How life can go badly wrong and what lessons we can learn.

Or, Pricing, reserving, uncertainty
and professionalism using some real data

Members of the working party

Prit Hanspal
Lars Hyllested
Paul Johnson
Susan Macaulay
Richard Rodriguez
Martin White
James Widdows (Chair)

Thanks also to Roger Massey for some early feedback.

Summary

The paper tells the semi-fictional story of Ken, a recently qualified actuary. We use real data to look at the issues that he faces as he seeks to do pricing and reserving. It is a somewhat sad tale and we think there are many lessons to be learned. We hope that there is something for everyone in the paper and the challenge for us all is 'Am I sure this couldn't happen to me (or happen to me again)?'

Competition

The people's names mentioned in the paper have something in common. The first person to e-mail the chair (james.widdows@resolutemanagement.com) with what this is will win a bottle of alcohol (eg champagne) or book tokens worth up to £40. The winner will be announced at the GIRO workshop.

The bit that all actuarial reports have nowadays….

This is the section where we tell you things like the world is an uncertain place and that you cannot possibly, under any circumstances at all, ever place any reliance on what we have done.

The paper tells a story. Elements of it are completely true and the data we have used is real. Some details have been changed and some elements of the story have been made up. Therefore the paper cannot be used as a factual account of what happened. But for a matter of timing it could easily have all happened this way though.

The views expressed in the paper are not necessarily the views of the working party as a whole and they are not to be taken as the views of the Institute of Actuaries or the employers of any working party member.

We hope that you will find much that is useful as there are many lessons to be learned from the sequence of events but please do not treat it as a definitive guide to anything. The paper looks back to some particular events and what has happened in the past is not necessarily a good guide to the future!

Introduction

So many of the professions' papers are based on theoretical data. In many instances this is great but it can be a little artificial. Datasets can be constructed that behave just too nicely or to make exactly the point the author wanted. When you come to apply such papers you find that life is not so simple and what looked good in theory cannot be used in practice. And yet we all have masses of real data out there. The idea for this paper was born from a desire to use some of that data in a way that will be of real benefit to people, to produce something that can be used in practice.

The paper tells the story of a fictional actuary, Ken Trowdene. It is made up of extracts from his diary plus the working party's thoughts on the things he should have considered and done. Ken has spent the last five years working for the reserving department of a UK insurance company called 'Gannet Insurance'. He has been involved in the reserving of predominantly UK commercial and personal lines business.

The paper divides up into the following sections:

Pricing

1. The placing information
2. Further placing information
3. Thoughts on the placing information
4. Other comments on the placing information
5. The value of underwriting experience
6. Thoughts on how to price the risk
7. Thoughts on the professional issues raised so far

Re-pricing

8. Placing information for the new deal
9. Thoughts on the placing information for the new deal
10. The exercise going on in Pool B
11. Thoughts on visiting the risk
12. Analysis of the placing information

Reserving

13. Projections after 33 months of development
14. Changes in the legal environment
15. A data issue regarding deductibles
16. The latest data, projections and ranges
17. What went wrong
18. Professional issues on reserving

Final thoughts

19. Final thoughts

Pricing

Diary extracts from July 1997

Results day tomorrow. I so hope I've got the pensions exam this time. I don't think I could face it for a third time. I'll go to Charing Cross to pick up a newspaper. Apparently they should be available about 10:30.

At last, after five long years I've qualified! I'll never have to look at a mortality table again and I can forget all those tedious pension regulations. No more studying ever again – that feels soooo good.

I can't believe that Gannet is only going to give me a rise of £5k for qualifying. Five years of hard labour and that is the best they can do. Carrie Hemlands at our auditors is getting a £15k rise. Why should she get so much more? Gannet are being so stingy.

A headhunter called today about a role that would give me a £25k pay rise and a decent bonus each year. Now that is more like it. The job is with Be Sure! They're looking to start an actuarial pricing department. They want a newly qualified actuary to start it off but they've said they expect to recruit a couple of students after a while. I'm meeting the headhunter tomorrow to find out a bit more about it.

The job sounds great. They mainly write commercial lines business, both property and liability. They want someone to focus on the larger risks. They outsource the reserving at the moment but are very keen to start with actuarial involvement in a pricing role and possibly expand into reserving later. I'd be reporting straight to the chief exec as well – it shows what an important job it is!

I've been offered the job!

Diary Entry – 1st August 1997

I'm going to accept the job with Be Sure!. Pricing seems to be the way to go and how could I pass up so much more money? Gannet have only offered me an extra £2k. Be Sure! don't seem concerned that I've only done reserving work so far and anyway, I've qualified, that means I know something about pricing. I can read up on it as well, there must be some papers around.

Diary Entry – 3rd November 1997

My first day at Be Sure! It went well, I spent the day sorting out my PC and meeting people. I'm sitting with the analysts who produce the management information and help prepare data for the accounts. I had a 10 minute chat with the chief exec – Sandy Renilo. He seemed very pleased that I'd started.

Diary Entry – 17th November 1997

I got my first big piece of work today. We've got a pack of information from the broker on a large liability risk. There looks to be plenty of data and even triangles in there – it should be something I can get stuck into. Sandy summonsed me to his office; he seemed excited that we had been offered this business. It would be quite a material premium to us and we would write it 100%. He wanted us to be able to respond by the end of the week. We don't want the broker to get nervous and start trying to place the risk elsewhere.

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1. The placing information

The following is the initial submission from the broker to Be Sure! and is therefore the starting point for pricing the risk. All figures have been converted to Sterling. More details of San Serriffe can be found at http://en.wikipedia.org/wiki/San_Serriffe.

Background

In the country of San Serriffe local government authorities look after community issues such as building development, road maintenance, refuse collection and sporting facilities. The national government departments look after bigger issues such as education, health services, police, fire fighting and child minding facilities.

Local governments have, at times, purchased their own Liability cover. However, fluctuating rates, periodic unavailability of sufficient coverage etc have caused significant problems for them. To attempt to counter this there have been various attempts to join together to purchase cover with the aim that the larger size will bring some stability. The success of these pools has been limited and the local authorities are now making a more concerted effort to form one large pool that will purchase cover on a longer term basis. The local authorities hope that the larger size and the purchase of cover for a number of years will at least bring some certainty in their budgeting for insurance over the next few years.

Underwriters will be provided with substantial funds up front which, together with the interest earned before claims payments are finally made, will more than exceed the projected level of claims expected to be made.

Details of cover sought

We invite quotations for the following:

- Three years of cover starting on 1st January 1998
- The premium is to be paid annually
- Cover is for Public Liability on a claims occurring basis and is costs inclusive and for Professional Indemnity on a claims made basis
- Cover is to be for £15m any one claim but we will arrange reinsurance in excess of £0.75m per claim
- Aggregate cover is unlimited although we will arrange reinsurance over an annual aggregate loss of £25m (with individual losses capped at £0.75m)
- Each local government has selected an excess of between £0 and £350k that they will retain on each and every claim.

Historic data supplied

The following pages contain summary loss data for five different pools. Each Pool typically represents a different geographic area of San Serriffe:

- Pool A started in January 1989
- Pool B started in January 1993
- Pool C and Pool D started in January 1994
- Pool E started in January 1995.

Pools B to D are shown in Table 1. The triangulation excludes two large claims from Pool C in 1994. One large claim has been settled at a cost of £3.5m, the other is outstanding at £3.75m and with no payment. The data is net of the local government excesses.

Pool A is audited by external actuaries (Smith & Smith) who do not require any development provision to be made beyond the fourth year. Pool A will not be part of the proposed scheme but we have included the data for information in Table 2.

Our selected development patterns based on Pool A are shown in Table 3.

Pool C is audited by Brown & Brown Actuaries who have based their analysis on a snapshot of claims history together with the payout pattern of private public liability insurers sourced from the regulatory returns for 1992. This is reproduced in Table 4. It is broadly similar to the payout pattern derived in Table 3 although it suggests a greater discount factor.

Exposure is considered to be fairly constant over the years in consideration because increases in local government spending have been running at a level consistent with changes in the retail price index. The number of local governments participating in the four pools is shown in the table below. Whilst it is hoped that the scheme will encourage other local governments to join it is not envisaged that the numbers will vary markedly from those shown. All the local governments (except those in Pool E) currently have an excess of at least £3,500 and are expected to maintain roughly the same excess going forward.

	Number of Local Governments	**Revenue (£bn)**
Pool B	75	1.01
Pool C	150	2.71
Pool D	120	1.77
Pool E	126	0.86
Total	**471**	**6.35**

In Table 5 we apply the development pattern from Pool A to Pools B to E to provide a loss forecast for the local governments being considered. A combination of paid and incurred development has been used with more weight given to the incurred forecast. This produces a forecast for 1998 of £13.125m which has a present value that is significantly less once account is taken of payment timings.

Table 6 shows the results of a frequency/severity simulation. The claims forecast is shown as the mean, which is the long run average claims level identified. The percentage values show the variability inherent in the forecast at various probability levels. The forecast is shown ground-up in the first column. An average local excess has been assumed at £3,500 and the amount expected within and above this excess in various layers are shown in subsequent columns. The forecasts are repeated after account has been taken for investment potential.

How the scheme will work

An integral part of the arrangement sought is the early payment of premium. The payment programme offered is £6m to be received by the underwriter on the 1st of February with the balance payable on or before the 31st of March.

A subsidiary of the broker will administer the scheme, including handling the claims. It will be necessary for local governments to have ready access to funds for paying claims and associated costs. An initial advance of £1m is suggested. Monthly reports will be forwarded to the underwriter and a system agreed for further advances when funds fall to an agreed figure.

San Serriffe Local Govenments **Table 1**

Claims development details

Valuation dates		31/12/1993			31/12/1994			31/12/1995			31/12/1996			30/06/1997		
Year	Pool	Paid	Outstanding	Incurred	Paid	Outstanding	Incurred	Paid	Outstanding	Incurred	Paid	Outstanding	Incurred	Paid	Outstanding	Incurred
1993	B	75,271	975,243	1,050,514	670,467	1,270,641	1,941,108	1,059,985	1,770,063	2,830,048	2,086,340	1,465,790	3,552,130	2,335,461	1,534,109	3,869,570
	C															
	D															
	E															
1994	B				67,432	1,136,399	1,203,830	454,992	2,043,187	2,498,179	2,676,666	1,395,453	4,072,119	3,369,713	1,187,887	4,557,600
	C				49,985	938,072	988,056	188,678	1,275,089	1,463,766	1,320,684	2,266,304	3,586,988	1,617,327	1,901,579	3,518,906
	D				42,445	166,295	208,739	423,525	429,566	853,091	817,310	516,122	1,333,431	962,657	526,910	1,489,567
	E															
1995	B							78,850	2,054,685	2,133,535	695,765	2,875,119	3,570,884	1,291,685	2,680,786	3,972,470
	C							38,214	665,969	704,183	706,439	2,118,109	2,824,548	1,339,144	2,612,111	3,951,255
	D							33,362	287,804	321,167	270,915	656,012	926,927	531,848	882,092	1,413,939
	E							45,750	549,000	594,750	280,500	774,000	1,054,500	759,000	531,000	1,290,000
1996	B										250,955	2,916,596	3,167,551	566,104	3,559,764	4,125,868
	C										77,900	830,743	908,643	241,980	1,676,676	1,918,656
	D										73,490	66,986	140,477	171,831	505,229	677,060
	E										82,500	831,000	913,500	269,250	967,500	1,236,750
1997	B													15,692	1,254,080	1,269,773
	C													30,685	871,442	902,127
	D													25,170	117,467	142,637
	E													48,300	366,000	414,300

The 1994 year of Pool C excludes the two large claims of £3.5m (paid) and £3.75m (outstanding) for the purposes of indentifying a development pattern.

San Serriffe Local Govenments **Table 2**

Data for Pool A

Paid claims triangle

	1989	1990	1991	1992	1993	1994	1995	1996
12	51,000	53,250	102,000	118,500	67,500	44,250	56,250	39,750
24	182,250	254,250	233,250	204,000	264,000	176,250	146,250	
36	256,500	687,750	342,000	247,500	416,250	238,500		
48	393,000	753,000	497,250	349,500	871,500			
60	447,750	783,750	600,000	443,250				
72	594,750	787,500	617,250					
84	609,750	788,250						
96	669,750							
To date	669,750	788,250	617,250	443,250	871,500	238,500	146,250	39,750

Incurred claims triangle

	1989	1990	1991	1992	1993	1994	1995	1996
12	316,500	260,250	337,500	487,500	543,750	333,000	380,250	377,250
24	484,500	733,500	831,750	561,000	1,759,500	540,000	742,500	
36	837,000	819,750	919,500	479,250	1,929,000	649,500		
48	607,500	837,750	1,277,250	598,500	2,248,500			
60	723,000	810,000	1,267,500	633,000				
72	728,250	808,500	1,251,000					
84	751,500	810,000						
96	762,000							
To date	762,000	810,000	1,251,000	633,000	2,248,500	649,500	742,500	377,250

San Serriffe Local Govenments **Table 3**

Selected development patterns based on Pool A data

Paid development factors

			Payout pattern		6%
Year	Select	To Ultimate	Cumulative	Incremental	Discounted
2:1	3.700	13.549	7%	7%	7%
3:2	1.666	3.662	27%	20%	18%
4:3	1.469	2.199	45%	18%	16%
5:4	1.142	1.497	67%	21%	17%
6:5	1.092	1.311	76%	9%	7%
7:6	1.011	1.201	83%	7%	5%
8:7	1.098	1.188	84%	1%	1%
9:8	1.060	1.081	92%	8%	5%
10:9	1.020	1.020	98%	6%	3%
11:10	1.000	1.000	100%	2%	1%
				100%	81%

Incurred development factors

			Incurred pattern	
Year	Select	To Ultimate	Cumulative	Incremental
2:1	2.126	2.962	34%	34%
3:2	1.147	1.393	72%	38%
4:3	1.117	1.214	82%	11%
5:4	1.034	1.087	92%	10%
6:5	1.020	1.051	95%	3%
7:6	1.016	1.030	97%	2%
8:7	1.014	1.014	99%	2%
9:8	1.000	1.000	100%	1%
10:9	1.000	1.000	100%	0%
11:10	1.000	1.000	100%	0%
				100%

Selected Factors From Above			Adjusted Selected Factors			Adjusted Factors to Ultimate	
After	Paid	Incurred	After	Paid	Incurred	Paid	Incurred
1	3.700	2.126	0.5				
2	1.666	1.147	1.5	2.482	1.562	7.044	2.031
3	1.469	1.117	2.5	1.564	1.132	2.837	1.300
4	1.142	1.034	3.5	1.295	1.075	1.814	1.148
5	1.092	1.020	4.5	1.116	1.027	1.401	1.069
6	1.011	1.016	5.5	1.051	1.018	1.255	1.041
7	1.098	1.014	6.5	1.054	1.015	1.194	1.022
8	1.060	1.000	7.5	1.079	1.007	1.133	1.007
9	1.020	1.000	8.5	1.040	1.000	1.050	1.000
10	1.000	1.000	9.5	1.010	1.000	1.010	1.000
			10.5	1.000	1.000	1.000	1.000

San Serriffe Local Govenments **Table 4**

Brown & Brown payout patterns

Assumed interest rate = 6%

Select	To Ultimate	Cumulative	Incremental	Discrete
4.091	18.182	5.5%	5.5%	5.3%
1.471	4.444	22.5%	17.0%	15.6%
1.344	3.021	33.1%	10.6%	9.2%
1.227	2.247	44.5%	11.4%	9.3%
1.192	1.832	54.6%	10.1%	7.8%
1.154	1.536	65.1%	10.5%	7.6%
1.095	1.332	75.1%	10.0%	6.8%
1.069	1.217	82.2%	7.1%	4.6%
1.039	1.138	87.9%	5.7%	3.5%
1.095	1.095	91.3%	3.4%	2.0%
1.000	1.000	100.0%	8.7%	4.7%
			100.0%	69.7%

San Serriffe Local Govenments **Table 5**

Data for Pools B to E projected based on the development analysis of Pool A

Year	Paid	Paid Development Factors	Ultimate Paid	Incurred	Incurred Development Factors	Ultimate Incurred	Selected Ultimate
1993	2,335,461	1.401	3,272,013	3,869,570	1.069	4,134,869	4,134,869
1994	5,949,698	1.814	10,793,590	9,566,073	1.148	10,986,620	10,986,620
1995	3,921,676	2.837	11,127,727	10,627,664	1.300	13,820,449	12,750,000
1996	1,249,165	7.044	8,798,952	7,958,333	2.031	16,164,200	13,500,000
1997	119,847			2,728,836			13,125,000
						1998 Forecast	13,125,000

San Serriffe Local Govenments **Table 6**

Risk Simulation Analysis Results

Total Claims Forecasts

	Ground Up	Within	175,000 xs	325,000 xs	750,000 xs	1,500,000 xs
	Total	3,500	3,500	3,500	3,500	3,500
5%	14,390,183	2,902,125	11,027,415	11,289,293	11,409,390	11,415,750
10%	14,758,538	2,937,287	11,235,705	11,588,858	11,701,853	11,753,160
15%	15,025,755	2,958,149	11,443,800	11,794,733	11,978,498	12,014,070
20%	15,243,608	2,977,809	11,622,758	11,993,325	12,162,915	12,223,020
Mean	**16,730,550**	**3,060,010**	**12,292,868**	**12,801,728**	**13,126,103**	**13,331,595**
80%	17,731,965	3,140,924	12,951,908	13,598,550	14,053,058	14,390,363
85%	18,124,343	3,161,678	13,109,070	13,781,205	14,257,943	14,682,180
90%	18,787,530	3,187,677	13,323,900	14,033,880	14,614,110	15,079,425
95%	20,186,783	3,226,436	13,625,850	14,428,035	15,071,760	15,731,265

Discounted For Investment Potential

	Ground Up	Within	175,000 xs	325,000 xs	750,000 xs	1,500,000 xs
	Total	3,500	3,500	3,500	3,500	3,500
5%	11,656,048	2,350,721	8,932,206	9,144,327	9,241,606	9,246,758
10%	11,954,416	2,379,203	9,100,921	9,386,975	9,478,501	9,520,060
15%	12,170,861	2,396,100	9,269,478	9,553,733	9,702,583	9,731,397
20%	12,347,322	2,412,026	9,414,434	9,714,593	9,851,961	9,900,647
Mean	**13,551,746**	**2,478,608**	**9,957,223**	**10,369,400**	**10,632,307**	**10,798,592**
80%	14,362,892	2,544,148	10,491,045	11,014,826	11,382,977	11,656,194
85%	14,680,718	2,560,959	10,618,347	11,162,776	11,548,934	11,892,566
90%	15,217,899	2,582,018	10,792,359	11,367,443	11,837,429	12,214,334
95%	16,351,294	2,613,413	11,036,939	11,686,709	12,208,126	12,742,325

Calculation Of Average Local Excess

	1995 Freq	Exp Deds	
Pool B	1,265	5,625	7,115,625
Pool C	335	7,500	2,512,500
Pool D	190	3,750	712,500
Pool E	1,136	-	-
			10,340,625
Weighted Average Deductible		3,534	

Diary Entry – 18th November 1997

There is a lot of data in the pack and it looks to be fairly good quality. I spent most of the morning typing it into a spreadsheet though – why do we only ever get things on paper? I made a start on projecting the data.

Diary Entry – 19th November 1997

I went and had a chat to Jane Charslock (underwriting director) who is looking after this risk. She was able to answer a few questions that I had but whilst I was talking to her it transpired that there was another pack of information that I'd not seen. I wish I'd had it to start with.

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2. Further placing information

It turns out that the underwriters have been given a more detailed submission and that Ken had only been given the numbers part. The following is a summary of the relevant and useful parts of the submission.

Claim numbers

Table A shows the development of the number of notified claims for the pools for which it is available.

Claim banding

Table B shows a claim banding for Pool C.

Summary by nature and cause

Table C shows a split of claims by cause and nature for Pool B.

A quick analysis of the claims for one year on Pool D shows that about 50% are slip and trip type claims, 20% involve vehicle, motorcycle or bike accidents and 30% are other causes.

Typical descriptions of slip and trip claims are:

- Claimant stepped on broken man-hole cover
- Claimant fell down stairs in mall
- Slipped on slippery footpath breaking left ankle.

Typical descriptions of vehicle accidents are:

- Fell off motorcycle when it struck hole in road
- Hit third-party vehicle at roadworks due to signage
- Bicycle struck raised manhole cover on bicycle route.

A representative sample of other claims are:

- Third party injured during roof tiling
- Burst water main caused clay slurry to enter dam damaging plants
- Employees spraying drain with poison wind carried poison onto plants
- Council employees dug up telecom lines
- PI claim arising from failure to act on complaints re neighbour
- Subsidence and landslip have caused damages to dwelling
- Professional indemnity due to incorrect building certificate
- Child fell from flying fox
- Claimant (minor) injured legs on swing which had no seat
- PI claim arising from incorrect info on rate search
- Gravel stockpile collapsed on child fractured leg
- Roof collapsed on house under construction
- Child injured when fell from top bunk of double bunk bed
- Claimant dived into shallow water in river fractured neck
- Claimant injured when hit by piece of wood flung by slasher mower
- Child sat on swimming pool filter intake perforated bowel
- Claimant burnt hand on newly welded metal plate
- Alleged defamation against third party by councillor
- Claim for misleading conduct, breach of bailment/fiduciary duty arising during burial.

Large claims

The two large claims for Pool C are:

Claim A – Paraplegic as a result of a vehicle overturning on a road under repair. This claim has been finalised and paid at £3.5m

Claim B – Quadriplegic as a result of diving into a shallow pond. The current outstanding is £3.75m but there are excellent prospects of resisting the claim.

Large claims for Pool B are:

Claim C – A head on collision between two vehicles on a resealed section of road in foggy conditions. The local government is being sued as it had recently completed the reseal of the road. Legal Advisers have assessed local government's liability exposure as minimal – up to 20%.

Claim D – The claimant lost control of her motor vehicle on a recently resealed road, due to, it is alleged, excessive aggregate being left on the road and/or insufficient or no signage being present. The claimant sustained severe injuries which have left her a paraplegic. The resealing of the road was performed by a large and reputable contractor, for and on behalf of the local government, whose duty it was to mark and leave the road safe for traffic, including erecting all warning signs. A contract was executed between the local government and the contractor, with an indemnity clause being in place in favour of the local government. The contractor is separately insured.

Claims C and D have an incurred cost between £0.2m and £0.4m.

Claim E – The claimant issued proceedings when the local government failed to go through with the compulsory acquisition of their land, for road extension purposes. As a result, the claimant alleged it was prevented from developing land. After a lengthy trial judgement was recently handed down in favour of the Council. The claimant has just lodged an appeal against this decision. Legal costs to date total approximately £0.4m.
Claim F – The claimant was bumped by teenagers running around the perimeter of the local government's pool whilst the claimant was standing on the edge of the pool, at the shallow end. As a result he fell into the shallow end head first becoming an incomplete quadriplegic after striking his head on the bottom of the pool. The action was settled earlier in the year for £2m plus costs.

The only large claim for Pool D is:
Claim G – Subsidence and landslip have caused damages to dwelling. The current incurred cost is £350k.

San Serriffe Local Govenments **Table A**

Development of the number of notified claims

Valuation dates		31/12/1993	31/12/1994	31/12/1995	31/12/1996	30/06/1997
Year	Pool					
1993	B					1,412
	C					
	D					
	E					
1994	B					924
	C		70	98	162	175
	D					95
	E					
1995	B					832
	C			47	143	183
	D					106
	E			522	628	639
1996	B					686
	C				119	151
	D					86
	E				753	870
1997	B					169
	C					57
	D					26
	E					361

Figures for Pool C do not include two large claims.

San Serriffe Local Govenments **Table B**

Claim banding for Pool C

	1994		1995		1996		1997	
	Number	Cost	Number	Cost	Number	Cost	Number	Cost
Claims under £7.5k	35	196,650	38	292,113	44	431,768	22	152,127
Claims £7.5k to £75k	131	2,437,014	137	2,475,036	104	1,165,889	34	450,000
Claims £75k to £200k	6	626,492	7	993,606	3	321,000	1	300,000
Claims £200k to £350k	1	258,750	1	190,500	-	-	-	-
Claims over £350k	2	7,250,000	-	-	-	-	-	-

San Serriffe Local Govenments **Table C**

Split of claims by nature and cause for Pool B

Cause	1993		1994		1995		1996		1997	
	Number	Cost	Number	Cost	Number	Cost	Number	Cost	Number	Cost
Roads & Footpaths	807	2,467,457	535	1,937,706	475	2,664,332	387	2,811,094	98	831,023
Environmental	202	339,078	105	255,743	99	219,207	70	315,125	16	61,125
Recreation	104	565,346	99	1,992,622	65	568,562	67	638,883	3	33,750
Other Causes	69	599,265	40	116,459	40	209,984	47	340,952	16	99,000
Buildings	62	257,458	21	8,962	36	219,107	20	151,460	10	58,125
Equipment & Services	20	16,975	21	105,801	13	47,591	4	19,125	2	7,500
Natural Causes	12	3,458	8	16,565	2	4,125	3	18,000	-	-
Professional Indemnity	136	587,927	95	863,298	102	1,032,681	88	862,697	24	179,250

Nature	1993		1994		1995		1996		1997	
	Number	Cost	Number	Cost	Number	Cost	Number	Cost	Number	Cost
Personal Injury	689	3,770,204	522	4,118,963	448	3,446,934	412	3,714,257	107	947,625
Vehicles	302	298,323	159	168,135	147	241,592	89	295,251	7	39,750
Buildings/Structures	247	266,259	113	176,574	99	247,163	92	445,691	27	88,148
Financial	98	401,801	101	819,335	98	938,218	75	614,851	23	178,875
Personal Property	35	7,451	15	10,706	11	4,650	5	25,125	4	7,875
Services/Cables/Pipes	14	11,735	9	375	17	37,232	3	6,929	1	7,500
Other	14	1,959	-	-	7	22,500	5	15,107	-	-
Crops & Agriculture	9	77,656	1	-	2	20,850	3	33,750	-	-
Animals	4	1,578	4	3,068	3	6,451	2	6,375	-	-

3. Thoughts on the placing information

We've included all the information in the main body of the report rather than in an appendix because it is a vital part of the story. If you've skipped over it then it may be worthwhile spending a few minutes reviewing it. On the face of it it looks good – it contains data, triangles and some actuarial analysis. But how good is it really? And what thoughts do you have on the risk itself? Would you write it?

Here are our thoughts. It is by no means a comprehensive list of things to think about, but we hope you might find it a helpful framework for considering the pricing of a risk.

With any insurance contract there are several generic issues that need to be addressed. These are not fundamental issues such as: -

- Do I have the experience to do this?
- Who is the insured?
- Is there an insurable interest?

Rather, we are considering the next levels up from there, where we start to consider problem solving. Each policy can be thought of as a problem to be solved. The solution to the problem is either that a risk can be priced or that it should not be priced. Sometimes the pricing will involve offering a different product from that requested. In order to make the important decision, we need to consider the following questions:

The Past - Information provided

1. What historical information have we been given and how good is it?
2. How relevant is it and how can we adapt it to be relevant to the future exposures?
3. What additional information do we need?

Predicting the Future – Estimating the price

4. Can we estimate the future cost?
5. If so, what is the expected claims cost for the next period?
6. What do we need to add to the expected cost to get our price?

Managing for the Future

7. How uncertain is this cost?
8. How does it aggregate with our other exposures?
9. Can we mitigate some of the uncertainty or the aggregation by changing the product?
10. How do we allow for changes in the risk during the period of cover?

Managing in the Future

11. How can we ensure that we keep in touch with the risk?
12. How can we ensure that claims are handled properly?

If at any point in considering a specific risk in the context of the above questions, you find yourself saying 'I don't know' or 'It's not possible to know' then you need to consider how material that lack of information is. If it is material in isolation or if there are several of these issues that are individually immaterial but become material when considered together then it is possible that the risk should not be priced. However, it is reasonable and probably advisable to price a risk whilst making a lot of assumptions provided that these assumptions are clearly communicated to the underwriter of the risk as it is better for the underwriter to have the best possible analysis even if it is uncertain rather than no analysis. The 'underwriter of the risk' could be an underwriter (as most people would understand) or it could be you. There is a balance between being prepared to quote for anything no matter how uncertain and not being prepared to quote for any risk.

In the following section, we will consider some of the more detailed comments and questions that arose from our consideration of this specific risk. These questions have been grouped according to the above list. Also included are the responses to those questions and, if appropriate, the implications of the responses. This list is in no way meant to be exhaustive or prescriptive. It simply provides a summary of what we considered to be most important to the pricing of this risk.

The Past - Information provided

Remember to have a look at the full submission and not just the summary
This is a very basic point but it is still worth making it. In this case, the main pricing document was titled 'Overview, history and loss forecast' and it would have been tempting to use that alone. However there were some important details that it did not cover such as:

- Giving details of exactly what the cover was
- The coverage was on a costs inclusive basis
- More details of what the large claims were
- Information on excesses/deductibles.

Is it possible to get the development data at a more detailed level?
This would help to do some further analysis that would assist with the pricing. It may help to answer any questions about consistency or fluctuations in individual case reserve strength. For example, it would be useful to have a listing of each individual claim. Ideally this would include the development history for each claim alongside the date of settlement, date of loss, year of the programme it falls into, claim type/cause etc. Amongst other things this would help to identify whether or not there have been any blips in the data due to unusual claim sources or new claim sources.

The exposure information included in the submission is very skimpy.
Local government revenues and population statistics should have been easily available A concern with the submission would be why such an obviously useful and readily available piece of information was not provided initially.

Have there been any significant changes in coverage over time?
This also needs to be thought about in a slightly different way. It may be that the actual cover has not changed but if the services the local governments provide have changed significantly then effectively cover has changed. For example, suppose the local government used to outsource a lot of services but has recently brought them back in-house. Underwriters would therefore be giving a lot more coverage. This is part of a broader issue about having a reliable exposure measure over the past and into the future.

Have the limits of indemnity changed over time?
Clearly, if the limits of coverage on individual claims increased recently then this will have a large impact on the appropriateness of the information provided.

Has the legal environment changed over time?
Are there any changes in legislation that are underway? Any changes could have had a significant effect on the price although this sort of change is very difficult to quantify and factor in accurately. The fact that the risk is in another country makes this much harder to assess.

What exclusions are there?
Are they standard ones? Have there been any changes over the last few years? Is the wording for this contract the same as for other countries?

What heads of damage are covered eg general damages, loss of future earnings?
Have these changed over time? This is another example of comparability of the past information with the future projected experience.

Are there any latent claims issues?
This is always a good question to ask and to think through. It would appear from the nature of the cover provided that this should not be an issue but remember that 'latent' means hidden rather than APH (Asbestos, Pollution and Health Hazards). Given that almost an entire country is being insured, it is quite likely that if there are any latent issues that this cover will have a good chance of being impacted by them. Exclusions may help to deal with the risk but you can only exclude things you can foresee.

Almost the whole country is being covered.
This means that there is no 'miss factor' within this country – if something does go wrong then Be Sure! will end up paying due to the aggregation of risk. They have a reputation risk in that if they wish to contest some claims, or more importantly some class of claims, then their name will be in the press in adverse circumstances. If they had plans to expand business in or into this country then this might impair their ability to do so.

How much reliance can you put on what the broker and your own underwriter are saying?
The longer you have worked with people the better you know them and the more you will understand how to deal with them and how to use what they say. The less you know them the more questions you should ask. In practice, you would typically have built up a degree of trust and understanding with the parties involved and they should know what information you are going to request and hence should be 'willing' to provide it if it exists. When you are forced to make assumptions regarding individual parameters, your judgement will be informed by your past experience of these people. This does not mean you are absolved of trying to get the right information on a risk!

Can I have a soft copy?
As with a lot of these sorts of things, all the data and documents were provided as hard copies. You can waste a lot of time typing things into a spreadsheet! If you have to type it in then there is the risk of errors and it leaves less time for analysis. It is always worth asking for data in a useable electronic form. It is usually worth not taking no for an answer. Somewhat incredibly, you might be told that, despite the fact that the presentation contains prints from Excel spreadsheets, that the spreadsheets themselves are not available.

Predicting the Future – Estimating the price

It is important to be clear on what cover is being provided.
This is a very basic point that can be difficult to apply in practice. In this case it would have been easy to miss the fact that Professional Indemnity cover is being included.

Is there any opportunity to review the premium annually rather than price for the three years at the start?
This would obviously be much better for the underwriter and so it must be worth asking. Getting locked into something for a number of years can be a huge cause of trouble. However, one of the reasons the local governments want to do the deal is to give more stability so the answer is very likely to be 'no'. There are several questions that point to the fact that we do not want to write a multi-year contract. Even if rates appear to be high now and we expect them to fall off over the period of the contract then you can be sure that the broker will try to factor that reduction into the process. More importantly, by writing a contract that is longer than usual, you are losing the ability to manage your participation on that contract as you normally would. This must signify increased risk.

Are there any break clauses in the policy?
If it all goes horribly wrong can you get out of it to limit the damage? Again the answer is likely to be 'no' but it has got to be worth trying.

Is there any way of getting some form of retrospective rating built in?
Again, this might help to mitigate the long-term nature of the risk.

How much work do the local governments contract out?
Could you seek subrogation against a contractor? For example, suppose road maintenance was contracted out and someone made a claim because they had damaged their car after driving through a large pothole. The claim is likely to be made against the local government as they are responsible for the roads. Would they be able to recover the claim from the contractors if they had failed to fix the pothole? The next point suggests that such liability would fall directly to the contractor rather than to the local government but we would need to be certain of this.

Should we give a reduction for liability falling to contractors?
Of particular importance in San Serriffe is the advent of Compulsory Competitive Tendering Legislation (CCT) that requires local governments to tender out up to 50% of their total operating expenses. However, because of the definition of 'operating expenses', the actual services tendered out or contracted out far exceeds 50% of their actual core services provided to the community. As a result of the CCT many of the functions provided by the local governments are now being provided by the successful tenderer and, in an ever increasing number, by organisations other than local governments. With the loss of these activities, the claims emanating from the provision of these functions should reduce. As the successful tenderer is required to effect insurance including the local government, the local governments are seeking premium reductions as the exposure to claims is becoming substantially reduced.

The estimate price is going to be sensitive to this issue, but you have no guarantee that contracting out will continue over the course of the policy.

What about claims inflation?
The initial submission doesn't deal with claims inflation. It should definitely be built into the pricing. Whilst it is never possible to allow accurately for claims inflation, there is always a reasonable approach that can be taken.

What aggregations of risk exist across the book?
There is a clear aggregation of risk from insuring the majority of local governments in one country. When considering writing the risk it is important to consider how this risk aggregates with other exposures that we might have in this country or with similar business in other countries. Alternatively, this risk might provide valuable diversification and if we write 100% of this risk then it is diversification that our competitors will not be able to access.

How does the reinsurance function?
It seems perverse that the broker is telling us what reinsurance it is appropriate for us to buy. Would we be able to determine quality of the reinsurers? If we choose to go ahead with this arrangement then we will need to allow for the credit risk in the price.

Can we get hold of any other data to help price the risk?
Can any assumptions be benchmarked? For example this could be done be using publicly available data from statutory returns, data from similar schemes written or from other risks in the same country. Anything available may be of some assistance although it is often difficult to balance having some data with how relevant it is.

Managing for the Future

Who handles the claims?
This seems fairly fundamental. The policy appears to give the broker *carte blanche* to settle every claim with unlimited authority and without our ability to intervene. It is immediately obvious that this is fraught with danger. It would be foolish to write this risk without at the very least understanding what the position is. It would be dangerous to write the risk with no control over claims handling.

What is the claims reserving philosophy?
How can you put a price on the risk given the limited development if you don't know how well reserved the claims are? A very conservative reserving philosophy would mean you could over price and a very lean and mean approach to setting reserves could lead to seriously under-pricing the risk. With such limited data this is pretty difficult to get a handle on. We should ask whether there have been any audits of the claims handling with reports that we could review.

There is no mention in the initial pricing information as to how the claims handling is paid for.
Does this need to be included in the price? This needs to be resolved before the risk is written.

What happens if extra local governments join the scheme?
How will the premium change? We need to put in place a method for accepting new local governments to the policy, even if that method is that each one will be underwritten on a bespoke basis.

Managing in the Future

How can we ensure that we keep in touch with the risk?
What information will we receive on a regular basis? Will we get a single page summary of how much we owe each quarter or will we get some meaningful information. Our ability to control our business in a wider sense is often dependent upon our ability to get useful information at a contract level.

How can we ensure that claims are handled properly?
No matter what controls we put in place, we actually want the broker to settle the vast majority of the individual claims as it should be more efficient given that they have a local presence. We need to ensure that we have an annual review of claims handling, possibly from a third party. This will help to ensure the reliability of this part of the process. Another idea for making sure the interests of the insurer and the broker are aligned would be to suggest some sort of profit share arrangement for a reasonable part of the broker's commission. Their reaction to the suggestion may be quite illuminating!

Overall thoughts

A brief description of the approach to all these points would be to focus on the negative but to remember the positive. In insurance, it is fair to say that any vaguely complicated assured will always look for an opportunity to select against an insurer. Insurers are in the business of accepting risk at a reasonable price. It is easy to get carried away and put in so many margins for caution that you produce quotes that never get taken up.

It is important to act within a framework that focuses on the management of risk. Thus, we can assess the risk and then see how we can improve on the proposition from our point of view whilst still providing a useful product. We need to consider the acceptability of the contract in isolation but also in a wider context. Such wider considerations are not explicitly considered every time, only when a risk falls outside guidelines or 'underwriting authorities'. This could be due to premium size, exposure size, territory, industry covered or one of many properties against which risks can be measured.

4. Other comments on the placing information

There are a number of other things we could comment on from the figures in the pack that the brokers gave. This is by no means an exhaustive list but includes some important observations:

- The pricing relies on using data from the one pool that Be Sure will not be writing! Whilst this has the innocent explanation that it is the pool with the most data, you would need to take great care in deciding whether or not you could use the data.
- The treatment of large claims does not seem very robust. All that seems to have happened is that a few large claims have been stripped out of the data. At the very least these claims should only have been removed above the point at which reinsurance kicks in. Alternatively a loading for large claims could be made in the price.
- The selection of the ultimate claims cost for each year in Table 5 is interesting. The paid ultimate and the incurred ultimate are quite different on the more recent years. This is not commented on and an ultimate between the two projections is selected. An incurred projection is usually more reliable because it includes the extra information of the outstanding claim amounts. So, unless there is a good reason, it is a little dangerous to limit the weight you put on it.

- The ultimate for 1997 seems to be being selected as the average of the ultimates for 1995 and 1996. And the projected ultimate for 1998 is set to be equal to that for 1997. There is no justification given for this and it seems curious when the trend in the ultimate claims is considered (1994 = £11m, 1995 = £12.75m and 1996 = £13.5m). Can we really believe that this increasing trend will be reversed?

One of the questions we considered above related to how extra local governments were to be treated if they joined the scheme. The actual treatment proposed was that the premium and the aggregate limit would each be increased according to the following:

- If a local government had an incurred claims cost totalling more than £0.2m in any one of the last three years then they would not be permitted to join.
- If a local government had less than three years of claims data then they would not be permitted to join.
- Otherwise, take the incurred claims cost up for up to a maximum of 8 years. If there are more than three years of data than the latest year is to be discarded.
- The average annual incurred cost is then used for the adjustment.

There are so many issues with this that it is difficult to know where to start! For example:

- It does not allow for inflation.
- It does not allow for development of the claims (other than by making sure there are some more developed years and excluding the latest year).
- It does not allow for changes in exposure.

All of these things should have made Ken very wary about relying on the broker's figures. Pointing out the shortcomings to others could have been quite a helpful thing to do. Even where we can't actually come up with a price for someone we can still be involved in the underwriting process as there may be helpful thoughts we can contribute.

5. The value of underwriting experience

Does Ken have the experience to price this account? If Ken had spoken to an underwriter with extensive Public Liability experience might he have thought twice about pricing the account?

We discussed the risk with such a person. The following is a list of questions he asked and points he made:

What do the local governments do?

- Is the locality responsible for social housing? Being a landlord for such housing would open the local government up to property owner's liability. They could be liable for any injuries due to the state of the properties they manage, and older housing might contain asbestos.
- Are there any major construction programs that are supported by the council? If so, has the council ensured that any contractors or property developers have adequate coverage of their own? Have they contractually arranged to limit the council's liability due to acts of the contractor or property developer?
- Does the council issue building permits? If a permit is issued for a building project that is subsequently determined to be faulty or even dangerous, there could be professional liability on the part of the council.
- Does the council have departments that monitor or advise on environmental issues such as refuse collection, pollution, or management of landfills? A claim could arise if the council is deemed to be ineffective in monitoring such activities. For instance, if hazardous material is disposed of near a housing development, the council could be liable for subsequent poisoning.
- Does the council renew liquor licenses? What about other licenses for commercial entities? Do they handle business licenses for bars and nightclubs? Liability could occur if these businesses are allowed to operate in a manner that is deemed unsafe for the public.
- Are there swimming pools and athletic parks? Claims could arise from defective equipment or inadequate life guarding or supervision.

What is covered?

- Are education, health services, police, fire fighting and child minding facilities definitely covered elsewhere? If not, the pool runs the risk of finding losses from these services creeping into its experience, disguised as covered risks.
- Do the covered programs include care for 'vulnerable' residents such as the elderly or handicapped? If these programs are covered, the pool risk would increase, as society feels that these residents are owed a greater degree of care. There is also a greater risk of abuse, as these residents may not be able to defend themselves adequately.
- How is Health Services (which is not part of the services provided) defined? Does it include Social Services? If Social Services are covered there could be negligence claims such as failing to identify and protect a child who is in an abusive home.

- Does Education (again, not part of the services provided) include pre-school, daycare or school groups? These entities would be susceptible to abuse and negligence claims. For example, if background checks on employees working with children were inadequate or if playground equipment was defective.

Other considerations

- How will the premiums be determined for the various localities of differing sizes, loss experience, deductibles and limits? This is important in order to ensure equitable premiums for all parties involved. For instance, should a large municipality have a £50k deductible or a £500k deductible and should it have a limit higher than the limit of a small village? Does a small village have the revenue to afford a higher deductible? What proportion of the pool premium should the large municipality pay for its coverage? If the allocations are not equitable, the pool will suffer from anti-selection, as participation is not mandatory.
- In the post 9/11 world, does the council have adequate emergency planning? How is adequate safety for public events (eg concerts, parades, fireworks) ensured? Have organizers of public events obtained their own insurance coverage? Has the council made contractual arrangements to ensure that liability falls on the organizers and not the council?

The clear message is that it is important to understand all facets of what you are insuring. Data itself doesn't make good actuarial work. If you don't know the right questions to ask, you could end up on risk for something that you never intended. So make sure you work with an underwriter (or experienced actuary) who understands the pitfalls of the class you are dealing with.

It is not necessarily the actuary's job to look in this level of detail but they are things that need to be considered. No actuary should be an island! There should be an underwriter considering these things. But what should you do if you don't have the experience and/or can't find anyone with experience? Refusing to price the risk is one option and we consider this further in a later section.

6. Thoughts on how to price this risk

The information supplied lent itself to rating using the claims experience supplied. To this end we projected the claims (paid and incurred) using a chain ladder approach, excluding the identified large losses.

Unfortunately there was insufficient data to project by claim type, or project using a frequency and severity type of analysis. Further, we were unable to split claims between those from occurrence based policies and those on claims made policies.

The general process for the working party members was to use a chain ladder approach for schemes B to E combined as the data was less erratic when as much as possible was combined across schemes.

In performing the rating in this way there are a number of issues that arose

- How adequate are the case estimate reserves?
- What development tail factor should we use?
- How much do we load for the large losses?
- How do we select the rate for the 1998 year from the prior years?

From the data little can be gleaned from the outstanding claim reserves as we cannot get any further information so we are left with judgementally applying our chain ladder factors to the data.

The tail factor on the oldest year of account was derived by judgement after considering Pool A's development and the work of Brown & Brown on Pool C. Overall, little reliance was placed on the third party work because we did not understand the underlying assumptions that were being made nor the final selected results.

The loading for the large claims ends up being judgemental as well and led us to load an average £2m on to the claims cost excluding large losses.

On both the tail factor and the large loss selection working party members differed causing a large difference in loss costs before any loadings.

We have been told that the exposure should remain constant so on the basis of this information we can just trend forward the claims from the 1997 and prior years to give a view of the 1998 year. One approach adopted was to trend using a straight line to give a view of the 1998 year, whilst another was to take an average over historic years and allow for some more claim cost inflation.

The total claims cost, including large claim loading, was then discounted, using a risk free rate of return with the payout pattern derived.

This then formed the basis of the claims cost in our rate. We then had to gross up for

- Expenses – remember that the broker is going to deal with all claims handling
- Contingency margin
- Profit load
- Outwards reinsurance load (assuming profit is given away of course).

For simplicity the profit load was put around 40% in the hope that it would cover items such as latent diseases, court awards and legislative changes, aggregation of risk and so on.

Having derived the rate for one year we then created a rate for the next two years by trending the 1998 rate forward for claims inflation on the assumption of constant exposure.

Given the differences in some of the assumptions used by the working party members we found that the premium derived was well in excess of £20m per year.

Diary extracts from the week beginning 24th November 1997

I've come up with my price for the San Serriffe risk. I reckon we need £20.5m for the first year of cover. I think our £25m layer will just about be exhausted each year. This is quite a lot higher than the broker's estimate of £13m! My price is basically discounting the £25m for the time value of money. I e-mailed Jane with the figures at the end of the day.

Jane had left a message that I was to go and see her as soon as I got in this morning. She was not happy with the figures I'd given her and told me to go away and have another look at them. I've managed to shave £1m off my price by being a bit more optimistic but I don't think that is going to be enough. I sent her the new price just before I left; I'm not looking forward to tomorrow.

I had to go and see Sandy and Jane first thing. Sandy seemed really cross. He wanted to know how I could possibly come up with such high figures but didn't really listen when I tried to take him through my assumptions. He said that the figures that the broker had given were much more sensible, they were based on detailed data and actuarial studies. He told me that my figures were wrong and that we would never get the business at that sort of price. Jane said that this was an important account for them and they would be writing it. What's more they are not going to buy the reinsurance – they think this looks such a good risk that they think it would be just paying away profit!

We're going to get a premium of just £10.7m for the first year. I can't believe they are going to totally ignore my views. I'm sure this is far too low. Oh well, time will tell.

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7. Thoughts on the professional issues raised so far

Information needed for pricing

On the face of it Ken has been given a good deal of information to price this risk although we have already commented on other things he could have asked for. In the London Market each risk is almost unique. This makes it difficult to have a standard list of information and data required and it is rare for all the information you want to be readily available.

This makes it hard to give a general answer to the question of at what point would you refuse to price a risk because you didn't have the information you wanted. (And looking at it the other way round, when do you just get on with what you've got?) It may be hard to answer but it should at least be a consideration. We must ask for data and sometimes we will need to push hard for it. Unreasonable rejections should raise concerns and we must be prepared to say 'no' to pricing the risk if we don't have enough. We'll only be able to get away with this if we have very good relationships with the underwriters and management and they understand and value what we do.

Relevant experience

Ken is new to pricing, so it is likely that this is the first time he is pricing this type of business. His lack of experience may affect how he prices it and his ability to communicate with confidence to the underwriters and management.

This raises the question of whether Ken should have taken the job in the first place. He was moving into a company that had no other internal actuaries, he had no experience of pricing and he was newly qualified. Is there any professional guidance that covers this?

The Professional Conduct Standard states in paragraph 3.2 that:

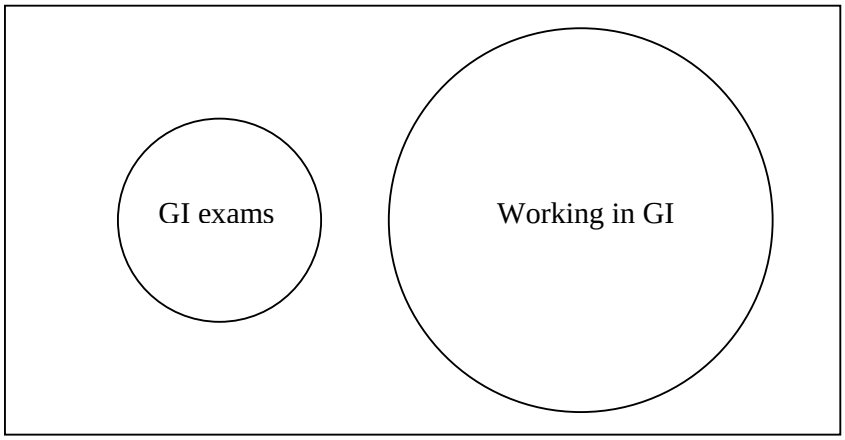
Many assignments offered to members require considerable knowledge and experience for proper completion. Requisite knowledge includes methodology, relevant legislation and local conditions. Members must not undertake assignments or give advice, unless: satisfied of personal competence in the relevant matters, ***or*** *acting in co-operation with, or with the guidance of, someone (not necessarily a member) with the requisite competence.*

Does this cover an employment as a whole, or just individual tasks within that employment? Could Ken argue that as he was working closely with the underwriters he was acting in co-operation with people of requisite competence? Paragraph 3.3 goes on to say:

Notwithstanding paragraph 3.2, a member may provide advice if the circumstances are such that, having regard to all the relevant factors, it would be contrary to the clients' interests to decline to do so. However, the member must make clear to the recipient that, in the absence of the constraining circumstances, the member would have recommended referring the matter to someone with the relevant knowledge and experience.

Once Ken was in the job, this would seem to give him good reason to work on any pricing task as long as he caveats it in line with the above. If he is employed to do pricing work then surely it would be contrary to his employer's interests for him not to act. Anything he can contribute must be helpful.

Anyway, he had qualified – surely by passing the exams he should be confident that he had enough knowledge to start the job? If the exams don't give you enough knowledge to start a role then what do they equip you for? Alternatively, some (but not all) on the working party had the following view of knowledge:



At first sight this may seem a little harsh. Our understanding is influenced by the fact that many people only sit the GI exams after they have been working in GI for quite some time.

We are heartened to see that there are proposals to split the GI exam into two and the syllabus is currently undergoing a substantial rewrite. We hope that in a few years time the above diagram will show some overlap! But you can't learn experience from an examination syllabus so there will always be some non-overlap.

Overall we felt Ken should probably not have taken the job. He didn't have enough experience. However this was a tricky call – actuaries would never move into new areas if we stuck strictly to the PCS. As one working party member said, 'You shouldn't take the PCS literally'. Is this a common view?

The working party felt that first and foremost, Ken has a duty to the profession, followed by the shareholders of Be Sure! and then his manager – in this case the Chief Executive. In theory there should be no conflicts between these parties, providing that the business really is being operated in the interests of shareholders. In practice there may be conflicts, especially where the managers are keen to write a particular piece of business.

How to decline to price a risk

Suppose Ken reached the point with this risk or another one where he felt he should refuse to price it (for example due to a lack of experience or not enough data). How exactly is he going to take this forward?

If Ken had previous experience of pricing similar risks then he would be in a position to demonstrate why he should not price this one. Previous experience would give him the justification and confidence to be able to decline. He could then take the underwriter through the pricing model and show where there was a lack of data or where it was difficult to make sensible assumptions.

A couple of alternatives that might be more appealing to all involved would be:

- Produce a range of possible prices. In a case where there are particular uncertainties it is likely that it would be such a wide range as to not be of any real use! But at least Ken would have done something and it would highlight the uncertainty.
- Produce a model with a number of key assumptions and let the underwriter pick those assumptions. Responsibility has then been shifted away from Ken.

How to escalate

What, if anything, should Ken have done when he found out that his views were to be ignored? Should he have done more than shrug his shoulders and say 'Oh well, time will tell'?

In this particular case the risk is significant in size for Be Sure! and this makes a decision of what to do much more important than it would be for a smaller risk. However, even with a small risk one might need to consider the same issues if the pricing is to be repeated across many similar risks.

As we said on the previous page (albeit rather simplistically), the duty of the actuary is first to the profession, then to the shareholders and then to the manager. Depending on how serious the issue is, Ken should ideally escalate in that order.

On a day-to-day basis, the responsibilities lie in the reverse order. A typical escalation path assuming that the dispute lies between the actuary and the underwriter might then be actuary's boss, underwriter's boss (possibly), CEO, Board, Profession and or Regulator (Lloyd's/FSA etc). The Board is the proxy for the shareholders as you cannot communicate with them in any meaningful way.

In theory, options of approaching the Institute (for confidential advice) or even the regulator exist, although you would have to bear in mind the sensitivity of company information. But in practice it would be unlikely to go higher than the chief underwriter.

In this case Ken is in a particularly difficult position. He reports to the Chief Executive and he is the one ignoring Ken's views. To escalate the matter Ken would have to go to the Board and say that he thought the Chief Executive was wrong – clearly a career limiting move! So maybe the only sensible approach is the one that Ken took. The Chief Executive has the authority to make the decision to write the business; Ken does not but he has done his bit by raising his concerns.

Keeping records

In this case it may prove prudent for Ken to keep a detailed record of his work and of the conversations he has had with Jane and Sandy. Ken had e-mailed his price to Jane – a sensible thing to have done so that he can prove he had passed on his thoughts. Keeping a detailed record of things can seem a pain and be time consuming but is maybe something we should do more of and be better at.

The work of consultants

'I take the consulting actuaries' work and throw it out.' This was one approach to the actuarial parts of the broker presentation because it is the approach of some members of the working party. Whilst it is probably unwise to rely on a report produced for 'the other side', it is likely that some information can be gleaned from such a report.

Is this the approach widely adopted by people? Why? Surely we should be able to rely on the work produced by our fellow professionals. Or is this naive? What would it take for us to be happy to rely on it? Would a full GN12 compliant report help? If one were writing a manual of actuarial practice what would our recommended practice be?

Time

Do we have enough time to look at things? Are we given enough time to look at pricing work? What do we do if we don't feel we've got enough time? How could we get the market to give us more time? At what point should we decline to price a risk because we've not been given enough time?

Peer review

How common is peer review of pricing work? Should it be the norm? If a qualified actuary is doing the work then isn't that good enough? What is the point of having a qualified actuary if you need another one to check their work?! To what extent does this depend on the size of the risk? The working party knows of situations where the pricing is never peer reviewed, although this is on smaller risks and situations where it is always peer reviewed, although this is for quite large risks.

Learning from our mistakes

How do we make sure we learn from our mistakes on pricing work? One way is to have close contact with those doing the reserving. Another way is to look at risks again when they come up for renewal. But one further year is unlikely to be enough to see if you were right or wrong. Do we look back for long enough eg are we still looking back on things we wrote five years ago? Do risks stay stable enough to be able to tell anything meaningful a number of years later? Also, you may not get to see things you didn't write.

Reserving before pricing

Should all actuaries have some actual experience of reserving before they do pricing? Would this be useful? Is it impossible to achieve though?

'I'm happier checking someone else's price than coming up with my own.'

This was a comment made by one member of the working party. Why should this be? Isn't it a little dangerous? If someone else has stuck their neck out and made some assumptions then would you be willing to say they have got it wildly wrong or is there a danger that you would be anchored to their assumptions and unwilling to move too far from them? How much does it depend on who priced it?

Re-Pricing

Diary Entry – 23rd September 1999

Oh no, the San Serriffe risk is back again! The broker wants to start a new three year deal after the end of this one, the second year of the deal. Sandy has asked me to take a look at it over the next week. Jane and Sandy have just come back from another week's visit to San Serriffe. They are very happy with how the risk is running, they think the claims are being well reserved and they've been shown lots of risk management initiatives that are reducing claims.

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8. Placing information on the new deal

Ken now has 18 months worth of data. The broker has suggested that the three year deal is broken after two years and a new three year deal is put in place for the following reasons:

- The local governments are very pleased with how the arrangement is going and are keen to know their insurance costs for the next three years.
- The figures are shaping up well, losses are well within the premiums and the payments so far are negligible.
- Renewing the risk now will ensure that nobody else can get their hands on such a prime account when it comes up for renewal at the end of the original three years.

The following is the submission from the broker which includes data for each of the pools (representing the different geographic areas). All figures have been converted to Sterling:

General Information

The reserving policy currently in operation involves a very cautious approach to setting claims reserves. This implies that any changes in reserves are likely to be down rather than up. There are also significant numbers of claims with standard reserves set against them but these standard amounts are conservative. Pool B is currently going through an exercise to review all the outstanding reserves on open claims. Indications are that this will lead to a significant reduction in the reserves, evidence of this conservative policy.

Risk management initiatives have resulted in large numbers of incidents being reported significantly earlier than in previous years, some of which are only incident reports and have not yet materialised into claims. Many of these incidents have conservative reserves set against them.

The significant changes in reporting timing and reserving policy make the development of incurred amounts in previous years not representative of the future. The paid development patterns are not affected by these changes and are therefore more useful to consider.

Our original forecast was of an ultimate claims cost of £13.125m. At the end of June 1999 payments (net of deductibles) were £0.7m or 5.3% of this ultimate. The payment pattern for Pool A on which we based our discounted forecast predicts that 22.5% of the ultimate should be paid by the end of the second year. If payments were to have reached say £2.0m by the end of 1999 then this would imply an ultimate claims cost of £8.9m.

So either the claims are being paid more slowly than expected for the 1998 year, which would afford more opportunity for investment income than originally assumed, or the total claims forecast might not reach the levels we were expecting.

So, in conclusion, whilst the incurred figures look higher than the past pattern might suggest, this can be explained by the faster reporting times and higher reserving policy. Although faster reporting might encourage faster payment, reducing the scope for investment income, faster payment often results in smaller payments thus reducing the total losses.

The exposure for each pool is believed to be relatively stable.

Claims Analysis

We have performed a number of frequency and severity forecasts to project the expected losses for the coming year. This has involved:

- Revaluing the claims to both 1998 (for comparison to the last analysis) and 2000 prices by:
    - Inflating the paid claims
    - Adding the current outstanding claims (this element does not need revaluing as future inflation is already built in through the reserving practice)

  The inflated current incurred cost for each pool is shown in Table 1.
- Fitting a curve to the distribution of inflated claim amounts
- The frequency forecasts have been calculated using two different scenarios taking into account varying degrees of:
    - The assumed over-stated number of claims in the 1998 policy year
    - The perceived increasing claims trend
    - The risk management initiatives which should mitigate this trend
- Using an average deductible assumption.

A summary of these results is shown in Table 2.

San Serriffe Local Govenments Table 1

The following table shows the current incurred cost, inflated to 1998 values, net of deductibles.

Year	Pool B	Pool C	Pool D	Pool E	Total
1994	5,529,164	5,437,607	2,379,195	-	13,345,965
1995	4,917,251	6,706,058	2,585,422	977,081	15,185,811
1996	4,493,328	5,673,636	2,649,959	1,283,970	14,100,893
1997	4,966,919	5,754,841	1,368,176	1,402,334	13,492,271
1998	4,862,084	4,867,734	1,666,900	1,230,454	12,627,172

Risk Simulation Analysis Results Table 2

Forecast of ultimate claims net of deductibles for the 2000 year

	Total Scenario 1	Total Discounted Scenario 1	Total Scenario 2	Total Discounted Scenario 2
5%	12,257,498	9,928,573	12,769,515	10,343,307
10%	12,584,295	10,193,279	13,058,408	10,577,310
15%	12,858,315	10,415,235	13,291,635	10,766,225
20%	13,062,158	10,580,348	13,453,905	10,897,663
Mean	**13,876,748**	**11,240,165**	**14,329,868**	**11,607,193**
80%	14,712,405	11,917,048	15,197,183	12,309,718
85%	14,903,903	12,072,161	15,398,130	12,472,485
90%	15,164,303	12,283,085	15,627,998	12,658,678
95%	15,651,038	12,677,341	16,073,640	13,019,648

9. Thoughts on the placing information for the new deal

The following are a few brief thoughts on the re-broking of the risk and the information that has been provided:

- We have only shown an extract of the actual data provided in the re-broking presentation because there were a number of problems with the data:
    - For some states only data for claims exceeding the deductible have been included. This means that claim counts cannot be compared to the triangulations of claim numbers in the original broker presentation.
    - The presentation showed the claim costs before application of the deductibles and the claims costs net of the deductibles but having had inflation applied. So it did not show paid or incurred claims that were comparable with the triangles in the original presentation.

  So, in fact the information provided was pretty useless for adding to the original presentation. That means the original projections couldn't be revisited.

- No update of the Pool A data has been provided. Given how much reliance was placed on it in the original presentation this would seem to be a glaring omission.

- There is some woolly information about the conservative level of reserving claims. How much of this do we believe? Unfortunately it is probably too early on to test what is being said so we are reduced to making a judgement call on the issue.

- Do the reasons for the re-broke make sense? Do they ring true? Could the broker be trying to lock Be Sure! in for another three years for some other reason?

10. The exercise going on in Pool B

The re-broke presentation contained the following statement:
'Pool B is currently going through an exercise to review all the outstanding reserves on open claims. Indications are that this will lead to a significant reduction in the reserves, evidence of this conservative policy.'

What is your initial reaction to this? We would understand it if you were sceptical. We should be sceptical of such a statement. It contains no facts and leads us to a conclusion before the review has finished. Why are they going through the exercise anyway? If they had a conservative reserving policy beforehand then they won't have one afterwards if they reduce all the reserves! Even if it were demonstrated to be correct for Pool B, would it also hold true for the other pools?

One problem with this sort of review is that you can never quite be sure of the results. If the reserves do all come down then they may well go back up again in the future. One of the reasons for producing this paper is to be able to test out this sort of statement. The table below shows what actually happened in the quarter of the review.

Figures are gross of excesses and only for claims that were already notified at the end of June 1999:

Incurred Movement	Number of claims	Movement in Incurred
Down	163	-1,561,766
No Change	285	0
Up	42	+258,953
Total	490	-1,302,813

The incurred did indeed reduce through the quarter. This was a 19% reduction – quite substantial. The average decrease was £9,581 whilst the average increase was £6,166. What we don't know is if these increases were because of the review or for some other reason.

The following table shows how the claims that decreased have moved subsequently (ie between the end of September 1999 and the latest set of data at the end of March 2006):

Incurred Movement	Number of claims	Movement in Incurred
Down	89	-634,070
No Change	55	0
Up	19	+267,434
Total	163	-366,636

So the claims that reduced during the exercise have subsequently reduced by a further £367k. Quite a low proportion - just under 10% of them subsequently increased again. So it does look as if claims were being over reserved as the broker presentation suggested.

The following table shows how the claims that increased have moved subsequently:

Incurred Movement	Number of claims	Movement in Incurred
Down	21	-186,544
No Change	10	0
Up	11	+264,358
Total	42	77,814

Claims that increased during the period of the exercise subsequently increased by a further £78k – a fairly neutral movement. Half of the claims decreased which goes some way to backing up the conservative reserving philosophy. However the average increase was three times the average reduction.

Finally, to get the complete picture we need to look at claims where the incurred did not change in the third quarter 1999:

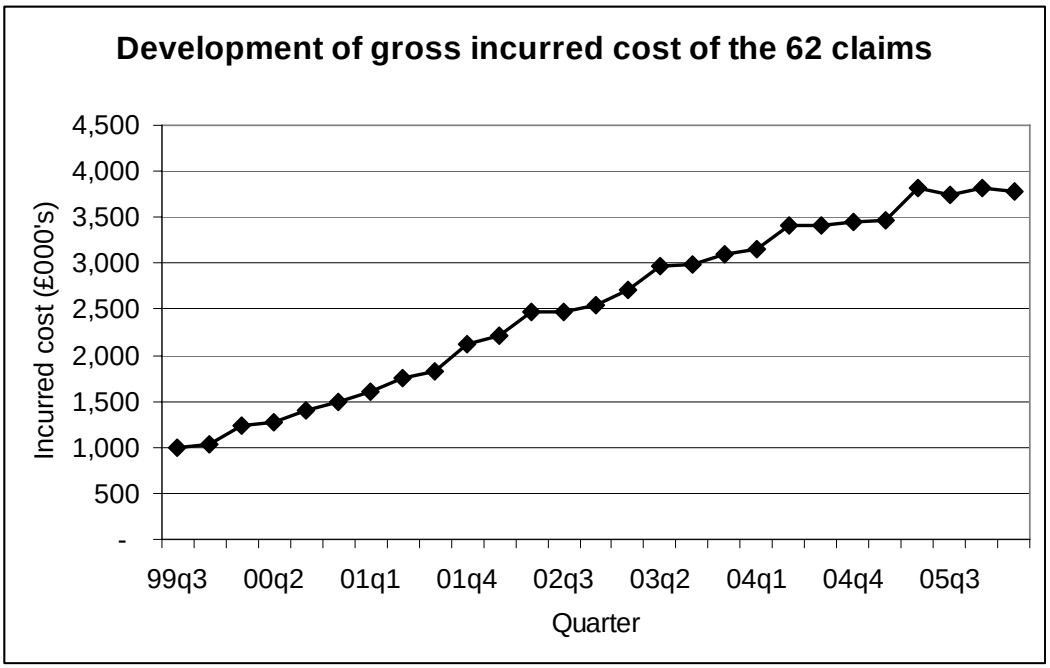
Incurred Movement	Number of claims	Movement in Incurred
Down	170	-1,700,206
No Change	53	0
Up	62	+2,791,248
Total	285	1,091,042

60% of claims subsequently reduced, again backing up the conservative reserving policy. But the big shock is that 62 claims increased by a total of £2.8m. The average increase on these claims was £45k whereas the average reduction was just £10k. The increase far outweighs the other reductions and means that overall the incurred cost increased by £0.8m after September 1999. Although overall the incurred did actually reduce between June 1999 and March 2006.

What does this tell us? On the face of it there seems to be evidence to support the assertion of a conservative reserving philosophy. But, if this was true, why did the 62 claims increase so much? The following shows a banding of the size of the increases:

Incurred Movement	Number of claims
<10k	25
>10k and <20k	16
>20k and <100k	16
>100k and <520k	5
Total	62

There were no huge increases and the range of increases was reasonably spread. Looking at the notification dates, about half of the claims were notified in 1998. So it is not the case that these were all the more recent claims where there was not enough information to put a sensible reserve on. The following graph shows how the incurred cost of these claims moved over time:



Between September 1999 and March 2004 the increase was surprisingly linear. Since then there has been little development most quarters with the occasional big jump. Examining the data more closely shows that the two jumps in the 2nd quarter 2004 and the 2nd quarter 2005 were each due to an increase on one claim.

This could provide some evidence for claims being under reserved – the 'right' figure being gradually realised. Or it may be that the flow of information and developments on these claims meant they could not be accurately reserved early on.

We have only looked at the movements of a few claims on one particular risk. But at the very least this should make us cautious about a conservative reserving policy. Even if claims are conservatively reserved, maybe there will be other claims that will still increase despite the best intentions of the reserving policy, leaving not much reduction overall.

11. Thoughts on visiting the risk

The Chief Executive and Underwriting Director have both been on a couple of week long trips to Sans Serriffe. This raises a few questions:

- Were they the most sensible people to have gone?
- What exactly did their visits achieve?
- How much detail did they go into?
- Were they being led around or did they have the opportunity to look at what they wanted to?
- From a pricing and underwriting perspective, what is the point of visiting the risk, and how we might go about it, if given the chance?

We are aware of very little by way of literature on this subject. The thoughts below owe as much to imagination as to experience.

A good first question to consider is how much you want to spend in time and travel costs, if that is what is needed to get a good enough insight? It should probably relate to the danger which the account is suspected to pose (and thus which needs to be mitigated, priced and underwritten), the size of the potential profits which are needed to make it worth considering at all, and the likelihood of actually writing the business. If an account represents a substantial danger but with the likely price level and volume providing only a small contribution, the up-front costs of visiting and spending time may not be justified, in which case the right decision may be to let this one pass.

In our San Serriffe example, the account is clearly big enough to justify a major effort, whether at the outset or at renewal. So we get to the question: how to go about it?

In this case, an important feature is that we have no control over the claims handling. Unless the underwriter has a very special relationship with the broker, then she would probably take everything the broker says with a pinch of salt. Even more than that, she would probably look for devious motives that worked against underwriters' interests in every aspect.

In our earlier section on the value of underwriting experience we list a number of points made on this type of risk by an underwriter with experience of public liability business. These questions mostly relate to understanding the nature of the risks run by the assured and therefore the cover given. They can be asked without a visit although a visit might help to confirm some of the answers.

We suggest that in a case such as this, the primary purpose of a visit is to understand how the account is actually run, to get any valuable insights which are there to be had on the nature of the claims themselves (by inspecting claims files and processes), and to see how the potential aspects of 'moral hazard' are dealt with – if they are dealt with at all. For example, the broker handling the account may have his strongest allegiance to the assured. It may not matter if the insurer gets burned providing he keeps the account. So, for example, a little flexibility in claims handling may work against the insurer.

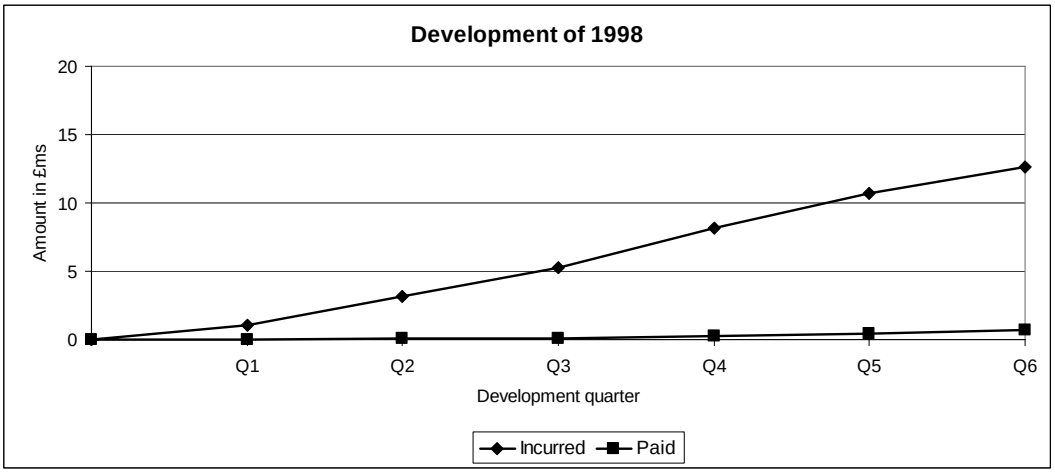
It helps if a member of the visiting team is both aware of the potentially important issues, such as consistency in claims handling and the gathering and presentation of statistics, and is sufficiently astute to spot the financially important questions. A young actuarial student, apparently brought along as a bag-carrier to the underwriter, may be able to find out more from relaxed conversations with administrative staff at the broker managing the claims than the underwriter or qualified actuary could glean from more formal meetings with senior staff.

Here are some brief thoughts that could be borne in mind on such a visit:

- How important is this business to the broker?
- Have you worked out who does what and who are the most revealing people to talk to?
- What is the process followed when claims are reported and how are potentially large or dubious claims dealt with?
- Whilst the claims process relates to the handling and recording of the claims suffered by the pools, what is the related process for advising and billing the insurer? And what does this mean about the quality and completeness of the data seen by the insurer?
- How consistent is claims handling across the whole account? Are pool members treated at all differently? What about consistency over time, as well as over the account?
- What does the actual claims experience (sample some files) tell you when set alongside the underwriting information originally provided?
- Are there any changes in the mix of business written, or in the terms on which the business is written?
- Are there any aspects which you discover, or which you begin to understand about the account which are not sufficiently evident from the data you have already studied? Clearly, the visit would be much more productive if the visiting team includes someone who has already analysed the data received to date.

12. Analysis of re-broking information

The following graph shows the development to date of the 1998 underwriting year:



The paid claims to date are negligible and are unlikely to be much use in projecting the ultimate outcome for 1998. The current incurred cost is greater than that projected initially by the broker but it does look as if it might be starting to level off.

We were a lot less comfortable with the risk at this stage. This was partly because of experience so far, partly due to rationale of the breaking of the original agreement and partly due to not having updated data for the historic years.

We performed a similar analysis as that of the original pricing exercise but with more conservative assumptions. It was interesting to note that the premium estimates produced at the time of the re-broking implied a somewhat higher initial premium than the original estimates – sometime as much as twice as large. The key difference was once again due to the selection of tail factors.

Typically the annual premium we derived was around £40m.

Diary Entry – 27th September 1999

I'm really struggling to price the new San Serriffe deal. There is very little of use in the broker presentation and there is hardly any development on 1999 so that only really leaves 1998. And on that year the paid is of no use so that only leaves the incurred claims development. It looks as if the incurred might be starting to level off but just about anything could happen.

Diary Entry – 30th September 1999

I've decided I need a tail factor of at least 2. But that will give me a higher answer than when I first priced the risk and Jane and Sandy didn't like it then. We are never going to get such a big jump in the premium so I'm beginning to think we shouldn't write this at all. I bet that won't be acceptable!

Diary Entry – 4th October 1999

As predicted, the idea of not writing the renewal was firmly rejected! This is an important account etc. They think the numbers supplied by the broker look reasonable. I tried to explain that I thought we needed a much bigger tail but they were not interested.

Diary Entry – 6th October 1999

The premium for the next year is going to be £12.5m. We are going to lose so much money on this.

Reserving

Diary Entry – 20th November 2000

Sandy called me into his office today. Our independent actuary (Danny Boronder at Kingfisher Consultancy) is coming up with some high ultimates for the San Serriffe risk in his 3rd quarter projections. As we still don't have an internal reserving department he has asked me to take a look at the figures to see if we can 'convince' the consultant to lower his figures. This would be a big hit to the reserves – we've been holding figures that assume an 80% ultimate loss ratio (or the incurred claims when they are higher) up to now. I found it pretty difficult not to get cross with him. How can he face asking me this after I came up with high figures when I priced it!

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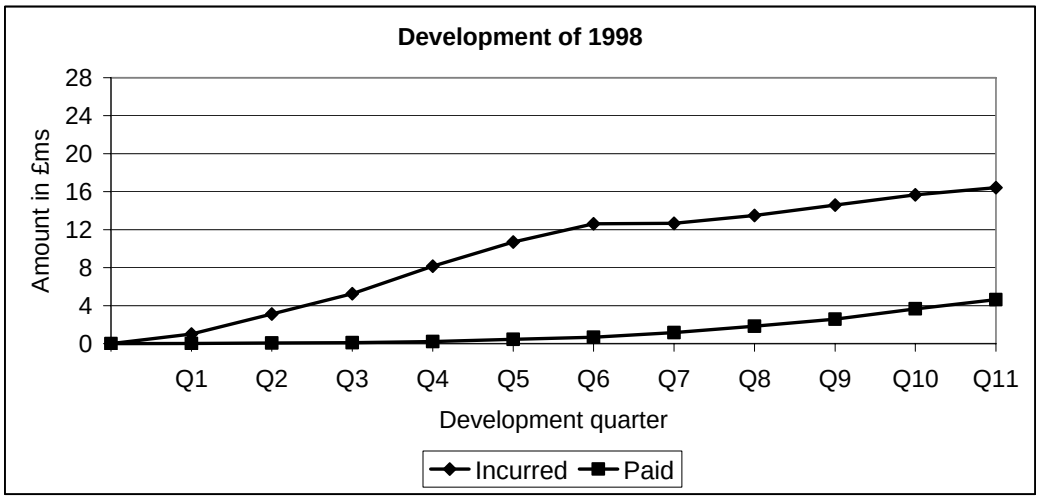
13. Projections after 33 months of development

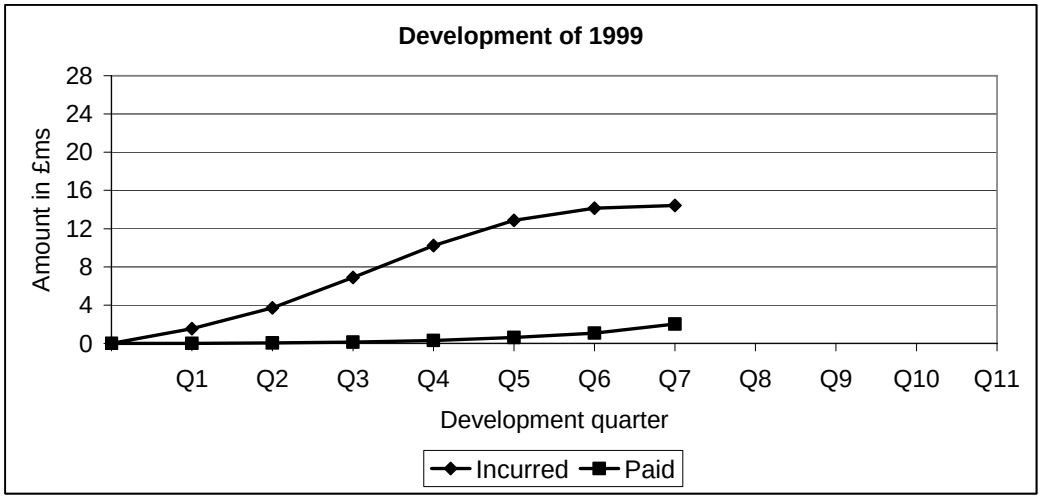
Before we start this section we need to consider whether it is valid to consider reserving for this one risk in isolation. One could argue that as it is only one risk it should not be reserved separately. But consider the following:

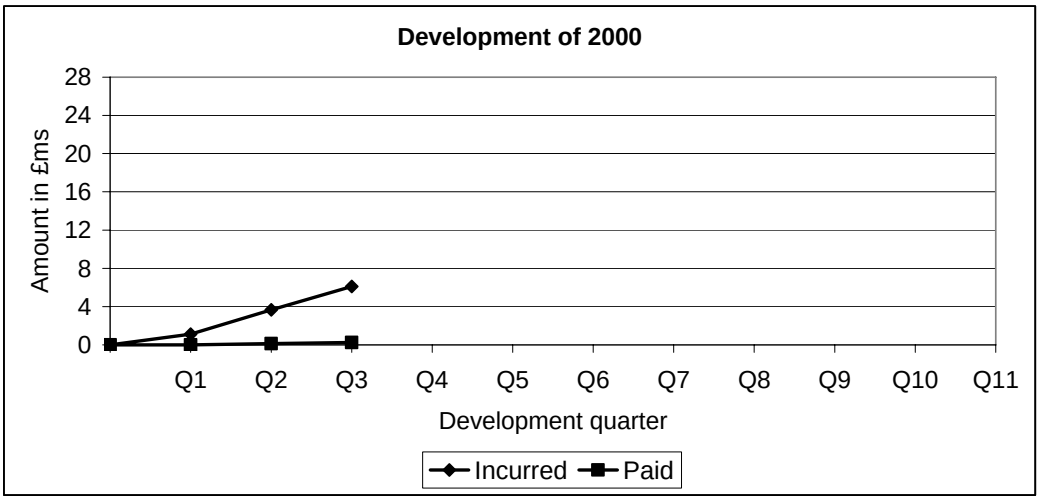
- It can effectively be considered a class of business because although it is one risk there are a large number of claims (17,195 at this point in the development) and that should give some stability.
- It is such a large risk that you wouldn't want it to distort the development of a class of business and would strip it out anyway.
- As it relates to one specific country then you probably wouldn't want to aggregate it with other data relating to other countries.

Therefore we think it is valid to consider reserving and uncertainty issues for this one risk in isolation.

The graphs on the following page show the development of the paid and incurred claims (net of the excesses) for each of the first three years of the deal:

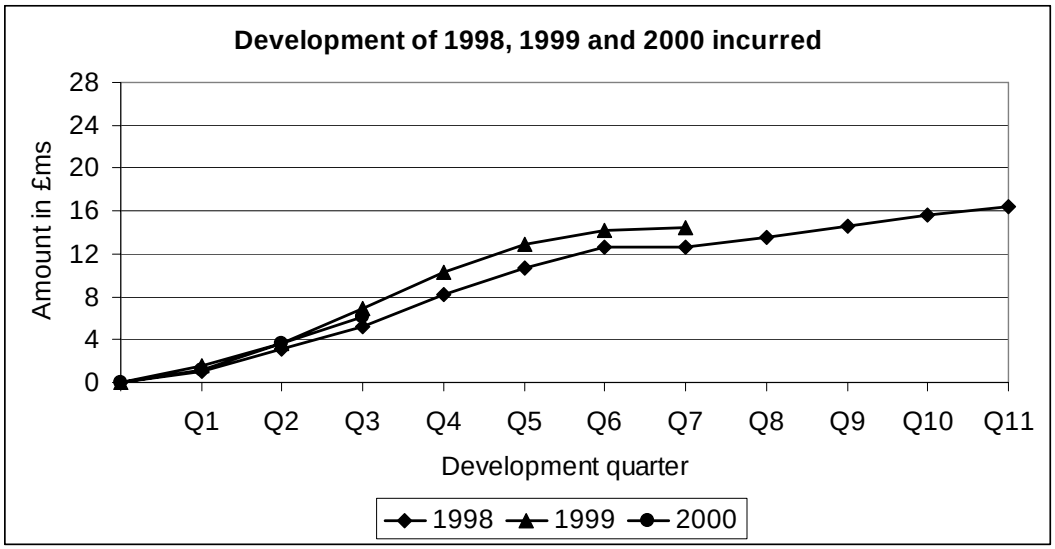

Development of 1998
Amount in £ms
28
24
20
16
12
8
4
0
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Development quarter
Incurred
Paid


Development of 1999
Amount in £ms
28
24
20
16
12
8
4
0
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Development quarter
Incurred
Paid


Development of 2000
Amount in £ms
28
24
20
16
12
8
4
0
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Development quarter
Incurred
Paid

A couple of initial observations are:

- The paid claims are very low even on the first year. It is unlikely they will be of any great use in projecting an ultimate position.
- The development looks amazingly consistent between years. This is confirmed by plotting the incurred development for all three years together on the same graph:



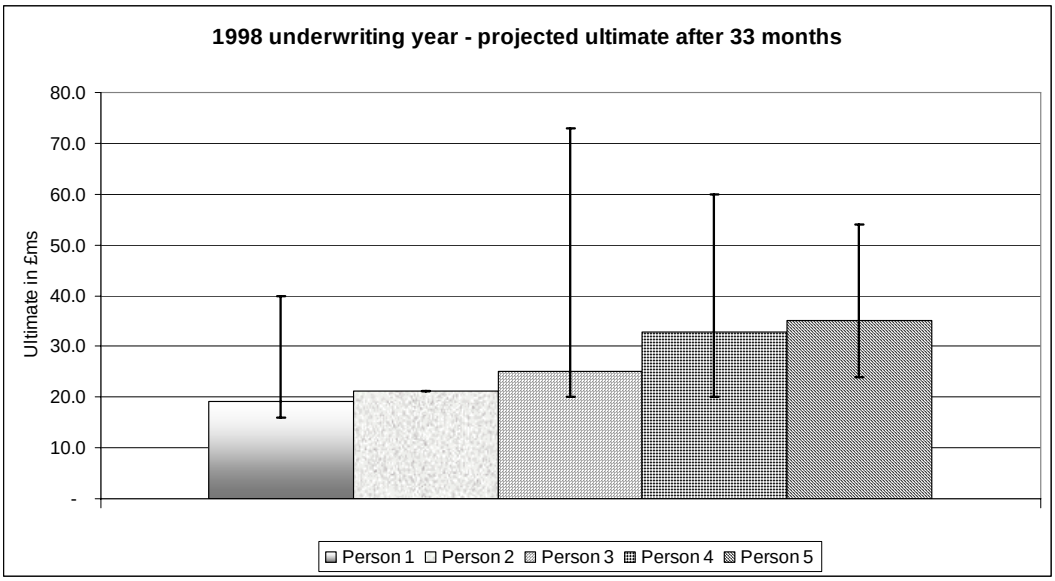
  Seeing such a high level of consistency may well cause an actuary to shout hooray (not out loud, obviously, we are talking about actuaries).
- If the graph were cut off after seven quarters of development then it might be tempting to think that the development had levelled off. Coincidentally (?) this is at about the level that the broker presentation projected (just over £13m).
- With a further year of development the broker's figure looks wrong and Ken's estimate starts to look more reasonable.

Before you read any further, take a few minutes to consider the graphs. Just from a visual analysis:

- What would be your best estimate of the ultimate claims?
- What range do you think other reasonable actuaries best estimates would lie in?
- What would be your range of possible outcomes?

Note down your answers so that you can compare them to the figures in the paper later on.

Between the members of the working party we came up with five different projections of the ultimate claims. If this were happening today then Danny, and arguably Ken too, would have to quantify the uncertainty in their projections as well. Therefore we also tried to come up with the first and ninety-ninth percentiles of the range of possible outcomes. We will compare the projections in detail later on in the paper but to give some idea of the range of answers we produced the following graph summaries the projections for the 1998 underwriting year. Each bar represents the best estimate ultimate for a person and the lines show the range of the 1st to the 99th percentiles. Note that one person did not produce a range:



There was a large range in the best estimates – from just under £20m up to just over £35m. The lowest projected ultimate lies below the 1st percentile of the highest three projections. The smallest range was £24m and the largest £53m.

In the absence of any useful exposure data or any credible prior estimates, everybody was forced into using the chainladder approach. Given the limited development of the paid claims the selected ultimates tended to be based exclusively on the incurred projections. There were a number of areas where people's approaches could have differed:

Pools combined or pools separately?

The projections were all done on data for the four pools combined. A couple of people did examine the data for each pool but then decided that the development was not different enough to warrant projecting separately.

Break down the figures by class or not?
The data is made up of Public Liability on a claims occurring basis and Professional Indemnity on a claims made basis. The two could (should?) have significantly different development patterns but only one person thought to break the classes out.

Deciding on the split of data (and here there were two dimensions – class and pool) can often be a tricky play-off between the following factors:

- Having enough volume to be credible.
- Not making the process unmanageable by having too many classes.
- Separating out classes with different development patterns.

In practice it is often difficult to tell whether or not areas have different development patterns and you may well be having to take the decision when there is not enough evidence to be sure (eg a new area of business). The decision may also be forced upon you by management requiring results at a certain level.

Look at the data gross or net of excesses?
Very little thought was given to the data before the application of excesses. We will think about this later in the paper but ignoring the gross data may have missed some useful information.

What about numbers and average costs?
Again, insufficient thought was given as to whether a projection of numbers and average costs would be of value. And again, this may have missed some useful information.

What should you do about large claims?
Anyone who has looked at the initial broking information should have had an expectation of at least an occasional very large claim. Very little consideration was given to large claims at this stage of development. In fact the largest claim at this point was well under £0.5m. Without any large claims in the data it may have been sensible to add an explicit load for them.

How do you pick a tail factor?
As everybody used very similar methodology, a lot of the discrepancy between the answers was down to the selection of tail factors. The methods people used essentially boiled down to judgement (with the main influences being the 'expected' length of tail for this sort of business and the development thus far) and some sort of curve fitting.

There is no reason why factors should follow a smooth curve. But if you judgementally select some factors then it is likely that they will follow some sort of smoothed curve anyway, so you may as well let a parameterised curve do the work for you. Rather than fitting the curve over the whole data range, it may be more sensible to pick a curve that is at a similar level and slope as the latest development factors.

How do you calculate the 1st and 99th percentiles?

The various methods used to pick a range were:

- Judgement
- By judgementally varying the tail factor
- Bootstrapping
- Considering a coefficient of variation
- Using a lognormal distribution with a coefficient of variation benchmarked on the year of account.

Diary Entry – 4th December 2000

I finished coming up with some projections for the San Serriffe risk today. They were £27m for each of the first two years and £25m for 2000. It looks as if it is going to be even worse than what I thought when we priced it. Danny has been suggesting figures like £35m which Sandy is appalled at. He says we've got to convince him to lower his projections. We've got a meeting with him tomorrow. I thought we were paying them to give an independent view! I'm not sure how I should deal with this.

Diary Entry – 5th December 2000

It was quite a stormy meeting with Kingfisher. Sandy was busy dropping hints about the future of our contract with them. Danny was quite adamant that this is a bad contract. I went through my projections and said that I thought their tail factors were very high. In the end Danny said he would go and review their work and see if there was any wiggle room.

Diary Entry – 8th December 2000

Kingfisher have said they are going to lower their projections to £30m for each year. Sandy was still not happy but Danny was quite firm that it was as far as he was prepared to go.

Diary Entry – 8th November 2002

It's that time of year again! Sandy wants me to look at the San Serriffe projections again. The man who looks after the risk for the broker in San Serriffe is coming in on Monday to talk about what is going on.

Diary Entry – 11th November 2002

The broker spent a long time going through how the legal environment has been changing in San Serriffe over the last few years. It looks as if it might explain a lot of the deterioration we've seen. It sounds as if they've really moved towards a compensation culture. But apparently legislation is being brought in that will help to discourage some claims and limit the size of the largest losses. This should affect all years and we should see some improvement in the figures.

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14. Changes in the legal environment

Over the past few years there have been a number of changes in attitude in San Serriffe:

- Communities have become much more litigious. They have started to have an expectation that the assertion of legal rights will lead to people being looked after. They have also developed an attitude that compensation can be claimed for almost anything. This has led to an increase in negligence claims and excessive claims inflation.
- Even saying 'sorry' is now perceived to be admitting liability!
- Courts have taken a much more lenient view of what constitutes negligence. For example, the influence of drugs or alcohol during an incident used to mean the defendant was not negligent.
- Courts giving much higher awards for bodily injury claims. The increases on such claims have far outstripped inflation.
- More variation in the outcome of cases. This has led to more speculative claims as people hope they might get lucky.

These changes have been compounded by lawyers taking on cases on a no-win no-fee basis thereby encouraging even more claims.

In addition to these changes in attitude, recent years have seen San Serriffe experience some very severe weather. This meant that the local authorities could not maintain all the recreation facilities adequately. In addition, road surfaces were damaged by the adverse weather. This all resulted in an increase in accidents and thus public liability claims.

Why has Ken not found out about these changes before now? This highlights the potential problems you might have by being remote to a risk and not having full control of the claims.

Legislation has been proposed that would control the number of claims and the cost of claims so the situation should quickly improve. For example it proposes:

- Caps on various heads of damage
- Minimum levels of damage before being able to sue
- Curbs on advertising by lawyers
- Lawyers having to pay the costs for spurious claims.

Any changes would apply to existing claims back to the beginning of 2002.

This provides some explanation as to why the experience so far has been much worse than the original placing information suggested. But what should Ken do with this information now?

At the moment the legislation has not been passed so he is probably wise to do nothing. Assuming something happens in time to affect the years that Be Sure! are covering then Ken would need to examine the details of the legislation and try to work out what the results might be. For example:

- He might expect fewer new claims
- The average cost of new claims might drop
- There might be some reduction in the incurred cost of existing claims
- Some existing claims might not be pursued.

Factoring any changes into the projections would be incredibly judgemental and difficult. In one sense the ideal solution might be to make no changes and then adjust the ultimates based on the emerging experience. However, given the situation Ken is in, it seems likely that he will come under a lot of pressure to make some reductions straight away.

Diary Entry – 13th November 2002

I decided to look at the San Serriffe data before the application of the excesses today to see if that was any help in projecting the ultimate position. Whilst I was doing it I noticed that there seems to be something odd going on with the data on one of the pools. I can't quite work out what is happening so I've e-mailed the broker. I'm a bit concerned that they are not applying the deductibles properly.

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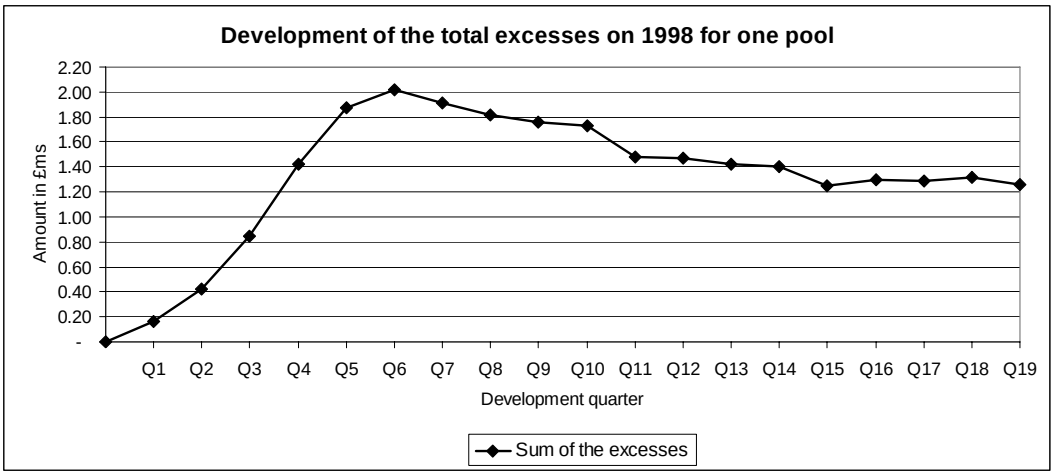
15. A data issue regarding deductibles

The following graph shows the total value of the excesses at each quarter for the first underwriting year on one of the pools.



As you would expect, the total value of the excesses increases over the first 18 months as new claims are notified. But this reaches a peak and the value of the excesses then drops away, losing about 30% of the peak value. The concern for Ken would be that excesses are being removed from claims. Be Sure! would then be paying too much.

From examining individual claims and after liaising with the broker, it turns out there are two different things going on.

The first is that when a claim is settled below the excess then the value of the excess is reduced to that settlement value. For example, consider the following claim:

	1998 q1	1998 q2	1998 q3	1998 q4
Gross Paid	0	1,645	1,645	1,645
Gross Incurred	11,250	11,499	1,645	1,645
Excess	3,750	3,750	1,645	1,645
Net Paid	0	0	0	0
Net Incurred	7,500	7,749	0	0

The excess is initially input as £3,750 but when the claim settles at £1,645 the excess is reduced to that amount. Although it is something to be aware of, it doesn't create any problems with the data either gross or net of the excesses.

The second issue is more problematic though. Consider the following claim:

	2000 q3	2000 q4	2001 q1	2001 q2
Gross Paid	8,235	8,548	22,178	22,178
Gross Incurred	15,000	30,000	22,178	22,178
Excess	3,750	3,750	0	0
Net Paid	4,485	4,798	22,178	22,178
Net Incurred	11,250	26,250	22,178	22,178

When the claim is settled the excess has been set at zero. One possibility is that the excess was reviewed on settlement of the file and found to be incorrect. But this situation happens too often in the data for this to be the case. The correct explanation is that:

1. *If the damages claimed are below the excess then the insurer is not involved at all.*
2. *Where the damages claimed are greater than the excess but the claim settles below the excess (and greater than zero), then the Insurers pay all defence costs and the insured pays the settlement amount.*

The following illustrates the possibilities:

Claim	Damages claimed	Excess	Damages Settled	Costs Settled	Cost to insurer
1	12,000	5,000	0	7,000	7,000
2	3,000	5,000	0	6,000	0
3	6,000	5,000	4,000	7,000	7,000
4	3,000	5,000	4,000	6,000	0
5	4,000	5,000	6,000	7,000	8,000
6	8,000	5,000	8,000	6,000	9,000

So in the example above, the paid of £22,178 was all fees and there were no damages paid. This meant that Be Sure! paid all the money and the insured paid nothing.

There are a number of issues with this sort of arrangement:

- It is impossible to verify the figures unless you know what the damages claimed are.
- It looks like it could be open to abuse – at what point are the damages claimed fixed? Might there be situations where it would be in the insured's interests to overstate the damages claimed?
- The recorded excess could be misleading but you don't find out until the claim settles.

As long as the claims are dealt with consistently in this fashion, and the damages claimed are fixed in a consistent way over time, then this shouldn't cause a great problem for the projections. However, it you were not aware of it then it could cause you problems (for example if a you applied development factors from one pool to another pool or if you projected gross of excesses and then netted down the answer). It seems strange that the existence of this way of dealing with claims took so long to emerge. Maybe if Ken had more experience or was working more closely with someone who did, he may have discovered it earlier.

Diary Entry – 20th November 2002

My projections for San Serriffe are now £35m for each year. This is quite a large change on when I last did them. Sandy threw a wobbly – he wanted to know how I could have got the projections so wrong last time and how I could now be coming up with figures now that were outside my ranges from last time.

Diary Entry – 25th November 2002

Danny is coming up with figures of about £45m a year. Sandy has been looking very worried and has spent a lot of time in discussions with people over the last few days.

Diary Entry – 4th December 2002

I can't believe it, Be Sure! are making me redundant. They are talking about having to cut costs given the scale of some of the losses they are experiencing and an actuarial team for pricing is a luxury Sandy says he can't afford.

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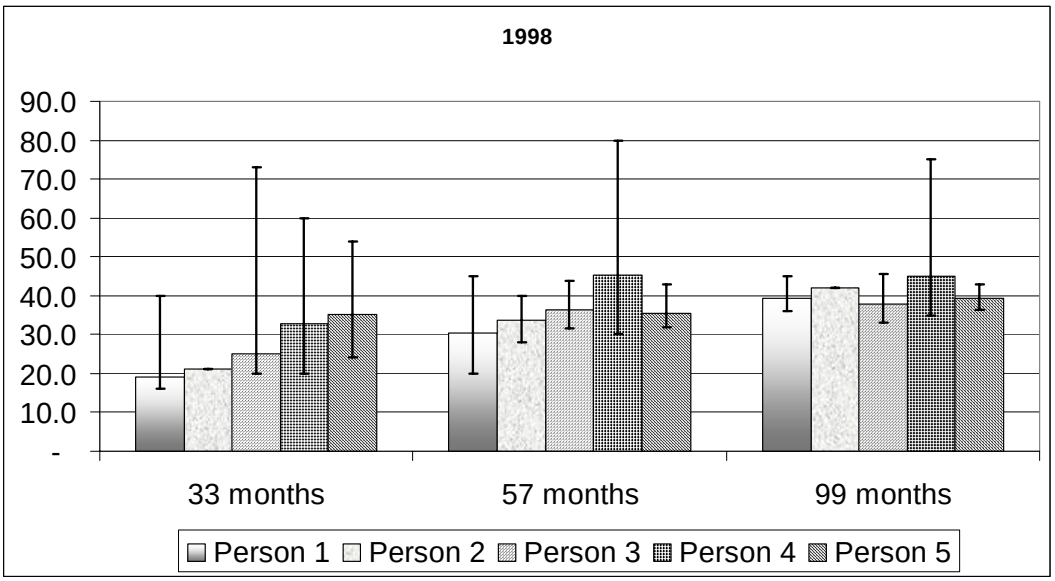
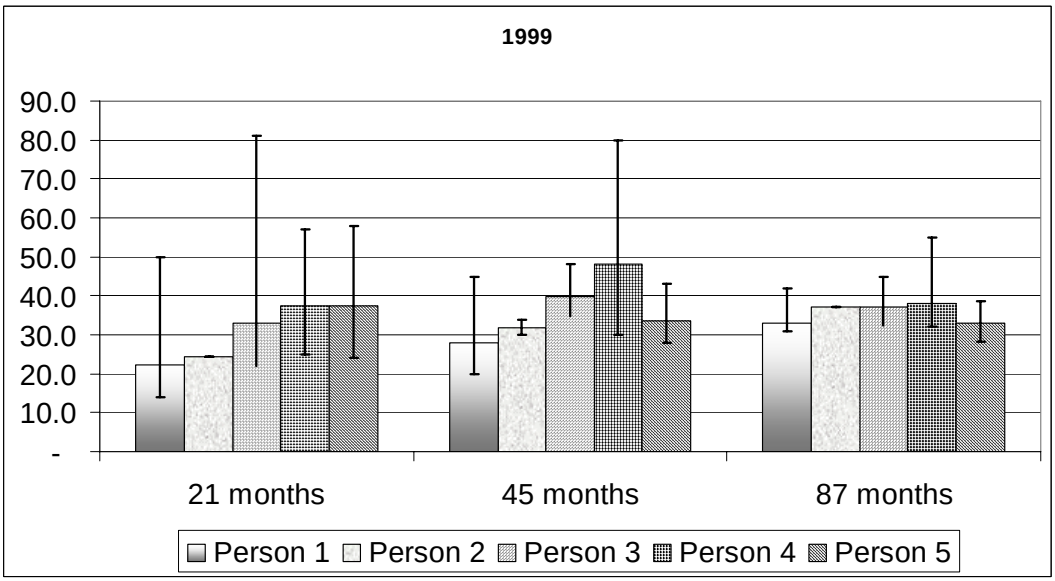
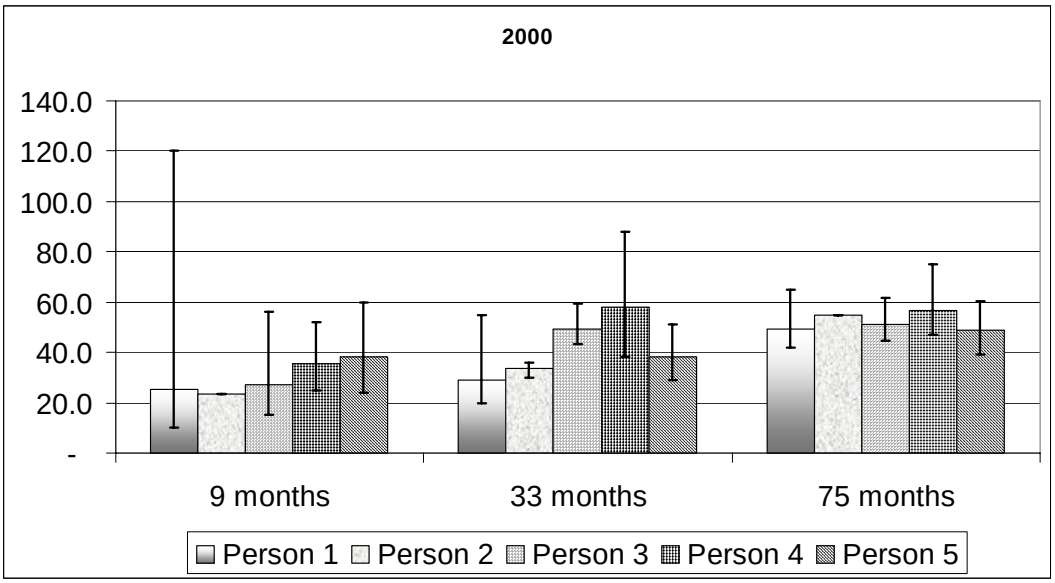
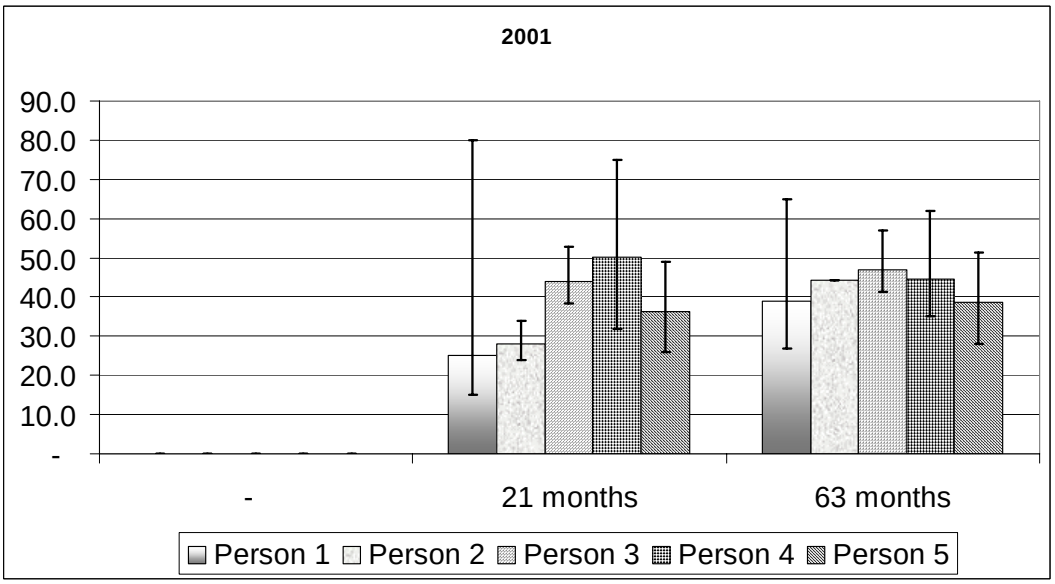
16. The latest data, projections and ranges

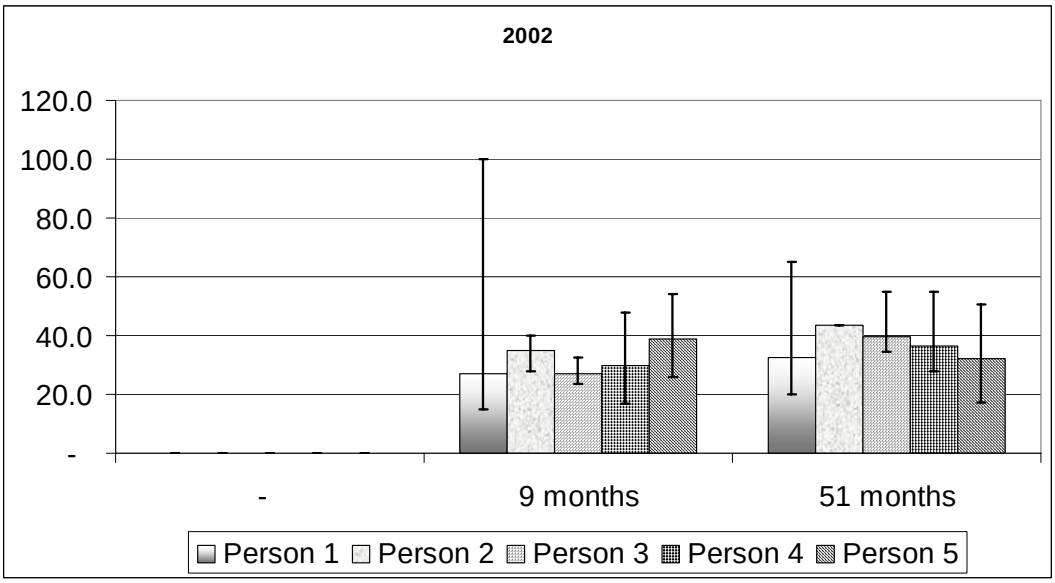
As well as projecting the data at the third quarter 2000 and the third quarter 2002 we also projected the latest set of data (first quarter 2006). The following series of graphs compare the projections between people for each underwriting year:






2000
140.0
120.0
100.0
80.0
60.0
40.0
20.0
-
9 months
33 months
75 months
Person 1
Person 2
Person 3
Person 4
Person 5


2001
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
-
-
21 months
63 months
Person 1
Person 2
Person 3
Person 4
Person 5



We have a number of observations from these graphs:

- People tended to underestimate the ultimate in each of the first two sets of projections sometimes by quite a significant amount!
- There was a big discrepancy between people in the first set of projections but (other than for 2002) the answers generally converged by the latest set of data. For example, on 1998 the highest less the lowest projection was £16m after 33 months but had reduced to £7.1m after 99 months. The answers may not have been converging to the right answer but they were at least converging. [As an aside, have you ever seen an underwriting year of any class ever actually reach the 'ultimate' position? Or have we always moved on by that stage or aggregated the class in with something else?]
- Generally speaking, a person who gave a low answer always gave a low answer (and similarly with high answers). One notable exception to this is person 5 who didn't seem to recognize that things were going wrong in the second set of projections. Their second set of ultimates showed very little change from the first set where as for other people there was a significant increase.
- As you would expect, the range of uncertainty tended to narrow as we went further through the development.
- There were quite a number of places where somebody had a range in the second set of projections that did not include the best estimate from the first set of projections.
- There were places where the best estimate of one person fell outside the range of another person.
- People came up with some very different sized ranges.

We can then apply these observations in a number of areas.

Communicating uncertainty

Whilst we were more familiar with estimating uncertainty for whole classes of business or for total reserves, it is quite difficult to bring this knowledge to bear on a single contract. Although with such a large contract as this one, it is possible to apply a distribution to the estimated ultimate claims or to the reserve element of the estimated ultimate claims. Indeed, this was one of the approaches taken. It is also possible to apply a bootstrap technique and this approach was also taken. Overall, it is not sensible to apply any technique without applying judgement to the situation.

Some members of the working party felt uncomfortable with giving such a range. In practice, it is reasonable for management to request such a view and almost impossible to avoid giving such a view, no matter how wide the range is or how uncertain the technique used for coming to that range is. One member of the working party initially refused to give a range and also said that if this were a real life example then he would tell their employer that they were unwilling to quantify the requested range. Whilst it could be viewed as lacking in professionalism to opine on a subject without detailed information and calibration, it is probably unrealistic to think that an employer would look kindly on anyone taking such an aggressive and apparently unhelpful stance. It is unlikely that anybody within an organisation is better placed than an actuary to give such an answer and it is unlikely that anybody is better placed to explain the problems associated with giving or interpreting such a range.

So, no matter how difficult it is to work out an uncertain figure or range, it is something that you will have to do at some point in your career – probably at many points in your career. All you can do is use your best judgement and try to employ your highly tuned communication skills. Whilst actuarial reports have their place, you should always take the opportunity to explain difficult issues face-to-face. Practically speaking, the people who make most use of internal actuarial reports are internal actuaries when they come to the next review date and external actuaries when they are reviewing the reserves. The time that actuarial reports are also useful is when things go wrong and you are looking to justify your actions to management or third parties who will have the wonderful benefit of hindsight.

Looking at the answers that we produced, it looks more like we produced something akin to a reasonable range of best estimates rather than a range covering 98 per cent of all possible outcomes. It is possible that we did this as we felt more uncomfortable giving a range that was so wide. Such a wide range might lead people to ask that if we were so uncertain of the final answer then how could we possibly have any confidence in our selected best estimate figure. This is a reasonable question but is more indicative of people's lack of understanding of how uncertain most things that actuaries do actually are. We should not shy away from explaining that the possible range of outcomes is immensely wide if this is the case. We have heard the suggestion that actuaries will sometimes underplay the uncertainty of their best estimate figure in order to ensure that management has confidence in what they are saying. This seems a dangerous thing to do.

Calculating uncertainty

As well as some of the observations mentioned earlier, there were a couple of instances where people's ranges did not overlap for a given underwriting year at a given point in time. It is quite interesting that two people looking at exactly the same data can be come up with such different answers and be so certain that the other is so very wrong.

GN12 now requires that uncertainty should normally be quantified. This exercise casts doubt on whether or not that is a sensible thing to have done for the following reasons:

- Do we have the tools and experience to do it well?
- Do we actually understand what we are trying to achieve?
- What are the people who read our reports going to say and think when we come up with vastly different answers to each other, or when our best estimate in a later period falls outside of our earlier range.
- Are we actually going to add any value by computing these ranges or are we going to end up setting such wide ranges that the man on the street could have done as well? [This point was nicely illustrated by Nick Dumbreck in his plenary address to GIRO last year. He projected the number of people attending Giro in 2031 and gave a range of uncertainty that ran from 15 to 10,000.]

When are we right? When are we wrong?

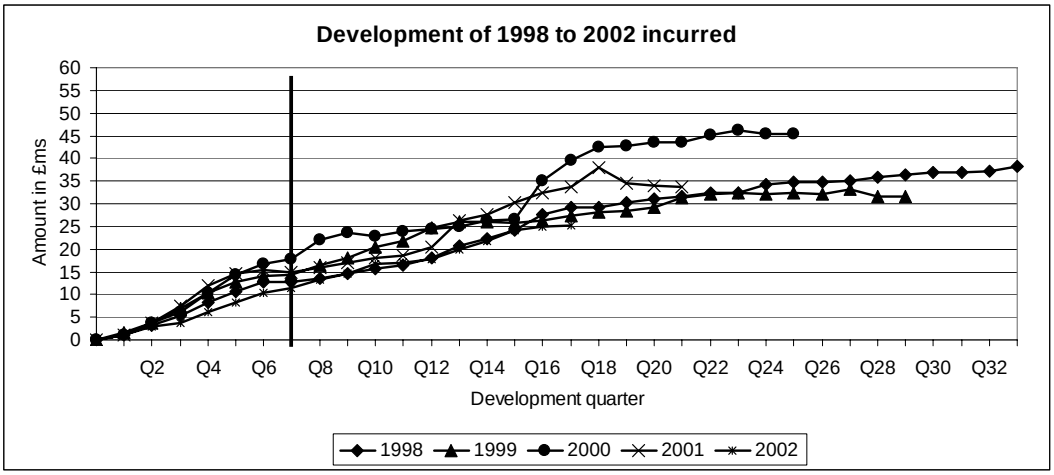
A point made by one of the members of the working party was that just because an individual underwriting year develops adversely against a given set of assumptions does not mean that those assumptions were at all 'incorrect' at the time. If we have applied sensible methodology and judgement to the information available at the time then in one sense we cannot be wrong.

It is only usually worthwhile doing a 'drains up' exercise on your previous best estimate if it proves to be materially incorrect – normally adversely. One test is to consider where within your previously assessed range of possible outcomes the current best estimate lies and to consider whether the claims experience on the class appears to be consistent with such a movement, either better or worse. A second test is to consider if there was anything you missed when you went through the information last time. To use more up-to-date information that simply has much worse claims experience to prove that your previous work was flawed is rather pointless, although this happens quite a lot.

Having thought through the adverse development, there are two opposing dangers in the way you might react. The first is to anchor to the original assumptions and the other is to have a knee-jerk reaction and assume that everything has gone pear-shaped. We suspect the first is more common than the second.

17. What went wrong?

We spent some time examining the data to see if we could find anything that would explain the deterioration in the incurred cost. After seven quarters of development the net (of excesses) incurred cost looked to be settling down on every one of the years. But it turns out that this was a lull before the storm.



The following table shows the current net incurred cost, the incurred cost after 7 quarters of development, the movement and the ratio of the two (all figures in £ms):

Year	Incurred after 7 quarters	Current Incurred	Movement	Net incurred cost development factor
1998	12.7	38.3	25.6	3.02
1999	14.5	31.6	17.1	2.19
2000	17.9	45.3	27.4	2.53
2001	14.9	33.8	18.9	2.26
2002	11.3	25.3	14.0	2.24

So the incurred on 1998 tripled and on all years it at least doubled. Whilst we wouldn't have expected the incurred to have stabilised after seven quarters, this does seem a remarkable level of development.

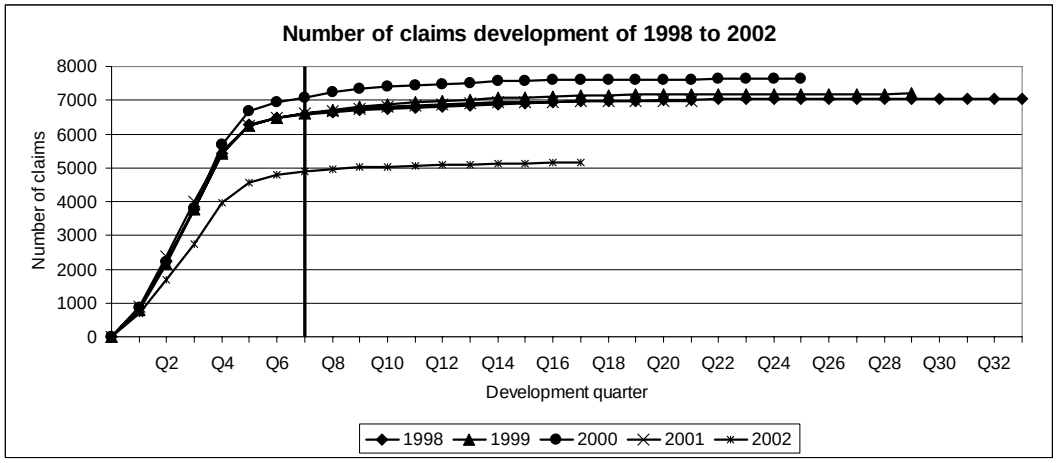
We wanted to see if there were lessons we could learn from the data. For example:

- Are there factors that Ken could have picked up early on that would have pointed to a possible problem?
- Could Ken have changed his methodology to do a better job of projecting an ultimate position?

We thought there were a number of dangers with trying to do this:

- We might end up with a conclusion along the lines of 'This is a list of X claims, all of which deteriorated quite a lot'.
- We end up spotting something that is peculiar to this case and would not make any difference to what we might do in the future (eg claims settling on a Tuesday follow an increasing geometric progression).
- We slice and dice the data to death.

Firstly we considered whether the deterioration was due to an influx of new, late notified claims. The following graph shows the development of the number of notified claims:



The development is amazingly consistent for 1998 to 2001 other than for 2000 between about 4 and 8 quarters of development. 2002 has quite a different pattern (which may be the legal changes taking affect).

What we can see clearly from the graph is that there is no great influx of late notified claims, so on the face of it, this does not provide an explanation for the deterioration in the incurred costs.

As the development is reasonably stable, would this have helped in some way with our projections? Looking at the data when each year has developed by 33 months and calculating the volume weighted average development factors gives the following:

q1 to q2	q2 to q3	q3 to q4	q4 to q5	q5 to q6	q6 to q7	q7 to q8	q8 to q9	q9 to q10	Q10 to q11
2.6197	1.7233	1.4575	1.1607	1.0348	1.0204	1.0166	1.0111	1.0093	1.0065

A tail factor could then be picked by judgement or by curve fitting. For example:

	q11 to q12	q12 to q13	q13 to q14	q14 to q15	q15 to q16	q16 to ult
Judgement	1.0055	1.0040	1.0030	1.0020	1.0010	1.0024
Exponential	1.0032	1.0020	1.0013	1.0008	1.0005	1.0009
Weibull	1.0027	1.0017	1.0010	1.0006	1.0004	1.0007
Power	1.0032	1.002	1.0013	1.0008	1.0005	1.0009
Sherman	1.0040	1.0029	1.0022	1.0017	1.0013	1.0062

These were fitted excluding the first three development factors (including the first three factors gave even lower results). [A good guide to curve fitting using these curves can be found in 'Claims Reserving working party Paper' by Graham Lyons et al.]

The following table compares the result of using these factors with the latest data (for 1998, 1999 and 2000 combined):

	Number at 33 months	Projected number at 2006 q1	Actual number at 2006 q1	Shortfall
Judgement	21,168	21,550	21,867	317
Exponential	21,168	21,350	21,867	517
Weibull	21,168	21,318	21,867	549
Power	21,168	21,356	21,867	511
Sherman	21,168	21,544	21,867	323

Even with the fairly well behaved data, curve fitting underestimates the tail by a significant amount. Fitting a Sherman curve gave a similar answer to judgementally picking factors but even these two methods underestimated by about 45%.

This raises a number of questions:

- Are these curves suitable for this sort of use?
- Should we use curves that have a much fatter tail?
- How good are we at picking a tail by judgement?
- Would we tend to underestimate it?

Perhaps this is an area where we can improve our methodology.

Coming back to the reason for the deterioration in the incurred cost, as well as looking at the number of later notifications, we also need to consider the cost of late notified claims. There are two opposing thoughts on the average cost of late notified claims compared to those notified earlier on:

1. Late notified claims tend to be larger in value because people will only make claims later on if they are significant.
2. Larger claims are more serious and so get notified earlier on.

The following table shows the average cost of claims notified in the first seven quarters and all notifications after seven quarters. We've used the latest data to calculate the averages and they are net of excesses. We've capped large claims at £1m:

Notified in	1998	1999	2000	2001	2002
Quarters 1 to 7	3,852	3,222	3,560	3,496	3,812
After quarter 7	26,408	17,520	25,995	23,713	23,968

There is a huge discrepancy between the averages on all years. Other than 1999 the pattern is pretty consistent. So on this risk it is definitely the large claims that are notified later on. Although there were not huge numbers of claims notified after 7 quarters of development, there was nevertheless a significant cost to them. This gives us part of the explanation as to why the incurred cost increased by such large amounts.

Investigating this further the first thing we noticed was that some of the late notified claims were Professional Indemnity. This is odd because PI claims were supposed to be on a claims made basis and therefore they should be notified within an account year. The following table shows the number of claims notified after the end of an account year:

Class	Notified within the year	Notified after the end of the year
PI	706	265
PL	25,277	7,751

The number of such claim – 265, was not insignificant. We dug deeper into the data and discovered that many of the late PI claims didn't seem to be PI claims at all! We found several loss descriptions on PI claims that were similar to the following examples:

- Child walked into plate glass door exiting premise
- Claimant lost control of his motor vehicle and ran off the road and struck a tree
- PI - Claimant fell off a ramp that did not have hand rails
- PI - father died in motor accident due to sharp edges of guard rail.

So perhaps the late PI claims weren't PI claims? More likely they were miscoded public liability claims.

As for the remainder of the late PI claims, we can find no substantive reason as to why they were reported after the end of the account year. We checked into the policy wording to see if there were any endorsements, extensions or wording changes and there were not. We also investigated the idea that claims were notified to the broker and the broker sat on them. However, it is fairly clear in the policy that claims had to be notified to the insurer during the account year.

We do know that there was a law change in San Serriffe toward the end of the five years that the account was inforce. This might explain a few of the claims being late (eg claims which were previously rejected before the law change have since re-opened.) However, we could not explain the rest.

The following table shows the number of claims notified more than seven quarters since the start of each underwriting year:

Pool	Total number of claims	Late notified	Proportion late notified
B	2,890	925	32%
C	17,450	2,900	17%
D	8,198	1,818	22%
E	5,461	1,200	22%
Total	33,999	6,843	20%

Rather a large proportion of the Pool B claims were notified late. The pool could have had issues with the claims reporting process that affected it more than the others. We note that it is the smallest pool with only 2,890 claims. We speculate that perhaps the municipalities in this pool were less familiar with the process of reporting claims, as they didn't have as many to report. Or perhaps the municipalities in Pool B were smaller and didn't have sufficient staff (i.e. a risk manager) to handle the process. If this trend had been spotted earlier on then action could have been taken to improve the reporting process.

We also looked at what was going on by the type of injury sustained. 53% of claims did not have an injury specified. The following table shows the claims that did. The average cost is gross of excesses and individual claims have been capped at £1m:

Injury	Total number of claims	Number notified late	% Notified late	Average cost of not late claims	Average cost of late claims	% Change in average cost
No injury	8,516	1,811	21%	2,287	2,205	-4%
Fractures	1,862	597	32%	14,938	21,931	47%
Other injuries	1,682	149	9%	8,034	17,195	114%
Sprains and strains	1,383	379	27%	7,851	7,300	-7%
Multiple injuries	598	207	35%	18,944	38,807	105%
Bruise/contusion	518	93	18%	4,253	6,344	49%
Lacerations	331	48	15%	4,035	11,695	190%
Superficial injury	331	96	29%	627	333	-47%
Open wound	167	44	26%	8,334	14,048	69%
Fatality	85	22	26%	42,045	75,988	81%
Dental	79	16	20%	6,929	1,511	-78%
Intracranial/concussed	53	19	36%	16,057	45,438	183%
Burns	37	11	30%	16,058	3,068	-81%
Dislocation	35	10	29%	34,845	17,421	-50%
Mental disorders	31	11	35%	86,060	87,418	2%
Exposure	31	21	68%	24,119	13,226	-45%
Amputation	18	9	50%	4,878	62,064	1172%
Disc protrusion	15	4	27%	68,367	70,800	4%
Brain damage	12	6	50%	365,392	175,515	-52%
Poisoning	11	2	18%	12,215	87,375	615%
Quadriplegic	11	5	45%	481,090	651,456	35%
Internal chest injury	8	4	50%	2,999	29,809	894%
Paraplegic	7	5	71%	513,701	640,413	25%
Respiratory disease	6	1	17%	1,565	11,573	639%
Circulatory system	4	3	75%	0	0	-
Loss of eye/eyes	3	1	33%	42,501	15,502	-64%
Foreign body	2	1	50%	8,473	37,500	343%
Loss of hearing	2	1	50%	637,500	86,203	-86%
Tetraplegic	2	1	50%	0	75,000	-
Hernia	1	0	0%	0	0	-
Ulcers & gastritis	1	0	0%	7,435	0	-
Sexual assault	1	1	100%	0	112,500	-

Some observations from this data are:

- For injuries above the thick black line (about mid-way through the table), the proportion notified late is typically between 20% and 35%. For injuries in the bottom half of the table, it is typically around 50% or higher. Injuries in the latter half of the table tend to be the more serious ones (although some in the top half will be more serious than others eg some of the fractures). So more serious injuries are more likely to be notified later. This helps to explain why the average cost of late notified claims is so much higher than the claims notified early on.
- There are quite a number of very serious claims that are notified late on (eg 6 brain injuries and 11 involving some level of paralysis). On the face of it this seems quite surprising.
- There is no clear pattern to the percentage change in the average costs. The average cost increases quite a lot on some more serious injuries (eg amputations) but decreases on others (eg brain damage).
- 54% of the claims did not involve an injury and the cost of those claims was pretty consistent between the early and late notifications.
- There were a lot of fracture claims and it looks as if the more serious ones (ie those with a higher average cost) tended to be notified late. The 597 claims had an average cost £7k above the early claims – a total additional cost of £4.2m.

Moving on from late notified claims, some of the deterioration can be put down to individual new large claims or large movements. We considered a claim of over £1m to be large and the following table shows the value of the part of the movement or new claim over £1m compared to the total movement for each year:

Year	Total movement in incurred	Movements on claims over £1m	As a proportion of the total
1998	25.6	0.5	1.8%
1999	17.1	0.0	0.0%
2000	27.4	6.0	22.0%
2001	18.9	1.8	9.7%
2002	14.0	0.3	2.4%

Only on 2000 have large movements had a significant effect. Even then, they account for less than a quarter of the overall movement.

Having looked at new claims and large movements (on new and existing claims), the balance of the deterioration was non-large movements on claims already notified after seven quarters. The following table summarises the breakdown of the movement into each of these categories:

Year	Total movement in incurred	Movement due to new claims		Large movements/ new claims		Non-large movements	
1998	25.6	12.3	48%	0.5	2%	12.9	50%
1999	17.1	10.3	60%	0.0	0%	6.8	40%
2000	27.4	14.0	51%	6.0	22%	7.4	27%
2001	18.9	8.6	46%	1.8	10%	8.4	45%
2002	14.0	6.3	45%	0.3	2%	7.4	52%

Around half of the deterioration in the incurred claims comes from new claims with the other half from non-large movements on existing claims. On the face of it this suggests a case of massive under-reserving after seven quarters with the incurred deteriorating by between 40% and 100% subsequently. The following table shows the number of claims that reduced, stayed the same or increased between the two dates:

Year	Reduced	Stayed the same	Increased
1998	1,110	5,037	438
1999	1,092	5,126	383
2000	1,354	5,378	356
2001	875	5,430	313
2002	584	4,111	192

The majority of claims remained unchanged in value and over twice as many claims reduced in value than increased in value. The problem came from the relative value of the increases and the decreases:

Year	Value of reductions	Value of increases
1998	(6.1)	19.0
1999	(6.9)	13.8
2000	(9.5)	16.9
2001	(7.3)	15.7
2002	(4.2)	11.6

The cost of the increase in the claims was far higher than the value gained from the reductions. Looking at what happened gross of the excess sheds some light on this. Firstly looking at the number of movements:

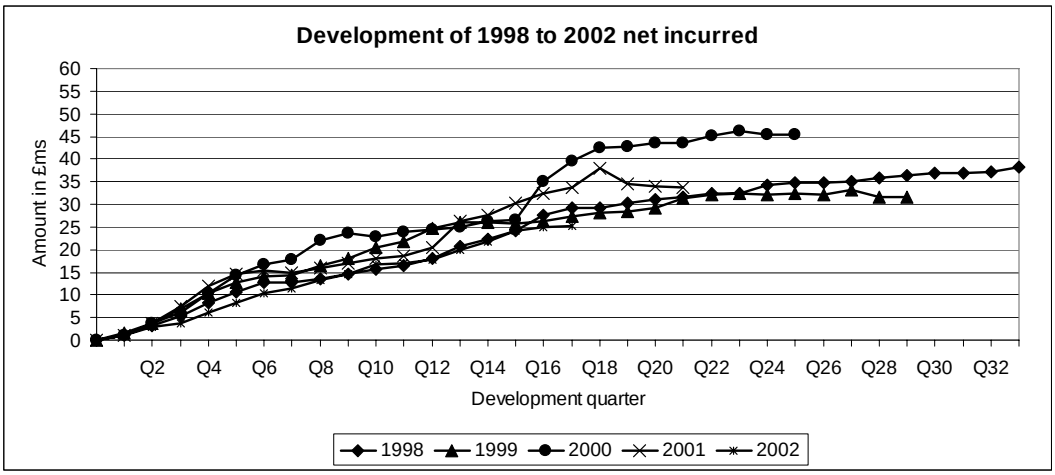
Year	Reduced	Stayed the same	Increased
1998	2,315	3,798	472
1999	2,488	3,659	454
2000	3,056	3,617	415
2001	2,128	4,114	376
2002	1,223	3,446	218

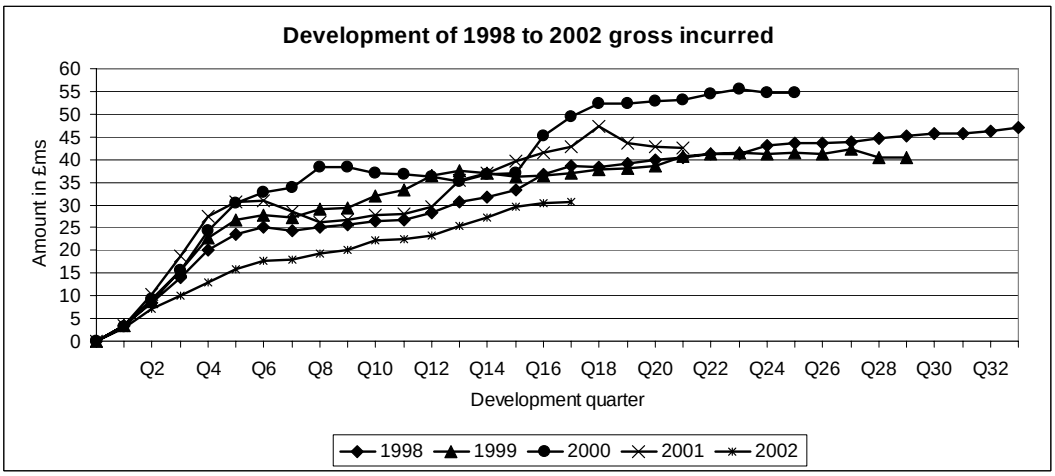
The number of claims that increased is reasonably similar to the numbers net of the excesses. But far more claims reduced in gross value than in net value. The next table shows the value of the changes gross of excesses:

Year	Value of reductions	Value of increases	Total
1998	(12.3)	19.9	7.6
1999	(13.9)	14.6	0.7
2000	(19.2)	17.6	(1.6)
2001	(14.6)	16.7	2.1
2002	(7.4)	12.3	4.9

Over 1999 to 2001 in particular the reserving was actually pretty reliable. What appears to be happening is that a lot of claims below the excess are reducing by small amounts while the claims that increased did so by quite large amounts. Gross of excesses the two offset each other to a large degree but because a large proportion of the reductions are within the excess this leads to quite a large deterioration net of excesses.

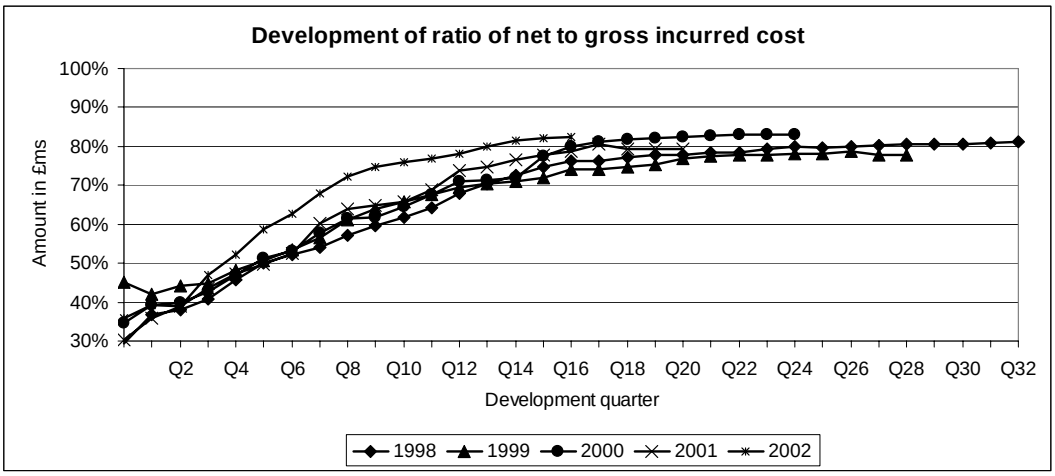
The other implication of this is that the gross incurred development has less of a tail than the net. The following graphs show the development of the net incurred claims (again) and then the gross so that the two can be compared:





The gross incurred cost does develop quicker than the net to start with but then levels off for a period before then deteriorating again. Across 1998 to 2001 the incurred between 6 and 11 quarters increased by just £8.1m but from 11 quarters onwards increased by £60m. So projecting the gross incurred rather than the net would probably not have helped – the flatter development between quarters 6 and 11 would probably have led to the selection of tail factors that were far too low.

The graph of the net to gross incurred ratios is shown below:



Other than 2002, the development is reasonably consistent across the years. On all years it looks to be settling on a figure of around 80% - a lot higher than the ratio in the earlier periods of development.

The deterioration in the ratios is fairly linear up to about 12 quarters of development, so if this data had been examined it would have indicated that there was an issue.

By examining the data we have reached some conclusions as to why the net incurred cost increased so much between 7 quarters of development and the latest position. In summary, there are two main reasons:

1. A greater number of new claims than expected (not quite so significant) with a very high average cost (much more significant).
2. A significant deterioration in the net to gross ratio or lots of claims decreasing by small amounts being more than offset by a few claims increasing by large amounts.

Large individual claim movements also had some affect.

Whilst this analysis might have thrown out some interesting features of the data, we need to ask the question 'So what?'. The following points are some warnings, lessons we can learn and ideas:

Projecting the number of claims

Do the distributions we might commonly use to fit a tail give a large enough answer? Maybe we need to include in our toolkit something that gives a larger tail.

We shouldn't be lulled into a false sense of security by a 'nice' looking development pattern.

Selecting average costs

Looking at the development of the average costs might tell you something useful. How much you gain from doing this might depend on exactly how you look at them. For example, consider the data in the following table (as at the third quarter 2000 – our first reserving point). It shows the average cost of claims notified in each quarter but using the incurred cost at 2000 q3 of those claims

	Average notified cost using the current incurred		
	1998	**1999**	**2000**
Q1	1,311	2,099	1,622
Q2	1,518	1,891	1,720
Q3	2,006	1,683	1,499
Q4	1,820	1,927	
Q5	3,017	2,779	
Q6	5,465	5,944	
Q7	11,066	5,465	
Q8	10,643		
Q9	13,890		
Q10	10,586		
Q11	6,626		

There is a strong upward trend in the averages for the first two underwriting years. If you were wanting to make assumptions about the average cost of late notified claims then you would want to understand this trend and project it forward.

Had you just looked at the cumulative incurred cost divided by the total number of notified claims at each point in time then it would have been a little less obvious what was going on. The average would move due to both newly reported claims and development of existing claims.

Another example of where you might need to do this sort of analysis would be in projecting commission. If the current commission ratio is 12% and the ultimate is 13%, then what does this imply about what the commission rate will be between now and ultimate? Is this a credible figure?

Beware of excesses

Excesses are significant on this risk. We have demonstrated that looking at both gross and net of the excesses can be useful. Just looking at the data one way could be misleading.

Using net to gross ratios

The net to gross ratio changed significantly over time. A common method of projecting net ultimate claims is to project gross and then use a net to gross ratio to give the net ultimate. We should consider how that ratio has changed over time rather than blindly selecting it at one point in time. (In this case the net and gross are of the excesses rather than the reinsurance but we think the point is still worth considering.)

Beware of a conservative reserving policy!

On 1998, between 7 quarters of development and the latest figures, 58% of claims kept the same value, 35% reduced in value and 7% increased in value. On the face of it the claims handlers could be commended for having a conservative reserving policy. But over the same period the incurred cost of the claims increased by £7.6m or 31% of the incurred after seven quarters. This doesn't look so good! Is it inevitable that some claims will increase by relatively large amounts?

Curve fitting

Slavish use of curve fitting can be dangerous. We need to use judgement when we are thinking about curve fitting. For example, applying a curve or a number of curves doesn't necessarily factor in information about the class of business – the curve doesn't know any better.

An alternative projection method?

Thinking through some of these issues leads to an alternative way of projecting to try and make better allowance for them. For example, you could think of the projection in three categories:

1. Pure IBNR
2. IBNER
3. A loading for large movements.

The pure IBNR could be assessed by:

- Projecting future claim numbers (taking care to select a fat enough tail)
- Look at the trend in average costs by notification quarter
- Project this forward to give an average cost for each future notification quarter
- Multiply the numbers and the average costs.

The IBNER could be calculated by:

- Judgementally allowing for some deterioration in the gross incurred cost for claims currently notified.
- Looking at the trend in the net to gross incurred ratio and projecting it forward.
- Applying the ultimate net to gross ratio to the ultimate gross cost for claims currently notified and deducting the current net incurred cost.

A judgemental loading for large claims could be added by thinking about the number and cost of large claims expected over a number of underwriting years.

We tried this approach for the 1998 to 2000 years based on the data at the third quarter 2000 (ie corresponding to the first set of projections we had done). The results were mixed. Comparing with the latest incurred position, the projection gave a very similar figure for 1999. But for 1998 and 2000 the projection still gave too low a figure. This was because the method underestimated the IBNER on 1998 and the IBNR on 2000. Compared to the other projections that members of the working party did, the ultimates were about two thirds of the way between the lowest and the highest figures.

This may seem an unsatisfactory outcome. You might be wondering why we've not got some method or trend from the data that gives us a much better answer. As we said right at the start of the paper, this is real data and it hasn't been manufactured to give the answers we want. This is real life and we don't always have all the answers. This is something we think that actuaries need to be more aware of and more prepared to say. Although we've not managed to come up with a magic method we think there has been plenty here to give food for thought.

18. Professional issues on reserving

When to change

A key professional issue is when you should change your ultimates and when you should stick with what you had from the previous exercise. We can think about this two ways:

- There will always be some level of volatility in the development of claims and depending on the projection method being used this could lead to a similar level of volatility in the ultimate. For example, consider the following development for one underwriting year:

Development year	Selected development factor	Incurred	Projected ultimate
1	1.250	80	126
2	1.100	95	119
3	1.060	107	122
4	1.040	119	128
5	1.020	123	127
6	1.010	124	126
7	1.005	125	126
8	1.000	126	126

The projected ultimate starts at 126 and finishes at 126. In between it ranges from 119 to 128 though. You could stick with an ultimate of 126 all the way through or move according to the actual ultimate.

- But suppose the actuary stayed with the initial projected ultimate of 126 but then development unfolded as follows:

Development year	Selected development factor	Incurred	Projected ultimate
1	1.250	80	126
2	1.100	95	126
3	1.060	102	126
4	1.040	107	126
5	1.020	110	126
6	1.010	112	126
7	1.005	113	126
8	1.000	114	126

  The ultimate ends up a long way below the projected ultimate. At what point should the actuary have moved away from the original projection?

This is where our actuarial judgement comes in! Anchoring to an older estimate is fine, as long as we are aware of it and keep on calibrating it.

When to change becomes more important when things are going wrong and critical when feeding back into pricing.

One particular circumstance when it can be hard to face a change is when the development eats up all the tail you had previously allowed. If you add another tail factor on then you are taking a double hit in one go but if you leave it and the figures deteriorate again then you have a continuing drift out of your projection.

Dealing with and communicating change

In many ways the first example on the previous page is easiest to deal with. The actuary would make relatively small adjustments each year and they would be fairly easy to explain away in terms of experience. The second example would require a large change at some point that couldn't be put down to experience in just the previous year and is therefore much harder to explain.

It can be tempting to hide a change in view by putting it down to differences between actual and expected development. Perhaps we need to be more prepared to be open and honest, and clearer at explaining changes. It may help others to understand projections and the volatility in them.

Understanding the risk

When you are remote to the risk then it makes it very difficult to get a handle on whether there have been any changes in things like:

- The reserving philosophy for individual claims
- IT issues
- Processing backlogs
- What the local authorities were doing
- The legal environment.

Can we actually do the reserving (or pricing) without knowing these things? Yes we can, but how good will it be? Without actually visiting the location, experiencing what is going on and asking the right people the right questions, it is pretty difficult to get a handle on the first three. There would be alternative ways of finding out about the last two and maybe Ken should have found a way to do so.

Interaction with external actuaries

How common is it for internal actuaries to be involved in trying to influence the views of external actuaries? We suspect it is not uncommon. What should Ken have done when he was asked to do this? What are the boundaries over which we should not step?

On the one hand, the internal actuary will usually be in a position of having a greater level of knowledge about the actual risks and claims, and if the company really believes its position then it is reasonable for the company, including the internal actuary, to put across the evidence and defend its position. It is up to the external actuaries to assess this information, decide how much credibility to give it and to seek out information that may not support the company's position.

On the other hand, you could consider that the external actuaries are being paid to come up with an independent view and so should not be influenced by the views of the internal actuary. Therefore perhaps there should be minimal interaction between them. The danger with this is that the external actuaries are not given crucial information or the internal actuary is not made aware of market knowledge or useful insights that the external actuaries might have.

Sensible middle ground may be to provide the external actuaries with factual information whilst not seeking to influence them one way or another. But it is difficult to do this in a way where the information is not biased one way or another. Working out how to play this sort of situation is made far more difficult if the internal actuary is at odds with those running the company as was the case for Ken.

The conduct of consultants

How frequently do consultants 'revisit' their figures to come up with something that is more acceptable to the client? Again, we think this is not a rare event. But can it be acceptable? There will usually be a range in which you consider that a best estimate should fall. Sometimes that range might be quite large. As long as you end up with an answer in this range and it is justifiable then does that make it okay?

The tempting answer to this is to say that if the actuary can come away with a clean conscience then it is acceptable. But is one's conscience perhaps too easily corruptible?

Final Thoughts

19. Final thoughts

The following are some final thoughts that didn't particularly fit elsewhere:

Something for everybody
As a result of the working party discussions one member of the working party has taken some action on an area that he felt uneasy about – even though the numbers were not giving cause for concern. We hope that in this paper there will be something for everyone who reads it, something that would be of use either now or in the future to stop them going the same way as Ken!

Long term contracts
You should be very wary of writing long-term contracts. At least some of the pain may have been prevented if Be Sure! had been able to cancel the risk after each year of cover. You should always ask yourself why the broker and/or client wants a long-term deal. Often it will be to take advantage of an insurer. Multi-year deals are much more common in a soft market.

The combination of casualty business, written on an occurrence basis in a long-term contract is about as bad (or as hard to work with) as it comes. We were split over which of the three characteristics was the worst.

The combination of pricing and reserving
If the same person does the pricing and the reserving there are a number of dangers:

- When doing the reserving there will be a temptation (consciously or sub-consciously) to anchor the projections to the pricing or business plan figures. This is possibly more likely (and certainly more damaging) when the risk or class is loss making.
- If there are problems starting to emerge with the class or risk then there may be a temptation to explain them away to start with.

Over-worked?
Are actuaries over-worked? Do we have enough time to look at all we need to? If we don't have the time to examine data in depth and research things thoroughly then by the time we realise there is a problem it may be too late. Do we too easily apply our usual methodology (ie an incurred chainladder)?

Diary Entry – 20th December 2002

I've got a job offer at last! Kingfisher Consultancy is offering me a huge increase on what I was getting at Be Sure! I think a consultancy will suit me much better.

And finally….

So, there you have it, a cautionary tale or just one of those things?

Ken had some useful things to offer but didn't get his message across to an unsympathetic audience. Should Ken have been more vociferous in his discussions or should Jane and Sandy have been more open-minded? As ever, the answer is almost certainly somewhere in the middle.

What do you think Ken's mistakes were? What could or should he have done differently? Have you encountered similar problems in your jobs? If so, how did you react and did you get a better result than Ken? Should we all just go and work in the safe and apparently well-paid world of consultancy?

Needless to say that Ken learned from this fairly harsh experience. He now knew for sure that if it looks like a loss making, long tailed account and develops like a loss-making, long tailed account, you can be reasonably sure it is a loss making, long tailed account. His youthful enthusiasm was tarnished by the brush of bitter experience. However, having lived through this it made him a better actuary than he previously was and he would never go hungry again.