty areas and issues; and
- (4) quantification of uncertainty when useful to recipient of report.

6.6.3.2 In view of the comments from our stakeholders, the concerns of actuaries, and the apparent inconsistencies and sometimes illogic of current practice, perhaps we should consider our objectives in communication and disclosure in reporting.

6.6.3.3 Perhaps our objectives in communicating about uncertainty include the following:

- (1) to be understood by the reader — clarity;
- (2) to be consistent with professional vocabulary usage;

- (3) to emphasise the more material issues;
- (4) to emphasise the unusual issues;
- (5) to comment in the context of our scope and purpose; and
- (6) to protect ourselves from litigation.

6.6.3.4 Clearly we are currently failing on (1) and (2). GN12 currently addresses (3), (4) and (5) although compliance with this has varying degrees of thoroughness. Many reports seem fully mindful of (6).

6.6.3.5 One area which is unclear is the extent to which actuaries should comment on the usual issues in regards to uncertainty. It is possible that the inclusion of a standard description of 25 causes of uncertainty in reserving could detract from the clarity and import of certain more material issues in the particular case. Currently GN12 implies that it is safer to cover all issues. It would be very helpful if the major or more unusual issues were covered fully and the minor, more ‘standard’, issues were de-emphasised. This is in keeping with the spirit of GN12.

6.6.3.6 In view of these objectives and our current practices, it seems that we should focus on development and usage of a common and clear vocabulary and clear communication of uncertainty and sensitivity quantification. We believe that the professional guidance requires some updating in these areas.

6.6.4 *Should quantification be mandatory?*

6.6.4.1 As discussed above, it arguably already is. Indeed, the proposed revised version of GN12 has stronger requirements than those in the existing GN12 which we have discussed here.

6.6.4.2 The main arguments in favour of quantification are that it will provide greater clarity and make our work more useful to our stakeholders.

6.6.4.3 The main arguments against quantification are that we do not have adequate tools to properly assess the whole of the distribution of possible outcomes, so we could end up providing a requirement which we cannot meet.

6.6.4.4 To counter the methodology point, if we constructed any quantification requirements in a manner sufficiently flexible to allow a pragmatic approach when modelling options are limited, this would enable us to move forwards without making life unnecessarily difficult. In terms of the scope point, in our view it is for the profession to decide what work it needs to carry out to properly conduct reserve reviews and to deliver actuarial advice, rather than customers restrict our scope and output.

6.6.4.5 On balance, we have therefore concluded after much discussion that our recommendation is that quantification of the uncertainty in the eventual outcome should be made mandatory for all reserving reports complying with GN12. Thus this would be ‘mandatory’ only when an a report needs to comply with GN12. This will require clarification and

amendment to GN12. We recommend that the profession targets 2007 for implementation.

6.6.5 Problems in communication

6.6.5.1 The difference between parameter uncertainty and process uncertainty is difficult to understand, and may not be readily understood by our report recipients. Indeed, it may not be understood by all actuaries. However, understanding of this area is critical to a proper appreciation of the work of an actuary in reserving, and we must work towards better communication and the education of ourselves and our fellow general insurance professionals.

6.6.5.2 As we have already discussed, inconsistent vocabulary creates difficulties in communication. We will generate a common vocabulary. In this way it should be clear what various types of estimates and ranges are meant to represent, which should facilitate more meaningful comparisons.

6.6.5.3 Understanding of the role of diversification and correlation in the measurement of uncertainty is difficult. Again, we must use a common vocabulary and seek to educate ourselves and the industry.

6.7 A Common Vocabulary for Uncertainty in Reserving

6.7.1 Challenges in achieving a common vocabulary

6.7.1.1 There are various problems, including the fact that various phrases are used outside of the profession in the industry, and they have vague and often inconsistent meanings, although many readers will believe they know what phrases mean and so may disregard any specific definitions provided.

6.7.1.2 Further, different actuaries currently use vocabulary in different ways so we may need a degree of give and take to decide and agree on a common usage. This process will be complicated by the international dimension of the profession and the existing inconsistencies between various usages currently.

6.7.2 Example definitions of terms

6.7.2.1 As a first step towards a common vocabulary we list below a number of terms with suggested definitions. We suggest that this list be defined in a future professional guidance note, or possibly a future update of GN12 or associated Advisory Note. The following are illustrative of the types of definition we might like to explore.

Best estimate

6.7.2.2 The best view of the actuary of the mean or expected value of the range of all possible outcomes of the outstanding claims (or, where specified, of all possible outcomes excluding certain particular named contingencies, or excluding new issues not adequately reflected in the

historical data), in the context of the data available for analysis. Various comments and issues relating to this definition of best estimate have been made to us in the consultation responses we have received. These are discussed in a short sub-section at the end of this section, and it seems to us that there may be a need for our profession to have a debate on the topic of best estimates and means.

Reasonable actuary

6.7.2.3 An actuary with sufficient competence and experience to practise as a reserving actuary on the book of business under consideration, who takes into consideration all the available information and applies their experience in selecting assumptions and methods to estimate a reserve.

Parameter uncertainty

6.7.2.4 The uncertainty within the estimation of reserves arising from the possible selection of alternative parameters and/or an alternative model, by another reasonable actuary, given identical information.

Process uncertainty

6.7.2.5 The uncertainty in the eventual outcome for the total unpaid claims arising from the random nature of future events.

Reserve uncertainty

6.7.2.6 The uncertainty in the eventual outcome for the total unpaid claims arising from a combination of parameter uncertainty and process uncertainty. This would need to set out what is included in the estimate of uncertainty (e.g. normal volatility in claim development) and what is not (e.g. another Ogden type issue, or major economic collapse, etc.).

Range of reasonable best estimates

6.7.2.7 The actuary's view of the range of best estimates that a reasonable actuary could determine based on the available information. This range describes the parameter uncertainty and does not allow for process uncertainty.

Range of likely outcomes: 25 to 75 centile

6.7.2.8 The range of possible outcomes falling between the 25th centile and the 75th centile of the distribution of possible outcomes calculated by the actuary in his reserving work. If different centiles are being used, then this needs to be made clear and the appropriate centiles noted.

Range of probable outcomes: 10 to 90; or 5 to 95 centile

6.7.2.9 The range of possible outcomes falling between the 10th centile (or 5th) and the 90th centile (or 95th) of the distribution of possible outcomes

calculated by the actuary in his reserving work. If different centiles are being used, then this needs to be made clear and the appropriate centiles noted.

6.8 *Recommendations*

6.8.1 *Common vocabulary*

6.8.1.1 We recommend that the profession adopt a common vocabulary, with the meanings to be set out in professional guidance. This vocabulary will cover various aspects of ranges and uncertainty. We have set out some examples for consideration by the profession in Section 6.

Compulsory quantification

6.8.1.2 We recommend that GN12 be extended to include guidance on the vocabulary of uncertainty and that inclusion of a measure or measures of uncertainty in the eventual outcome be necessarily included in the actuary's report. We recommend that the profession targets implementation for 2007.

Suggested amendments to GN12

6.8.1.3 The following are some suggested wordings for consideration by the GN12 working party for inclusion in Section 4.

6.8.1.4 The term best estimate must typically be used to refer to the expected value of the distribution of possible outcomes, although in some cases this will be modified to exclude contingent risks and/or new issues not reflected in historical data. (However, we believe there may be a need for the profession to have a debate on this definition of best estimate to discuss the issues set out at the end of this section.) If the actuary is using the term to mean a different definition from the mean, then the actuary must state this alternative definition clearly and explain why he does not consider it appropriate to apply the typical definition. For example, if the actuary has decided to exclude any loading for certain remote contingencies, with a low probability and a potentially very material severity, then, without compensating adjustment, the actuary must state that the best estimate is below the standard of expected value or mean, to the extent that the expected value excludes these remote contingencies.

6.8.1.5 The actuary must illustrate the uncertainty in the eventual outcome of the ultimate claims with a numerical quantification which he considers appropriate. The actuary must explain in a clear vocabulary what his measure of uncertainty is intended to cover. The actuary must state how he has calculated his range or measure. If the actuary specifies the range using the phrases parameter uncertainty and/or process uncertainty, he must explain these terms clearly. At least one measure must be given which allows for both parameter and process uncertainty.

6.8.1.6 The actuary must explain his uncertainty measure in the context of his own best estimate and/or any other reserve estimate on which he is

commenting. For example, he might observe that the other reserve estimate is inside or outside of his range.

6.8.1.7 The actuary must identify and report on the main factors which cause uncertainty and carry out a sensitivity analysis for each.

6.8.2 *Examples of communication of uncertainty quantification*

6.8.2.1 For example, the actuary may chose to make statements such as described below.

6.8.2.2 *Example 1.* The best estimate reserve is based on my assessment of the mean or expected value of the range of potential outcomes for the ultimate claims settlements, undiscounted for future investment income. This reserve has been estimated for the purposes of providing a statement of actuarial opinion. In order to comment on the uncertainty in the eventual outcome, I have carried out a bootstrapping analysis. I consider there to be a 45% probability that the eventual outcome will exceed my best estimate. I consider there to be a 25% probability that the eventual outcome will exceed my best estimate by more than £20m. These measures of uncertainty have allowed for both parameter uncertainty and process uncertainty. I have carried out my uncertainty calculations by class of business and combined to the whole by adjusting for diversification credit.

6.8.2.3 *Example 2.* The best estimate reserve is based on my assessment of the mean or expected value of the range of potential outcomes for the ultimate claims settlements, undiscounted for future investment income. This reserve has been estimated for the purposes of providing a statement of actuarial opinion. I have calculated this best estimate, for the 2004 underwriting year, by using the Bornhuetter Ferguson method, where the prior loss ratios have been derived, by class of business, by considering past experience and adjusting for large losses, pricing, inflation and terms and conditions. As such there is uncertainty arising from the unknown pricing strength of the business. In order to comment on the uncertainty, I have carried out sensitivity testing around the prior loss ratio assumption derivation. I have also allowed for the uncertainty of claims experience using sensitivity testing. I consider there to be a 48% probability that the eventual ultimate gross loss ratio will exceed my best estimate. I consider there to be a 25% probability that the eventual ultimate gross loss ratio will exceed my best estimate gross loss ratio by more than ten percentage points. The measures of uncertainty allow for both parameter uncertainty and process uncertainty.

6.8.2.4 *Example 3.* The best estimate reserve is based on my assessment of the mean or expected value of the range of potential outcomes for the ultimate claims settlements, undiscounted for future investment income, excluding those contingent circumstances surrounding the potential, but remote, unfavourable outcome of 'Dispute X'. This reserve has been estimated for the purposes of providing an independent best estimate to the

board for their consideration, along with other information and views at their disposal, in forming their view of the reserves to carry in their published accounts. In order to comment on the uncertainty in deriving a suitable best estimate, I have carried out sensitivity testing around the key assumptions to derive a range of reasonable best estimates. Such a range allows for parameter uncertainty, but does not allow for process uncertainty. As such, the range represents my view of the set of best estimates which could be produced by reasonable actuaries reviewing the same information and data with the same scope and purpose. This range does not illustrate the inherent uncertainty in the eventual outcome and how this may differ from the expected outcome. I have also carried out a bootstrapping analysis and provided a range of likely outcomes. I believe that there is approximately a 90% chance that the eventual outcome will lie in the range quoted, with approximately a 5% probability that it will fall below and 5% above.

6.8.2.5 *Example 4.* The best estimate reserve is based on my assessment of the mean or expected value of the range of potential outcomes for the ultimate claims settlements, undiscounted for future investment income, using a range of claims modelling techniques. This reserve has been estimated for the purposes of providing an independent best estimate to My Client who are considering acquiring The Company, and to enable illustration to them of the risk inherent in the run off of The Company's reserves. In order to comment on the uncertainty in the eventual outcome for the ultimate claims, I have carried out a combination of bootstrapping analysis and sensitivity testing. This analysis allows for parameter uncertainty and process uncertainty. I have produced a table which illustrates my estimation of the full distribution of possible ultimate claims outcomes with indicative probability bands.

6.8.2.6 *Example 5.* The best estimate reserve is my estimate of the expected value of future claims. However, there is of course considerable uncertainty in the eventual outcome of claim payments, and future claim payments could be more or less, possibly significantly so, than the best estimate. Estimating this uncertainty is a judgemental process, but in my view it is perfectly possible that claim payments could exceed the best estimate by £xm or more. Some of the key features which contribute to this uncertainty are:

- (1) the XYZ legal dispute, which could cost up to £Y₁m or produce savings of £Y₂m;
- (2) normal volatility in claim payments experienced in the past, which, if it repeats in the future, could result in claims costing £zm more or less; and
- (3) uncertainty on the impact on reserves of the change in underwriting strategy in 2004 and 2005. This could increase reserves by £Pm or reduce them by £Qm.

6.8.2.7 Examples 1 to 4 might be appropriate where the actuary has done significant detailed work on uncertainty and feels that the precision implied by discussing percentile points is appropriate. Example 5 might be more appropriate where the actuary is not confident in the precision implied by reporting percentiles.

6.8.3 *The ultimate goal?*

6.8.3.1 Perhaps the ultimate goal for us as a profession should be the development and proliferation of such methods, so as to enable all actuarial reserving exercises to include full quantification of the parameter uncertainty and the production of a full distribution of possible outcomes. This, combined with a common vocabulary and education of ourselves and our industry, should address many of the issues which have rightly been raised by our stakeholders and the members of our profession.

6.8.3.2 In any event, whatever the ultimate goal, the profession needs to commission more research on quantifying uncertainty in practice to enhance our tools, techniques and understanding in this area.

6.9 *A Note on ‘Best Estimates’*

6.9.1 Earlier in this section we discussed the recommendation that ‘best estimate’ should refer to the mean of the distribution of possible outcomes. This implies that the actuary’s single point estimate should normally be the mean of the distribution of outcomes, and is consistent with existing formal guidance, where the nature of the point estimate is specified. However, there is arguably a lack of clarity in our profession on what the actuary needs to do to meet this ‘obligation’ of producing an estimate of the mean. In particular, there are potentially different views on:

- the extent to which standard methods such as the chain ladder need to be adjusted to produce statistically unbiased estimates of the mean, and if so how this should be done; and
- whether standard methods need to be adjusted because the triangle of data to which they are applied is unlikely to be big enough to representatively capture rare large claims or claim deteriorations.

6.9.2 Also, there may be the danger that the requirement to estimate a mean, if interpreted too rigorously, could result in inconsistencies in the results produced by actuaries in practice and in addition force us to debate with our stakeholders on a topic which they might see as technically esoteric and of limited relevance to business issues.

6.9.3 Although we think it unlikely that our profession will want to depart from the objective of estimating a mean, we believe that it might be worth investigating alternatives, such as a median. Assuming that the mean is the measure which is agreed on, we believe that there is a

need to create a consensus view in our profession on the adjustments (if any) required in practice to the standard methods to meet this objective.

7. IMPROVING OUR METHODS

If one were to survey today's IBNR computational techniques and then reread Mr Tarbell's 1934 paper, one might conclude that it must still be 1934.

The Actuary and IBNR, by R. L. Bornhuetter & R. E. Ferguson (1972)

7.1 Introduction

In this section we turn to the question of whether the methods employed by reserving actuaries can be improved upon. This addresses one of GRIT's key terms of reference.

7.2 Do we need Better Methods?

7.2.1 Given the problems which reserving actuaries have faced in the recent past, it is natural for the methods which they employ to be called into question. However, GRIT believes that addressing the issues raised in the other sections of this paper will, on their own, lead to significant improvements in both the quality of reserving work and of clients' satisfaction with it. In particular, a deeper knowledge of the business will improve the actuary's understanding of the distribution of possible reserve outcomes. Improved communication will transfer this understanding to the client. GRIT does not believe that the solution lies solely in the development of more sophisticated methods.

7.2.2 It is tempting to point out that the reserves set by insurance organisations are the responsibility of the directors, who are not obliged to follow the actuarial advice which they are given. The temptation is to assume that actuarial reserve estimates have performed much better than is publicly recognised and to lay the blame at the door of directors who may have chosen to set lower reserves during the soft market.

7.2.3 Of course, it is impossible to test this argument; data on companies' actuarial advice are not available. Perhaps the next best test is to examine whether actuaries have the best tools available to give the directors the 'correct' reserve estimates in the first place.

7.2.4 The 2003 GIRO Reserve Cycle Working Party used FSA returns to analyse how well the traditional reserving methods perform on market data. They showed that these methods are subject to distortion over the course of the underwriting cycle and can lead to a corresponding cycle of reserve adequacy. We have extended this analysis to the Lloyd's market's risk code data and formed similar conclusions.

7.2.5 In the next section we look at the results of analysing Lloyd's

data, and the effectiveness of current standard methods. We then go on to look at why these methods may be failing.

7.3 *Analysis of Lloyd's Data*

7.3.1 Firstly, we built an automatic reserving model to produce chain ladder (CL) and Bornhuetter-Ferguson (BF) reserve estimates for quarterly development periods. We applied this to Lloyd's risk code triangles at every development period from 1993 to the present. The model was provided with tail factors for the early years and a rate index based on eventual results. The recommended reserves at each quarter were compared with those based on hindsight. We looked at individual underwriting years and then looked at the aggregate reserves across all underwriting years projected at each quarter. One may argue that a spreadsheet model cannot recreate the work of an actuary. This is true; there are many factors which can distort a mechanical model of which one would hope that the actuary would be aware. An example would include inception date accounting, for which our model made no allowance. However, a spreadsheet is not subject to the external pressures and internal 'anchoring bias' which might afflict the actuary in the heat of battle.

7.3.2 Analysis of the ultimate loss ratios (ULRs) across all risk codes from 1993 to 2002 immediately shows the cycle of profitability known as the underwriting cycle. ULRs are reasonable between 1993 and 1996/7, after which they generally increase significantly between 1998 and 2001. There is an equally significant movement in ULRs, this time downwards, in 2001/2. See Figure 7.1.

7.3.3 The model produced deficient reserves on many risk codes during the late 1990s. When the reserves projected by the model were aggregated across all underwriting years and compared to hindsight they were often found to be severely deficient, by as much as 40% in some classes. See Figures 7.2 to 7.21. (Note that there is one of these for each of 20 risk codes.)

7.3.4 We obviously need to be careful in drawing conclusions from 'mechanical' projections of the form used to derive these results, as more detailed projections judgementally adjusted for known issues might give different results. However the only systematic issue of which we are aware that would affect all the projections is the introduction of inception date accounting (IDA) at the end of 1995, and we do not believe that this was sufficiently large as to be the sole cause of the reserve deficiency patterns across all risk groups which appear in Section 7.8.

7.3.5 In many cases we found these deficiencies to be caused by changes in the length of the tail over the cycle. Clearly this distorts the standard methods when they are applied automatically. There are many reasons why the tail may change over the cycle, and these are covered below. Using the automatic reserving model, we showed that the methods are surprisingly

sensitive to changes in tail length. This was demonstrated using some very simple faked data. An increase in the development tail by just one quarter can produce material deficiencies. This is exacerbated by loss ratios increasing and premium remaining constant, as recent years' dominate the total liabilities more than usual.

7.3.6 In addition, we found a positive correlation between the ultimate loss ratio (ULR) and the tail length for many classes. The tail was quantified by fitting a curve to every year of every risk code.

7.3.7 The curve was of the form: $\text{Claims}(t) = A \times (1 - \exp(-(b/t)^c))$.

7.3.8 The 'time' parameter (b) of the fitted curve was used as a measure of the tail length, as b affects the time taken for claims to reach any given % of the ultimate (b itself gives the time taken to reach 63%). As the market softens, loss ratios increase rapidly and the development tail lengthens. See Charts B2 and B3 in Figures 7.2 to 7.21 (again there are one of these for each of 20 risk codes). Note that A gives the ultimate claims whilst c determines the shape of the curve.

7.3.9 The a priori for the BF method is often derived by applying a rate index to previous years' ULRs. However, these ULRs may be deficient. In addition, the development factors based on history may be understated. This leads to inadequate reserves on the BF method too. This is exacerbated by rate indices which may fail to capture the full extent of rate softening. The question of rate indices was the subject of a previous working party, and was also covered by the Reserving Cycle Working Party. Rate indices have certainly become more prevalent during the recent hard market, with many companies and syndicates publishing their indices alongside their results. Whether these indices will foretell results more accurately than they did historically remains to be seen, especially as the market softens. A significant problem with rate indices is that they only cover renewed business. It is possible for all companies to be reporting rate increases whilst average rates across the market are falling. Institute guidance requires actuaries to satisfy themselves as to the accuracy of rate index data where it is relied upon in a reserving calculation.

7.3.10 We have noted that, as loss ratios increase, development tails lengthen and rate indices may be inadequate. These three effects combine to give 'the perfect storm'. A longer tail and inadequate initial estimates hide worsening experience. More often than not, premium volumes remain constant whilst exposures increase, so that the growing deficiencies become even more material. The result is a significant deficiency in aggregate reserves.

7.3.11 Unsurprisingly, we found a correlation between the premium tail and claim tail for many classes. See Charts B4 in Figures 7.2 to 7.21 (one for each of 20 risk codes). We also found that, for a number of classes, the premium tail itself lengthened during the soft market. The premium tail is influenced by the period of exposure, and therefore can to some extent drive the claim tail. Also, there are occasions where a change to the premium tail is

unrelated to the exposure period. A feature of the recent soft market was deterioration in the terms of trade — premiums were simply paid later than before. Also, payment of profit commissions and receipt of reinstatement premiums affect the premium development and are linked to periods of profits and losses respectively.

7.3.12 The premium development tail is influenced by the use of delegated underwriting, moving inception dates and the use of multi-year contracts, often attaching to binding authorities. These are all soft market features, and serve to lengthen the exposure period. This shows the importance of understanding how business is written by breaking the data down into ‘direct’ and ‘delegated’, as well as attachment date and policy term. Delegated policies can be analysed on a ‘look through’ basis if underlying certificate data are available from the coverholder. A further data enhancement, to allow the production of accident year statistics, would go even further by removing origin period distortions completely.

7.3.13 Even when the premium tail is unchanged over the cycle there are plenty of reasons why the claim tail will vary. Other terms and conditions can affect claims reporting and development. For example, looser terms may give rise to more frequent and more extended litigation. More optimistic case reserving may lengthen the tail on incurred development. Again, a deeper understanding of both the risks written and the business process is required.

7.3.14 For many classes in the last soft market, loss ratios deteriorated significantly from one year to the next, usually from 1996 to 1997. We often talk of the underwriting cycle, perhaps thinking of a smooth, sinusoidal curve. In fact, movements in loss ratios can be catastrophic. It is highly unlikely that any rate monitoring system would have captured such changes. ‘Anchoring bias’ may lead actuaries to move loss ratios in small steps, from quarter to quarter. These two problems can combine within the BF method to give a very slow recognition of deteriorating loss ratios. Many actuaries have expressed concern to us that the BF method is misused in this way.

7.3.15 The underwriting cycle is the inevitable result of a small number of simple, opposing forces. Whilst structural changes to the industry may have reduced the amplitude, or increased the period, the cycle is a constant feature of the industry. Actuaries will continue to face the challenge of adjusting their reserving methods to compensate for its effects on claims development. This is in addition to dealing with one-way trends such as claims inflation and one-off shocks such as legal judgements.

7.3.16 There are some classes where no amount of analysis of a development triangle, or premium rates, will give the correct answer. As suggested by the Morris review, we have to accept that there is a limit to what can be achieved.

7.4 Better Reserving Methods

7.4.1 Significant advances in reserving methodology are limited by the

level of detail in the data available. This constraint is most acute in the London Market, where often only paid and incurred claims development is available. This restricts actuaries to the traditional triangle methods of chain ladder (CL) and Bornhuetter-Ferguson (BF). Even the availability of open and closed claim number triangles would open up access to a range of additional well known methods, including those which can analyse trends in the adequacy of case estimates.

7.4.2 In the U.K., academic research into reserving methods is limited to City University. There, the emphasis has been on putting traditional methods onto a statistical footing and developing the field of stochastic reserving. In the U.S.A., the CAS produces a large and regular volume of papers on reserving issues. These tend to be restricted to stochastic methods also. Aside from the 2003 GIRO Working Party paper, we have seen no research into the effects of the underwriting cycle on traditional reserving methods or how to deal with them.

7.4.3 We are hesitant to suggest that there is an as-yet undiscovered reserving method which will meet the challenges posed by the underwriting cycle. There is a limit to what can be done mathematically with only paid and incurred development triangles.

7.4.4 However, it is vital that actuaries do recognise that the underwriting cycle has a detrimental effect on their cherished chain ladder assumptions. We would encourage actuaries to examine their own past data for cyclical features. Testing the goodness of fit of the chain ladder model to triangles can be instructive. After all, this forms part of the measurement of ‘model error’ in stochastic reserving.

7.4.5 The effects of the cycle need to be understood and adjustments made to the standard methods. We make some suggestions for how this analysis may be undertaken below.

7.5 *Options for Dealing with the Underwriting Cycle*

7.5.1 A simple initial step involves looking at how the development factors vary over the cycle. For instance, years can be grouped into ‘hard’ and ‘soft’ and development factors derived for each group. This obviously requires an a priori determination of the current state of the market. For example, this may mean using factors from the early/mid 1990s to project claims from the early 2000s.

7.5.2 Moving a stage further, we attempted to produce a formal method to quantify the ULR vs tail relationship found in the data. This involved a curve-fitting method using a curve of the form given above: $\text{Claims}(t) = A \times (1 - \exp(-(b/t)^c))$.

7.5.3 The b parameter is a measure of the tail length and tends to vary with the ULR for certain classes. This property should be understood and exploited. Actuaries could examine their own data and plot tail length against ULR over the cycle. Furthermore, the shape parameter c tends to

remain fairly constant for a given risk code over the cycle. This can be exploited when fitting curves to immature years.

7.5.4 The relationship between the premium tail and claim tail could be used more regularly. Again, curve fitting can be used to measure the premium tail length. Any indication of a lengthening premium tail (which is not attributable to loss activity) should be used to inform the claim tail used. There is currently no formal method of doing this.

7.5.5 We have investigated the link between the incurred loss ratio at a particular development point and the development factor to ultimate required at that point. This would give a way to use the experience to date to indicate whether an adjustment needs to be made to the historical average development factors. We found little sign of a strong correlation in the Lloyd's statistics, possibly due to distorting large losses early in the development. Again, this is something which actuaries could investigate in their own data.

7.5.6 A second possibility is to understand the process of claims development more deeply by attempting to model it. This means modelling the various delays which occur between policy inception and claim settlement. This would allow specific adjustments to be made for changes in any one of the many factors which influence claim development. Clearly a reasonable amount of data would be needed to parameterise such a model.

7.5.7 Finally, the requirement for actuaries to validate, and in some cases design, rate indices means that more work may be needed in this area. Actuaries should be aware of the important features of an accurate rate index.

7.6 *Summary*

7.6.1 Loss development patterns are subject to variation over the course of the underwriting cycle, and this distorts traditional actuarial reserving methods. This can lead to material under-reserving during soft markets.

7.6.2 Actuaries should be aware of this, examine their data for cyclical effects and compensate where necessary. We believe that this is an area which needs more research, but in the interim the results based on exponential curve fitting, set out in Appendix A, may be useful.

7.6.3 The link between ULR, claim tail and premium tail should be exploited.

7.6.4 Further work should be undertaken to help actuaries to design and to validate rate indices.

7.6.5 Simple claims process models could be investigated, so that the effects of various changes can be understood.

7.6.6 Actuaries writing formal reports should be required to comment on how the effects of the cycle have been measured and addressed. If the actuary believes that there are no cyclical effects, and that no adjustments are needed, then this should be stated.

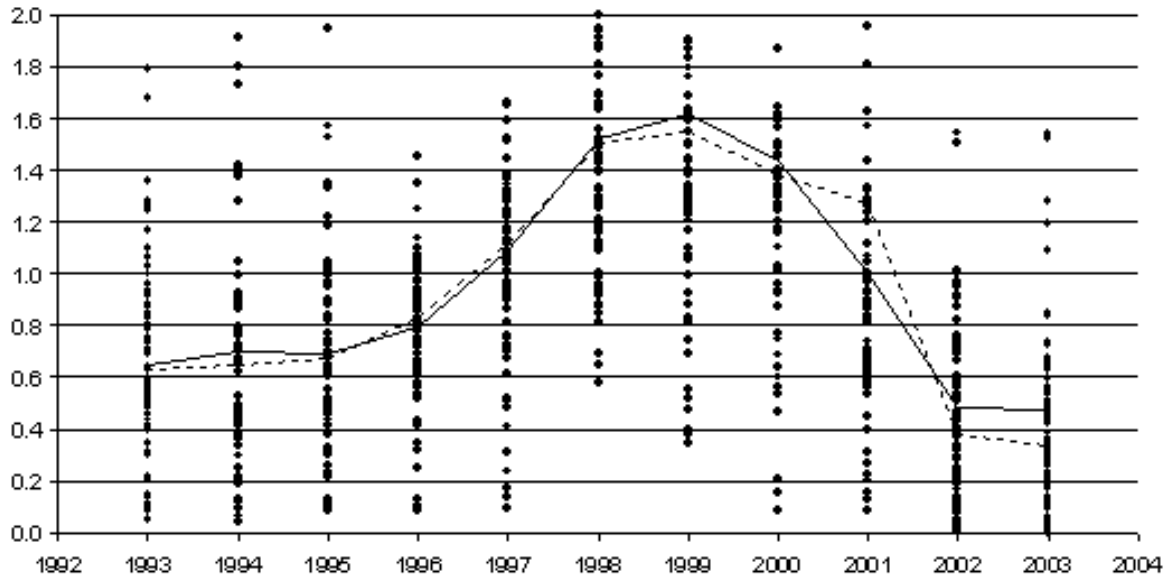


Figure 7.1. Chart of underwriting cycle

7.7 *The Underwriting Cycle*

7.7.1 Figure 7.1 shows a chart of the underwriting cycle. The axes are as follows:

- x axis shows underwriting years; and
- y axis shows ULR as a fraction of the average ULR over 1993 to 2002 (i.e. a normalised ULR).

7.7.2 Each point represents a risk code. Only risk codes present from 1993 to 2002 inclusive have been included. Significant outliers (where the normalised ULR exceeds ten in any year) have been excluded. The vertical scale has been limited to two to preserve the detail in the chart.

7.7.3 The solid line shows the average normalised ULR across the non-excluded risk codes. The dotted line connects the points relating to analysis of the whole account Lloyd's triangle, the sum across all risk codes. This serves as a useful check on the average of the non-excluded data.

7.8 *Improving our Methods — Charts*

7.8.1 The following sets of charts (B1 to B4) in Figures 7.2 to 7.21 are referred to in the text. We have included these charts for 20 risk codes. These have been chosen partly based on premium volume and partly on whether the graphs produced are sensible. Clearly there are some classes where this type of analysis is not appropriate. However, we have not simply included those classes which fit neatly with our conclusions. We have tried to show a range of classes to demonstrate that the conclusions do not always hold.

7.8.2 Note that the ULRs shown are the result of fitting a curve to premium and claims patterns automatically, using a VB macro in Excel. This

may not always provide the best fit and, almost certainly, will not provide the most accurate ULRs for recent years. For example, the curve does not deal well with negative incurred development.

7.8.3 The ULRs shown may not reflect the true underwriting results emerging from the classes included.

JEWELLERS BLOCK JEWELLERY ETC INC ROBBERY
JB

Chart B1: Adequacy of aggregate reserves at each quarter
Rolling 4 quarter averages. Quarter 4 represents 31/12/1993.

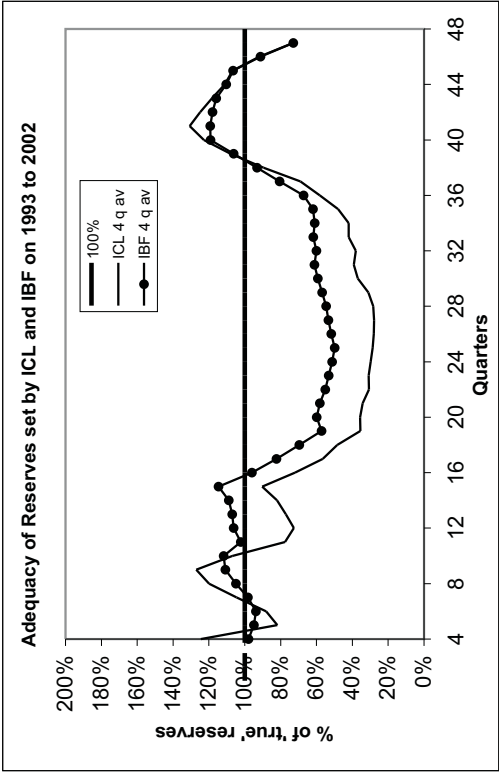


Chart B2: Claim tail, premium tail and ULR for each underwriting year

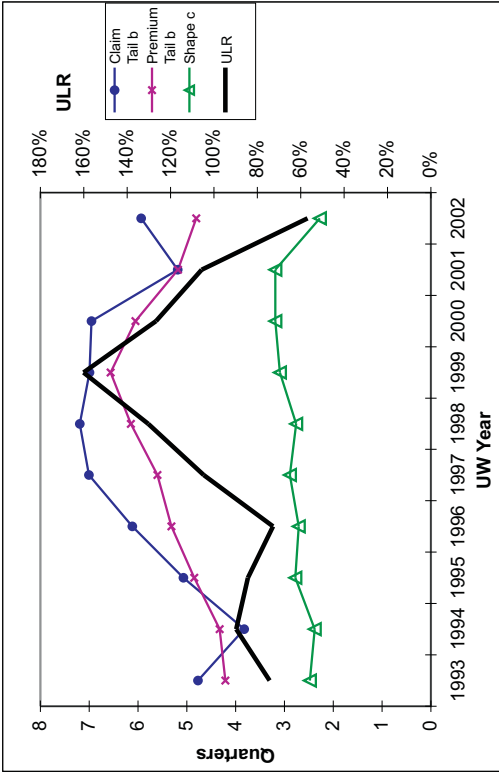


Chart B3: Claim Tail in Quarters vs ULR

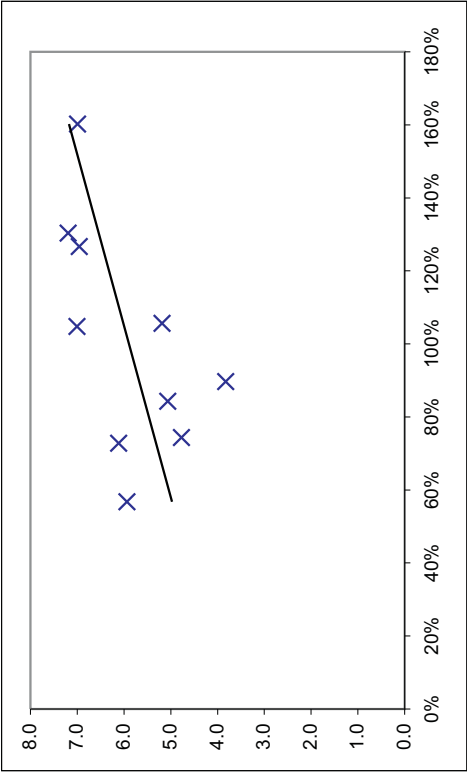


Chart B4: Claim Tail (y-axis) vs Premium Tail (x-axis). Quarters

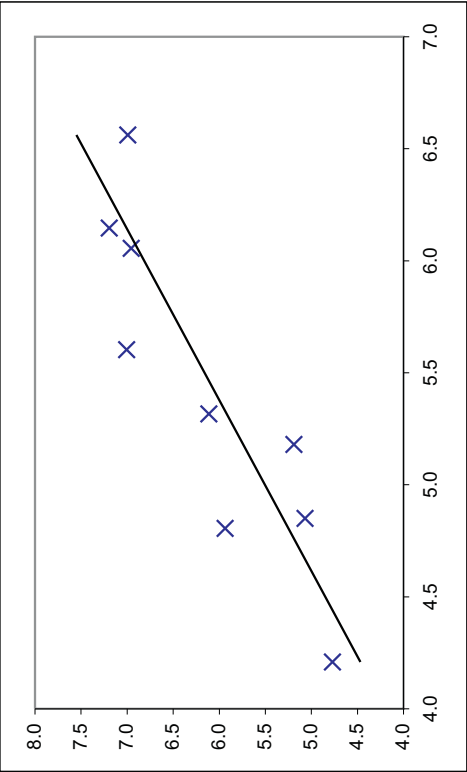


Figure 7.2. Charts B1 to B4 for Lloyd's reserve code JB

ALL RISK PHYSICAL LOSS DAMAGE NO DIRECT PPNL RI
PD

Chart B1: Adequacy of aggregate reserves at each quarter
Rolling 4 quarter averages. Quarter 4 represents 31/12/1993.

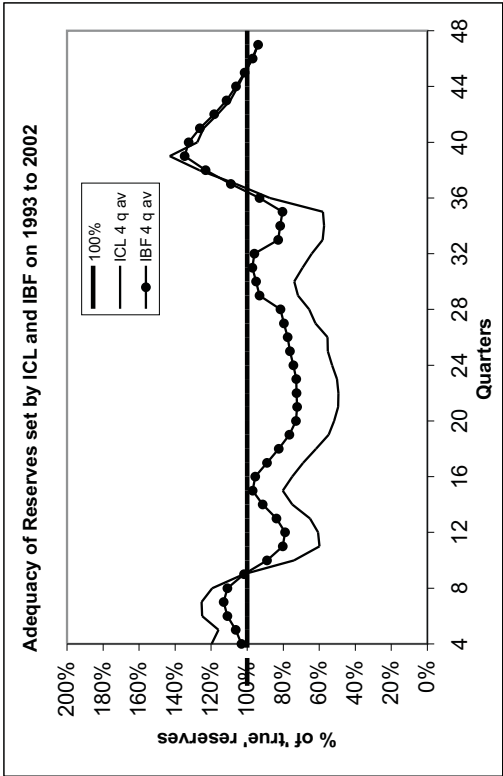


Chart B2: Claim tail, premium tail and ULR for each underwriting year

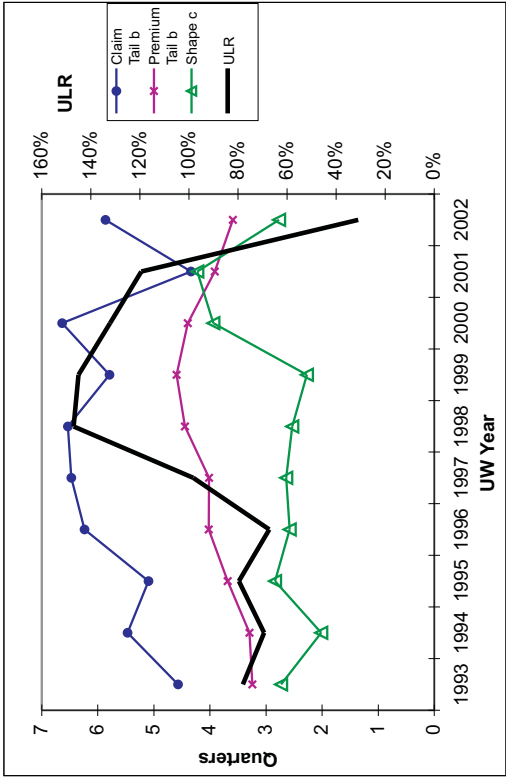


Chart B3: Claim Tail in Quarters vs ULR

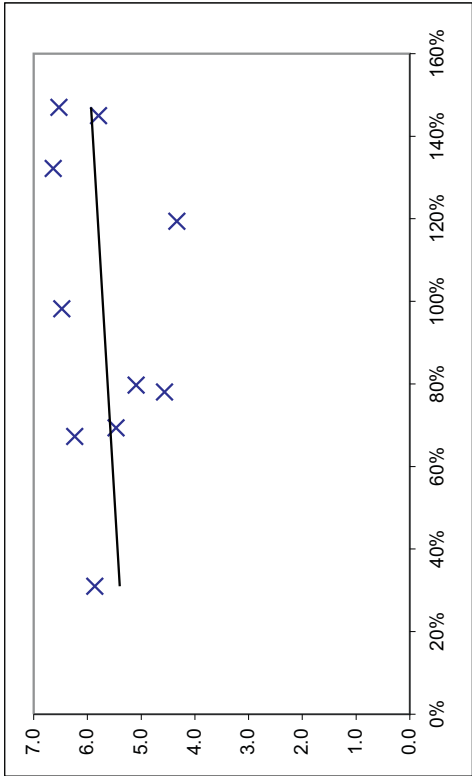


Chart B4: Claim Tail (y-axis) vs Premium Tail (x-axis). Quarters

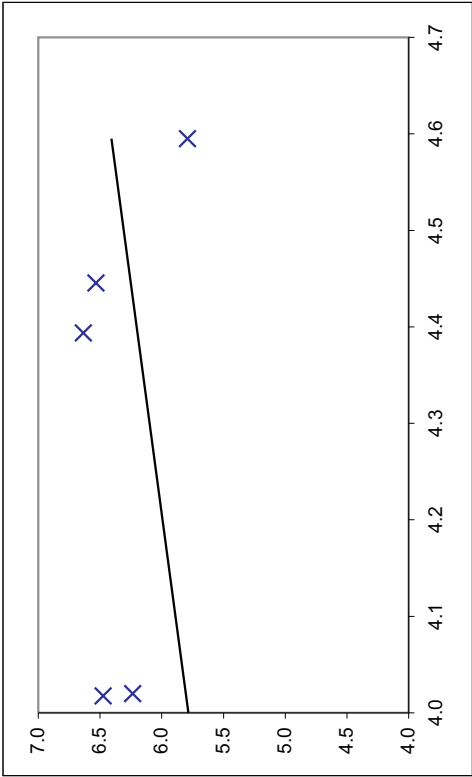


Figure 7.3. Charts B1 to B4 for Lloyd's reserve code PD

E AND O OR PROFESSIONAL INDEM EXCL FINANCIAL INST
PI

Chart B1: Adequacy of aggregate reserves at each quarter
Rolling 4 quarter averages. Quarter 4 represents 31/12/1993.

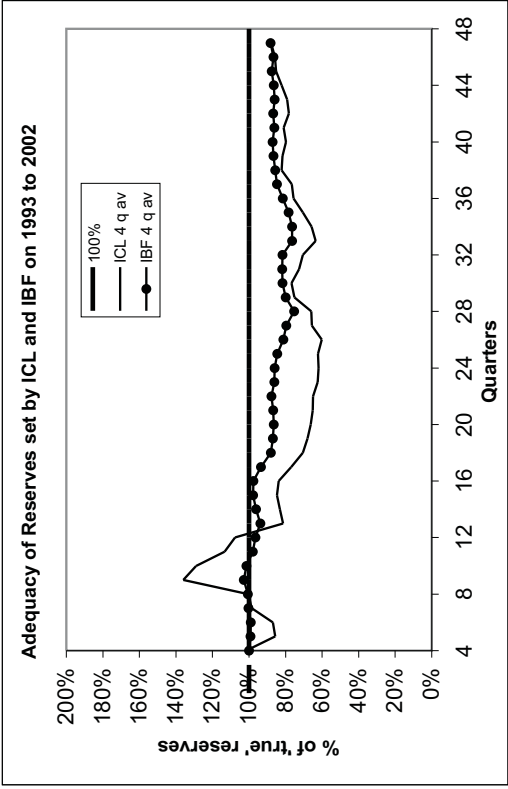


Chart B2: Claim tail, premium tail and ULR for each underwriting year

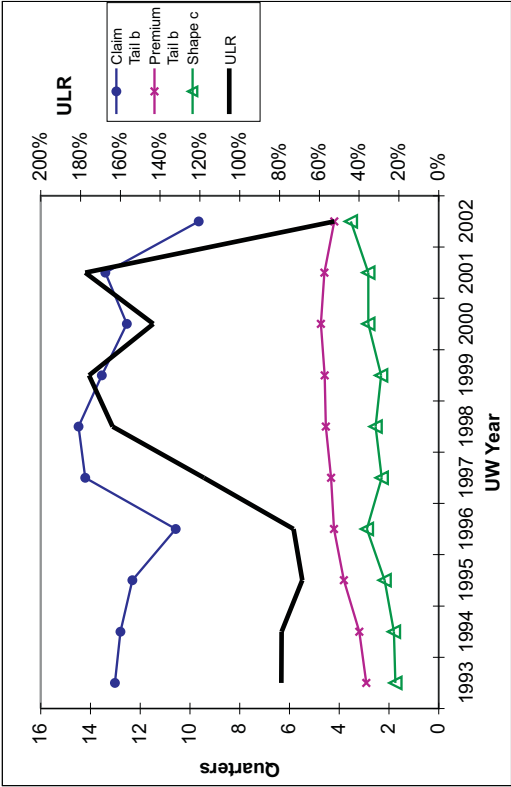


Chart B3: Claim Tail in Quarters vs ULR

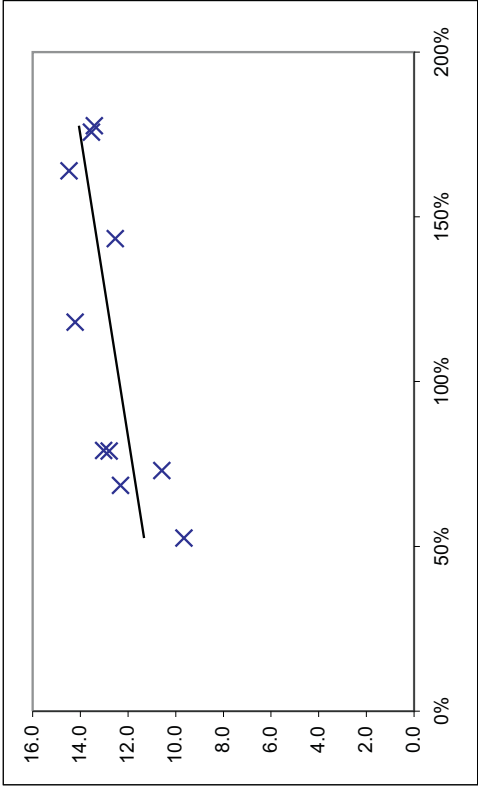


Chart B4: Claim Tail (y-axis) vs Premium Tail (x-axis). Quarters

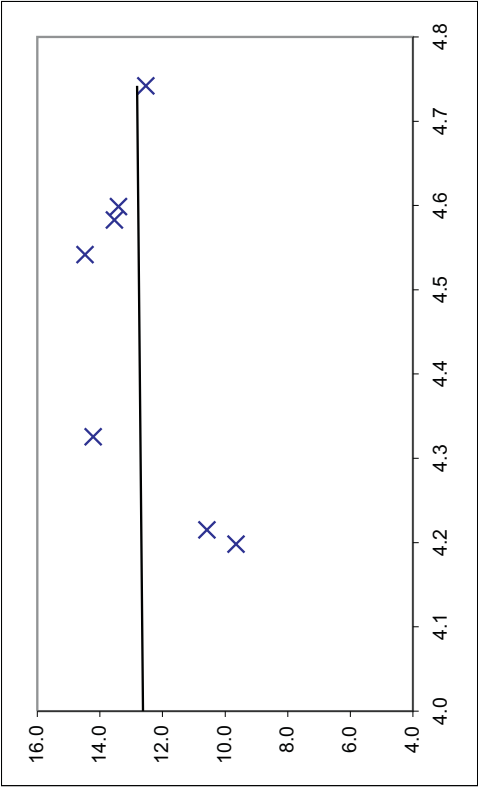


Figure 7.4. Charts B1 to B4 for Lloyd's reserve code PI

T
VESSELS SHIPBLDG ACV LOH AND CONTAINERS EX WRO

Chart B1: Adequacy of aggregate reserves at each quarter
Rolling 4 quarter averages. Quarter 4 represents 31/12/1993.

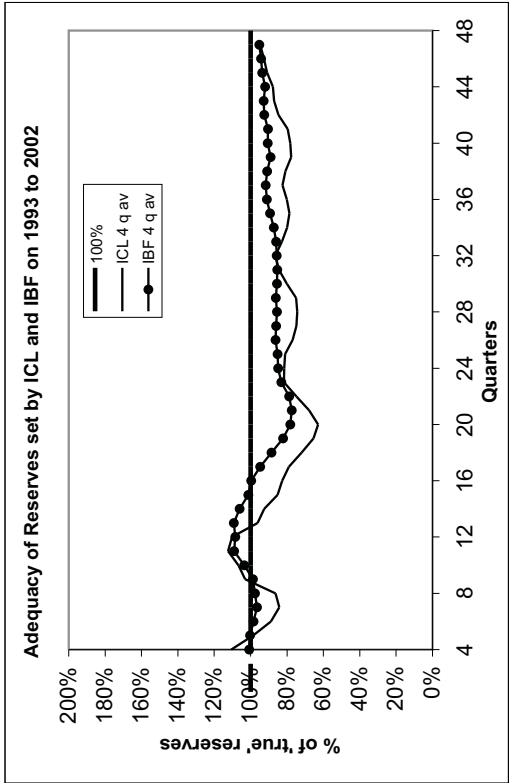


Chart B2: Claim tail, premium tail and ULR for each underwriting year

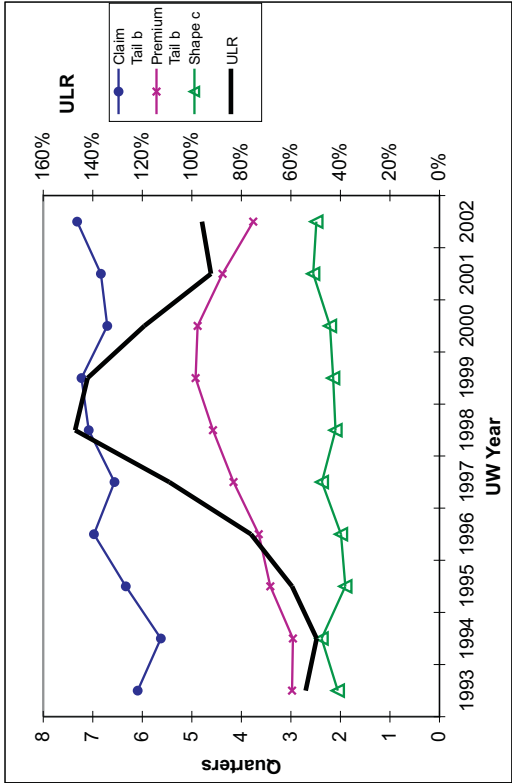


Chart B3: Claim Tail in Quarters vs ULR

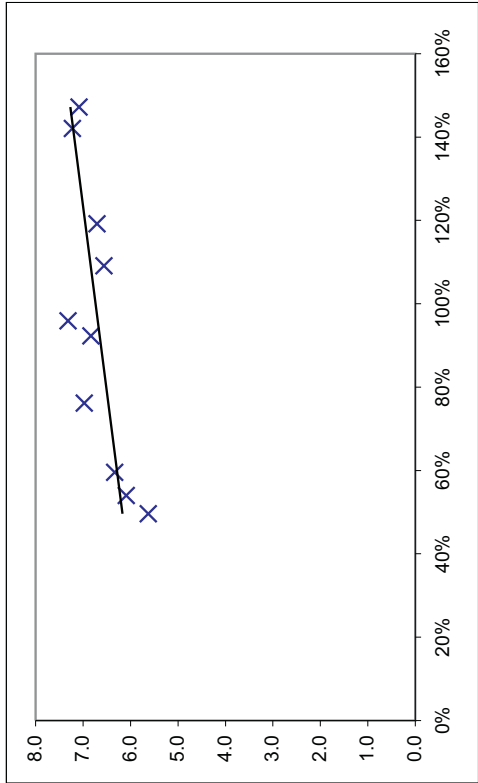


Chart B4: Claim Tail (y-axis) vs Premium Tail (x-axis). Quarters

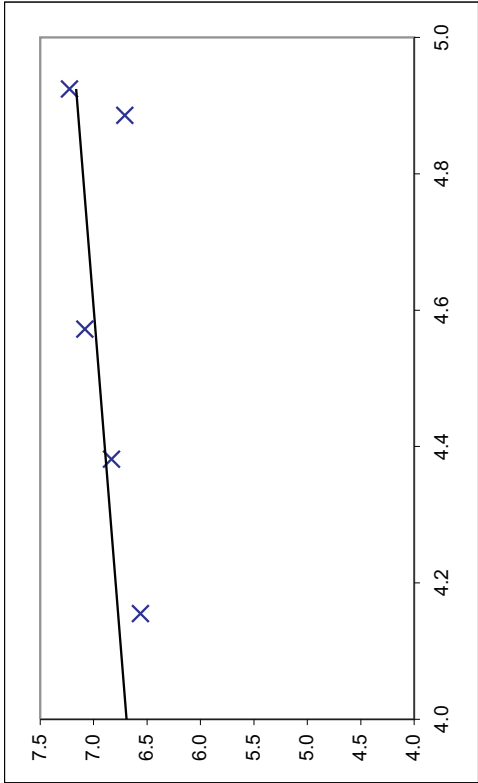


Figure 7.5. Charts B1 to B4 for Lloyd's reserve code T

DIRECTORS AND OFFICERS LIAB EXCL FINANCIAL INST
DO

Chart B1: Adequacy of aggregate reserves at each quarter
Rolling 4 quarter averages. Quarter 4 represents 31/12/1993.

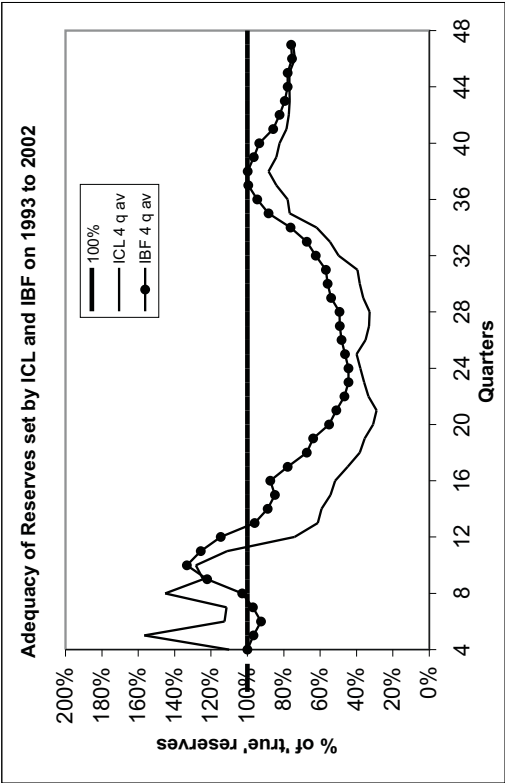


Chart B2: Claim tail, premium tail and ULR for each underwriting year

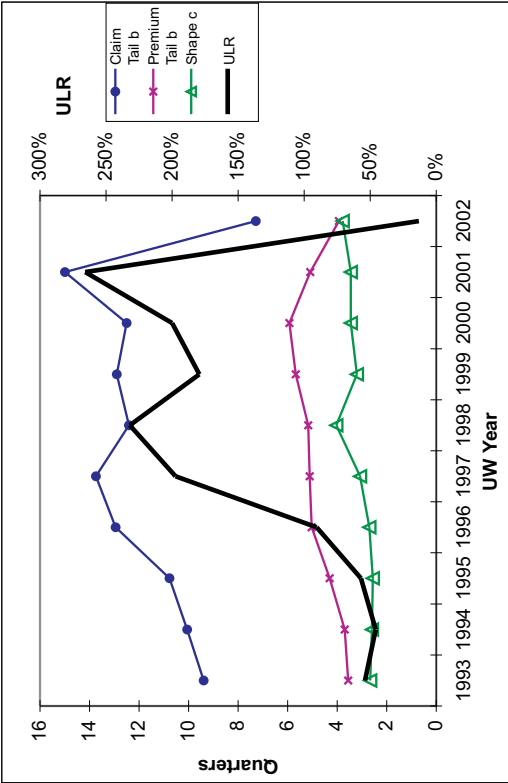


Chart B3: Claim Tail in Quarters vs ULR

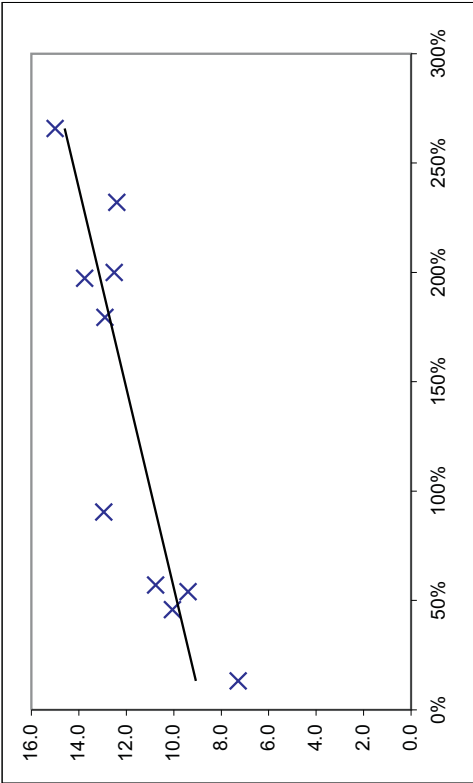


Chart B4: Claim Tail (y-axis) vs Premium Tail (x-axis). Quarters

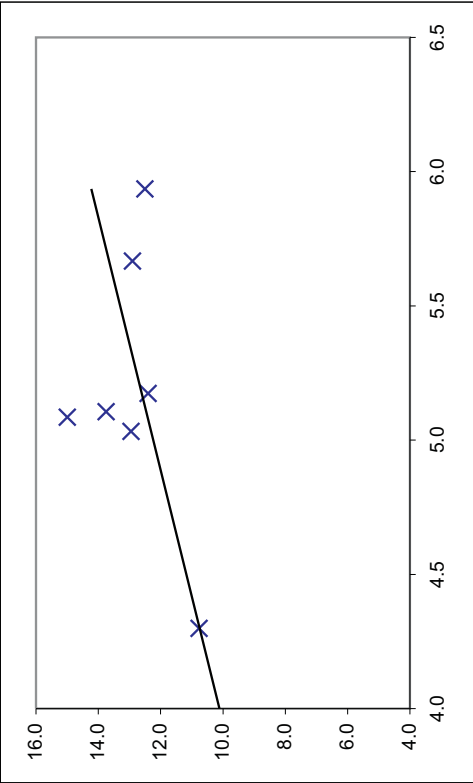


Figure 7.6. Charts B1 to B4 for Lloyd's reserve code DO

CARGO ALL RISKS INC WAR EX WRO
V

Chart B1: Adequacy of aggregate reserves at each quarter
Rolling 4 quarter averages. Quarter 4 represents 31/12/1993.

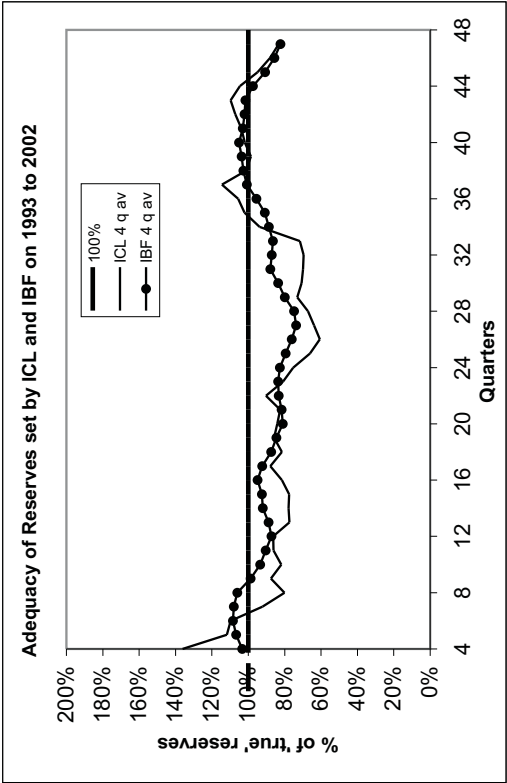


Chart B2: Claim tail, premium tail and ULR for each underwriting year

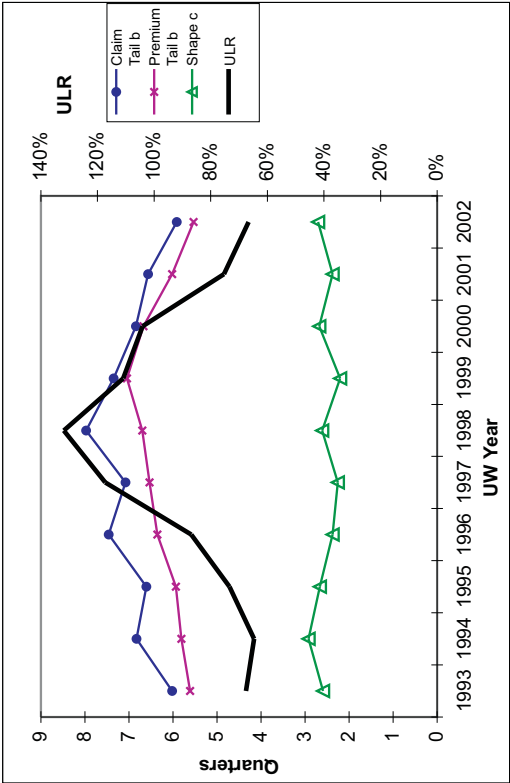


Chart B3: Claim Tail in Quarters vs ULR

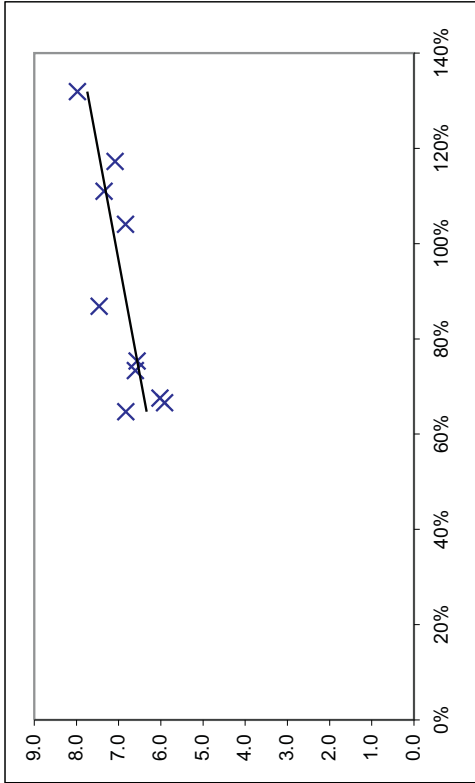


Chart B4: Claim Tail (y-axis) vs Premium Tail (x-axis). Quarters

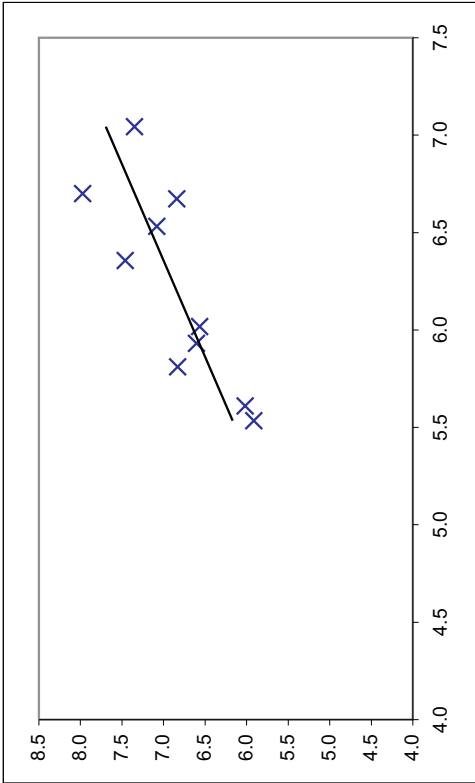


Figure 7.7. Charts B1 to B4 for Lloyd's reserve code V

MARINE LEGAL LIAB ALL OTHER NO CARGO EX WRO
G

Chart B1: Adequacy of aggregate reserves at each quarter
Rolling 4 quarter averages. Quarter 4 represents 31/12/1993.

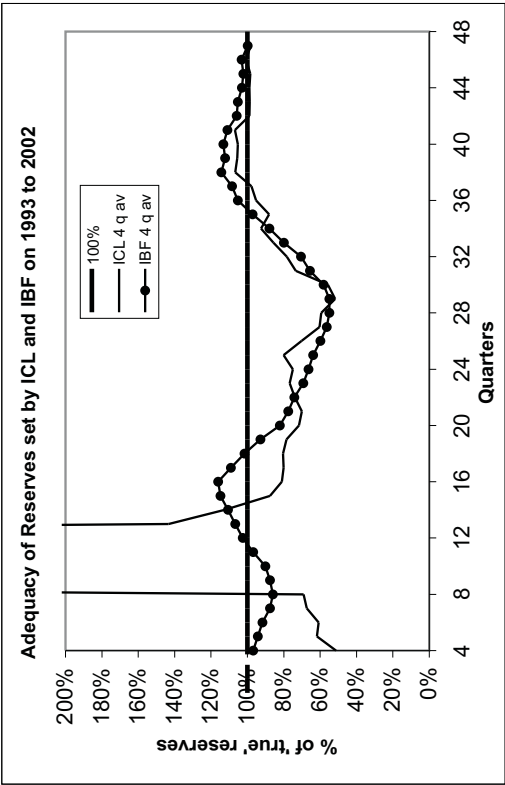


Chart B2: Claim tail, premium tail and ULR for each underwriting year

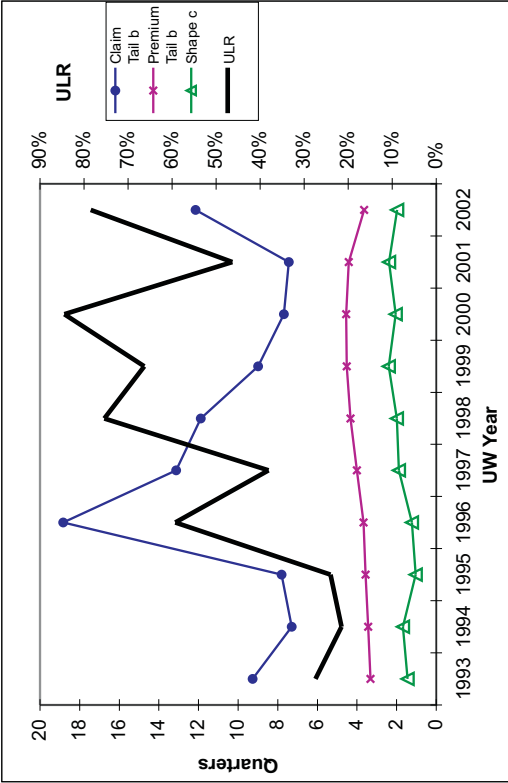


Chart B3: Claim Tail in Quarters vs ULR

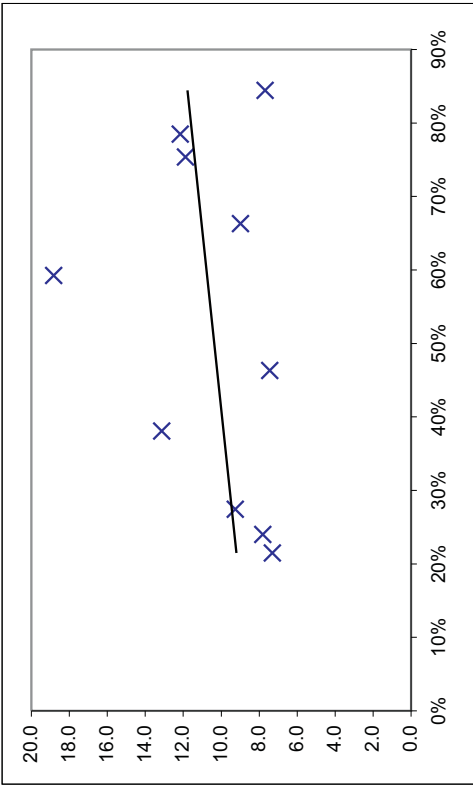


Chart B4: Claim Tail (y-axis) vs Premium Tail (x-axis). Quarters

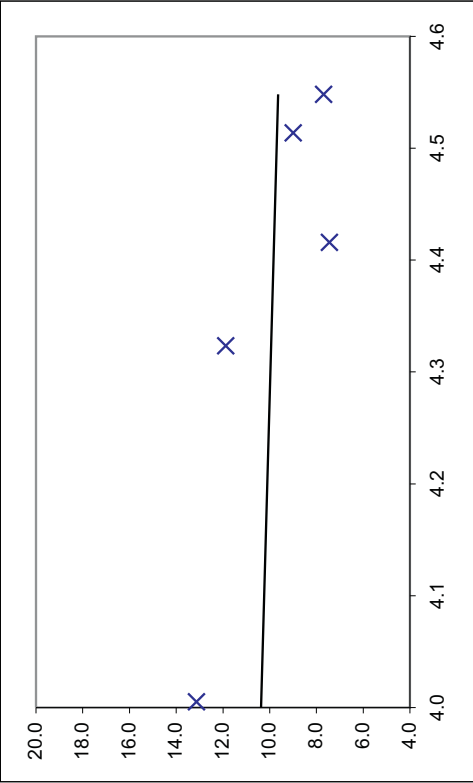


Figure 7.8. Charts B1 to B4 for Lloyd's reserve code G

FIDELITY COMPUTER CRIME AND BANKERS POLICIES
BB

Chart B1: Adequacy of aggregate reserves at each quarter
Rolling 4 quarter averages. Quarter 4 represents 31/12/1993.

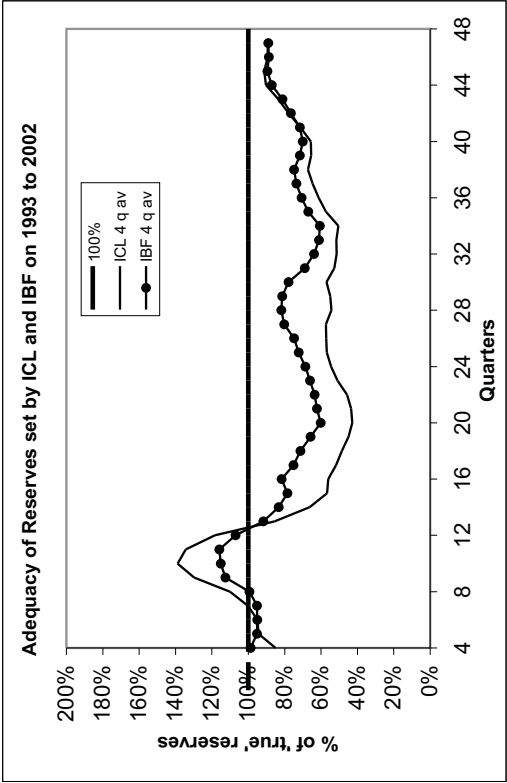


Chart B2: Claim tail, premium tail and ULR for each underwriting year

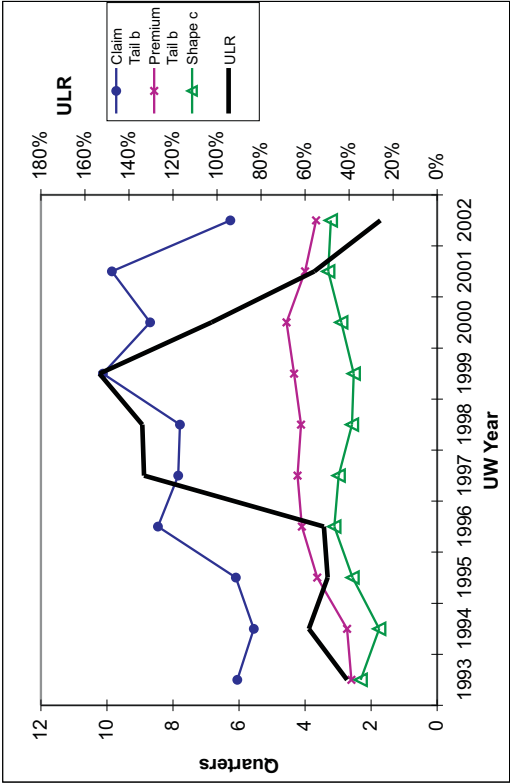


Chart B3: Claim Tail in Quarters vs ULR

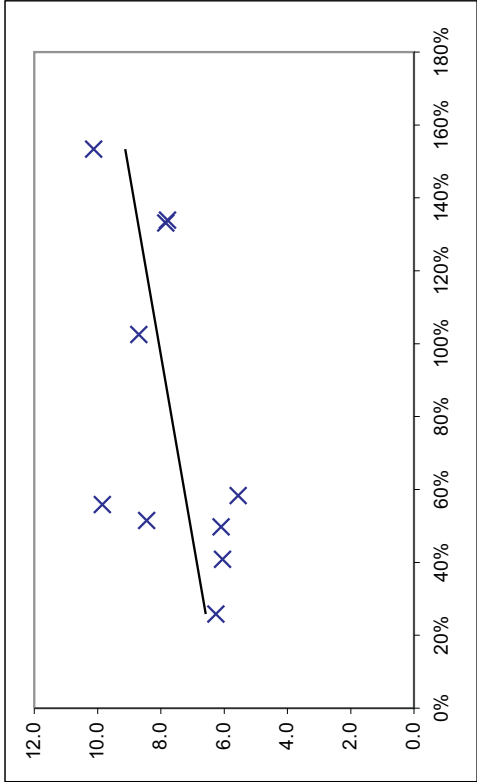


Chart B4: Claim Tail (y-axis) vs Premium Tail (x-axis). Quarters

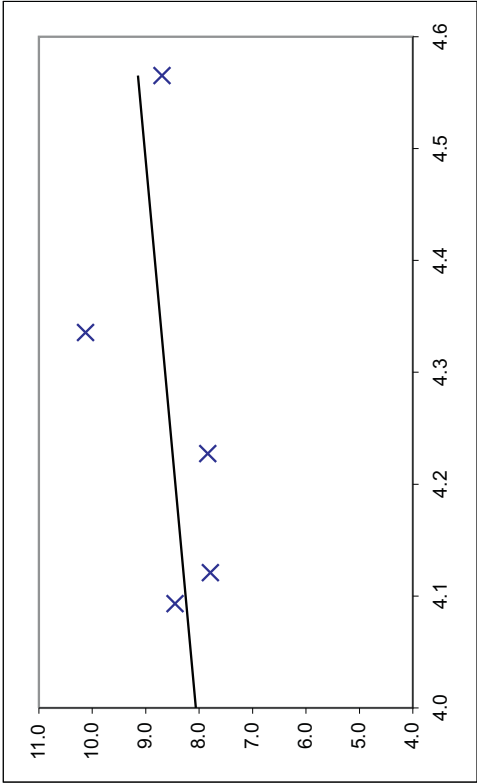


Figure 7.9. Charts B1 to B4 for Lloyd's reserve code BB

WORKERS COMPENSATION AND EMPLOYERS LIABILITY
WC

Chart B1: Adequacy of aggregate reserves at each quarter
Rolling 4 quarter averages. Quarter 4 represents 31/12/1993.

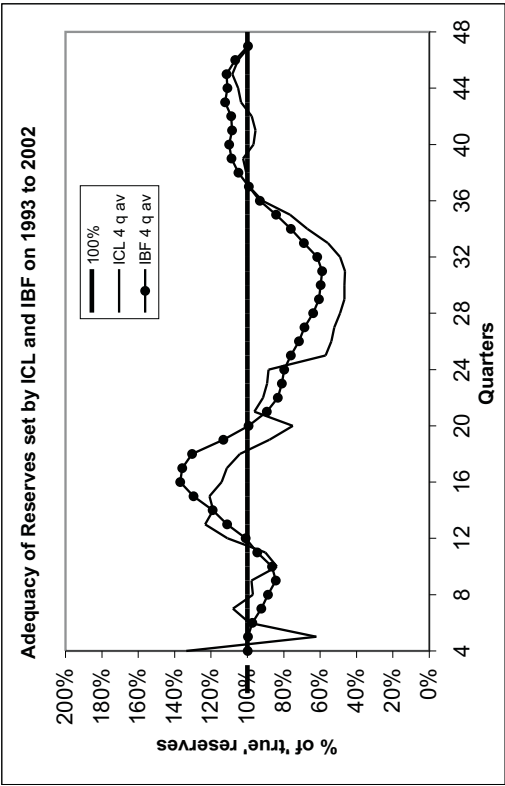


Chart B2: Claim tail, premium tail and ULR for each underwriting year

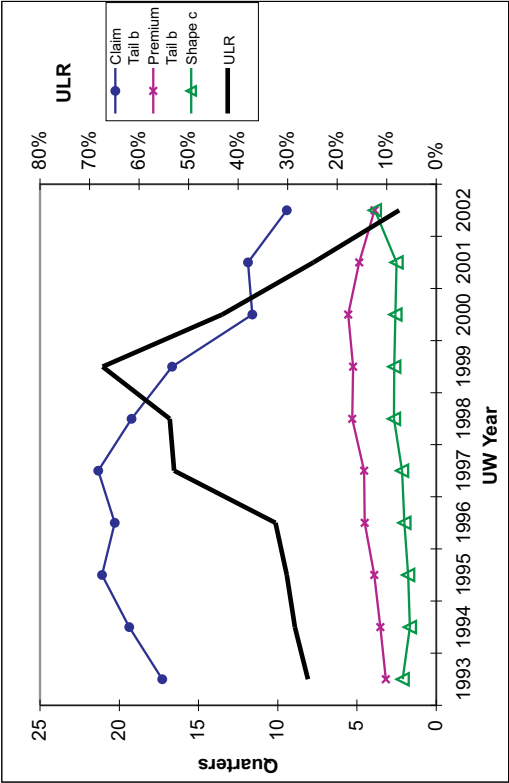


Chart B3: Claim Tail in Quarters vs ULR

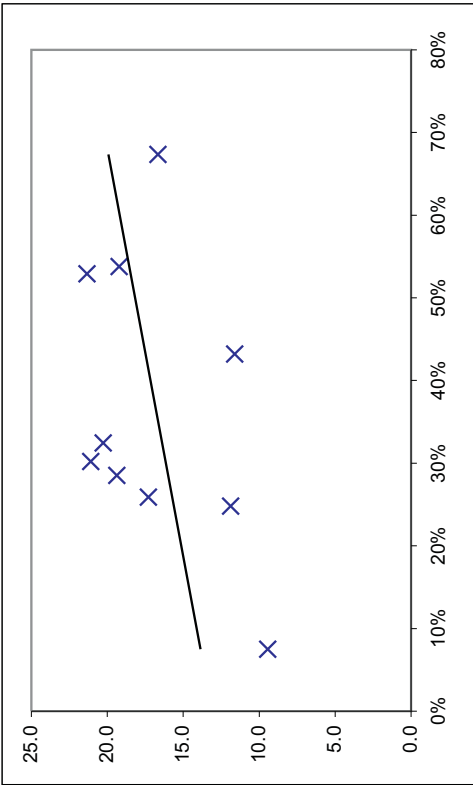


Chart B4: Claim Tail (y-axis) vs Premium Tail (x-axis). Quarters

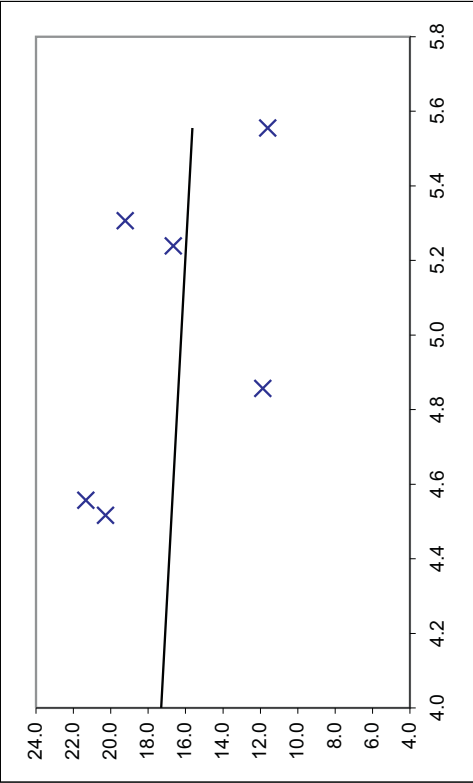


Figure 7.10. Charts B1 to B4 for Lloyd's reserve code WC

HULLS OF AIRCRAFT EX SPACE OR ACV EX WRO
H

Chart B1: Adequacy of aggregate reserves at each quarter
Rolling 4 quarter averages. Quarter 4 represents 31/12/1993.

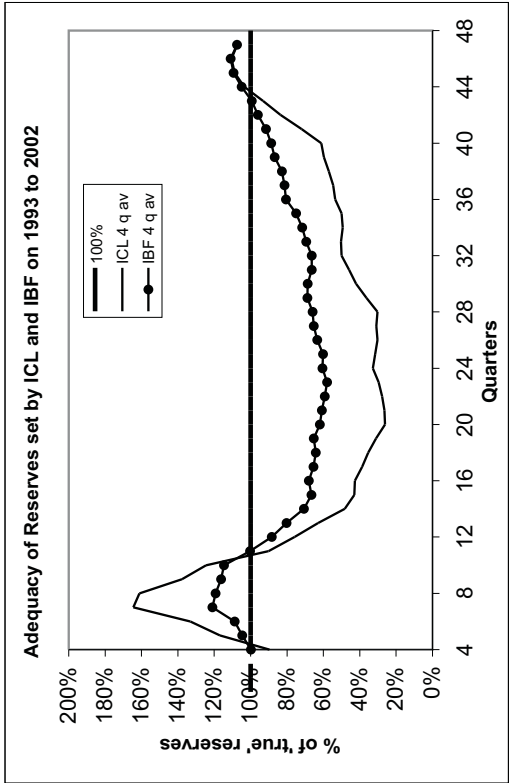


Chart B2: Claim tail, premium tail and ULR for each underwriting year

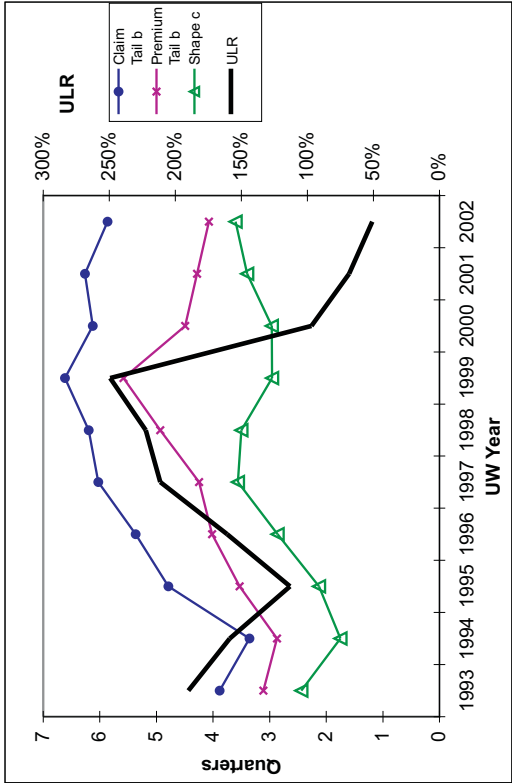


Chart B3: Claim Tail in Quarters vs ULR

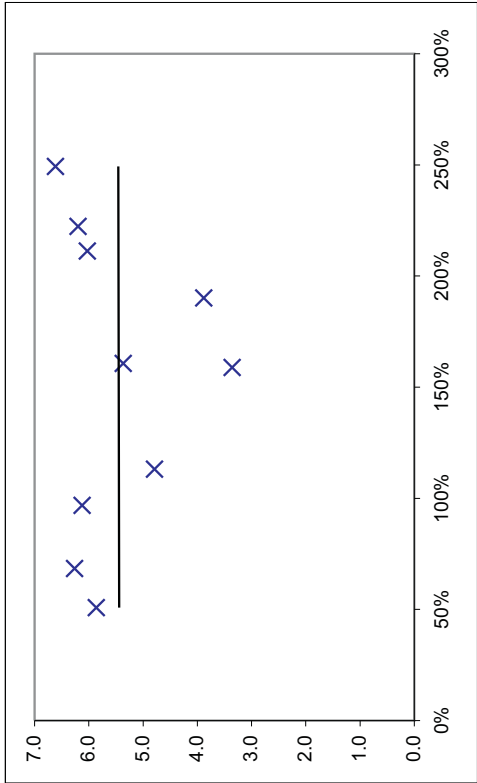


Chart B4: Claim Tail (y-axis) vs Premium Tail (x-axis). Quarters

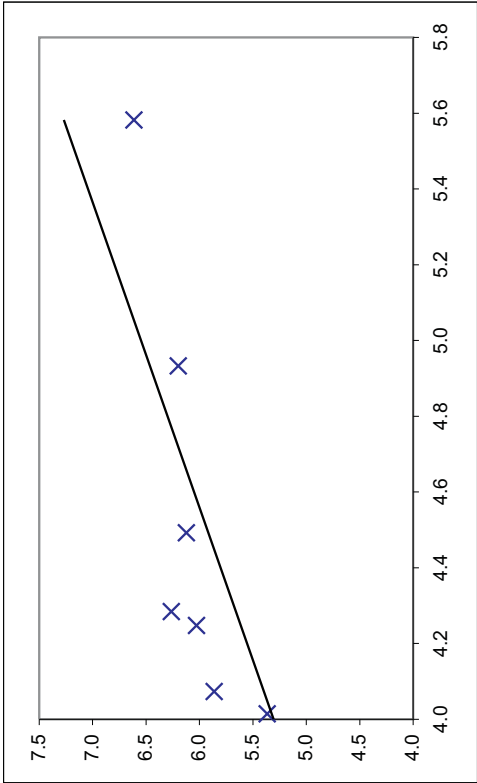


Figure 7.11. Charts B1 to B4 for Lloyd's reserve code H

UK HOUSEHOLD BUSINESS
HP

Chart B1: Adequacy of aggregate reserves at each quarter
Rolling 4 quarter averages. Quarter 4 represents 31/12/1993.

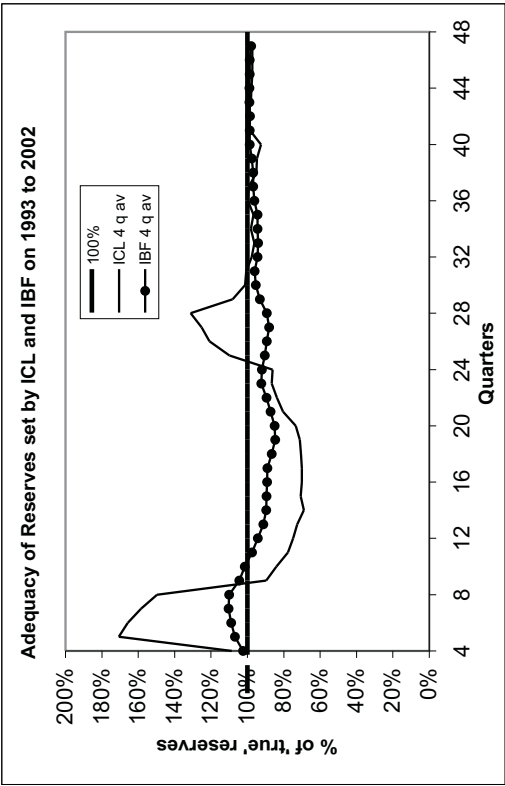


Chart B2: Claim tail, premium tail and ULR for each underwriting year

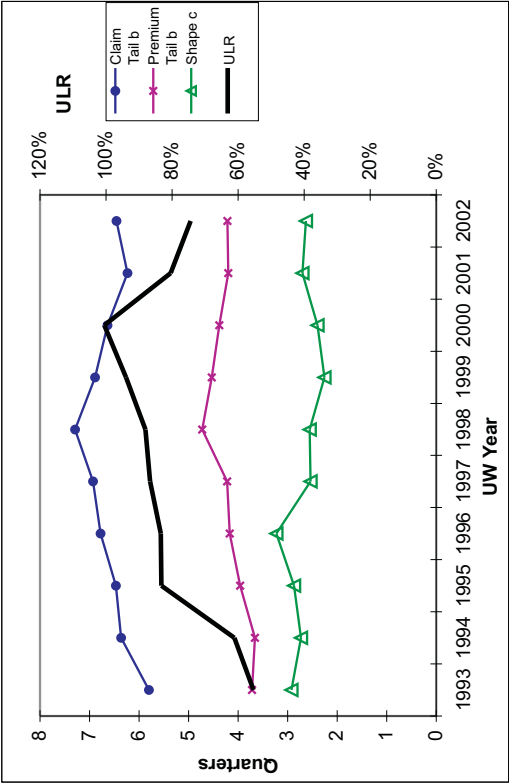


Chart B3: Claim Tail in Quarters vs ULR

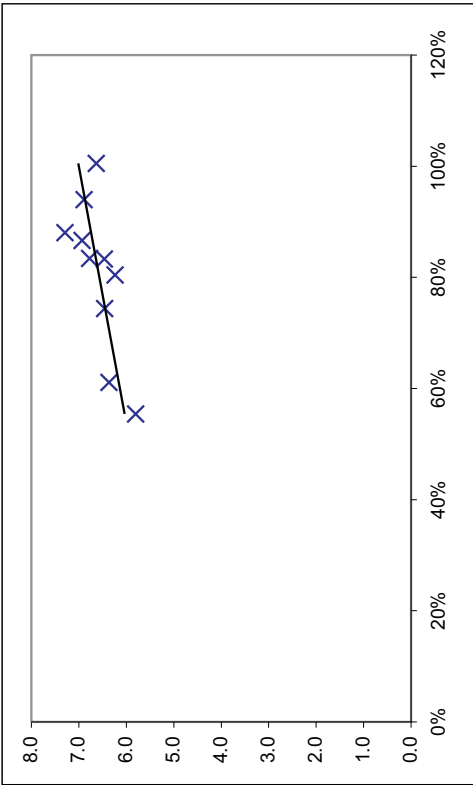


Chart B4: Claim Tail (y-axis) vs Premium Tail (x-axis). Quarters

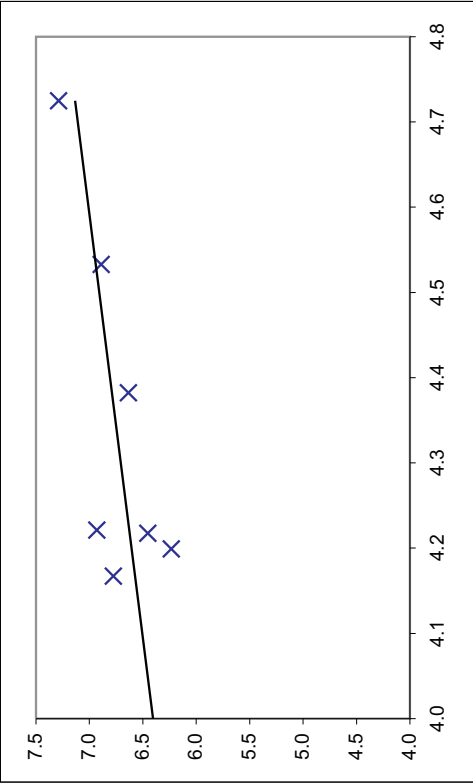


Figure 7.12. Charts B1 to B4 for Lloyd's reserve code HP

NM GENERAL AND MISC LIABILITY ALL OTHER EXC USA
NA

Chart B1: Adequacy of aggregate reserves at each quarter
Rolling 4 quarter averages. Quarter 4 represents 31/12/1993.

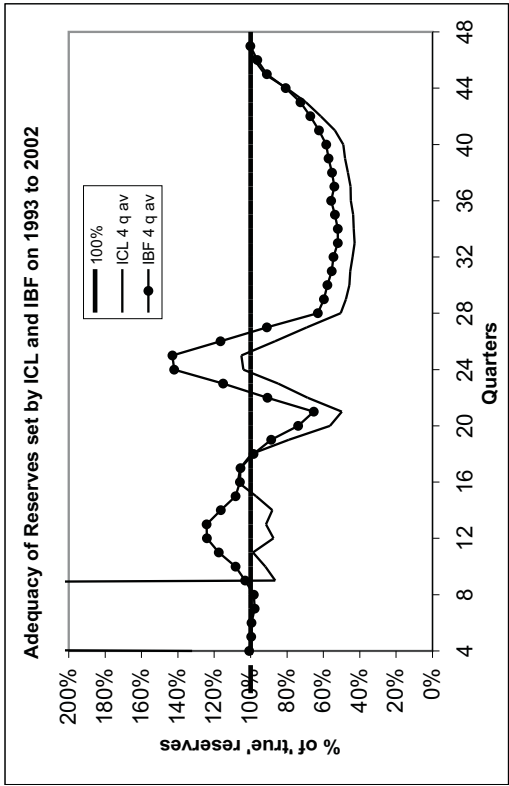


Chart B2: Claim tail, premium tail and ULR for each underwriting year

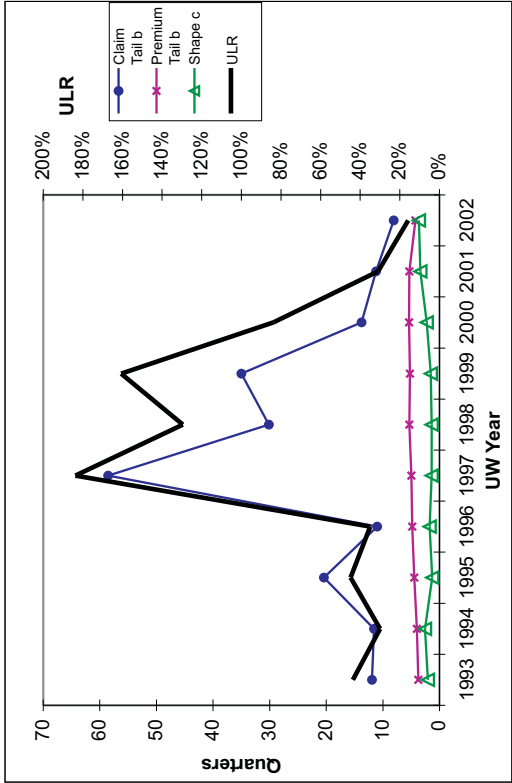


Chart B3: Claim Tail in Quarters vs ULR

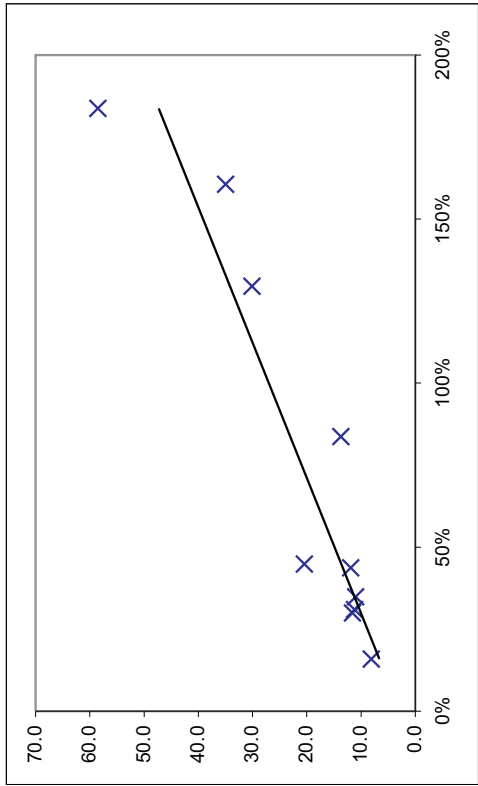


Chart B4: Claim Tail (y-axis) vs Premium Tail (x-axis). Quarters

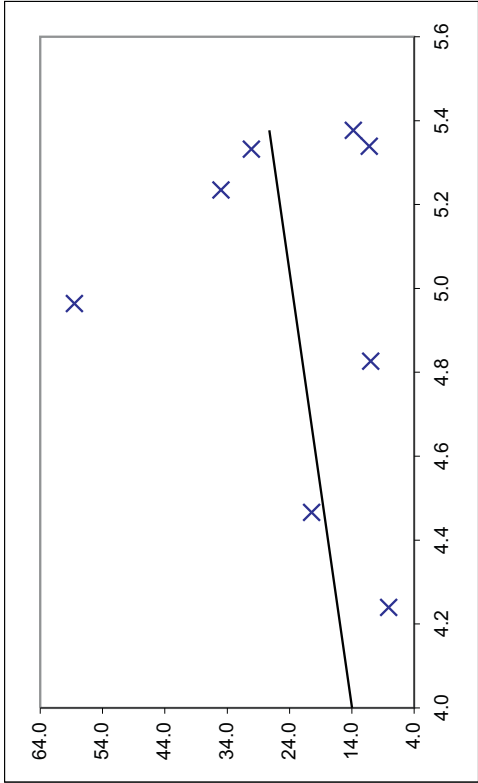


Figure 7.13. Charts B1 to B4 for Lloyd's reserve code NA

NM GENERAL AND MISC LIABILITY ALL OTHER INC USA
UA

Chart B1: Adequacy of aggregate reserves at each quarter
Rolling 4 quarter averages. Quarter 4 represents 31/12/1993.

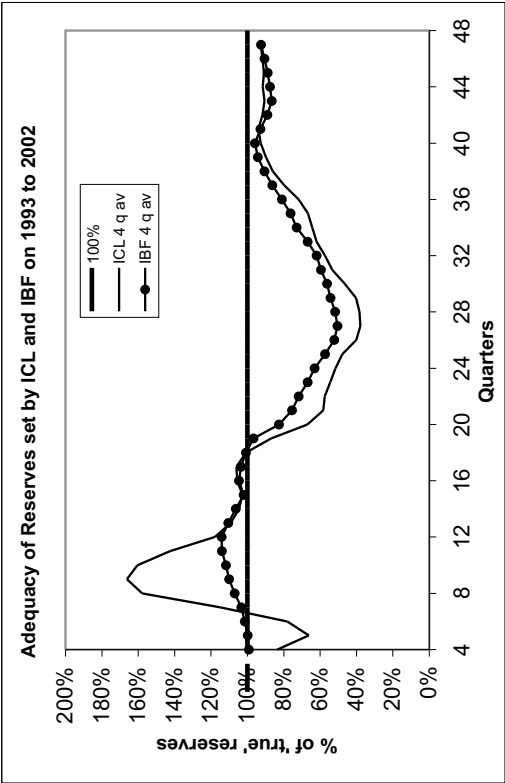


Chart B2: Claim tail, premium tail and ULR for each underwriting year

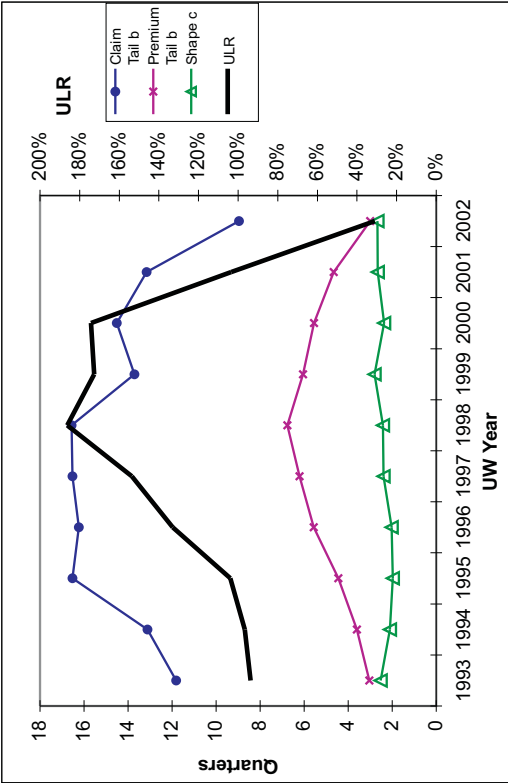


Chart B3: Claim Tail in Quarters vs ULR

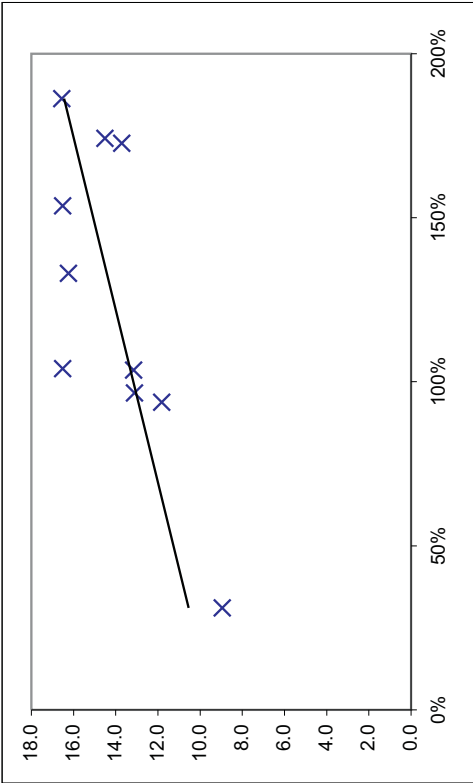


Chart B4: Claim Tail (y-axis) vs Premium Tail (x-axis). Quarters

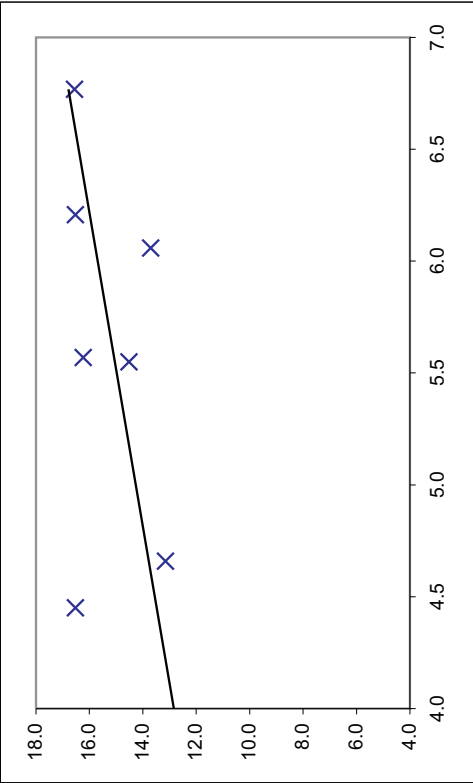


Figure 7.14. Charts B1 to B4 for Lloyd's reserve code UA

MISCELLANEOUS PECUNIARY LOSS

P

Chart B1: Adequacy of aggregate reserves at each quarter Rolling 4 quarter averages. Quarter 4 represents 31/12/1993.

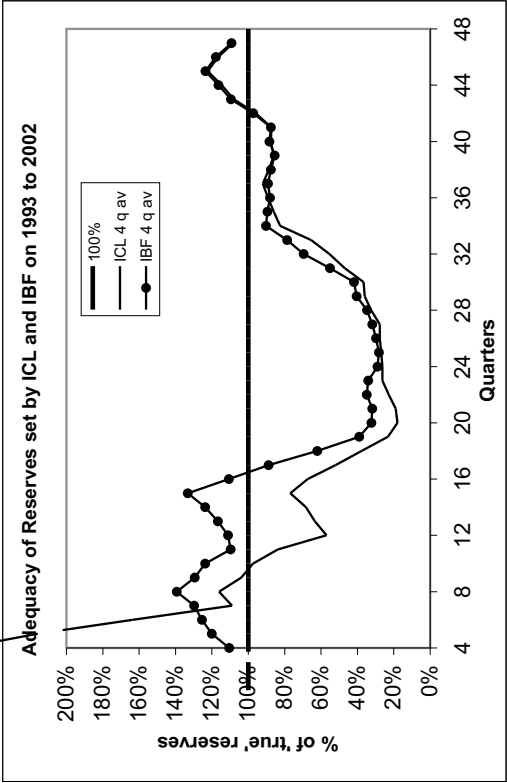


Chart B2: Claim tail, premium tail and ULR for each underwriting year

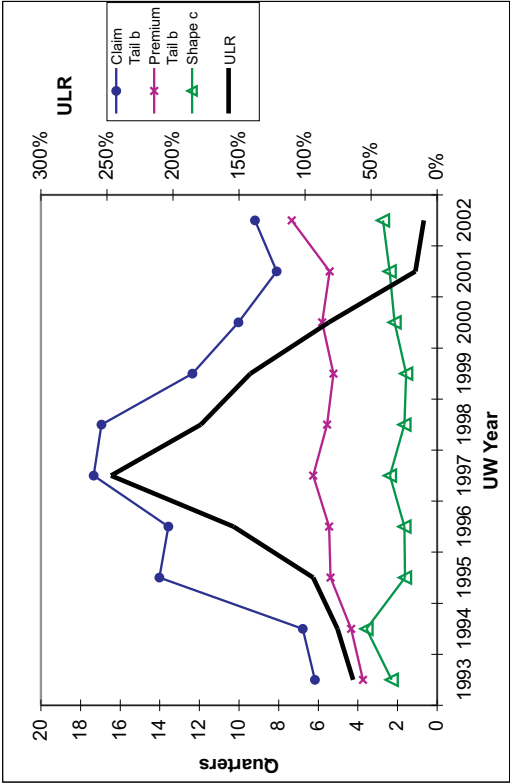


Chart B3: Claim Tail in Quarters vs ULR

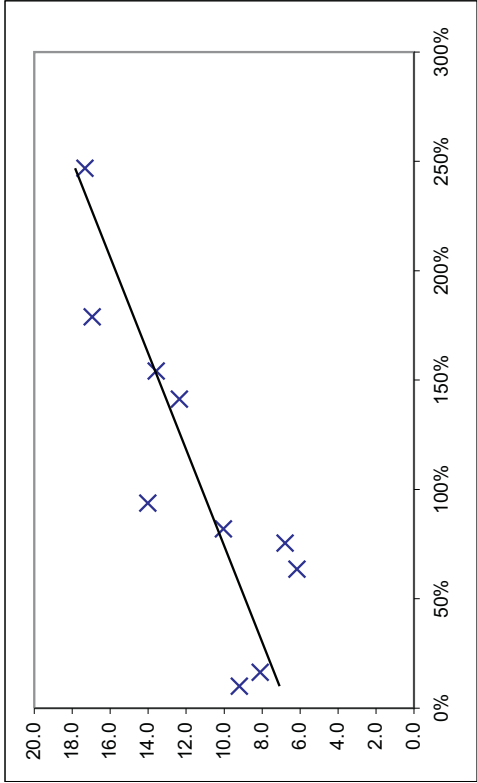


Chart B4: Claim Tail (y-axis) vs Premium Tail (x-axis). Quarters

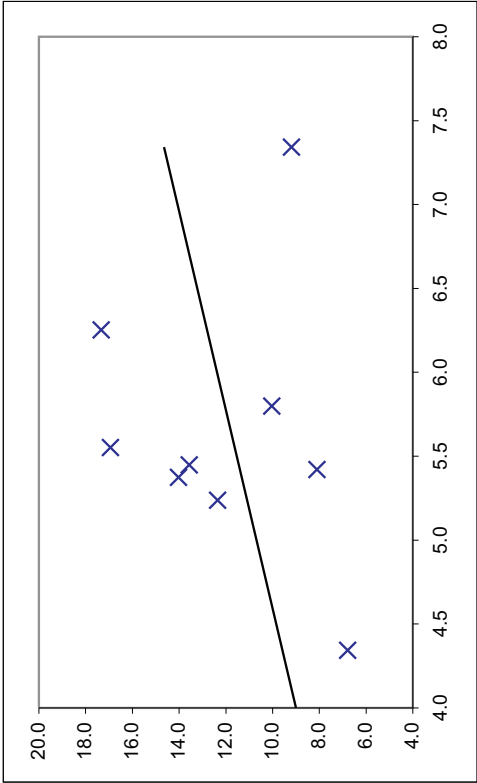


Figure 7.15. Charts B1 to B4 for Lloyd's reserve code P

USA AND CANADA MOTOR VEHICLE PHYSICAL DAMAGE
MG

Chart B1: Adequacy of aggregate reserves at each quarter
Rolling 4 quarter averages. Quarter 4 represents 31/12/1993.

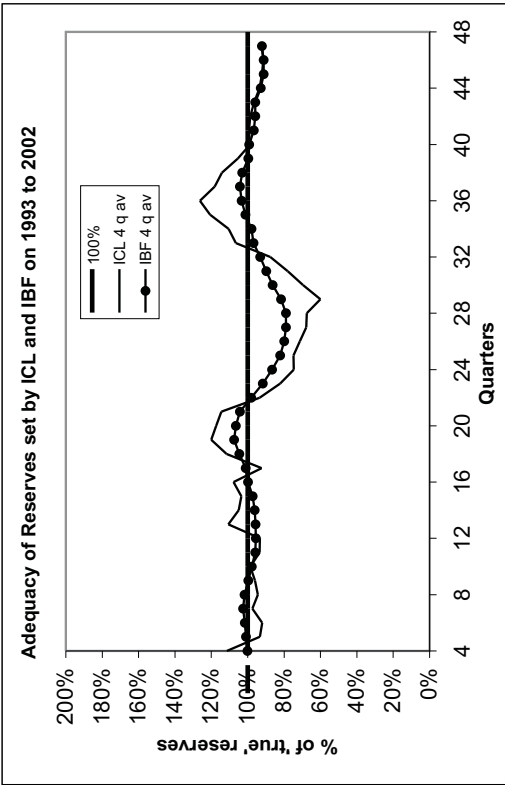


Chart B2: Claim tail, premium tail and ULR for each underwriting year

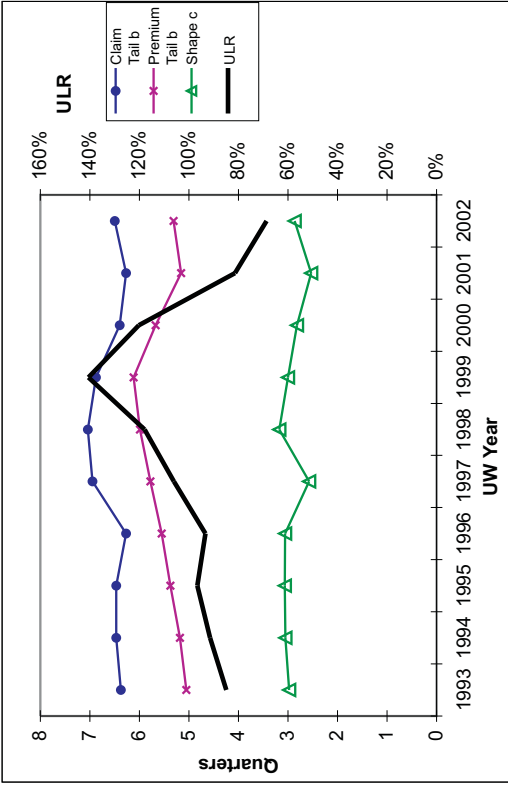


Chart B3: Claim Tail in Quarters vs ULR

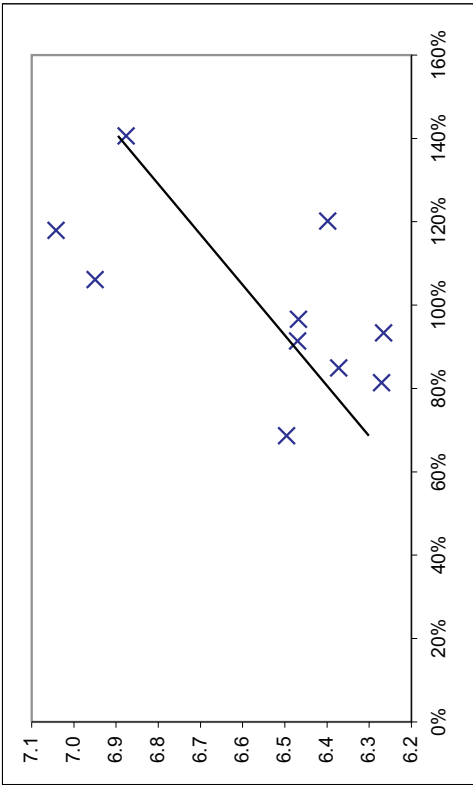


Chart B4: Claim Tail (y-axis) vs Premium Tail (x-axis). Quarters

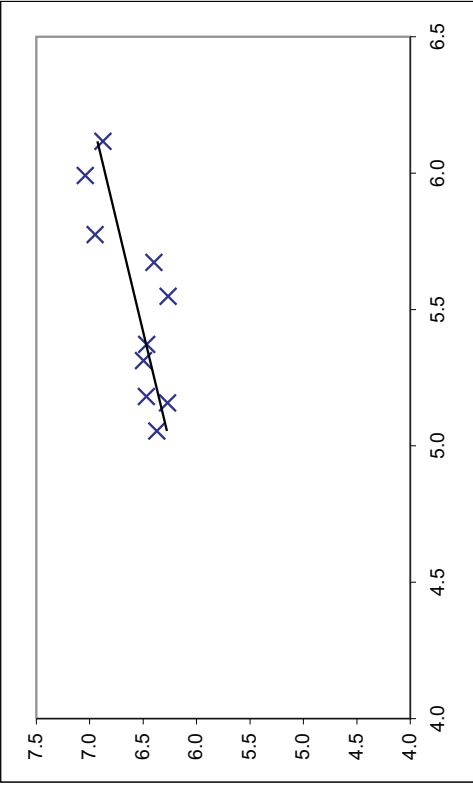


Figure 7.16. Charts B1 to B4 for Lloyd's reserve code MG

Chart B1: Adequacy of aggregate reserves at each quarter
Rolling 4 quarter averages. Quarter 4 represents 31/12/1993.

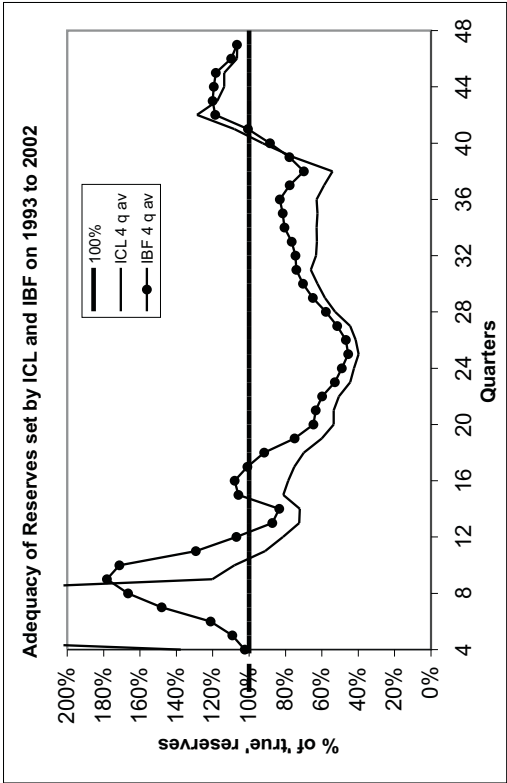


Chart B2: Claim tail, premium tail and ULR for each underwriting year

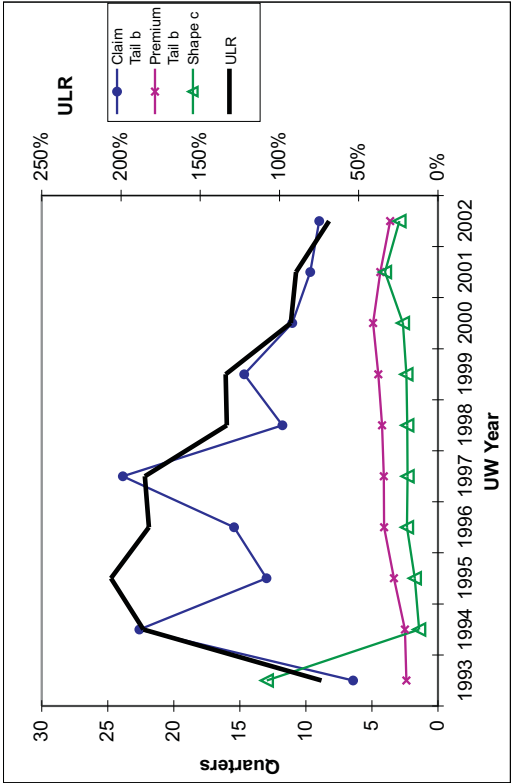


Chart B3: Claim Tail in Quarters vs ULR

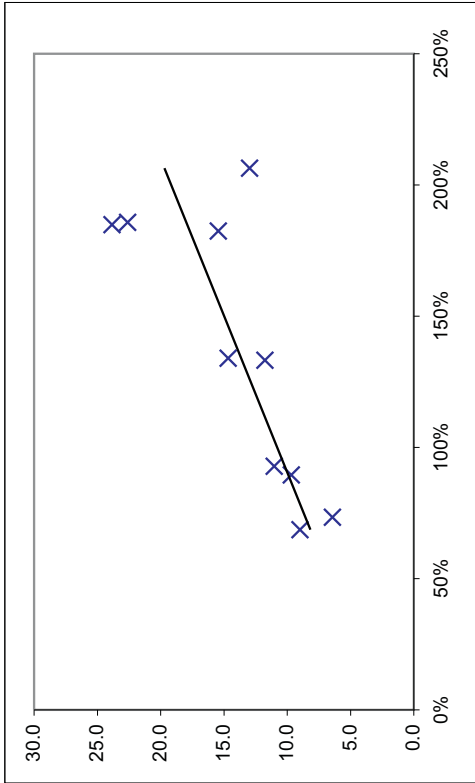


Chart B4: Claim Tail (y-axis) vs Premium Tail (x-axis). Quarters

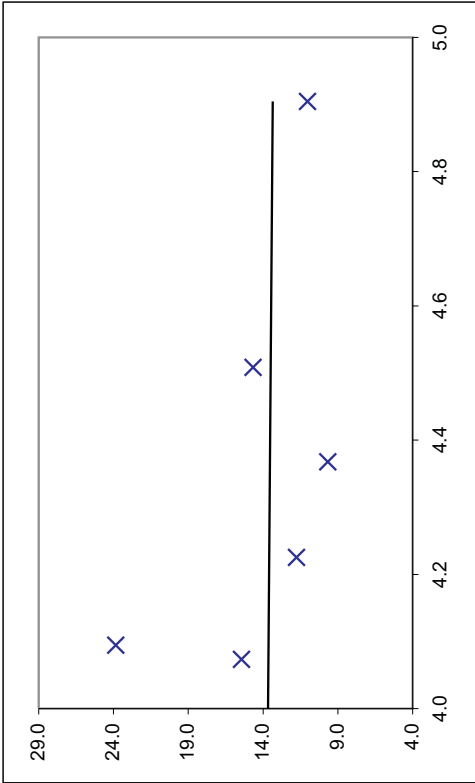


Figure 7.17. Charts B1 to B4 for Lloyd's reserve code AP

EXTENDED WARRANTY
WA

Chart B1: Adequacy of aggregate reserves at each quarter
Rolling 4 quarter averages. Quarter 4 represents 31/12/1993.

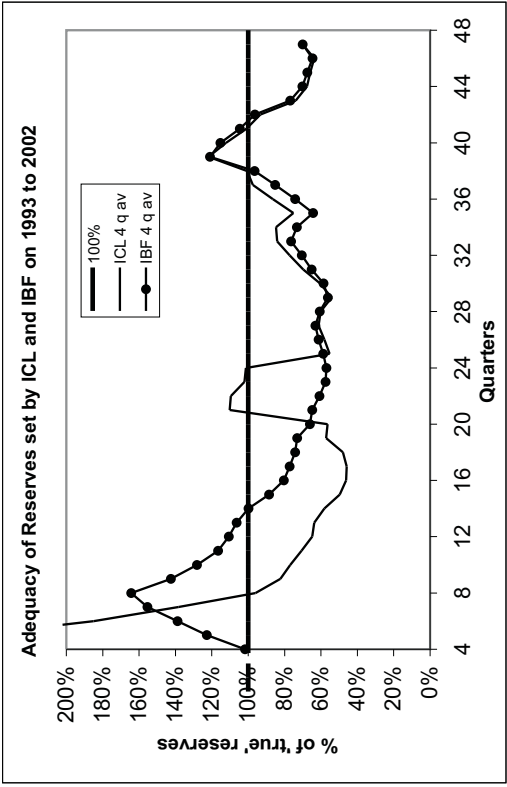


Chart B2: Claim tail, premium tail and ULR for each underwriting year

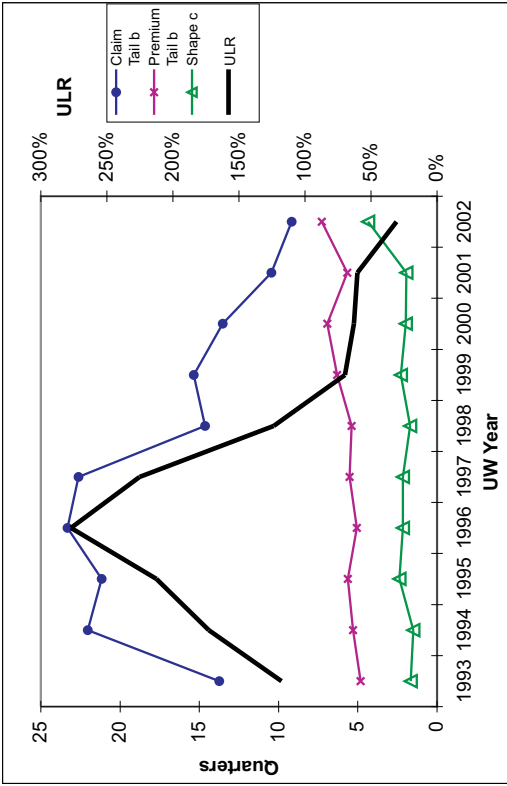


Chart B3: Claim Tail in Quarters vs ULR

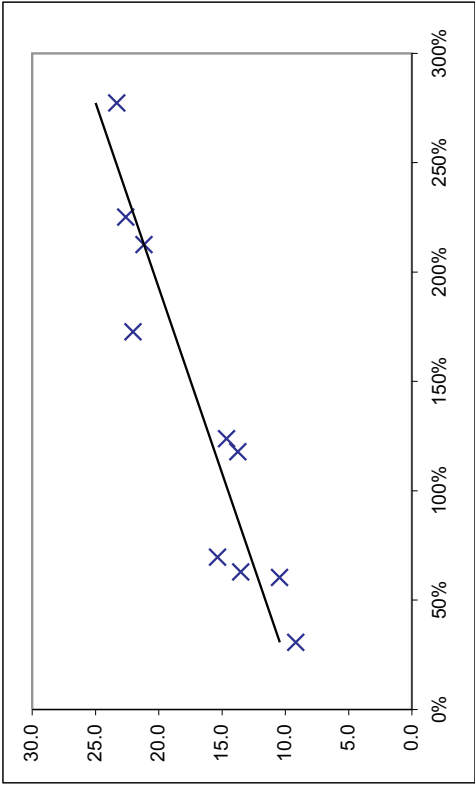


Chart B4: Claim Tail (y-axis) vs Premium Tail (x-axis). Quarters

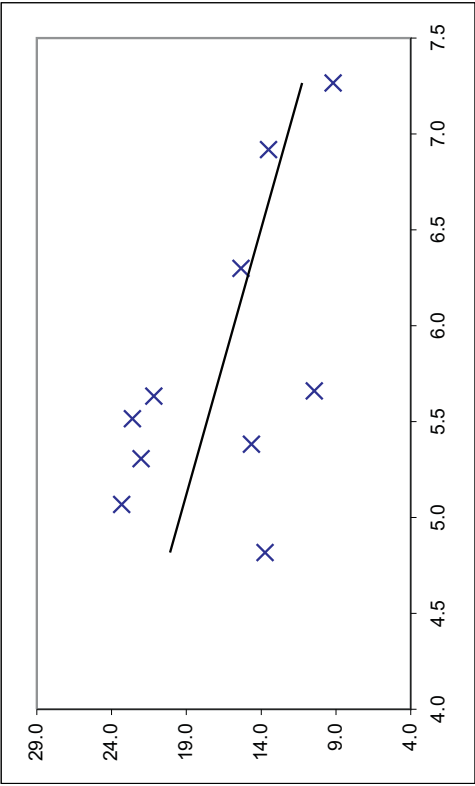


Figure 7.18. Charts B1 to B4 for Lloyd's reserve code WA

ARMoured CARRIERS AND CASH IN TRANSIT
CT

Chart B1: Adequacy of aggregate reserves at each quarter
Rolling 4 quarter averages. Quarter 4 represents 31/12/1993.

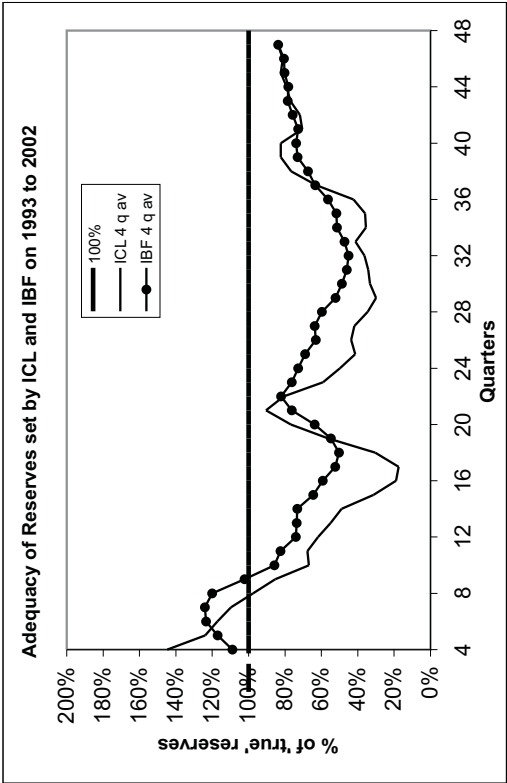


Chart B2: Claim tail, premium tail and ULR for each underwriting year

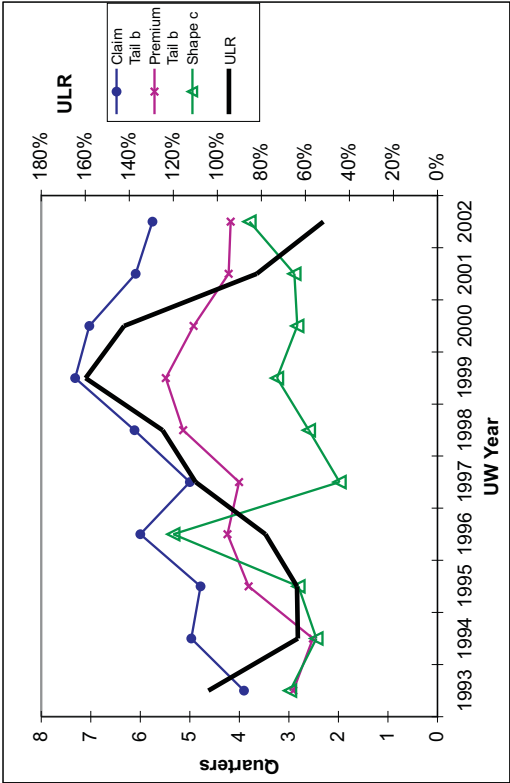


Chart B3: Claim Tail in Quarters vs ULR

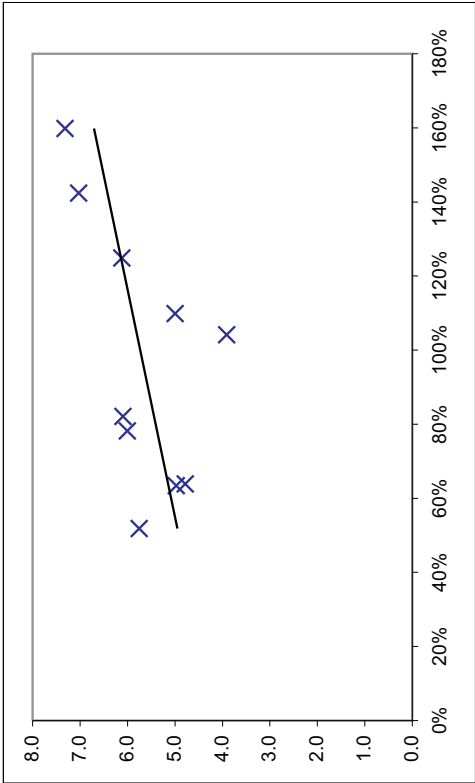


Chart B4: Claim Tail (y-axis) vs Premium Tail (x-axis). Quarters

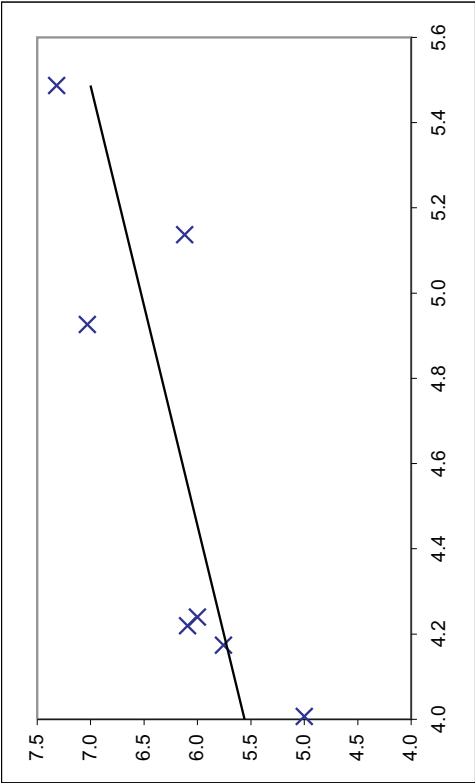


Figure 7.19. Charts B1 to B4 for Lloyd's reserve code CT

OVERSEAS MOTOR DAM AND TPL EX USA CAN EU AND EEA
MF

Chart B1: Adequacy of aggregate reserves at each quarter
Rolling 4 quarter averages. Quarter 4 represents 31/12/1993.

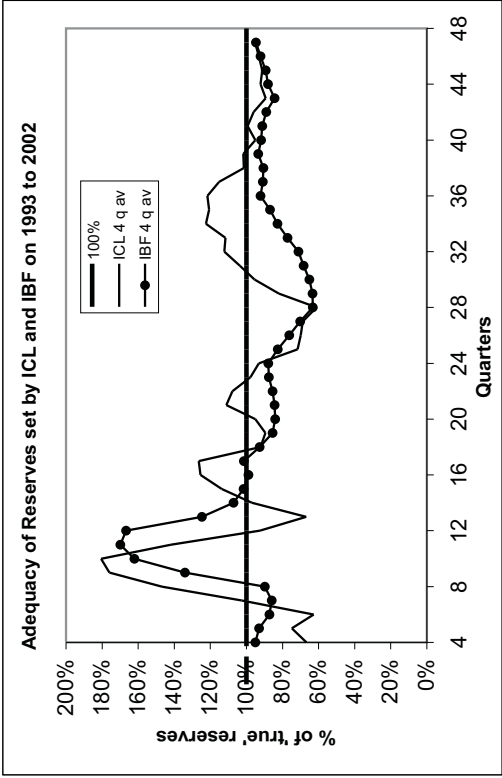


Chart B2: Claim tail, premium tail and ULR for each underwriting year

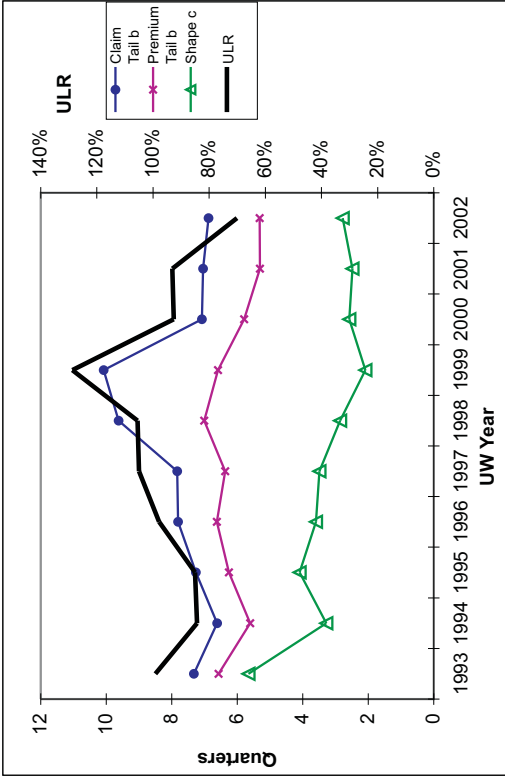


Chart B3: Claim Tail in Quarters vs ULR

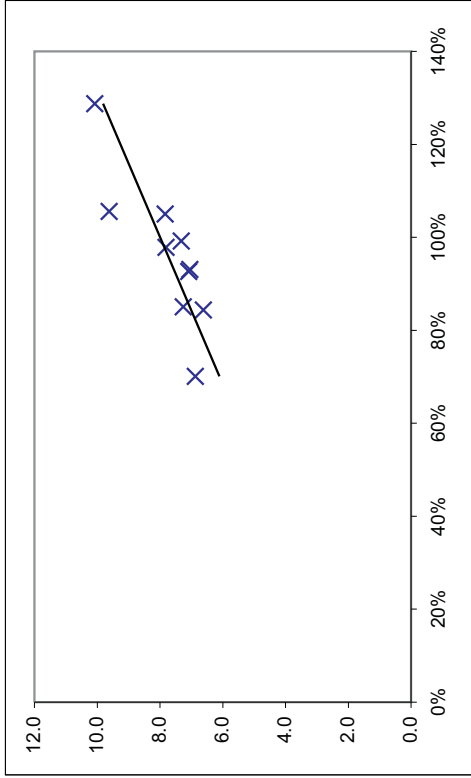


Chart B4: Claim Tail (y-axis) vs Premium Tail (x-axis), Quarters

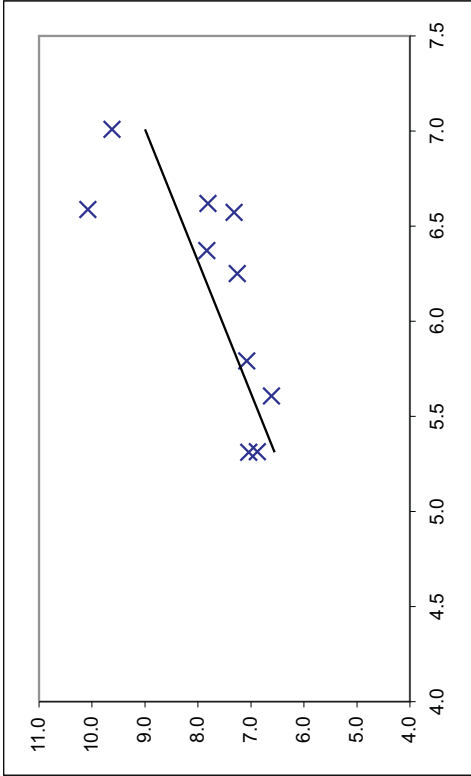


Figure 7.20. Charts B1 to B4 for Lloyd's reserve code MF

VSSLS SHIPBLDGA CV LOH AND CONTAINERS TLO EX WRO
B

Chart B1: Adequacy of aggregate reserves at each quarter
Rolling 4 quarter averages. Quarter 4 represents 31/12/1993.

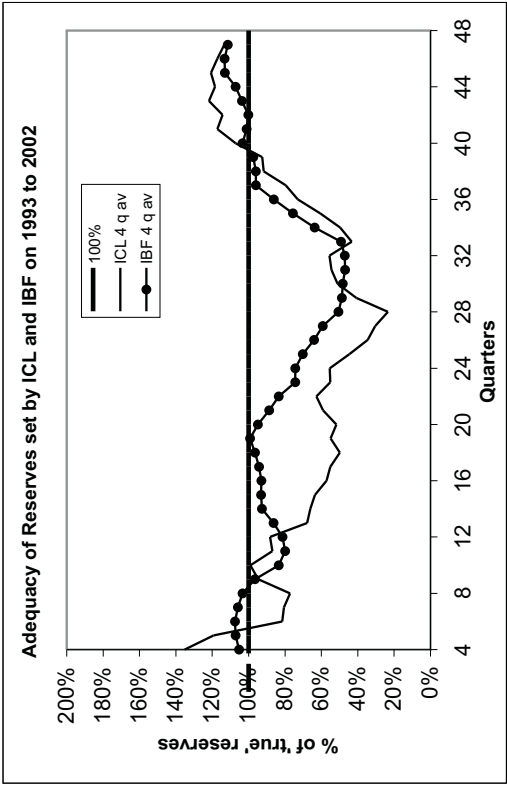


Chart B2: Claim tail, premium tail and ULR for each underwriting year

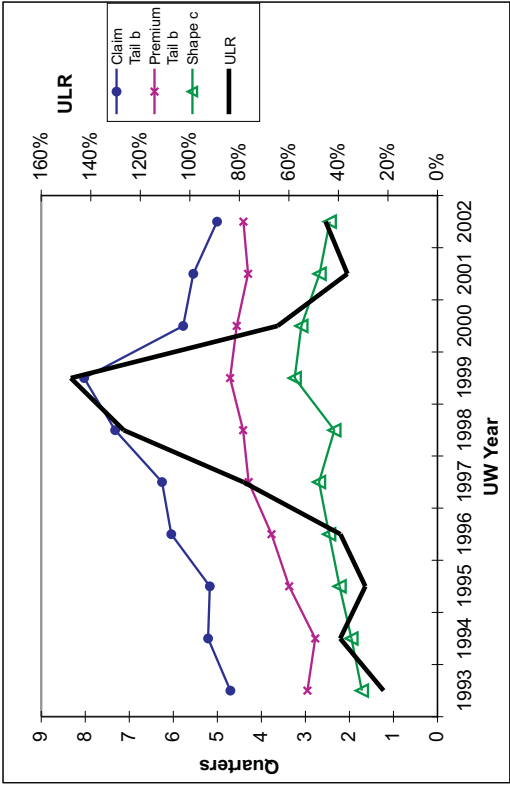


Chart B3: Claim Tail in Quarters vs ULR

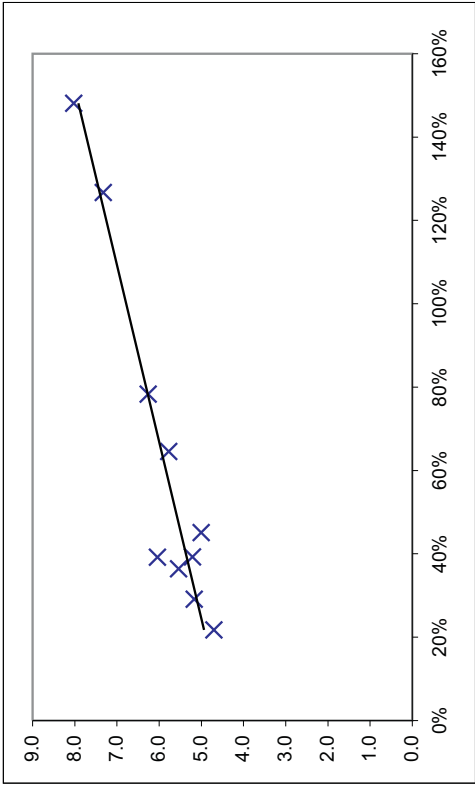
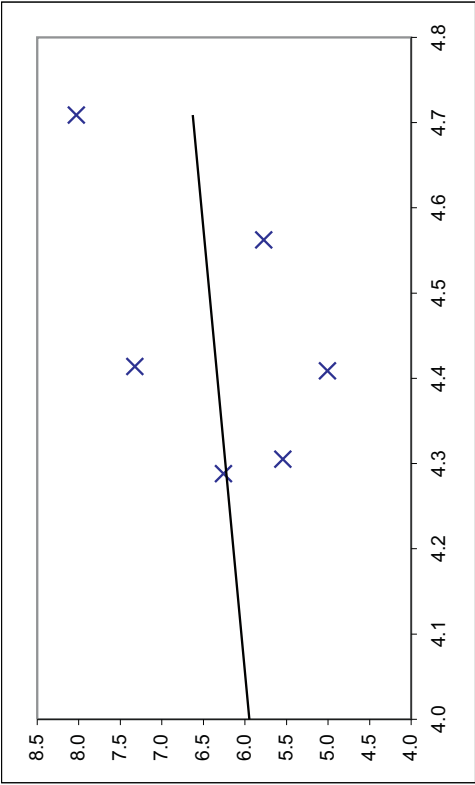


Chart B4: Claim Tail (y-axis) vs Premium Tail (x-axis). Quarters



8. BEHAVIOURAL ISSUES AND THIRD PARTY INFLUENCE

8.1 *Introduction*

The following section considers the types of pressure which an actuary might experience at various stages of the underwriting cycle, the potential impact this might have on actuarial estimates and considers ways of helping actuaries respond to this pressure. The section first considers the actuary's own behaviour which might influence his/her work, and then considers the forms of pressure exerted by third parties, particularly management.

8.2 *Own Behaviour*

8.2.1 We first considered how the actuary's own behaviour might change at different parts of the cycle.

8.2.2 In what follows the text draws heavily on an excellent paper by Nigel Taylor entitled 'Making Actuaries Less Human' presented to The Staple Inn Actuarial Society on 18 January 2000 (the GIRO 2000 paper 'Insurance, Games and Psychology', by Lowe *et al.* considers the issues further). Nigel's paper considers typical human behaviour when applied to making judgements about uncertain events. Only brief examples and issues have been extracted to highlight how our own behaviour might be impacting on our estimation process.

8.2.3 The main conclusions of his paper are:

- (1) decisions are often made by adjusting from an existing position (anchoring);
- (2) people are risk averse when facing gains, but become risk seeking when facing losses (prospect theory);
- (3) the framing of a problem can materially impact the decision which is made (framing);
- (4) almost everybody is overconfident; and
- (5) errors are most likely when the subject matter is complicated, the outcome uncertain and feedback is slow (the reserving process?).

8.2.4 *Anchoring*

8.2.4.1 One of the most common effects of anchoring is underreaction, a failure to react to new information quickly enough. How often do we hear of companies apparently 'step reserving', gradually drip feeding reserve deterioration. Is there similar evidence that actuaries too often start with their prior estimate or with an estimate from another source (the underwriter) or show reluctance to move away from prior assumptions (link ratios, IELRs, ultimates, inflation)?

8.2.4.2 It has been suggested that reserving too frequently could possibly increase the effect of anchoring, because it is more difficult to explain large movements when estimates might only recently have been

agreed. It is not difficult to imagine recently agreed estimates from, say, a few weeks ago which now require revision because new information has materialised. This could be difficult to explain to management or other parties if they are unaware that small changes in assumptions can lead to very significant changes in estimates, and this might well increase the pressure on the actuary to look for reasons not to overreact.

8.2.4.3 Anchoring can also go hand in hand with confirmation bias where individuals show a tendency to search for or be overly impressed by information that confirms the current anchor.

8.2.5 *Prospect theory*

8.2.5.1 Consider the following example (an experiment conducted by Kahneman and Tversky — two Israeli psychologists):

Alternative 1: 80% chance of winning \$4,000, 20% chance of winning zero.

Alternative 2: 100% chance of winning \$3,000.

Alternative 1 has the largest expectation, yet 80% of people chose the certain upside of Alternative 2.

8.2.5.2 When the alternatives were re-expressed as:

Alternative 3: 80% chance of losing \$4,000, 20% chance of losing zero.

Alternative 4: 100% chance of losing \$3,000.

Alternative 3 has the largest expectation of loss, yet 90% of people chose this rather than the certain downside of Alternative 4.

8.2.5.3 Is there evidence in our own work that when we can ‘justify’ an estimate, we lean towards a lower estimate if the other option is too unpalatable?

8.2.6 *Framing*

8.2.6.1 In another experiment (Slovic, Fischhoff & Lichtenstein) two options were outlined:

Option 1: Lose \$50.

Option 2: 25% chance of losing \$200 and a 75% chance of losing zero.

80% of subjects chose Option 2 consistent with prospect theory above.

8.2.6.2 However, when Option 1 was rephrased as:

Option 1: Pay \$50 insurance premium to avoid a 25% chance of losing \$200;

65% of subjects chose Option 1. So, when the 100% chance of loss is presented as an insurance premium to prevent the chance of losing \$200, most people become risk averse.

8.2.6.3 What becomes clear here is the importance of expressing downside and uncertainty so that management understands the decisions that they are making when setting the reserves. What price now to limit the

chance of further deterioration? Do we explain the risk of further deterioration to the reserves well enough?

8.2.7 *Over confidence*

8.2.7.1 People tend to overestimate their abilities whether they have large egos or low self esteem. The profession feeds off stories of what we have seen other actuaries do, yet do any of us consider ourselves to be in anything but the better half of the profession?

8.2.7.2 Nearly all experiments show that over confidence increases as the respondent is more knowledgeable, possibly due to the belief that more knowledge will lead to better decisions. The conclusion from all research is that over confidence is greatest for difficult tasks with low predictability which lack fast clear feedback (reserving).

8.2.7.3 In the paper by Lowe *et al.*, an example of the anchoring principle showed that in estimating a confidence interval between the 1st and the 99th percentiles, the actual outcomes were outside the estimated ranges 30% of the time; possibly just as much an example of over confidence of the individuals estimating the range.

8.2.7.4 The biggest danger for the profession appears to be overselling our capabilities to predict the future, regardless of the technical advances in our methods. Given all of the complex interactions and range of potential outcomes, the most important issue facing the profession seems to be one of explaining and communicating these uncertainties to an audience which is all too willing to believe we can bring ‘certainty out of uncertainty’.

8.3 *Third Party Pressure*

8.3.1 First we consider whether there is any evidence of pressure placed on the actuary to influence his/her results. Then we consider what motivates the third party to influence the independent work which they have likely commissioned, and finally look at some recommendations for the individual and the profession.

8.3.2 *Evidence of pressure*

GRIT was first widely exposed to the non-life population of the Institute and Faculty at the GIRO 2004 conference in both a plenary session and several workshops. At the workshops a request was made for individuals to anonymously share their own experiences of pressure exerted by management by way of a box placed at the back of the room. Perhaps not surprisingly, there was a fairly disappointing response, with only a handful of examples. However, we feel that this is not particularly representative of the experiences of the profession, as little time was available to individuals to consider any response. The workshops by their very nature only hit a small percentage of the non-life membership. However, it is worth discussing some examples.

8.3.3 *Auditors*

8.3.3.1 “Our auditors regularly come up with broad statements to which we are supposed to give credence when formalising our actuarial view, which unfortunately management not only have to respond to, but also use when it is convenient. Without appearing to do any detailed work, the auditors regularly say that the range of best estimates should be plus or minus 10%. Some of the issues we were reserving for gave a range skewed significantly above this, which management wanted to reserve positively for until the issues become clearer. This appeared to give the audit profession difficulty in coming to their view on the accounts, with what appeared to be a push to reserve at a lower level which they felt would look better against their more balanced range.”

8.3.3.2 “There seems to be no clear understanding of what a company’s published reserves actually mean and how they have been assessed. Until there are clear accounting rules which the market can interpret and understand, especially with regard to understanding potential volatility, then the market will continue to get surprises which should really be seen as inevitable at some stage for some companies under the current regime.”

8.3.4 *Underwriters*

8.3.4.1 “Some of our underwriters can be very reluctant to discuss details of new events until they get further information, which can be due to a reluctance to get a number wrong or occasionally embarrassment over something which they have written. Recently, a throw away comment by one of our underwriters about some loss that would not come of anything led us to uncover a potential loss which could add up to 20% to their loss ratio. Because there were some offsetting issues regarding coverage, they felt that they could basically ignore the potential loss. Several people in the organisation were aware of the loss, yet the information flow through to claims and actuarial did not happen. We also had a similar loss which senior management believed would not be paid, although the main class underwriter and claims staff believed that it would. We came under considerable pressure to reserve nil for this claim, arguing that for individual large losses we should follow the company’s view.”

8.3.4.2 “I am often asked to factor in changes to the way business is written, whether it is because there is a new underwriter, or they have cut out certain loss making types of the account, or terms and conditions have changed, usually favourably. I feel that I have to make allowance for these issues, as ignoring these soft issues appears wrong, but rarely do I have any real information on which to base a decision. All I know is that my current approach is probably wrong, and I feel drawn to the underwriter’s view.”

8.3.5 *Claims*

“I have recently become aware that our claims manager is being put

under some pressure to rethink his/her view on some contentious claim issues. My current expectation is there will be a lowering of the ultimate estimate of several issues. I know that I do not have the legal/claims knowledge to argue against their judgement, and will probably have to run with their latest view on these issues. If things pan out negatively, I know that I will be the one who has to explain why.”

8.3.6 *Management*

8.3.6.1 “Management has basically ignored our estimates throughout the year, but has suddenly become very interested since income estimates started to drop towards the end of the year, and now the chance of hitting forecasts for our results looks less likely. It is never pleasant having the CEO on your back discussing the company’s result and their own future job prospects.”

8.3.6.2 “I am getting very tired of management throwing the blame at me when things go against us, especially when I have continually explained the potential for these things to happen and outlined the other people and departments which I have relied on to come up with my view.”

8.3.7 *Actuarial consultants*

“Prior to our annual external review, our actuarial consultants come in and hold meetings with all our key underwriting unit leaders, the head of claims and outwards reinsurance and the actuarial team. These meetings take place over several days, because we have found in the past that, unless sufficient time is spent on them, understanding all the issues from everyone’s perspective, we get a very poor initial product. Our previous consultants seemed only too willing to just rely on discussing all the issues, be they state of the market or detailed claim information, with just one representative from the company, even if that was just a finance representative. It would be interesting to know how many reserve reviews take place where the actuaries rely on data and information from only one source and consequently open themselves up to a potentially biased information flow.”

8.3.8 *Survey*

8.3.8.1 Other indicators came from the replies to the GRIT survey issued post the GIRO 2004 conference, as respondents had further time to reflect on their own experiences. The wider results of the survey are discussed elsewhere in this paper.

8.3.8.2 Q30_1 of the survey asked whether the actuary felt that reserve estimates in the U.K. have significantly understated the actual outturn in recent years and, if so, what did they consider to be the cause.

8.3.8.3 Of the 55 detailed replies to this question, not all of which agreed with the underlying premise that reserves were understated, some 20

mentioned some form of management/underwriter pressure or undue influence on the actuary's assumptions as one of the contributing factors.

8.3.8.4 Comments included:

- (1) "pressure applied ... for business ... political reasons";
- (2) "put under pressure to reserve at the lowest level possible";
- (3) "pressure on management to produce good results";
- (4) "priors ... based on ... underwriter estimates that do not have a robust quantitative basis";
- (5) "willing to tailor their estimates to ... management";
- (6) "pressure to ... give required ... financial result";
- (7) "commercial pressures ... benefit of the doubt"; and
- (8) "pressure ... to a biased result ... lead to a lower result".

8.3.8.5 Some of the comments also related to the behaviour of the actuary himself/herself during the cycle, which has already been discussed above.

8.3.8.6 It appears from the survey that there is some evidence that considerable pressure in the recent past has been exerted to influence actuaries' estimates and companies' reserves to a lower level than might have been expected in the normal course of reserving.

8.3.8.7 Similarly, in a poll of a limited number of the profession, many of the London Market practitioners highlighted underwriter influence as a concern; perhaps highlighting the difficulty in challenging underwriters with regard to some of the more judgemental issues; for example changes in terms and conditions, coverage, etc.

8.3.8.8 Individual experiences vary depending on the type of employment, whether as a consultant or working directly for an (re)insurer, and the attitude or financial position of their client or employer. Not all individuals who responded highlighted management influence as a potential cause of any perceived under reserving, but this was clearly a general theme throughout the replies.

8.3.9 *Motivation*

8.3.9.1 Most of the motivation to influence the estimation of reserves has been touched on in the comments above. However, it is important to reflect on the number of different stakeholders who can influence the reserving process and their often conflicting needs.

8.3.9.2 Social changes and wider legal precedents are often unpredictable and are usually outside the control of the profession.:

- (1) Brokers and clients looking to minimise costs are subject to similar pressures and changes in behaviour as the (re)insurance companies which engage with them, which can affect their reporting and settlement patterns.
- (2) External legal/claims adjustors often make crucial decisions regarding

setting individual reserving standards. This can often involve changing standards, not only from the same individual for the same claim at a future point in time after reacting to other events which they have seen, but also due to changing of individuals and firms looking at the same issue over time.

- (3) Individual claims and underwriting staff are clearly emotive about their own performance, regardless of how they are remunerated.
- (4) Senior management has many conflicting requirements to manage; top line income, profit forecasts, share price, maintaining the company rating, minimal back year deterioration, bonus expectations and, perhaps not least, job preservation.

8.4 *Recommendations*

8.4.1 Many of the issues touched on above are extremely difficult, if not impossible, to allow for in the reserving process. The actuary can possibly spot some behavioural changes by engaging with their client more effectively and being aware of the pressures which all parts of the business and markets are under.

8.4.2 Changes in behaviour impacting settlement and reporting of claims may not be apparent from the elements of the claim chain further removed from the actuary and their client, e.g. original client, claims adjuster, broker, and therefore it is critical that the profession does not present itself as being able to provide more certainty beyond that it can reasonably measure.

8.4.3 With regard to pressure and influence from third parties, the actuary can often refer those parties to any relevant guidance notes and the Professional Conduct Standards (PCS) which impose certain responsibilities and restrictions on the way an actuary's advice can be formed. Actuaries are required to act in the 'spirit and the letter' with regard to the PCS. It states quite clearly the responsibility of the actuary and that users of a members services "are entitled to have absolute confidence in the skill, objectivity and integrity of the member". If work is "precluded by cost or time constraints the member should normally either decline to act or qualify the advice." It seems that there might be areas where we have been unduly influenced by third parties with little or no evidence to back up our judgements, and it appears that this could well be deemed to be in breach of our own professional guidance.

8.4.4 However, there are a number of areas which could be considered with regard to improving the reserving process. These are categorised into more immediate actions and some longer term issues to consider.

8.5 *Immediate Actions*

8.5.1 *The actuary*

8.5.1.1 It is important to actively engage management whenever work is

performed and to ensure that a successful closing meeting takes place, detailing all the key assumptions and sensitivities. Management may be distracted by other issues, but it is not enough to rely on caveats buried deep inside the report that may not be produced for several months after the work. All the key issues and sensitivities need to be documented and understood by management at closing. The Morris report [P48 2.129] is quite critical of how actuaries have communicated results to their clients and this is a critical area for us to address.

8.5.1.2 Actuaries need to understand how a business is managed, how business is written and how key decisions are made. They should openly engage relevant individuals at key decision making levels, whenever possible, throughout the business, to ensure that they receive a rounded view of the company to minimise the likelihood of anti-selection or bias of issues discussed/disclosed.

8.5.1.3 During any reserve review the actuary should discuss the key issues with relevant individuals, whenever possible. It is likely that claims issues are better discussed with the claims director and underwriting issues with senior underwriters rather than relying on one individual for the company view on all matters. Often individuals in a company hold different views or have different interests regarding the likely outcome of an issue, and it is extremely important for the actuary to get a balanced view.

8.5.1.4 The actuary should usually look for evidence beyond discussion with underwriters to make significant judgements.

8.5.1.5 All significant changes between current and prior estimates should be explained in detail in both reports and closing meetings. A detailed explanation should also be provided showing how the current methodology and assumptions have been adjusted to allow for these issues. We encourage all actuaries to make efforts to monitor privately, for their own purposes, the run-off of their own reserve estimates.

8.5.1.6 The ratio of management booked reserves to actuarial best estimate should be maintained.

8.5.2 *The Profession*

8.5.2.1 It is apparent that a considerable portion of the Profession is subject to pressures from many interested parties when justifying their work. Although the examples above might indicate pressure to lower reserves, several members of the committee were aware of examples where pressure was applied in order to influence the actuary to increase their reserve estimates. Recent examples might just reflect current market circumstances, as there is no reason to think that pressure would not be exerted if actuarial estimates were deemed too low to support management's current reserving strategy. The Profession needs to consider the best way to support individual actuaries subject to pressure. This could range from an informal 'buddy' system through to setting up an independent counselling body to assist

actuaries where they may need to discuss matters outside of their working environment. A ‘buddy’ system might not go far enough for individuals who need to rely on professional advice to maintain their position, but the current reluctance to share what is (or perceived to be) confidential information prevents open dialogue which would clearly assist the Profession to move forward. This matter would appear to be one requiring further debate.

8.5.2.2 External markets need educating to understand the volatility which can be inherent within published results.

8.5.2.3 The members of GRIT debated about how best to track the run off of actuarial best estimates by either the Profession or an independent third party to better answer public criticism of the Profession’s performance. However, we could not agree on a mechanism which overcame issues of client confidentiality or the concerns which arose with regard to its potential use in a litigation scenario. This issue should be reconsidered by the GIB in future, to look at ways to defend the Profession and educate stakeholders and the public with regard to reserving uncertainty.

8.6 *Longer-Term Actions*

8.6.1 *The Profession*

8.6.1.1 The Profession should have a discussion with the audit profession to enhance each profession’s understanding of the issues involved in estimating reserves and selecting a figure for the financial statements.

8.6.1.2 There needs to be greater clarity in published results of the potential reserve volatility in the business.

8.6.1.3 Does the Profession prepare individuals adequately to deal with the different types of processes (underwriting, wording, loss adjustment, claims handling) which can impact on reserve estimation? The education system should be reviewed to look at whether a more specialised non-life qualification is preferable to a wider one encompassing other actuarial areas.

8.6.1.4 The professionalism course should be reviewed to look at whether it should be extended further or changed to specifically cover non-life matters only. Areas covering dealing with individuals in pressure situations, possibly through role play, should be added to the course.

8.6.1.5 The Institute and the Faculty should consider developing a wider study on how individual behaviour can impact the estimation process, and develop an education strategy to raise awareness amongst actuaries of how this may impact on their own work, and to help develop strategies to limit the impact.

8.6.1.6 The Profession should include within the education system the behavioural issues highlighted above.

8.6.1.7 The Morris report [p100 6.40] has highlighted the need for the Profession to share experience of dealing with ethical issues through ‘real-life’ case studies. There appears to be a lack of willingness to share experiences, as shown by the lack of response at GIRO.

9. MEASURING THE PAST

9.1 *Introduction*

9.1.1 In this section we discuss how good actuarial best estimates have been. The reliability of best estimates is, of course, distinct from the reliability of insurer's booked reserves, recognising that insurers can, and do, book different amounts from actuarial best estimates for various reasons.

9.1.2 We review what papers there have been looking at the reliability of actuarial best estimates (a précis of these papers appears in Section 9.9). We have also revisited some statistical analysis done a decade ago to understand possible links between over/under reserving and profitability (Sections 9.3 to 9.6). Finally, we describe the results of a more focussed survey of experienced practitioners (Section 9.10), seeking their views as to the causes of over/under reserving.

9.2 *Let us not Reinvent the Wheel — what Work has been done Elsewhere and what does it Conclude?*

9.2.1 In the U.K., there have been a number of GIRO papers looking at trends in reserve adequacy — see the Bibliography in Section 9.8. The 1993 GIRO paper 'Variance in Claim Reserving' looked at U.K. FSA returns and tested a number of hypotheses about reserve adequacy. In particular, the paper looked at whether reserve adequacy (of booked reserves) was linked to underwriting result. The paper is summarised in Section 9.9. The headline conclusion from the paper was that "It is clear that companies do strengthen reserves when they feel they can afford it, and draw them down when they need to."

9.2.2 Ten years later, the 2003 GIRO paper 'The Cycle Survival Kit' again looked at reserve adequacy over time and its links with the underwriting cycle. The paper concluded that there is a reserving cycle, the underwriting cycle may distort development patterns, and that premium rating indices generally under-estimate the amplitude of the underwriting cycle.

9.3 *Data Sources to Consider Past Reserving Movements*

9.3.1 The main source of information on reserve movements for the U.K. company market are the FSA returns. There are a number of commercial packages which allow one to access and manipulate electronic copies of the FSA data. Like the Cycle Survival Kit Working Party, GRIT has used Standard & Poor's Synthesys to analyse FSA data.

9.3.2 As noted above, the FSA returns track booked reserves by accident period, or underwriting year for funded business. The booked reserves may or may not reflect the underlying actuarial best estimates, so one cannot directly infer anything about the reliability of best estimates. We investigated collating best estimate tracking data from individual companies.

While a number of companies kindly agreed to provide such data, in the end we did not receive enough data submissions to publish anything without compromising the anonymity of the donors.

9.4 *Some Details from the 1993 Working Party*

9.4.1 The GIRO 1993 working party looked at FSA returns from 1987 to 1991 for a total of 49 companies. The companies were grouped by 1991 incurred claims in four size bands, namely less than £10m (nine companies), £10 to 100m (17), £100 to 1,000m (16) and £1,000m+ (seven). The tests were also done for ‘all companies’. Our ability to analysis FSA data has moved on in the last decade, thanks to databases such as Synthesys, so we could, if we wished, quite easily look at FSA data for *all* companies from 1985 to 2003.

9.4.2 Section 9.6 describes the headline tests and conclusions from the paper. The three hypotheses tested were:

- *Hypothesis 1.* Claims reserves will be boosted in years when underwriting results are good, and weakened when underwriting results are poor. This was tested by plotting savings on estimates in year $t + 1$ against underwriting results in year t .
- *Hypothesis 2.* Claims reserves will be boosted in years when underwriting results are good, and weakened when underwriting results are poor (same as Hypothesis 1), but this time tested by plotting savings on estimates recorded in year $t + 1$ against *adjusted* underwriting results in year t , the adjustment being the savings in $t + 1$. In other words this is the underwriting result which the company *would* have had, if it had not put money on one side which was subsequently released in year $t + 1$. The 1993 working party noted that this test was a potentially dubious statistical procedure: we are adding one variable (savings) to another (underwriting result) prior to testing for correlation. The justification of the 1993 working party was that the variable being added (the savings) had in fact previously, consciously, been deducted: part of the hypothesis being that companies deliberately chose to under/over declare results in times of higher or lower profitability. So the adjustment is a correction to the data, rather than a distortion to the test.
- *Hypothesis 3.* The level of IBNR set up is related to the level of underwriting profit. This was tested by plotting IBNR as a percentage of total reserves against underwriting profit as a percentage of premium income.

9.5 *What have we done This Time?*

9.5.1 We started by performing the same three tests for all companies for all years. Because we had data for such a long period, it no longer seemed sensible to group claims into size bands based on *current* incurred claims: some companies will have grown a lot, or shrunk a lot, over this period, so

that companies with large or small incurred claims now might have had considerably smaller or larger incurred claims at various times in the past which might distort the analysis. So, we treated each individual year as a separate data point for the purpose of grouping, so a company could appear in a 'small' size band one year, and a 'large' size band the next.

9.5.2 It soon became apparent that we had many hundreds of really very small companies in our analysis. The FSA database contains details of over 250 companies, many of which are very small indeed. In fact, looking at the total premium written by all companies over this period, the smallest half of the companies by number wrote less than 1% of all premiums. So, we decided there were small companies and there were small companies. And, no disrespect to the Atlantic Mutual International Company, Uzbekinvest International or Kyoei F&M U.K., the very small companies probably did not add anything to our analysis, and in fact rather subtracted from our understanding of the overall picture.

9.5.3 So, we drew the line at companies representing 95% of all premium income over 1985 to 2002. We noticed that a handful of these companies were (large) reinsurers, which we suspected had some rather atypical claims developments. Also, when looking at the proportions of different types of reserves, a handful of healthcare companies appeared to have quite different characteristics from other companies (lots of IBNR and very little case reserves), so we excluded these too. For these tests we only looked at business recorded on an accident year basis. This left around 60 companies. The 'less than £10m' category seemed rather too small in this day and age, so we chose three size bands which more or less split the companies evenly between them, namely less than £50m (incurred claims), £50m to 250m and £250m+.

9.5.4 We repeated the Chi squared tests for all years and the last ten years. When the 1993 working party looked at the 'all companies' grouping, they observed that the range of claim sizes meant that tests on the total group were rather distorted by monetary amounts which were of very different orders of magnitude. So, for the 'all' group they scaled the reserve movements as a percentage of the previous year's reserves and the underwriting result as a percentage of premium. Having pondered this adjustment, we thought that we would do both types of test (scaled and unscaled) for all size bands and the 'all' grouping, so we had consistent tests between the sub-groupings and the total. The unscaled, monetary amounts were indeed inconsistent between the sub-groupings and the 'all' for Hypothesis 1, so we plumped for the scaled version of the tests.

9.6 *What are the Results?*

9.6.1 The results for each test, using the scaled data (percentages, not absolute amounts), for all years and the last ten are summarised below. In case you have forgotten how Chi squared tests work, the data are 'quartered', then the number of points in each quarter counted, tested to see if they are

randomly spread across the four quarters, or if there is some sort of systematic distribution of points across the 2×2 grid. The significance levels for the Chi squared distribution with one degree of freedom are given in Table 9.1.

9.6.2 Generally the tests are pretty positive for all our hypotheses for all the ‘all company’ groupings and most size bands. Hypothesis 2 has such enormously positive results that it probably highlights the statistical dubiousness of the construction of the test rather than proof beyond reasonable doubt of the hypothesis. The only exception to the confirmation indicated by the tests seems to be that smaller companies do not show such a clear link between profitability and reserve strength (Hypothesis 1) as medium/larger companies. Whilst the overall conclusion of the 1993 working party was that: “It is clear that companies do strengthen reserves when they feel they can afford it, and that they draw them down when they

Table 9.1. Testing links between reserve strength and profitability

Value	Level
1.6	80%
2.7	90%
3.8	95%
5.0	97.5%
6.6	99%

Hypothesis 1

Size	All years	Last ten years
Band	Chi-squared	Chi-squared
<£50m	0.0/Not sig	0.1/Not sig
£50-250m	7.1/For	6.2/For
£250m+	6.6/For	15.1/For
All	9.1/For	9.4/For

Hypothesis 2

Size	All years	Last ten years
Band	Chi-squared	Chi-squared
<£50m	24.2/For	10.3/For
£50-250m	53.2/For	36.7/For
£250m+	31.7/For	40.5/For
All	113.4/For	81.3/For

Hypothesis 3

Size	All years	Last ten years
Band	Chi-squared	Chi-squared
<£50m	7.8/For	2.2/Weakly for
£50-250m	3.9/For	0.4/Not sig
£250m+	0.4/Not sig	2.0/Weakly for
All	24.4/For	4.8/For

need to”, the tests performed then were not quite as significant as those summarised above (remember that they only looked at five years’ worth of data).

9.6.3 So in summary, the tests show a link between reserve strength and profitability.

9.7 *Views from the Actuarial Profession*

9.7.1 As well as the general, profession-wide survey described in Appendix A, we conducted a more focussed survey of a small group of more experienced (i.e. older) practitioners. This comprised some 400+ person years of post-qualification GI actuarial experience. We asked a small number of simple questions about the extent to which practitioners thought companies booked amounts other than best estimates and people’s views of likely causes of under/over reserving. We also asked people to share anonymously their experience of tracking best estimates by major class in recent years. The survey questions are set out in ¶9.10.

9.7.2 *Qualitative views of practitioners*

9.7.2.1 We did not do very well getting responses from reinsurers, and in fact we have omitted the one reinsurer response we had to questions 1 to 4, because Person X could not bring himself to ordering the causes of reserve movements (Q4) and had a proviso answer to questions 2/3. Person X’s more general and enormously valuable comments in answer to question 5 are included in the overall summary below.

9.7.2.2 So, reinsurers aside, what did our learned practitioners think was going on with the industry’s reserve movements?

9.7.3 *Q2. Do companies book different amounts than actuarial best estimates in their accounts?*

Absolutely *everyone* thought that their own company, or companies generally, *do* book different amounts than best estimates in their accounts. So this confirms that one cannot look at industry-wide reserve movements *per se* and assume that they represent movements in actuarial best estimates.

9.7.4 *Q3. Do companies tend to book higher amounts in times of good profitability, lower amounts in times of not so good profitability?*

9.7.4.1 The vast majority (80%+) thought that this was the case. In other words, companies put more money on one side during the ‘good’ years.

9.7.4.2 So, the answers to questions 2 and 3 support the apparent decisions being made to strengthen reserves at times of higher profitability, highlighted in Section 9.4.

9.7.5 *Q4. What are the main causes of the industry-wide reserve movements which we have seen?*

The different types of respondent had some subtly different answers. What do our different groups of old actuary people agree and disagree on?

9.7.6 *Deliberately booking amounts different than best estimates*

All the company actuaries thought that this was the first or second most likely reason behind swings and roundabouts in reserve adequacy. Interestingly, all the Lloyd's/London Market actuaries thought that this was either not a reason at all or was very low down the pecking order (fourth or fifth out of five). The consultants had a range of responses, most putting this in the middle of the range.

9.7.7 *Randomness*

Everyone thought that 'randomness' was either not behind the overall reserve adequacy movements which we have seen or was low down the pecking order (all bar one put this as #4 or #5 out of five, or not a factor at all).

9.7.8 *Systematic estimation errors*

All the company actuaries thought that this was not an issue, or to the extent that it was, it was fairly low down the pecking order (#4 or lower). The Lloyd's/London Market actuaries and consultants had a more mixed response. Half of both groups thought that this was one of the main (#1) reasons behind recent reserve movements, the other half concluding that it was not an issue at all or was of fairly lowly significance.

9.7.9 *Insufficiently robust*

9.7.9.1 All the Lloyd's/London Market actuaries and consultants thought that: "Being systematically wrong due to being insufficiently robust, for example underwriter influence" was the first or second most important reason for recent reserve movements. None of the company actuaries thought that this was particularly significant, all of them rating this item #3 or lower in the pecking order.

9.7.9.2 Many consultants spend a considerable amount of time working on Lloyd's/London Market clients, so one might suppose that the consultant's answers were coloured by a view of this market too. One might infer that either Lloyd's/London Market actuaries and consultants are a particularly spineless lot; or, rather more likely, that underwriters and senior management in Lloyd's/London Market companies hold rather greater sway over actuarial best estimates than they do in the company market.

9.7.10 *External factors (for example Ogden)*

All the company actuaries thought that this was one of the main reasons,

ranking either #1 or #2. Lloyd's/London Market actuaries mainly put this in the middle of the pack, and consultants ranked this evenly across the range.

9.7.11 *Headlines from the 'any other comments' free-form part of the survey*

9.7.11.1 The comments match the choice of reasons for changes in reserve adequacy. Changes in reserve strength for company/direct insurers is attributed to "booking stronger reserves when profits are good and weaker reserves when profits are poor" or "over-reserving in hard markets and under-reserving in soft markets". A common theme for Lloyd's/London Market companies was "not making sufficient allowance for weakening of policy terms", "insufficient understanding of terms/conditions, long-term deals, widening coverage". These comments were combined with "insufficiently robust IELRs", "over-optimism as reflected in IELR", "Over-optimistic and under-validated business plan loss ratio assumptions being routinely selected as prior year loss ratios in the BF method", and "if management/underwriters are optimistic, by definition you have to be (if you take account of their views)".

9.7.11.2 Some specific reasons for market-wide (mainly Lloyd's/London Market) reserve deteriorations were fingered by a number of people, namely: "insufficient understanding of exposures for example U.S. D&O", "U.S. liability developments", "investment banking and corporate collapses" and our old favourite across all markets "asbestos".

9.7.12 *Overall conclusions*

9.7.12.1 There are clearly marked differences between the views of company actuaries in the direct insurance market and those who work in Lloyd's/London Market companies. The view from the company/direct insurance market is that any market wide trends in reserve adequacy are primarily caused by booking different amounts than actuarial best estimates and systematic external factors, such as the introduction of the Ogden tables.

9.7.12.2 Those in the Lloyd's/London Market and consultancies see the main reasons for reserve movements as actuarial best estimates being 'insufficiently robust', for example being overly influenced by underwriters; with some, but not all, of these two groups thinking that there are systematic estimation errors in reserving methodology which may contribute to industry-wide reserve movements.

9.7.12.3 Given the different nature of the two types of market, it is probably not surprising that there may be different influences at play. Given that there may be different issues in the two markets, this perhaps points to different solutions to any perceived issues in either market, rather than any 'one size fits all' approach to regulation, reporting or methodologies in either market.

9.8 *Bibliography of References in Section 9*

- BRICKMAN, S.J. *et al.* (1993). Variance in claim reserving. Paper presented to the 1993 GIRO Convention.
- CONGER, R. (2002). Actuaries: deeper? broader? or uncertain? Presentation to the 2002 GIRO Convention.
- CONGER, R. (2004). Loss reserve surprises ... implications for rating bureaus. Paper presented to the 2004 WCIO Meeting.
- FARNHAM, R. (2001). Industry loss reserve adequacy: A. M. Best's perspective. Paper presented to the Casualty Actuarial Society's Loss Reserve Seminar.
- LINE, N.J.S. *et al.* (2003). The cycle survival kit. Paper presented to the 2003 GIRO Convention.
- WHITE, M.G. (2003). Cynic and idealist: two views of the insurance cycle. Paper presented to the 2003 GIRO Convention.
- WICK, K. (2001). Insurance reserve adequacy. Presentation to the Casualty Actuarial Society's Loss Reserve Seminar.

9.9 *Précis of the Papers mentioned in Section 9*

'Actuaries: Deeper? Broader? Or Uncertain?', Bob Conger

9.9.1 Bob's lively talk focussed on the direction(s) actuaries need to move in as a profession. Part of the talk showed how good (or otherwise), the reserve estimates of U.S. property/casualty insurers had been over the last 20 years (relative to the estimates of claims costs reported at the end of the first year). This showed a pronounced 'cycle' of over-estimation in the mid-to-late 1980s, under-estimation in the early 1990s, then over-estimation in the late 1990s, allegedly.

9.9.2 The figures shown were produced by Bob for GIRO 2002, they were not part of any previous paper or presentation, however they have sparked considerable interest since, in the U.K. and in the U.S.A. In the U.K., the table prompted some of the work of the Cycle Survival Kit Working Party (see below).

'Cynic and Idealist: Two Views of the Insurance Cycle', Martin White

9.9.3 This paper was a one man spin-off from the GIRO 2003 Cycle Survival Kit paper (see below). As can be inferred from the title, it is a discursive paper, putting forwards two diametrically opposed views as to why the underwriting cycle exists and what might be done to reduce it.

9.9.4 The main point of disagreement between the two 'sides' is whether change to the current situation is possible. One of the main conclusions is that aligning the remuneration of insurance company senior management with long-term shareholder returns is a good thing, with there also being room for improvement in the way in which investment managers are remunerated.

'Industry Loss Reserve Adequacy: A. M. Best's Perspective', Robert Farnam

9.9.5 This looked at the analysis done by A. M. Best using a range of different methods. It noted a general trend of adverse reserve developments in recent accident years (in 2001) with some gloomy prognostications about further (U.S.) reserve deteriorations to come.

'Insurance Reserve Adequacy', Kevin Wick

9.9.6 This presentation described a range of industry wide analyses of overall U.S. reserve movements. It showed that the minority of (U.S.) insurers were within $\pm 5\%$ of their original estimates over any period from one to ten years after the end of an accident year. Only about a third were within $\pm 10\%$ five years after the event, and one had to increase the range to $\pm 25\%$ before one got the vast majority of the market within a certain range after the end of an accident year.

'The Cycle Survival Kit', Nick Line et al.

9.9.7 This GIRO working party paper investigated whether there was a reserving cycle in the U.K. (which it confirmed that there is). It was inspired by Bob Conger's presentation about the U.S. reserving cycle at GIRO 2002.

9.9.8 The working party concluded that the underwriting cycle (as distinct from the reserving cycle) may distort development patterns and that premium rate indices are likely to understate the amplitude of the underwriting cycle.

9.9.9 The main numerical work in the paper reviewed U.K. FSA returns by major class and observed a reserving cycle with a peak in the early 1990s and a trough in the late 1990s, with a much greater amplitude for funded business (mainly London Market business). This reserving cycle is more pronounced for longer tail lines of business. The paper noted, of course, that these peaks and troughs relate to companies' *booked* numbers, as opposed to actuarial best estimates of liabilities.

9.9.10 The paper also looked at whether mechanical chain ladder projections lead to a reserving cycle (which they do), and considered the causes of the underwriting cycle.

'Variance in Claim Reserving', Simon Brickman et al.

9.9.11 This GIRO 1993 paper considered a range of statistical techniques for measuring reserve variability, and included a review of the actual out-turn from the reserves of some U.K. insurance companies over the previous decade. The main emphasis of the paper is on introducing some of the newer (at the time) statistical reserving techniques.

9.9.12 In the section on a 'Review of Past Reserving Adequacy', the paper considered two things, looking at U.K. FSA returns by major class. Firstly biases: is there consistent under or over reserving and is there any evidence that reserving practice is influenced by underwriting result?

Secondly variability: how close are initial estimates to ultimate payments, how does this vary across companies and what difference is there between classes of business?

9.9.13 On the biases front, the working party tested a number of hypotheses, using a simple contingency table/Chi squared approach. The hypotheses were:

9.9.13.1 Claims reserves will be boosted in years when underwriting results are good, and weakened when underwriting results are poor. For each company size band, and overwhelmingly when all companies were taken together, there was *very* strong support for this hypothesis. The test was done on two bases; the second, and most positive, adding back prior year savings to the current year result.

9.9.13.2 The level of IBNR set up is related to the level of underwriting profit. There did *not* seem to be an 'IBNR effect' in the same way that there clearly did seem to be an overall reserving effect.

9.10 *Survey on Causes of Under/ Over Reserving: Questions Asked*

GRIT Follow Up Survey: what's caused recent reserve movements

Please enter your answer in the five red areas in column B. Should take less than 5 minutes, depending on loquaciousness for Q5!

Please save spreadsheet and return to either:

peter.stirling@actuaries.org.uk (if you want your answers to be protected by a veil of anonymity)
julianlowe@norwich-union.co.uk

Please could you complete and return this ever-so-brief questionnaire by 30 April (2005) at the latest. Many, many thanks.

Q1. Please enter your type of employment (pick a-e):

c

- a. Direct Insurer
- b. Lloyds/London Market
- c. Reinsurer
- d. Consultant
- e. Other

Q2. Does your company explicitly, deliberately, book a different amount than Actuarial Best Estimates in your accounts?

Yes/No

Q3. If the answer to Q2 is 'Yes', would you expect your company to book more than Best Estimates at times of high profitability, less than Best Estimates at times of low profitability?

Yes/No

Q4. There has been market-wide over-(broadly early 1990s) or under-reserving (late-1990s). What do you think the main reasons for this have been:

(Please rank any of the following that you think may have contributed 1-5: 1 being most likely, 5 being least. For example, if you only thought the first two contributed, you might rank these '1' and '2'.)

Enter number
below:

Number — Deliberately booking a different amount than Actuarial Best Estimates

Number — Actuarial Best Estimates simply being 'randomly' wrong, with the benefit of hindsight

Number — Actuarial Best Estimates being systematically wrong, e.g. through collective flaws in understanding inflation

Number — Actuarial Best Estimates being insufficiently robust, e.g. through being overly influenced by underwriters

Number — External factors (such as retrospective legislation, for example Ogden multipliers)

Q5. Are there any significant (at industry-wide level) factors that you think have contributed to over- or under-reserving in the 1990s, either generally or for specific classes:

Put as much text here as you like

GRIT: Best Estimate tracking

Please enter indexed Net Best Estimates of claims costs from the end of the Accident year to date in the red cells below.

Please blank out any Accident Years/Calendar periods for which data are not available.

Please apply common sense to produce a meaningful progression and allocation to classes (!).

Please produce these tracking figures for each major class and in total in the sheets that follow, giving an indicative overall size band (of ultimate claims cost in recent years) for each class completed, by entering a figure in cell B17 below.

Please save spreadsheet and return to either:

peter.stirling@actuaries.org.uk (if you want your answers to be protected by a veil of anonymity)

julianlowe@norwich-union.co.uk

Please could you complete and return this ever-so-brief collection spreadsheet by 30 April (2005) at the latest. Many, many thanks.

10. OTHER TOPICS

10.1 *Introduction*

This final section covers some specific topics not covered in the other workstreams. These are:

- terms and conditions;
- market-issue exposure modelling; and
- implementation.

10.2 *Terms and Conditions*

10.2.1 This sub-section discusses terms and conditions, and contains some specific recommendations to help actuaries understand terms and conditions better, and in future keep abreast of how these change through the underwriting cycle.

10.2.2 The workstream ‘Helping Actuaries Understand the Business Better’ sets out a range of information which will help the actuary understand better the business being projected.

10.2.3 One of the items mentioned in Section 5 is ‘recent changes in the standard terms and conditions’. Several other items identified are also flagged as influenced by terms and conditions.

10.2.4 However it is outside the scope of the ‘Helping Actuaries Understand the Business Better’ workstream to identify and list the standard terms and conditions for each line of business.

10.2.5 Moreover, the GRIT task force is not aware of a comprehensive listing of these terms and conditions available anywhere in the actuarial literature. As there is no list, then it goes without saying that there is no process for keeping abreast of changes over time in these terms and conditions.

10.2.6 GRIT considers that more information on terms and conditions is vital, particularly to help actuaries respond to the underwriting cycle. In the soft cycle, terms and conditions are broadened, thus increasing the scope of coverage and also affecting the quantum and timing of claims. The Reserve Cycle Working Party observed that rating indices underestimate the amplitude of the underwriting cycle, and we believe that one reason for this is that rating indices do not fully capture the financial impact of changing terms and conditions.

10.2.7 However, capturing information on changing terms and conditions is difficult. Items which are coded and captured on the policy information database can be identified by the policy segmentation methods suggested in the ‘Helping Actuaries Understand the Business Better’ workstream; but not all terms and conditions are coded in this way, and those that are not are difficult to track. For these the only practical methods seem to be:

- discussion with the underwriters; or
- sampling policies and reviewing their wordings.

10.2.8 In practice, neither of these is likely to be successful if left to individual actuaries to apply in isolation.

10.2.9 GRIT believes that, for selected lines of business, actuarial research should be carried out to identify the key terms and conditions applying to each, together with an indication of their impact on the quantum of claims, and the shape of claim emergence. Also, it would be necessary to continually review and keep abreast of market practice to identify changes in terms and conditions, together with their likely impact.

10.2.10 This research would be much more likely to be successful if it was carried out in conjunction with other insurance professionals and industry bodies, and GRIT believes that the feasibility of this should be investigated if at all possible.

10.2.11 GRIT therefore recommends that the GIB sets up a process to:

- identify those lines of business where it would be beneficial to track terms and conditions through central actuarial research;
- establish an inventory of existing terms and conditions, possibly augmented by significant changes in recent history, together with their likely impact on claims experience thereafter;
- track market practice and business written to identify changes in terms and conditions, together with their likely financial impact on claims; and
- publish this information in a way that is readily available to all actuaries carrying out reserving work.

10.2.12 One way of implementing this would be to sponsor GIRO working parties. In the early years, the information and knowledge base feeding this research would be based on actuaries' working knowledge in the market, possibly augmented by a focus to acquire more information on terms and conditions. In the longer term, if the industry chooses to record data about terms and conditions in a more structured way electronically, then this better quality information would be used.

10.2.13 If at all possible, GRIT believes that this work should be carried out in conjunction with other insurance professionals and industry bodies.

10.3 *Market Issue: Exposure Modelling*

10.3.1 This subsection deals with exposure modelling as a reserving tool for market level issues. It is not intended to apply to exposure type reserving calculations which an individual actuary might use on specific accounts or on individual policies.

10.3.2 The workstream 'Helping Actuaries Apply Existing Methods More Consistently' has developed material to improve the consistency with which the actuarial profession applies existing reserving methods.

10.3.3 'Exposure' methods are outside the scope of the above workstream. This is because exposure methods are typically used when claims cannot be projected from past experience using traditional

triangulation methods. Rather, they tend to be used for specific areas of liability (e.g. asbestos liabilities) which cannot be modelled by reference to previous experience, and have to be quantified by modelling the mechanisms giving rise to the liabilities. This typically involves:

- quantifying the original exposures at the insured level;
- identifying relevant policies written by the insurer;
- modelling the impact of policy terms and conditions; and
- evaluating and modelling the impact of reinsurance.

10.3.4 By definition, exposure modelling tends to be specific to the liabilities under investigation, and depends heavily on the research and knowledge available to the actuary on the four topics above.

10.3.5 The market level liabilities which are subject to exposure modelling can be both material and topical, as they are often dealing with emerging or evolving areas of claims where the financial amounts involved are significant. However, these are the circumstances that unfortunately often also make them the most difficult for actuaries to estimate consistently. For example, the approaches adopted by different actuaries over the years to both asbestos and pollution liabilities illustrate the difficulty which the profession has encountered in applying exposure modelling on a consistent basis.

10.3.6 On the other hand, where we have a coordinated approach to market level issues such as WTC and U.K. asbestos, the results have been effective and helped all actuaries deal with the reserving issues consistently and constructively.

10.3.7 The GIB may wish to consider whether any processes could be constructed to support actuaries performing exposure modelling. This is a sensitive area, as there is a tension between competitive commercial advantage for consultants (because they may have invested in understanding a topic in detail) and sharing information between all actuaries to ensure the consistency of approach within the profession. Also, these can be commercially sensitive areas for the insurance industry, and actuaries working for underwriting organisations may not feel able to share knowledge about them.

10.3.8 In the absence of sharing knowledge there is a danger of inconsistency between actuaries, making the profession look foolish. However, it is difficult to see how sharing can be enforced.

10.3.9 As a compromise solution, GRIT recommends that the GIB establishes a process for identifying and tracking the market level liabilities requiring exposure modelling, and for creating and maintaining a base knowledge of information amongst actuaries for these topics. For the avoidance of doubt, it may be worth adding that the recommendation is not that the profession builds up a database of underlying exposures for each area requiring ‘exposure modelling’. Rather, its role is to keep an inventory of those areas where exposure-based reserving is being applied, and monitor

and influence the quality and consistency of data and methods applied by actuaries in each.

10.4 *Interaction between Reserving Methodology and Data*

10.4.1 In practice, in order to have sufficient mass, smaller data classes are often aggregated together and are therefore heterogeneous to some extent. It has been suggested to us that there may be benefit in researching techniques which would allow actuaries to use data subdivided into classes which are not fully credible.

10.4.2 Most commonly used reserving methods focus on analysing data by policy type. It may be more appropriate to subdivide data by type of claim, although this might need changes in the data capture systems in the industry.

10.5 *Implementation*

10.5.1 Implementation of GRIT's recommendations will require more than just agreement by the GIB to the GRIT report. It will require a change management strategy and concerted actions to embed changes into the ways actuaries work. In particular we believe that this will include:

- strengthening the training and educational material as regards claims reserving; and
- increasing the level of debate and research in the profession on claims reserving.

10.5.2 This could include increasing the claims reserving content at GIRO or possibly having a separate claims reserving meeting similar to the U.S.A. This should be supported by a strategically focused research agenda sponsored by the profession. This research agenda should include both actuarial matters (e.g. reserving methodologies) and business issues (more detail on the working of specific classes of business).

10.5.3 In our membership survey a significant proportion of actuaries were in favour of the profession compiling historical loss development data for major classes of business. GRIT discussed this in some detail, but was not persuaded that it would be possible to collect meaningful data consistently at a more granular level than is currently available from commercial providers. It was also noted that there have previously been GIRO working parties reporting on line of business aggregate loss development data on a regular basis, but were discontinued because there was not sufficient support for this.

10.5.4 GRIT'S recommendations will lead to more work being done by actuaries when carrying out reserving. This will have resource implications for both in-house actuaries, other in-house professionals such as underwriters and claims staff, and for the information captured and reported from computer systems. It therefore needs to be managed and possibly phased.

10.5.5 There needs to be a continued focus on reserving. We have recommended various actions for the profession which, if adopted, will need to be implemented in future. Also, it is likely that these will themselves give rise to a need for other follow on activity, and there will also be a continuing need to track new issues as they arise. Given that reserving is probably at present the core product for general insurance actuaries, we believe that it requires specific oversight and drive going forward. In order to provide a focus and impetus for these reserving specific issues, we recommend that consideration be given to creating a continuing subgroup of the GIB with the responsibility of overseeing all reserving issues on behalf of the GIB. This could be some new form of committee, for example a General Insurance Reserving Board, or possibly a continuation of GRIT.

10.5.6 The Casualty Actuarial Society (CAS) is also looking at the issues which GRIT has been considering, and it is important that the profession and CAS keep in touch and coordinate as actuaries have a global brand.

ACKNOWLEDGEMENTS

We would like to express our thanks to everyone who has helped us in our work, and particularly to the following: Neil Bruce, Paul Duffy, Phil Ellis, Sejal Haria, Peter Hinton, Mohammad Khan, Tracey Moore, Karl Murphy, Eric Pizzaro, Jennifer Ross, Peter Stirling, Martin Salmon, Stephen Wilcox, Steve Wilson and Sian VanPraagh.

The Chairman of the taskforce also wrote: “Finally, on a personal note, I would like to express my enormous gratitude to the members of the GRIT taskforce. Everyone has worked on this for a long time with enthusiasm and commitment, and tolerated with good patience some blunt progress chasing when the day job has claimed too much of their time. This has been an extremely stimulating group to work with and I am sure the thanks I pass on are on behalf of our entire profession.”

APPENDIX A

QUESTIONNAIRE AND SUMMARY RESULTS

A.1 In autumn 2004 GRIT conducted a survey of U.K. general insurance actuaries on their views on claims reserves and claims reserving issues. The survey was completely web-based; no paper copies were sent.

A.2 Who Responded

A.2.1 There were 83 responses representing a cross-section of the U.K. profession. Two-thirds of the respondents work for a (re)insurer and one third are consultants. Almost all are involved in claims reserving, with it being the majority of their work for one third.

A.2.2 15% were five years or less post-qualification, 45% between six and ten years, and 10% in excess of 21 years.

A.2.3 In the last two years, 75% attended GIRO, 4% ASTIN and 15% SIAS.

A.3 Key Findings

The key findings were:

- There is very wide-spread support for research and broad-based data aggregation.
- There is general belief that U.K. actuaries have performed at least adequately in claims reserving over the recent past.
- Almost all respondents use triangular methods; 60% make some use of stochastic methods.
- There is concern about the quality of the data used in reserve analyses.
- There is a general lack of robust price monitoring data.
- The views on requiring reserve opinions were evenly divided amongst in favour, opposed and undecided.
- Three quarters of the respondents thought that the users of claims reserving work do not have a sufficient understanding of the uncertainty in the estimates.
- Approximately half think that there is adequate claims reserving material at professional meetings, 20% did not and the rest were undecided. The views on the sufficiency of the literature are similar.

A.4 GRIT Observations

A.4.1 The views expressed by actuaries on recent reserving performance are different from the views expressed by others, both to GRIT and in the press. This may be due to a different expectation arising from the actuaries' better understanding of the uncertainties involved. Whatever the reason, it points to a need for better communication between actuaries and the users of their work.

A.4.2 The concerns on the quality of information available to support reserving, both claims data and pricing information, are not issues which actuaries can resolve in isolation. We wonder whether it is possible for the profession to engage in a dialogue with the industry on improving the nature and quality of data captured and maintained.

APPENDIX B

UNDERSTANDING THE BUSINESS BETTER

(‘Helpful’ and ‘Handy to have’ sections)

B.1 London Market (LM)

Table B.1. Policy database diagnostics (LM)

Policy Database Diagnostics (LM)

By interrogating the policy database, useful observations can be made of whether the data are reasonably homogeneous. When the data are not homogeneous the actuary should consider further sub-division of the data, and where necessary remove and project separately the heterogeneous parts. The residual homogeneous parts can then be projected using traditional methods. Where data exist, the following policy database diagnostics should assist the actuary understand more about the fundamentals of the business written. The term [T&C] in the text below indicates where diagnostics can reveal changes in policy terms and conditions.

Policy — helpful	Commentary
(1) For each policy section calculate the rate per unit of exposure (for example the rate per employee, rate per doctor, rate per unit of turnover, etc.) and compare with the U/W manual.	Ascertain whether the rates actually achieved are consistent with the minimum or expected rates specified in the underwriting manual. This will quickly reveal whether the underwriting manual rates are being upheld or exceeded. Rates which exceed manual rates could indicate business that is more profitable than expected, whilst the converse might also be true.
(2) Premium calculation type (i.e. fixed, free reinstatements, reinstateable, adjustable based upon final declared exposures, swing rated based upon subsequent loss experience, etc.) by underwriting year based upon gross written or signed or projected premiums.	A chart similar to Figure 5.2 will identify the proportions of policies where future adjustment premiums can be expected. For homogeneity, the proportions should be consistent year on year.

Table B.1 (continued).

Policy — helpful	Commentary
(3) Method of placement analysis (direct, facultative, proportional, non-proportional, binders, line slips, open market, MGAs, etc.) analysis by underwriting year based upon gross written or signed or projected premiums.	A chart similar to Figure 5.2 will reveal whether the method of placement type is consistent year on year. Where there have been rapid changes in the proportion of any one method of placement type, consider whether the business should be further sub divided before projection. A rapid increase in the proportion of binding authority business for instance might take longer to develop than non-binder business.
(4) For non-proportional business track the average number of reinstatements weighted by minimum and deposit premiums if available, otherwise current booked premiums, by underwriting year.	A chart similar to Figure 5.1 showing the average numbers of reinstatements will indicate how the coverage changes year on year. During a soft market one might expect the average number of reinstatements and hence coverage to increase.
(5) Early settlement provision mix (proportion of policies with sunset clauses, commutation clauses, portfolio transfer clauses, pure run off) [T&C].	A chart similar to Figure 5.2 will reveal the proportion of policies with termination clauses. An increasing proportion over time might decrease the mean term of loss development and should be taken into consideration when reserving.
(6) Commission and brokerage (C&B) percentages by underwriting year based upon gross written or signed or projected premiums [T&C].	In a soft market one might see the C&B percentages increase. Particularly in the Lloyd's environment where premiums are reported net of commission and brokerage, this is an important consideration which setting the IELRs for the BF method.
(7) Broker mix by underwriting year based upon gross written or signed or projected premiums.	A chart similar to Figure 5.2 showing the broker mix by year will highlight whether there has been any abnormal dependence on a particular broker.

Table B.1 (continued).

Policy — helpful	Commentary
(8) Customer base and/or affinity group mix by underwriting year based upon gross written or signed or projected premiums.	A chart similar to Figure 5.2 showing the customer base and/or affinity group mix by year will highlight whether there is any dominant dependence on a particular sector which requires special attention.
(9) Average signed line size weighted by premium volume by underwriting year.	A chart similar to Figure 5.1 capturing the outlying percentiles and extreme values will reveal any migration from lead to non-lead business and vice versa.
Policy — handy to have	Commentary
(1) Where the data exist, measure the historical ratios by underwriting year of the proportion NTU (not taken up) quotes.	In a hard market one might expect the proportion of NTUs to increase.
(2) Provided that appropriate data fields exist, monitor the proportion of risks priced individually using technical methods, using rating manuals and using other methods.	A higher proportion of risks priced individually using technical methods should allow the actuary greater access to the pricing process and provide him/her with better in-depth understanding of the expected profitability of the business.
(3) For inward excess of loss reinsurance of primary business use appropriate excess loss factors to derive an estimate of the FGU primary rate per unit of exposure.	Repeat the rate per unit of exposure analysis mentioned in helpful point 1 above, and determine whether the business has been written at levels above or below guideline rates.
(4) Measure the changes by year in the rates per unit of exposure.	Compare the changes of the company's/syndicate's and market rate indices and note the differences. These can be discussed with management so that more informed estimates can be made about the IELRs.

Table B.1 (continued).

Policy — handy to have	Commentary
(5) For each underwriting year monitor the proportion of premiums by class written and renewed in each calendar month.	This will indicate whether some years may be expected to mature either earlier or later than adjacent years. If the results are significant, appropriate allowances should be made, particularly in respect of the most recent underwriting years.

Table B.2. Claims database diagnostics (LM)

Claims Database Diagnostics (LM)

The following understanding of the underlying claims data will assist in the separation and sub analysis of those sections which require individual consideration. It will also assist in identifying areas of significant loss activity which warrant full and detailed analysis.

Claims — helpful	Commentary
(1) Audit the integrity of the loss event coding, for example, for each known catastrophe loss date list all claims with the same loss date and territory, and check whether any claims have the potential to be event coded.	If a significant proportion of loss events codes are absent from the database this could have a material impact on a company's ability to identify reinsurance recoveries, and adversely impact the net result.
(2) Claims size distribution of the individually reported claims.	Check whether certain large losses are distorting the development of the account and should be removed and reserved separately. Alternatively, they can be capped at a certain value with a separate reserve established to cover the anticipated development above the capped amount.
(3) Claims inflation.	For each type of primary claim (personal injury, third party liability, material damage, etc.) investigate the influence of calendar year inflation. Understand, if

Table B.2 (continued).

Claims — helpful	Commentary
	possible, the influence of different sources of inflation, i.e. economic, social, legal, medical, compliance with new regulations, etc. It is crucial to adopt realistic future claims inflation assumptions in methods which explicitly project the future number and future value of anticipated claims.
(4) Proportion of incurred losses with catastrophe or large loss event codes by underwriting year.	A chart similar to Figure 5.2 will reveal which years are susceptible to the most reinsurance protection, potential reinsurance exhaustion and credit risk.
(5) Cover remaining analysis.	For all policies with identifiable contact limits produce the cover remaining per policy to obtain a view on the IBNER potential.
Claims — handy to have	Commentary
(1) Incurred and ultimate loss ratios by sub class by underwriting year.	This will indicate whether any sub-classes should be separately reserved.
(2) Proportion of incurred and projected losses by number and amount in excess of a prescribed monetary amount or in excess of the net retention for each underwriting year.	The greater the proportion of incurred losses above the net retention will reveal each year's dependence on reinsurance and the associated credit risk.
(3) Proportion of incurred losses reported individually, in the aggregate or as bordereau block entries by underwriting year.	Before looking at a loss distribution it is important to remove the aggregate and block entries because they will artificially distort claim sizes.

Table B.2 (continued).

Claims — handy to have	Commentary
(4) Where pricing method indicators exist, generate incurred loss ratio comparisons for risks priced individually using technical pricing methods, using rating manuals and using other methods.	Compare the loss experience of business rated technically with the remainder of the account. It will give the actuary confidence in the underwriter's ability should the technically priced business outperform the remainder of the account.

Table B.3. Major open risks investigations (LM)

Major open risks (LM) — with emphasis on policies recently written

For recently underwritten risks which are significant by virtue of premium size and/or loss exposure, it is important to assess independently how profitable they might be, given that their outcome will materially influence the outcome of the entire class. Such an analysis will give the actuary a fuller understanding of the underwriting process and pricing techniques used. Inevitably such analysis will promote meaningful discussions with the underwriter and management.

Major risks — helpful	Commentary
(1) Independently assess the profitability of a contract with the management's expected return.	If material differences occur between the actuary's independent assessment of the profitability of a contract with that held by the underwriter, appropriate questions should be raised with the underwriter to establish the expected profitability of each such contract. A positive outcome (i.e. where the actuary's estimated profit is greater than the underwriter's) will enhance the actuary's confidence in the underwriter's ability.
(2) Assess the shock or catastrophe pricing assumptions where they exist and form a view of their relevance and reasonableness.	If the shock or catastrophe assumptions used to price the risk are materially different to those considered appropriate by the actuary, a discussion should take place with the underwriter so that a more informed opinion can be obtained.

Table B.3 (continued).

Major risks — handy to have	Commentary
(1) Where little or no underwriting analysis is visible from the files, attempt to reconcile the quoted premium with one derived by applying the indicative underwriting manual rates to the exposures.	The actuaries should be concerned where the quoted rates are less than those set out in the underwriting manual.
(2) Review policy wordings and terms and conditions. [T&C].	Where any uncertainty or ambiguity exists obtain clarity from the underwriter. Afterwards if uncertainty or ambiguity still remains, it may be appropriate to incorporate a margin of prudence into the reserves.

Table B.4. Underwriting investigations

Underwriting (LM)

Critical questions can be raised with the underwriter and management where there appears to be material changes in the business source and mix, changes to policy terms and conditions, changes in pricing techniques, etc. The following underwriting checklist should provide a valuable insight into the quality of the business that has been written.

Underwriting — helpful	Commentary
(1) Recent changes in the standard terms and conditions [T&C].	Discuss with the underwriter their affect on the expected emergence and timing of future premium and loss experience?
(2) U/W cycle.	Try to assess where in the cycle the business class lies and estimate the ramifications for current and future premium rates.
(3) Underwriting guidelines.	Be aware of the classes to be written and per policy exposures. Try if possible to assess the impact of how these may have changed by reviewing current with historical guidelines.

Table B.4 (continued).

Underwriting — helpful	Commentary
(4) Dependence on major broker sources.	Watch out for brokers who have produced business with poor results.
(5) Economic cycles.	Try to identify economic events which could influence the U/W result (e.g. impact of dot.com boom on FI/PI/D&O policies — could the current losses have been foreseen?).
(6) Rating index.	Understand the principal elements used in the rating index and take these into account when setting the IELR.
(7) Deductibles.	Try to assess the impact of changes in deductibles on the loss development patterns.
(8) Spitzer.	Be aware of the impact of Spitzer investigation on potential claims from the broking and insurance communities.
(9) Claims severity.	Identify the key drivers behind the current and future expectations of claims severity, with particular reference to the influence of changes in social attitude and the legal environment.
(10) Claims frequency.	Identify the key drivers behind the historical and future expectations of claims frequency, with particular reference to the influence of changes in social attitude and the legal environment.
(11) Methods employed to monitor and control aggregates.	Check that where aggregates can be measured they are adequately protected by reinsurance.
(12) Benchmarks.	Assess the benchmarks used to price major risks where the placement information is insufficient to independently evaluate the contract.

Table B.4 (continued).

Underwriting — handy to have	Commentary
(1) Changes in the legal process and social attitudes.	Assess whether the U/W manuals have changed to adequately reflect changes in the legal process and social attitudes.
(2) Cumulative incurred development pattern.	Compare the underwriter's pattern with that derived from the triangulated data and discuss differences with the underwriter and ascertain the most appropriate pattern for the recently written business.
(3) Cumulative paid development pattern.	Same as above, but in respect of paid development.
(4) Pre-renewal analysis.	Ascertain whether any pre-renewal analysis is undertaken to ascertain those policies which will be renewed provided that certain rates and conditions are achieved.

Table B.5. Claims management investigations (LM)

Claims Management (LM)

Claims management — helpful	Commentary
(1) Board level influence on claims reserving philosophy.	The actuary should be aware of all high-level management directives and assess the influence these may have on the claims development data.
(2) Changes in current claims reserving philosophy.	Any changes in reserving philosophy and their impact on the claims development should be understood by the actuary. If, for example, there has recently been an exercise to determine and write off redundant claim reserves, this will have a calendar year effect on claims development, and should be taken into account in the reserve study.

Table B.5 (continued).

Claims management — helpful	Commentary
(3) Claim handling expenses, by class if available, as a percentage of paid and incurred claims.	An understanding of these is required to assess the level of ALAE reserves.
(4) Delays in claims reporting and the reasons behind them.	Any abnormal delays in claim reporting can cause a calendar year effect which should be taken into account.
(5) Future claim handling costs.	Should the future claim handling costs be significantly different to those incurred historically, the actuary should understand the reasons for the differences before automatically accepting management's review.
(6) Historical adequacy of individual claim reserves.	For each large loss, a review of the trend in reported incurred amount will reveal whether management has historically been optimistic, realistic or pessimistic with its claim estimates. Provided that the over or under reserving has been consistent over time, standard reserving techniques should implicitly accommodate such trends moving forward.
(7) Philosophy for the admitting of precautionary claims.	A pro-active approach by management to recognise loss potentials will greatly assist the actuary in any exposure-based study.
(8) Reserve redundancy for claims with little or no activity over the past few years (e.g. LMX reserves).	When the development trends of paid and incurred claims indicate the possibility of reserve redundancy, it is always instructive to obtain management's view on claim reserve redundancy before incorporating an element of downward adjustments into the reserves.

Table B.5 (continued).

Claims management — handy to have	Commentary
(1) Attitude towards negotiated market settlements and policy buy-backs with particular regard to asbestos, pollution and health hazards.	If management is pro-active in supporting market settlements and pursuing policy buy-backs, a high proportion of policies may have no future development potential and should be removed from the projection process.
(2) Issues surrounding pools, binding authorities, managing general agents, etc.	Business from such sources is notorious for being longer tailed than other sourced business.

Table B.6. General issues on processing and data integrity (LM)

General issues on processing and data integrity (LM)

General — helpful	Commentary
Issues arising from the processing of inwards commutations.	Sometimes inwards commutations have not been processed correctly leading to inaccurate paid and outstanding records. Where these are material and can be identified the actuary should manually edit the reserve data.
General — handy to have	Commentary
(1) Exchange rate issues surrounding reinsurance processing and collections.	The reinsurance contract exchange rates may be quite different to historical currency market rates. When the original currency amounts are converted into another currency (say Sterling), distortions in the net figures can occur when the reinsurance recoveries are netted off the gross transactions.
(2) Issues caused by historical foreign exchange rates on gross transactions.	Wherever possible it is always advisable to project the original currency statistics, as this avoids the distortion caused by viewing the transactions converted to another currency at varying historical rates.

B.2 *Personal Lines*

B.2.1 *Motor*

Consideration should be given as to the significance of the volume of non-comprehensive business written. If information by claim type is available, and the non-comprehensive book is small, then it may be sufficient to model by combined cover; otherwise comprehensive and non-comprehensive business should be modelled separately. Equally if significant volumes of commercial motor (such as commercial vehicles or fleets) is written, these should be analysed separately, especially if there are significant changes in volumes written between years.

B.2.2 *Data requirements*

Table B.6 below provides a guideline of major policy and claims information that should be sought for motor business.

Table B.7. Policy and claims information — motor

Policy — helpful	Commentary
(1) Earned exposure split by underwriting period and accident period.	Useful if accident period results are to be allocated back to underwriting period results, either for Lloyd's reporting, pricing purposes, or for consistency with reinsurance programs.
(2) Earned premium split by underwriting period and accident period.	For same reasons as splitting earned exposures.
(3) 'Risk index'.	This is a measure of the change in mix of a portfolio over time. Index is usually derived from results of a multi-variant analysis and provides further information on changes in exposures over time. This allows a priori views of the impact of changes in portfolio balance to be allowed for within projections.
Claims — helpful	Commentary
(1) Understanding of current adequacy of case estimates.	Understand any changes within the claims department which will impact

Table B.7 (continued).

Claims — helpful	Commentary
	the claims development, on either paid or incurred claims. This will include changes in reserving policy due to different claims managers, or changes in reserving policy due to previous under or over-reserve estimates.
(2) Understanding of settlement patterns.	Understand any changes in settlement patterns which may be caused by changes in claims department procedures, back-logs, or by legal disputes.

B.3 *U.K. Commercial Lines — Comments on LM Market from a CL Point of View*

B.3.1 *Policy database — helpful*

Lloyd's data are likely to be net of commission by default; personal lines data are likely to be gross. The actuary needs to understand the basis on which the data are reported. Commission rates should be monitored, as changes in commission (e.g. moving from a commission to a policy fee charging structure) will affect the calculation of an initial estimate of loss ratio.

B.3.2 *Policy database — handy to have*

As the renewal dates tend to be reasonably uniform throughout the year, accident year data tend to be more homogeneous than LM data.

B.3.3 *Claims database — handy to have*

The ability to check the proportion of claims settled at each stage of development to assess whether payment patterns have changed is 'handy to have' rather than key for CL business, as it tends to be more evenly written across the year than LM business. How have aggregate/block entries been recorded and has this process of recording changed year to year? A whole year's claims may be allocated to a single loss date, which will affect any projections performed with more than one cohort per year.

B.4 *Reinsurance Investigations*

To appreciate the financial protection afforded by reinsurance, the following points should be useful.

Table B.8. Reinsurance investigations

Reinsurance — helpful	Commentary
(1) Full information on ongoing legal processes, mediations, arbitrations, settlement discussions and commutation negotiations.	Suitable allowance should be made for all such cases where the dispute could reduce the expected reinsurance recovery.
(2) List of unsettled balances and loss reserves for each reinsurer before and after bad debt provision.	This will identify the most significant exposures by reinsurer. It can also be used as the offset when producing a principal to principal ledger.
Reinsurance — handy to have	Commentary
(1) Collection issues arising from inwards commutations.	Unless there has been a prior agreement the prospect of recovering IBNR on inward commutations is always doubtful. Sometimes it may not even be possible to collect the outstanding loss reserves from the reinsurers.
(2) Future recovery costs as a percentage of collections and changes in collectables.	For any run off and in any business plan allowance should be made for the cost of current and future collections.
(3) Management rationale for latest structure.	The approach to buying reinsurance will reveal whether the purchasing procedure is pro-active or not (management might just purchase the same as last year). A pro-active approach, using stochastic methods, should optimise the ability to obtain value for money reinsurance protection.
(4) Processing issues caused by the partial commutation of outwards reinsurance contracts.	Outwards commutations only stop the recoveries from commuted reinsurers whilst leaving the original reinsurance contracts active for all non-commuted reinsurers. Sometimes it is difficult for the

Table B.8 (continued).

Reinsurance — helpful	Commentary
	outwards reinsurance system to recognise only partial collections from the non-commuted reinsurers. In such situations the reinsurance output has to be manually adjusted to reflect the non-recoverable elements of the commuted reinsurers.
(5) Impact of current and future underwriting cycles on reinsurer security.	Over the downward side of an underwriting cycle, profits are squeezed and the security of reinsurers comes under pressure. The credit risk (bad debt) margins should therefore rise in sympathy with the cycle.
(6) Impact of current and future underwriting cycles on reinsurers willingness to pay.	Just because a reinsurer is financially secure does not guarantee speedy recoveries. In a soft market more questions may be raised on the validity of ceded losses.

B.5. *General Issues on Processing and Data Integrity (All)*

Table B.9. General issues on processing and data integrity (All)

General issues on processing and data integrity (All)

The reserving actuary should be aware of the following general issues.

General — helpful	Commentary
(1) Reconciliation of transactional data with the statistics and audited accounts.	In theory, the transactional data should agree with the statistics, which in turn should agree with the audited accounts. If all three reconcile this will considerably enhance the confidence which the actuary can give to the data.
(2) Integrity of underwriting exposure information.	Complete and accurate underwriting exposure information will

Table B.8 (continued).

General — helpful	Commentary
	considerably enhance the actuary's confidence about the company's management of other statistical and financial data.
(3) Details of legacy systems which have not yet been integrated into the main computer system.	Quite often old systems are not fully converted onto current systems and historical premiums and claims could be missing from the database provided. Provided that the actuary is aware of the missing data he/she can make the necessary adjustments to the reserve study.
(4) Inaccuracy and/or omission of critical historical data on conversion to current database.	Same as before.
(5) Issues arising from the processing of outwards commutations.	Despite outwards commutations, sometimes the computer system might still calculate cessions in respect of the commuted reinsurance. In such situations the actuary should make appropriate write-off adjustments to the recoveries.
(6) Processing backlogs of policy header information.	Where significant volumes of policies have not been processed, a manual assessment of the unprocessed premiums and loss potentials must be undertaken.

APPENDIX C

GRIT'S TERMS OF REFERENCE

BACKGROUND AND OUTLINE TERMS OF REFERENCE

C.1 Background

C.1.1 The General Insurance Board (GIB) of the Actuarial Profession wishes to establish a taskforce to consider a number of issues arising in relation to general insurance reserving. Some of the key issues are as follows (in no particular order of priority):

- the actions which the profession should take in relation to the observations made in the Reserving Cycle Working Party paper presented at GIRO 2003;
- consideration of any improvements which could be made to reserving techniques or best practices to reduce the possibility of material run-off surpluses or deficits;
- what additional work is needed by the profession in relation to consideration of reserving best practices;
- what changes need to be made to the profession's GI Reserving Manual to cater for any of the items raised by GRIT's work; and
- what issues are raised for the U.K. profession by the ongoing debate raised by S&P?

C.2 Deliverables

Draft terms of reference for GI Board (by end February 2004).

Finalised detailed terms of reference, agreed between GIB and GRIT (end March 2004).

Short progress report to each GIB in 2004.

Draft discussion paper and presentation at GIRO 2004, including recommendations for further work.

Finalised GRIT paper/manual/Sessional paper (June 2005).

C.3 Members

Tony Jones (chairman), Peter Copeman, Lis Gibson, Nick Line, Julian Lowe, Paul Martin, Peter Matthews, Dave Powell.

C.4 Other Points

The GRIT will need to liaise with appropriate overseas actuarial bodies such as the CAS, so as to coordinate with their activities in this area.

Work needs to cover both London Market and non-London Market business, but with a specific consideration of our current main statutory role at Lloyd's.

A survey of current reserving techniques used and practices applied might be appropriate as part of the work of GRIT.

GIB will need to consider if any action needs to be taken relating to content of professional guidance, following GRIT work (and link in with the possible changes in GN12, 20 and 33).

GRIT will need to decide whether it wishes to cover all major classes of GI, and/or whether it wishes to include or exclude certain types of claim (e.g. APH).

GRIT should consider at least one particular class of business (for example U.S. errors and omissions or U.K employers liability) in some detail, as a basis for an appropriately detailed consideration of the technical issues.

Input from outside the actuarial profession would be advisable (but without representation on GRIT?).

GRIT might consider whether there is a need for a reserving best practices manual to be produced.