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PROCEEDINGS

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ACCIDENT LIMITATIONS FOR RETROSPECTIVE RATING

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The need for changes in retrospective rating plan accident limitation charges has been apparent for some time.

This paper describes recently adopted recommendations of the National Council on Compensation Insurance for developing such charges. The charges for accident limitations are familiarly known as Excess Loss Premium Factors or ELPF's. They are percentages of standard earned premium which are paid by the policyholder in lieu of his being charged for losses above a selected limit per accident. These charges also vary by industry grouping (hazard groups) to reflect the differences in expected frequency density and size of claim.

About 25 years ago, a system was developed for calculating ELPF's[1]. To Dunbar Uhthoff's great credit, this system has withstood the test of time for most of the 25 years. However, the accelerating impetus of inflation has brought about many qualitative and quantitative changes in insurance. The basic forces at work are:

a. Monetary inflation (the decreasing purchasing power of the accident limitation).

b. Loss development (greater development on more severe injuries).

c. Removal of benefit limitations.

d. Relatively higher medical cost inflation versus indemnity benefit inflation, increasing the spread of the claim size distribution.

[1] D. Uhthoff, "Excess Loss Ratios via Loss Distributions," *PCAS*, Vol. XXXVII, (1950), p. 82ff.

Both frequency of claims and average claim costs have been seriously affected. In particular, claim costs have risen significantly with the dramatic rise in average weekly wages, medical costs and benefits afforded by workers' compensation laws. As an illustration, countrywide average weekly wages during the first six months of 1950 were $52.51 compared with $175.34 for the same period in 1975[2]. Average claim costs for death cases are $97,024 (Illinois) on 1975 benefit levels compared to $3,967 (Illinois) which was used in the 1950 paper.

Since that time, many states which had previously limited the maximum dollar amount payable for such claims have enacted laws which provide lifetime benefits with significantly higher costs. Changes of such magnitude are bound to affect distributions of extreme values. Because charges for accident limitations represent costs which are intended to cover (on the average) amounts in excess of selected limitations, it follows that inflation will shift larger percentages of the total cost over to the higher end of the distribution.

The shift, wherein greater percentages of total cost have been transferred to the higher end of the scale, has been feared and known for some time. Newer tables which reflect the shift were needed. Documentation of the changes in distribution of cost was accomplished by digging into the customary reports used by the National Council on Compensation Insurance for ratemaking. The information was not in readily usable form[3] and revisions of developed individual reports were required for purposes of this study. The need for mature reports is apparent in light of the substantial development of average cost per claim at successive reports. For example, in the state of Connecticut, permanent total average cost per claim for policy year 1969-70[4] was $87,348 at first report, $95,047 at second report and $121,432 at third report.

The program for updating distributions by size of claim called for the use of fourth reports for each of the serious loss categories of fatal, permanent total and major permanent partial injuries. Serious loss categories were used because these are the ones which are likely to result in individual claim costs in excess of the accident limit selected. Distributions as a ratio

[2] NCCI "Call for Wage Data for Injured Employees."

[3] Because normal ratemaking requires aggregate data for developments, such aggregates were captured without taking the time to guarantee that individual claim reports were included in the data base at developed amounts.

[4] Policies issued between August 1, 1969 through July 31, 1970.

of average cost were obtained for the medium or high benefit jurisdictions of Arkansas, Connecticut, District of Columbia, Maryland and Nebraska. By observing each jurisdiction in terms of that portion of cost which represented excess cost per case according to the intervals as a ratio to average, the problem of recognizing different benefit levels and different average costs per case in each of the jurisdictions was minimized. It then became possible to combine the excess cost per case for particular ratios to average. This combination was made based upon the total number of cases for the particular injury type in each of the jurisdictions considered (see Exhibits I-1 and II-1).

EXHIBIT I-1

FATAL—LIMITED

Ratio to Avg.	Excess Ratios			
	Maryland	Nebraska	Arkansas	Average*
.00	1.000	1.000	1.000	1.000
.25	.775	.776	.778	.776
.50	.591	.597	.607	.597
.75	.430	.439	.454	.440
1.00	.289	.300	.339	.308
1.25	.171	.181	.242	.196
1.50	.143	.131	.164	.147
1.75	.123	.124	.102	.116
2.00	.105	.117	.052	.090
2.25	.091	.110	.026	.073
2.50	.078	.103	.017	.063
2.75	.067	.096	.009	.054
3.00	.058	.089	.002	.046
3.25	.047	.082	.000	.039
3.50	.041	.075	.000	.034
Total Number of Claims	85	36	59	xxx

*Average excess ratios weighted by state's total number of claims

The combined results were plotted on semi-logarithmic graph paper and compared with the tables known as "Uhthoff's Tables" (see Exhibits I-3 and II-3). It immediately became apparent that the latter have become seriously out of date at the high end of the scale.

The graphic representation of data for permanent total cases showed a remarkable coincidence with the data for fatal limited cases. For this reason, it was decided to use the fatal limited tables for permanent total as well.

Unlimited fatal cases indicated much lower charges than did the table for limited fatal cases. Due to the paucity of unlimited fatal claims, and in the light of actual results, it was decided to apply the new table for limited fatal cases to the unlimited as well.

Since the values obtained by the averaging method described above were only calculated at each 25% of the average cost per claim, a method was needed to produce a complete table. The method of least squares was used in fitting various equations to the combined results (see Exhibits I-2 and II-2). Each fitted equation was required to produce a value of 1.000 for a zero ratio to average cost. For those selected equations which did not lend themselves to a true least squares analysis, both an approximate least squares method (utilizing logarithms) and a method of collocation were tried. Collocation involves the algebraic solution of the general equation such that the collocation equation thus obtained passes through selected values of the actual data[5]. This is an iterative technique; it was continued until the observed deviations were evenly spread over the entire distribution. The equations, which exhibited the minimum sum of squared differences, were then used to generate complete tables of excess ratios. Exhibits I-4 and II-4 contain the new values developed by the collocation method.

A committee of actuaries reviewed and approved the use of the newly developed tables. The tables will be utilized in conjunction with the current excess loss premium factor calculations[6] until such time as fourth reports of losses by type of injury become available. (See Appendix A for an example of these calculations). At this point, the calculation shall be modified to incorporate the use of estimated actual development by type of injury in lieu of the 1.6 factor which Uhthoff's procedure uses[7]. Detailed comparisons of results under Uhthoff's methods and the new method are described in Appendix A.

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[5] For a general description of collocation, see Stephen G. Kellison, *Fundamentals of Numerical Analysis*, Richard D. Irwin, Inc., (1975), p. 20ff.

[6] These are based upon an average of first and second reports, updated by law amendments.

[7] The factor is low in comparison with excess reinsurers' development factors based on actual experience:

EXHIBIT I-2
FATAL—LIMITED

EXCESS RATIOS

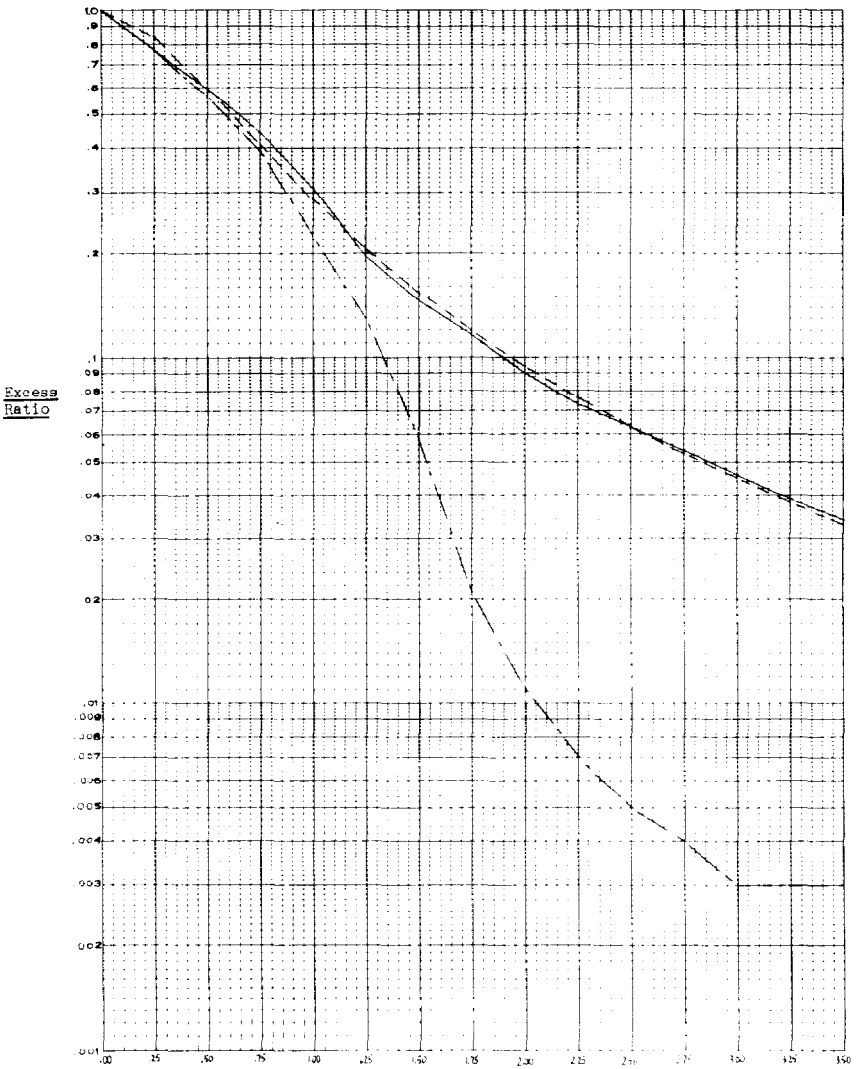
		CURVES FIT BY LEAST SQUARES CRITERION				
(x) Ratio to Avg.	(y) Actual*	$y' = (.342)^x$	$y' = .151x^2 - .779x + 1$	$y' = e^{.127x^2 - 1.417x}$	$y' = \frac{1}{1 + .185x + 2.310x^2}$	$y' = \frac{1}{1 - x + 3.883x^2 - .406x^3}$
.00	1.000	1.000	1.000	1.000	1.000	1.000
.25	.776	.765	.815	.707	.840	1.014
.50	.597	.585	.648	.508	.599	.704
.75	.440	.447	.501	.371	.410	.442
1.00	.308	.342	.372	.275	.286	.288
1.25	.196	.262	.262	.207	.207	.199
1.50	.147	.200	.171	.159	.154	.146
1.75	.116	.153	.099	.124	.119	.112
2.00	.090	.117	.046	.098	.094	.089
2.25	.073	.089	.012	.078	.076	.073
2.50	.063	.068	—.004	.064	.063	.061
2.75	.054	.052	.000	.053	.053	.052
3.00	.046	.040	.022	.045	.045	.045
3.25	.039	.031	.063	.038	.038	.040
3.50	.034	.023	.123	.033	.033	.036
$\frac{\Sigma \lvert y - y' \rvert}{n}$	xx	.020	.046	.021	.010	.026
$\frac{\Sigma (y - y')^2}{n}$	xx	.00749	.002620	.001264	.000379	.004569

*See Exhibit I-1 for derivation.

EXHIBIT I-3

FATAL - LIMITED

Comparison of Current, Observed and Proposed Excess Ratios



Current — — — — — — — —

Observed ————————

Proposed - - - - - - - - - - (Least squares fit of observed values: $y = \frac{1}{1 + .185 x + 2.310 x^2}$)

EXHIBIT I-4

FATAL CASES (LIMITED AMOUNT)*

Ratio To Aver.	Excess Per Case	Ratio To Aver.	Excess Per Case	Ratio To Aver.	Excess Per Case
0%	1.000	33	.762	66	.470
1	.998	34	.752	67	.463
2	.995	35	.742	68	.456
3	.992	36	.732	69	.449
4	.989	37	.722	70	.442
5	.985	38	.712	71	.436
6	.981	39	.702	72	.429
7	.976	40	.693	73	.423
8	.971	41	.683	74	.416
9	.966	42	.673	75	.410
10	.960	43	.664	76	.404
11	.954	44	.654	77	.398
12	.947	45	.645	78	.392
13	.941	46	.635	79	.386
14	.934	47	.626	80	.381
15	.926	48	.617	81	.375
16	.918	49	.608	82	.370
17	.911	50	.599	83	.364
18	.902	51	.590	84	.359
19	.894	52	.581	85	.354
20	.885	53	.572	86	.349
21	.877	54	.564	87	.344
22	.868	55	.555	88	.339
23	.859	56	.547	89	.334
24	.849	57	.539	90	.329
25	.840	58	.531	91	.325
26	.830	59	.523	92	.320
27	.821	60	.515	93	.315
28	.811	61	.507	94	.311
29	.801	62	.499	95	.307
30	.792	63	.492	96	.302
31	.782	64	.484	97	.298
32	.772	65	.477	98	.294

*Excess per case $= \dfrac{1}{1 + .185\,(\text{Ratio to Average}) + 2.310\,(\text{Ratio to Average})^2}$

EXHIBIT 1-4 (CONT'D)

Ratio To Aver.	Excess Per Case	Ratio To Aver.	Excess Per Case	Ratio To Aver.	Excess Per Case
99	.290	134	.185	169	.126
100	.286	135	.183	170	.125
101	.282	136	.181	171	.124
102	.278	137	.179	172	.123
103	.275	138	.177	173	.121
104	.271	139	.175	174	.120
105	.267	140	.173	175	.119
106	.264	141	.171	176	.118
107	.260	142	.169	177	.117
108	.257	143	.167	178	.116
109	.253	144	.165	179	.115
110	.250	145	.163	180	.113
111	.247	146	.161	181	.112
112	.244	147	.160	182	.111
113	.240	148	.158	183	.110
114	.237	149	.156	184	.109
115	.234	150	.154	185	.108
116	.231	151	.153	186	.107
117	.228	152	.151	187	.106
118	.225	153	.149	188	.105
119	.223	154	.148	189	.104
120	.220	155	.146	190	.103
121	.217	156	.145	191	.102
122	.214	157	.143	192	.101
123	.212	158	.142	193	.100
124	.209	159	.140	194	.099
125	.207	160	.139	195	.099
126	.204	161	.137	196	.098
127	.202	162	.136	197	.097
128	.199	163	.134	198	.096
129	.197	164	.133	199	.095
130	.194	165	.132	200	.094
131	.192	166	.130	201	.093
132	.190	167	.129	202	.093
133	.188	168	.128	203	.092

EXHIBIT I-4 (CONT'D)

Ratio To Aver.	Excess Per Case	Ratio To Aver.	Excess Per Case	Ratio To Aver.	Excess Per Case
204	.091	239	.068	274	.053
205	.090	240	.068	275	.053
206	.089	241	.067	276	.052
207	.089	242	.067	277	.052
208	.088	243	.066	278	.052
209	.087	244	.066	279	.051
210	.086	245	.065	280	.051
211	.086	246	.065	281	.051
212	.085	247	.064	282	.050
213	.084	248	.064	283	.050
214	.084	249	.063	284	.050
215	.083	250	.063	285	.049
216	.082	251	.062	286	.049
217	.081	252	.062	287	.049
218	.081	253	.062	288	.048
219	.080	254	.061	289	.048
220	.079	255	.061	290	.048
221	.079	256	.060	291	.047
222	.078	257	.060	292	.047
223	.078	258	.059	293	.047
224	.077	259	.059	294	.046
225	.076	260	.058	295	.046
226	.076	261	.058	296	.046
227	.075	262	.058	297	.046
228	.074	263	.057	298	.045
229	.074	264	.057	299	.045
230	.073	265	.056	300	.045
231	.073	266	.056	301	.044
232	.072	267	.056	302	.044
233	.072	268	.055	303	.044
234	.071	269	.055	304	.044
235	.070	270	.055	305	.043
236	.070	271	.054	306	.043
237	.069	272	.054	307	.043
238	.069	273	.053	308	.043

EXHIBIT I-4 (CONT'D)

Ratio To Aver.	Excess Per Case	Ratio To Aver.	Excess Per Case	Ratio To Aver.	Excess Per Case
309	.042	323	.039	337	.036
310	.042	324	.039	338	.036
311	.042	325	.038	339	.035
312	.042	326	.038	340	.035
313	.041	327	.038	341	.035
314	.041	328	.038	342	.035
315	.041	329	.038	343	.035
316	.041	330	.037	344	.035
317	.040	331	.037	345	.034
318	.040	332	.037	346	.034
319	.040	333	.037	347	.034
320	.040	334	.037	348	.034
321	.039	335	.036	349	.034
322	.039	336	.036	350 & Over	.033

A study of experience by hazard group is also under review. The indicated hazard group differentials to average are based upon a review of the experience indications of high, medium and low benefit states as well as the experience of the totals of the three groups of states. The experience is shown in Appendix B (Exhibits B-1 through B-4).

These procedures and tables reflect the situation known today. It is hoped that they may survive periodic review and serve the insurance industry's requirements as long as "Uhthoff's Tables" have.

Accident Years	Range of Factors
1968-1974 (1st Report to Ultimate)	3.10-3.51
1968-1973 (2nd Report to Ultimate)	1.68-2.13
1968-1972 (3rd Report to Ultimate)	1.41-1.67
1968-1971 (4th Report to Ultimate)	1.37-1.46

Reported in March, 1976 issue of *Best's Property/Casualty Review*, pp. 14-18.

EXHIBIT II-1

MAJOR PERMANENT PARTIAL

Ratio to Avg.	Excess Ratios					
	Ark.	Conn.	D.C.	Md.	Neb.	Avg.*
.00	1.000	1.000	1.000	1.000	1.000	1.000
.25	.750	.751	.751	.751	.751	.751
.50	.509	.528	.518	.526	.504	.519
.75	.343	.281	.361	.383	.339	.344
1.00	.248	.194	.253	.285	.242	.249
1.25	.178	.140	.174	.216	.181	.182
1.50	.129	.105	.118	.165	.141	.136
1.75	.096	.082	.081	.127	.113	.103
2.00	.073	.065	.059	.098	.094	.080
2.25	.058	.055	.050	.077	.082	.065
2.50	.046	.045	.042	.063	.075	.053
2.75	.040	.037	.036	.052	.067	.045
3.00	.030	.033	.031	.044	.058	.038
3.25	.025	.029	.028	.038	.052	.033
3.50	.021	.024	.022	.029	.051	.027
3.75	.020	.021	.021	.025	.050	.024
4.00	.017	.018	.018	.021	.049	.021
4.25	.015	.015	.016	.018	.048	.019
4.50	.013	.015	.013	.016	.047	.017
4.75	.012	.012	.010	.013	.046	.015
5.00	.010	.011	.008	.012	.045	.013
5.25	.009	.010	.006	.011	.044	.012
5.50	.008	.009	.005	.010	.043	.011
5.75	.007	.007	.003	.010	.042	.010
6.00	.006	.006	.001	.009	.041	.009
Total Number of Claims	794	666	290	1,022	233	xxx

*Average excess ratios weighted by state's total number of claims

EXHIBIT II-2

MAJOR PERMANENT PARTIAL

EXCESS RATIOS

CURVES FIT BY LEAST SQUARES CRITERION

(x) Ratio to Avg.	(y) Actual*	$y' = (.267)^x$	$y' = .072x^2 - .565x + 1$	$y' = e^{.113x^2 - 1.435x}$	$y' = \frac{1}{1 + .555x + 2.655x^2}$	$y' = \frac{1}{1 + .805x + 2.044x^2 + .167x^3}$
.00	1.000	1.000	1.000	1.000	1.000	1.000
.25	.751	.719	.863	.703	.766	.751
.50	.519	.517	.736	.502	.515	.517
.75	.344	.371	.617	.363	.344	.354
1.00	.249	.267	.507	.267	.238	.249
1.25	.182	.192	.406	.198	.171	.181
1.50	.136	.138	.315	.150	.128	.136
1.75	.103	.099	.232	.115	.099	.105
2.00	.080	.071	.158	.089	.079	.082
2.25	.065	.051	.093	.070	.064	.066
2.50	.053	.037	.038	.056	.053	.054
2.75	.045	.026	—.009	.045	.044	.045
3.00	.038	.019	—.047	.037	.038	.038
3.25	.033	.014	—.076	.031	.032	.032
3.50	.027	.010	—.096	.026	.028	.028
3.75	.024	.007	—.106	.023	.025	.024
4.00	.021	.005	—.108	.020	.022	.021

*See Exhibit II-1 for derivation

EXHIBIT II-2 (CONT'D)

MAJOR PERMANENT PARTIAL EXCESS RATIOS

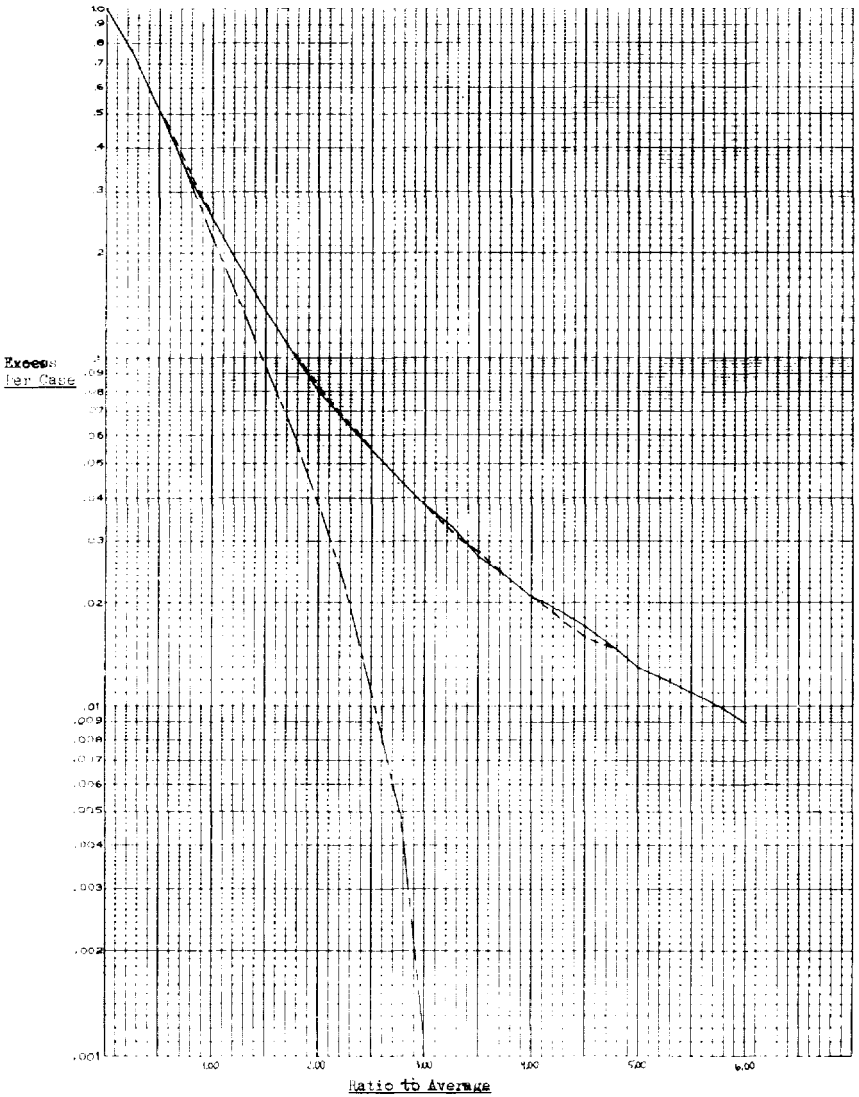
		CURVES FIT BY LEAST SQUARES CRITERION				
(x) Ratio to Avg.	(y) Actual*	$y' = (.267)^x$	$y' = .072x^2 - .565x + 1$	$y' = e^{.113x^2 - 1.435x}$	$y' = \frac{1}{1 + .555x + 2.655x^2}$	$y' = \frac{1}{1 + .805x + 2.044x^2 + .167x^3}$
4.25	.019	.004	—.101	.017	.019	.018
4.50	.017	.003	—.085	.015	.017	.016
4.75	.015	.002	—.059	.014	.016	.015
5.00	.013	.001	—.025	.013	.014	.013
5.25	.012	.001	.018	.012	.013	.012
5.50	.011	.001	.071	.011	.012	.011
5.75	.010	.001	.132	.011	.011	.010
6.00	.009	.000	.202	.011	.010	.009
$\frac{\Sigma \lvert y - y' \rvert}{n}$	xx	.013	.114	.007	.003	.001
$\frac{\Sigma (y - y')^2}{n}$	xx	.000231	.018594	.000160	.000023	.000005

*See Exhibit II-1 for derivation

EXHIBIT II-2

MAJOR PERMANENT PARTIAL

Comparison of Current, Observed and Proposed Excess Ratios



Current — — — — — — — —

Observed ————————

Proposed - - - - - - - - - - (Least squares fit of observed values: $y = \frac{1}{1+.20'x+2.044x^2+.167x^3}$)

EXHIBIT II-4

MAJOR PERMANENT PARTIAL CASES*

Ratio To Aver.	Excess Per Case	Ratio To Aver.	Excess Per Case	Ratio To Aver.	Excess Per Case
0%	1.000	33	.669	66	.405
1	.992	34	.659	67	.399
2	.983	35	.650	68	.393
3	.975	36	.640	69	.387
4	.966	37	.630	70	.381
5	.957	38	.621	71	.376
6	.947	39	.612	72	.370
7	.938	40	.603	73	.365
8	.928	41	.593	74	.359
9	.918	42	.584	75	.354
10	.908	43	.576	76	.349
11	.898	44	.567	77	.344
12	.888	45	.558	78	.339
13	.878	46	.550	79	.334
14	.867	47	.541	80	.329
15	.857	48	.533	81	.324
16	.846	49	.525	82	.320
17	.836	50	.517	83	.315
18	.825	51	.509	84	.311
19	.814	52	.501	85	.306
20	.804	53	.494	86	.302
21	.793	54	.486	87	.298
22	.783	55	.479	88	.294
23	.772	56	.471	89	.290
24	.761	57	.464	90	.286
25	.751	58	.457	91	.282
26	.741	59	.450	92	.278
27	.730	60	.443	93	.274
28	.720	61	.437	94	.270
29	.710	62	.430	95	.266
30	.699	63	.424	96	.263
31	.689	64	.417	97	.259
32	.679	65	.411	98	.256

*Excess per case $= \frac{4}{1 + .805\ (\text{Ratio to Avg.}) + 2.044\ (\text{Ratio to Avg.})^2 + .167\ (\text{Ratio to Avg.})^3}$

EXHIBIT II-4 (CONT'D)

Ratio To Aver.	Excess Per Case	Ratio To Aver.	Excess Per Case	Ratio To Aver.	Excess Per Case
99	.252	134	.163	169	.111
100	.249	135	.161	170	.110
101	.246	136	.159	171	.109
102	.242	137	.157	172	.108
103	.239	138	.155	173	.107
104	.236	139	.153	174	.106
105	.233	140	.152	175	.105
106	.230	141	.150	176	.104
107	.227	142	.148	177	.103
108	.224	143	.147	178	.102
109	.221	144	.145	179	.101
110	.218	145	.143	180	.100
111	.216	146	.142	181	.099
112	.213	147	.140	182	.098
113	.210	148	.139	183	.097
114	.207	149	.137	184	.096
115	.205	150	.136	185	.095
116	.202	151	.134	186	.094
117	.200	152	.133	187	.093
118	.197	153	.131	188	.092
119	.195	154	.130	189	.091
120	.192	155	.129	190	.090
121	.190	156	.127	191	.090
122	.188	157	.126	192	.089
123	.185	158	.124	193	.088
124	.183	159	.123	194	.087
125	.181	160	.122	195	.086
126	.179	161	.121	196	.086
127	.177	162	.119	197	.085
128	.175	163	.118	198	.084
129	.172	164	.117	199	.083
130	.170	165	.116	200	.082
131	.168	166	.115	201	.082
132	.166	167	.113	202	.081
133	.164	168	.112	203	.080

EXHIBIT II-4 (CONT'D)

Ratio To Aver.	Excess Per Case	Ratio To Aver.	Excess Per Case	Ratio To Aver.	Excess Per Case
204	.080	239	.059	274	.045
205	.079	240	.059	275	.045
206	.078	241	.058	276	.045
207	.077	242	.058	277	.045
208	.077	243	.057	278	.044
209	.076	244	.057	279	.044
210	.075	245	.057	280	.044
211	.075	246	.056	281	.043
212	.074	247	.056	282	.043
213	.074	248	.055	283	.043
214	.073	249	.055	284	.042
215	.072	250	.054	285	.042
216	.072	251	.054	286	.042
217	.071	252	.054	287	.042
218	.070	253	.053	288	.041
219	.070	254	.053	289	.041
220	.069	255	.052	290	.041
221	.069	256	.052	291	.040
222	.068	257	.052	292	.040
223	.068	258	.051	293	.040
224	.067	259	.051	294	.040
225	.066	260	.050	295	.039
226	.066	261	.050	296	.039
227	.065	262	.050	297	.039
228	.065	263	.049	298	.039
229	.064	264	.049	299	.038
230	.064	265	.049	300	.038
231	.063	266	.048	301	.038
232	.063	267	.048	302	.037
233	.062	268	.047	303	.037
234	.062	269	.047	304	.037
235	.061	270	.047	305	.037
236	.061	271	.046	306	.037
237	.060	272	.046	307	.036
238	.060	273	.046	308	.036

EXHIBIT II-4 (CONT'D)

Ratio To Aver.	Excess Per Case	Ratio To Aver.	Excess Per Case	Ratio To Aver.	Excess Per Case
309	.036	344	.029	379	.024
310	.036	345	.029	380	.023
311	.035	346	.028	381	.023
312	.035	347	.028	382	.023
313	.035	348	.028	383	.023
314	.035	349	.028	384	.023
315	.034	350	.028	385	.023
316	.034	351	.028	386	.023
317	.034	352	.027	387	.023
318	.034	353	.027	388	.022
319	.034	354	.027	389	.022
320	.033	355	.027	390	.022
321	.033	356	.027	391	.022
322	.033	357	.027	392	.022
323	.033	358	.026	393	.022
324	.033	359	.026	394	.022
325	.032	360	.026	395	.022
326	.032	361	.026	396	.021
327	.032	362	.026	397	.021
328	.032	363	.026	398	.021
329	.032	364	.026	399	.021
330	.031	365	.025	400	.021
331	.031	366	.025	401	.021
332	.031	367	.025	402	.021
333	.031	368	.025	403	.021
334	.031	369	.025	404	.021
335	.030	370	.025	405	.020
336	.030	371	.025	406	.020
337	.030	372	.024	407	.020
338	.030	373	.024	408	.020
339	.030	374	.024	409	.020
340	.029	375	.024	410	.020
341	.029	376	.024	411	.020
342	.029	377	.024	412	.020
343	.029	378	.024	413	.020

EXHIBIT II-4 (CONT'D)

Ratio To Aver.	Excess Per Case	Ratio To Aver.	Excess Per Case	Ratio To Aver.	Excess Per Case
414	.020	449	.016	484	.014
415	.019	450	.016	485	.014
416	.019	451	.016	486	.014
417	.019	452	.016	487	.014
418	.019	453	.016	488	.014
419	.019	454	.016	489	.014
420	.019	455	.016	490	.014
421	.019	456	.016	491	.014
422	.019	457	.016	492	.013
423	.019	458	.016	493	.013
424	.019	459	.016	494	.013
425	.018	460	.016	495	.013
426	.018	461	.016	496	.013
427	.018	462	.015	497	.013
428	.018	463	.015	498	.013
429	.018	464	.015	499	.013
430	.018	465	.015	500	.013
431	.018	466	.015	501	.013
432	.018	467	.015	502	.013
433	.018	468	.015	503	.013
434	.018	469	.015	504	.013
435	.018	470	.015	505	.013
436	.017	471	.015	506	.013
437	.017	472	.015	507	.013
438	.017	473	.015	508	.013
439	.017	474	.015	509	.012
440	.017	475	.015	510	.012
441	.017	476	.014	511	.012
442	.017	477	.014	512	.012
443	.017	478	.014	513	.012
444	.017	479	.014	514	.012
445	.017	480	.014	515	.012
446	.017	481	.014	516	.012
447	.017	482	.014	517	.012
448	.016	483	.014	518	.012

EXHIBIT II-4 (CONT'D)

Ratio To Aver.	Excess Per Case	Ratio To Aver.	Excess Per Case	Ratio To Aver.	Excess Per Case
519	.012	547	.011	575	.010
520	.012	548	.011	576	.009
521	.012	549	.011	577	.009
522	.012	550	.011	578	.009
523	.012	551	.010	579	.009
524	.012	552	.010	580	.009
525	.012	553	.010	581	.009
526	.012	554	.010	582	.009
527	.012	555	.010	583	.009
528	.012	556	.010	584	.009
529	.011	557	.010	585	.009
530	.011	558	.010	586	.009
531	.011	559	.010	587	.009
532	.011	560	.010	588	.009
533	.011	561	.010	589	.009
534	.011	562	.010	590	.009
535	.011	563	.010	591	.009
536	.011	564	.010	592	.009
537	.011	565	.010	593	.009
538	.011	566	.010	594	.009
539	.011	567	.010	595	.009
540	.011	568	.010	596	.009
541	.011	569	.010	597	.009
542	.011	570	.010	598	.009
543	.011	571	.010	599	.009
544	.011	572	.010	600 & Over	.009
545	.011	573	.010		
546	.011	574	.010		

APPENDIX A

Three exhibits which follow set forth the calculation of Excess Loss Premium Factors. The first (Appendix A-1) describes the present procedure based on Uhthoff's tables, the second (Appendix A-2) describes the present procedure based on revised tables and the third (Appendix A-3) describes the present procedure (modified) based on revised tables. For convenience, they will be referred to as A-1, A-2 and A-3, respectively

All three exhibits rest upon two policy years of experience; one at a first report and one at a second report. The average claim cost is determined by adjusting the reported incurred losses to reflect law amendment factors and then dividing the result by the number of cases. This is performed by type of injury and is shown in Column 12 of A-1 and A-2. With respect to A-3, not only are the incurred losses adjusted to reflect law amendment factors, they are also modified to reflect loss development by type of injury. The resulting average claim cost is shown in Column 16 of A-3.

The average claim costs are shown on lines 13 (death), 16 (permanent total), and 19 (major) for Exhibits A-1 and A-2. The corresponding lines for Exhibit A-3 are lines 17, 20 and 23. In all three exhibits, the bottom half shows the selected accident limit ranging from $10,000 to $250,000 arranged by columns lettered from (A) through (L). These amounts are expressed as ratios to the average cost for each serious type of claim. These ratios are then used to enter the appropriate table, namely, Uhthoff's or Revised in order to determine the excess ratio contribution by each type of claim. These excess ratios are then weighted in proportion to the contribution to total cost made by each type of claim. The proportion, which is shown on line 22, is derived from the data in Column 11 for A-1 and A-2. These proportions shown on line 26 of A-3 are different from those of A-1 and A-2 because loss development has been included; they are derived from Column 15. The average excess ratio is multiplied by the permissible loss ratio increased by 10% to reflect the conversion of data complied on a per claim basis to a "per accident" basis. It is then increased by flat loadings ranging from .005 to .001 as the accident limit increases. Finally, the indicated Excess Loss Premium Factors are modified by a factor of 1.6 to reflect loss development with respect to the procedures in A-1 and A-2. With respect to A-3, this factor is not necessary since development was included at the beginning; consequently the indicated Excess Loss Premium Factors are the proposed Excess Loss Premium Factors.

The present procedures based on the revised tables tend to produce lower charges for the lower accidents limits and higher charges for the higher accident limits than those based on Uhthoff's tables. This is also true for the present procedure (modified) based on the revised tables wherein loss development by type of injury is included in the calculation of the average claim cost.

It is believed that the revised tables and the modified procedures will effectively generate more appropriate charges since quite frequently the proposed Excess Loss Premium Factors at the lower limits may need to be arbitrarily reduced because they exceed the permissible loss ratio.

APPENDIX A-1

PRESENT PROCEDURE — BASED ON UHTHOFF'S TABLES

		Policy Period (70-71) 2nd				Policy Period (71-72) 1st					
(1) Type Of Injury	(2) No. Of Cases	(3) Indemnity	(4) A.F.	(5) Medical	(6) A.F.	(7) Indemnity	(8) A.F.	(9) Medical	(10) A.F.	(11) Total	(12) Average (11) ÷ (2)
Death	86	2,451,463	1.150	87,228	1.000	2,280,619	1.100	57,109	1.000	5,472,200	63,630
P.T.	19	344,657	1.033	384,440	1.000	1,284,254	1.091	614,261	1.000	2,755,853	145,045
Major	1,271	6,950,644	1.145	2,585,223	1.000	8,763,791	1.086	3,948,947	1.000	24,010,134	18,891
Minor	xx	6,125,412	1.143	2,281,834	1.000	7,238,922	1.089	2,740,605	1.000	19,906,971	xx
T.T.	xx	5,617,151	1.156	3,495,883	1.000	7,883,248	1.097	5,247,349	1.000	23,884,582	xx
Other Med.	xx	xx	xx	2,651,245	1.000	xx	xx	3,584,517	1.000	6,235,762	xx
TOTAL	xx	xx	xx	xx	xx	xx	xx	xx	xx	82,265,502	xx

A.F. = Amendment Factor to current law level.

(Amounts in 1,000's)

	10	15	20	25	30	40	50	75	100	150	200	250
13. Average Death Cost (Incl. Med.)	(A) 63,630	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
14. Ratio to Average (A), (B), (C), etc. ÷ (13)	.16	.24	.31	.39	.47	.63	.79	1.18	1.57	2.36	3.14	3.93
15. Excess Ratio for Death (from Tables)	.841	.761	.694	.630	.569	.453	.347	.156	.069	.027	.021	.021
16. Average P.T. Cost (Incl. Med.)	145,045											

APPENDIX A-1 (CONT'D)

17. Ratio to Average (A), (B), (C), etc. ÷ (16)		.07	.10	.14	.17	.21	.28	.34	.52	.69	1.03	1.38	1.72
18. Excess Ratio for P.T. (from Tables)		.930	.900	.860	.831	.791	.724	.668	.510	.378	.194	.103	.059
19. Average Major Cost (Incl. Med.)		18,891											
20. Ratio to Average (A), (B), (C), etc. ÷ (19)		.53	.79	1.06	1.32	1.59	2.12	2.65	3.97	5.29	7.94	10.59	13.23
21. Excess Ratio for Major (from Tables)		.496	.324	.200	.127	.081	.031	.007	.001	.001	.001	.001	.001
22. Ratios to Total Cost	a. Death	.067											
	b. P.T.	.033											
	c. Major	.292											
23. Average Excess Ratio		.232	.175	.133	.107	.088	.063	.047	.028	.017	.009	.005	.004
24. Permissible Loss Ratio		.610											
25. (24) × 1.10		.671											
26. (23) × (25)		.156	.117	.089	.072	.059	.042	.032	.019	.011	.006	.003	.003
27. Flat Loadings		.005	.004	.003	.002	.002	.002	.001	.001	.001	.001	.001	.001
28. Indicated ELPF'S (26) + (27)		.161	.121	.092	.074	.061	.044	.033	.020	.012	.007	.004	.004
29. Proposed ELPF'S (28) × 1.6		.258	.194	.147	.118	.098	.070	.053	.032	.019	.011	.006	.006

*23 = [(15) × (22a)] + [(18) × (22b)] + [(21) × (22c)]

APPENDIX A-2

PRESENT PROCEDURE — BASED ON REVISED TABLES

		Policy Period (70-71) 2nd				Policy Period (71-72) 1st					
(1) Type of Injury	(2) No. Of Cases	(3) Indemnity	(4) A.F.	(5) Medical	(6) A.F.	(7) Indemnity	(8) A.F.	(9) Medical	(10) A.F.	(11) Total	(12) Average (11) ÷ (2)
Death	86	2,451,463	1.150	87,228	1.000	2,280,619	1.100	57,109	1.000	5,472,200	63,630
P.T.	19	344,657	1.033	384,440	1.000	1,284,254	1.091	614,261	1.000	2,755,853	145,045
Major	1,271	6,950,644	1.145	2,585,223	1.000	8,763,791	1.086	3,948,947	1.000	24,010,134	18,891
Minor	xx	6,125,412	1.143	2,281,834	1.000	7,238,922	1.089	2,740,605	1.000	19,906,971	xx
T.T.	xx	5,617,151	1.156	3,495,883	1.000	7,883,248	1.097	5,247,349	1.000	23,884,582	xx
Other Med.	xx	xx	xx	2,651,245	1.000	xx	xx	3,584,517	1.000	6,235,762	xx
TOTAL	xx	xx	xx	xx	xx	xx	xx	xx	xx	82,265,502	xx

A.F. = Amendment Factor to current law level.

(Amounts in 1,000's)

	10	15	20	25	30	40	50	75	100	150	200	250
13. Average Death Cost (Incl. Med.)	(A) 63,630	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
14. Ratio to Average (A), (B), (C), etc. ÷ (13)	.16	.24	.31	.39	.47	.63	.79	1.18	1.57	2.36	3.14	3.93
15. Excess Ratio for Death (from Tables)	.918	.849	.782	.702	.626	.492	.386	.225	.143	.070	.041	.033
16. Average P.T. Cost (Incl. Med.)	145,045											

APPENDIX A-2 (CONT'D)

17. Ratio to Average (A), (B), (C), etc. ÷ (16)	.07	.10	.14	.17	.21	.28	.34	.52	.69	1.03	1.38	1.72
18. Excess Ratio For P.T. (from Tables)	.976	.960	.934	.911	.877	.811	.752	.581	.449	.275	.177	.123
19. Average Major Cost (Incl. Med.)	18,891											
20. Ratio to Average (A), (B), (C), etc. ÷ (19)	.53	.79	1.06	1.32	1.59	2.12	2.65	3.97	5.29	7.94	10.59	13.23
21. Excess Ratio for Major (from Tables)	.494	.334	.230	.166	.123	.074	.049	.021	.011	.009	.009	.009
22. Ratios to Total Cost a. Death	.067											
b. P.T.	.033											
c. Major	.292											
23. Average Excess Ratio	.238	.186	.150	.126	.107	.081	.065	.040	.028	.016	.011	.009
24. Permissible Loss Ratio	.610											
25. (24) × 1.10	.671											
26. (23) × (25)	.160	.125	.101	.085	.072	.054	.044	.027	.019	.011	.007	.006
27. Flat Loadings	.005	.004	.003	.002	.002	.002	.001	.001	.001	.001	.001	.001
28. Indicated ELPF'S (26) + (27)	.165	.129	.104	.087	.074	.056	.045	.028	.020	.012	.008	.007
29. Proposed ELPF'S (28) × 1.6	.264	.206	.166	.139	.118	.090	.072	.045	.032	.019	.013	.011

*23 = [(15) × (22a)] + [(18) × (22b)] + [(21) × (22c)]

APPENDIX A-3

PRESENT PROCEDURE (MODIFIED) — BASED ON REVISED TABLES

(1) Type Of Injury	(2) No. Of Cases†	(3) Indemnity	(4) A.F.	(5) Dev.	(6) Medical	(7) A.F.	(8) Dev.	(9) Indemnity	(10) A.F.	(11) Dev.	(12) Medical	(13) A.F.	(14) Dev.	(15) Total	(16) Average (15) ÷ (2)
Death	110	2,451,463	1.150	1.298	87,228	1.000	1.121	2,280,619	1.100	1.482	57,109	1.000	1.207	7,543,877	68,581
P.T.	28	344,657	1.033	2.329	384,440	1.000	1.121	1,284,254	1.091	2.394	614,261	1.000	1.207	5,355,850	191,280
Major	2,082	6,950,644	1.145	1.385	2,585,223	1.000	1.121	8,763,791	1.086	1.916	3,948,947	1.000	1.207	36,922,405	17,734
Minor	xx	6,125,412	1.143	.971	2,281,834	1.000	1.121	7,238,922	1.089	1.012	2,740,605	1.000	1.207	20,641,937	xx
T.T.	xx	5,617,151	1.156	1.095	3,495,883	1.000	1.121	7,883,248	1.097	1.136	5,247,349	1.000	1.207	27,186,778	xx
Other Med.	xx	xx	xx	xx	2,651,245	1.000	1.121	xx	xx	xx	3,584,517	1.000	1.207	7,298,558	xx
TOTAL	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	104,949,405	xx

† No. of cases include development factors by type of injury. A.F. = Amendment Factor to current law level.

	Amounts in 1,000's) 10	15	20	25	30	40	50	75	100	150	200	250
17. Average Death Cost (Incl. Med.)	(A) 68,581	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
18. Ratio to Average (A), (B), (C), etc. ÷ (17)	.15	.22	.29	.36	.44	.58	.73	1.09	1.46	2.19	2.92	3.65
19. Excess Ratio for Death (from Tables)	.926	.868	.801	.732	.654	.531	.423	.253	.161	.080	.047	.033
20. Average P.T. Cost (Incl. Med.)	191,280											
21. Ratio to Average (A), (B), (C), etc. ÷ (20)	.05	.08	.10	.13	.16	.21	.26	.39	.52	.78	1.05	1.31

APPENDIX A-3 (CONT'D)

22. Excess Ratio For P.T. (from Tables)	.985	.971	.960	.941	.918	.877	.830	.702	.581	.392	.267	.192
23. Average Major Cost (Incl. Med.)	17,734											
24. Ratio to Average (A), (B), (C), etc. ÷ (23)	.56	.85	1.13	1.41	1.69	2.26	2.82	4.23	5.64	8.46	11.28	14.10
25. Excess Ratio for Major (from Tables)	.471	.306	.210	.150	.111	.066	.043	.019	.010	.009	.009	.009
26. Ratios to Total Cost a. Death	.072											
b. P.T.	.051											
c. Major	.352											
27. Average Excess Ratio*	.283	.220	.181	.153	.133	.106	.088	.061	.045	.029	.020	.015
28. Permissible Loss Ratio	.610											
29. (28) × 1.10	.671											
30. (27) × (29)	.190	.148	.121	.103	.089	.071	.059	.041	.030	.019	.013	.010
31. Flat Loadings	.005	.004	.003	.002	.002	.002	.001	.001	.001	.001	.001	.001
32. Indicated ELPF's (30) + (31)	.195	.152	.124	.105	.091	.073	.060	.042	.031	.020	.014	.011

* 27 = [(19)×(26a)] + [(22)×(26b)] + [(25)×(26c)]

APPENDIX B

EXHIBIT B-1

Derivation of Indicated Hazard Group Differentials (High Benefit States)†

Hazard Group	(1) All Cases	(2) All Losses	(3) Claims Over 9,999 Cases	(4) Claims Over 9,999 Losses	(5) Claims over 24,999 Cases	(6) Claims over 24,999 Losses
I	106,786	39,062,759	803	16,861,263	191	7,793,946
II	674,620	303,854,815	6,410	141,923,132	1,564	68,176,269
III	267,399	191,174,298	4,329	111,871,561	1,315	65,717,152
IV	39,542	33,592,782	721	21,036,472	274	14,445,293
TOTAL	1,088,347	567,684,654	12,263	291,692,428	3,344	156,132,660

Indicated Hazard Group Relativities: Losses Over 24,999

Hazard Group	(7) Average Excess Ratio [(6) − 25,000 × (5)] ÷ (2)	(8) Indicated Relativities (7) ÷ (7) Total
I	.07728	.60
II	.09569	.75
III	.17179	1.34
IV	.22610	1.77
TOTAL	.12777	

Indicated Hazard Group Relativities: Loss Over 9,999

Hazard Group	(9) Average Excess Ratio [(4) − 10,000 × (3)] ÷ (2)	(10) Indicated Relativities (9) ÷ (9) Total
I	.22608	.76
II	.25612	.86
III	.35874	1.20
IV	.41159	1.38
TOTAL	.29781	

†Includes data from Alaska, Arizona, Connecticut, District of Columbia, Idaho, Illinois, Maine, Michigan, Minnesota, Oregon, and Rhode Island.

APPENDIX B

EXHIBIT B-2

Derivation of Indicated Hazard Group Differentials (Medium Benefit States)†

Hazard Group	(1) All Cases	(2) All Losses	(3) Claims Over 9,999 Cases	(4) Claims Over 9,999 Losses	(5) Claims over 24,999 Cases	(6) Claims over 24,999 Losses
I	94,238	22,064,844	362	6,133,760	46	1,595,904
II	657,109	187,377,649	3,367	64,327,682	563	23,329,029
III	257,383	123,407,829	2,629	58,061,238	606	26,863,892
IV	41,777	25,527,288	596	14,455,738	177	7,812,199
TOTAL	1,050,507	358,377,610	6,954	142,978,418	1,392	59,601,024

Indicated Hazard Group Relativities: Losses Over 24,999

Hazard Group	(7) Average Excess Ratio [(6) − 25,000 × (5)] ÷ (2)	(8) Indicated Relativities (7) ÷ (7) Total
I	.02021	.29
II	.04939	.71
III	.09492	1.37
IV	.13269	1.92
TOTAL	.06920	

Indicated Hazard Group Relativities: Loss Over 9,999

Hazard Group	(9) Average Excess Ratio [(4) − 10,000 × (3)] ÷ (2)	(10) Indicated Relativities (9) ÷ (9) Total
I	.11393	.56
II	.16361	.80
III	.25745	1.26
IV	.33281	1.62
TOTAL	.20492	

†Includes data from Arkansas, Colorado, Hawaii, Indiana, Iowa, Kentucky, Maryland, Missouri, Nebraska, New Hampshire, South Dakota, Tennessee, Vermont and Wisconsin.

APPENDIX B

EXHIBIT B-3

Derivation of Indicated Hazard Group Differentials (Low Benefit States)†

Hazard Group	(1) All Cases	(2) All Losses	(3) Claims Over 9,999 Cases	(4) Claims Over 9,999 Losses	(5) Claims over 24,999 Cases	(6) Claims over 24,999 Losses
I	106,736	28,424,675	486	8,633,223	58	2,396,027
II	693,890	193,922,765	3,853	71,691,448	519	21,896,794
III	334,485	158,990,080	3,750	74,442,781	654	27,209,740
IV	53,826	31,652,377	783	18,042,199	182	8,726,708
TOTAL	1,188,937	412,989,897	8,872	172,809,651	1,413	60,229,269

Indicated Hazard Group Relativities: Losses Over 24,999

Hazard Group	(7) Average Excess Ratio [(6) − 25,000 × (5)] ÷ (2)	(8) Indicated Relativities (7) ÷ (7) Total
I	.03328	.55
II	.04601	.76
III	.06830	1.13
IV	.13196	2.19
TOTAL	.06030	

Indicated Hazard Group Relativities: Loss Over 9,999

Hazard Group	(9) Average Excess Ratio [(4) − 10,000 × (3)] ÷ (2)	(10) Indicated Relativities (9) ÷ (9) Total
I	.13274	.65
II	.17100	.84
III	.23236	1.14
IV	.32264	1.58
TOTAL	.20361	

†Includes data from Alabama, Florida, Georgia, Kansas, Louisiana, Mississippi, Montana, New Mexico, North Carolina, Oklahoma, South Carolina, Utah, and Virginia.

APPENDIX B

EXHIBIT B-4

Derivation of Indicated Hazard Group Differentials (All States)†

Hazard Group	(1) All Cases	(2) All Losses	(3) Claims Over 9,999 Cases	(4) Claims Over 9,999 Losses	(5) Claims over 24,999 Cases	(6) Claims over 24,999 Losses
I	307,760	89,552,278	1,651	31,628,246	295	11,785,877
II	2,025,619	685,155,229	13,630	277,942,262	2,646	113,402,092
III	859,267	473,572,207	10,708	244,375,580	2,575	119,790,784
IV	135,145	90,772,447	2,100	53,534,409	633	30,984,200
TOTAL	3,327,791	1,339,052,161	28,089	607,480,497	6,149	275,962,953

Indicated Hazard Group Relativities: Losses Over 24,999

Hazard Group	(7) Average Excess Ratio [(6) − 25,000 × (5)] ÷ (2)	(8) Indicated Relativities (7) ÷ (7) Total
I	.04925	.54
II	.06897	.76
III	.11702	1.28
IV	.16700	1.83
TOTAL	.09129	

Indicated Hazard Group Relativities: Loss Over 9,999

Hazard Group	(9) Average Excess Ratio [(4) − 10,000 × (3)] ÷ (2)	(10) Indicated Relativities (9) ÷ (9) Total
I	.16882	.69
II	.20673	.85
III	.28991	1.19
IV	.35842	1.47
TOTAL	.24390	

†Includes data from the states listed in exhibits I, II, and III.