HOMEOWNERS RATEMAKING

BY STACY J. WEINMAN

BIOGRAPHY:

Ms. Weinman is an Actuarial Manager with the Hanover Insurance Companies in Worcester, Massachusetts. She has responsibility for homeowners ratemaking procedures and for supporting rate changes in all lines of business for six states. She has also worked at the Massachusetts Rating Bureaus, Tillinghast, and John Hancock Property and Casualty. Ms. Weinman became both a fellow of the CAS and a Member of the American Academy of Actuaries in 1986. She graduated with a BA in Mathematics from Clark University in 1978.

ABSTRACT:

This paper gives a detailed account of the entire homeowners ratemaking procedure from adjusting premium and losses to spreading the statewide indicated rate level change by territority. Many traditional techniques, such as adjusting the data to a common deductible and tempering premium trend, are discussed in terms of their appropriateness to certain situations. New techniques for calculating premium trend, loss trend, credibility, and territorial indications are also introduced.

Although much discussion has occurred in ISO meetings and at individual companies regarding homeowners ratemaking, nothing has been written on the entire procedure since Michael Walters' 1974 paper[1]. This updated version is intended to summarize many of the new ideas introduced over the past several years. Hopefully, it will stimulate more discussion and encourage testing of the new theories and techniques presented.

Homeowners ratemaking is based on a loss ratio approach. Basically, a projected loss ratio developed from actual data is divided by the expected loss ratio to produce the rate level indication. Exhibit I displays the statewide indications for dwelling forms for a sample state, and will be described line by line in the following explanation.

EXPERIENCE DATA

Five accident years of earned premium and incurred losses are used as a basis for the projected loss ratio. Five years are used in homeowners due to greater stability of the data over time than for other lines of business and statutory requirements for five years in most states. Accident year experience is used since calendar year data can be distorted by reserve changes occurring for prior years' claims.

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[1]See Michael A. Walters, "Homeowners Insurance Ratemaking", PCAS Vol. LXI (1974).

EARNED PREMIUM AT CURRENT RATE LEVEL

In Exhibit I, the earned premium in Line (1) is brought to current rate level. The on-level earned premium represents a past set of insureds evaluated at current manual rates. Two methods are available for this adjustment:

1. All policies during the five year period can be rerated at current rates. This method would be the most accurate, but has two major drawbacks. First, extensive computer resources are necessary to do this accurately (including the maintenance of 5 to 6 years of rating system master files and the ability to rerate every rating element). Second, it might not be possible to rerate some policies for which current rates don't exist. For instance, if a company had a particular endorsement five years ago, but no longer offers such coverage, the endorsement wouldn't be ratable at current rates.

2. Premium adjustment factors can be calculated by using the parallelogram method. This method has the advantage of being simple, but assumes policies are written evenly throughout each year. Also, the historical rate changes used in the calculation may be distorted if the off-balances used were inaccurate. For example, if an off-balance for a new Coverage A curve was determined using the distribution of Coverage A amounts at the time of the rate change, but the actual distribution during the time the rates were in effect was very different, the rate change percentage would be distorted. Adjustments can be done to correct for this.

ADJUSTING TO A COMMON DEDUCTIBLE

In the past, actuaries traditionally adjusted homeowners premium (and losses)

to a common deductible. Premiums were adjusted by multiplying premium by the appropriate factor to bring it to the common deductible or by rerating policies at a single deductible. As an example of using factors, assume the following distribution of premium by deductible:

Deductible	Earned Premium	Deductible Factor
$100	$50,000	1.10
$250	100,000	1.00
$500	1,000	.90

To adjust the premium to a $250 deductible basis, multiply each earned premium amount for the $100 and $250 deductibles by the appropriate factor. The $500 deductible premium would be excluded as not all $500 deductible losses could be adjusted to a $250 deductible basis and must be excluded. The resulting adjusted premium would then be $155,000 (50,000 x 1.1 + 100,000 x 1).

Adjusting to a common deductible is appropriate for situations where certain deductible options are being phased out, all deductible relativities are being revised, or the distribution of deductibles has shifted considerably over the experience period. Under conditions where the deductible structure will be left intact, however, adjusting to the common deductible isn't necessary, and might produce some distortions in the data. Some reasons the data could be distorted include:

- The deductible factors used for adjusting premiums may be inadequate or redundant.
- The higher deductible experience, which may produce different loss ratios

than the common and lower deductibles, is excluded.

- Some types of losses don't have deductibles such as liability and Scheduled personal property losses. (Note that some companies exclude Scheduled personal property experience from their Homeowners data and group it with the Inland Marine line.) The method shown above for adjusting premium would produce distorted results for types of premium that couldn't be segregated from the data.

- The LAE factor is generally calculated based on a mixture of deductibles. When applied to a single deductible, it may not be as accurate.

So, the example used in this paper assumes no change in deductible relativities and the premiums and losses are not adjusted to a common deductible.

PREMIUM TREND

In some lines, only losses are trended. However, in homeowners, since the policy covers replacement cost of the dwelling which inflates each year, many companies have an inflation guard endorsement, which automatically increases the amount of insurance at the renewal date of the policies. Also, insureds typically buy higher amounts of insurance for newly purchased homes. These higher amounts of insurance translate into a gain in premium each year. Thus, premiums must be projected.

Premium trend is calculated by first computing average amount of insurance relativities for the five years. The average relativities are the weighted average of the proposed Coverage A curve with earned exposures. The Coverage A curve, exposures, average relativities, and average Coverage A amounts are displayed in Exhibit II. The proposed Coverage A curve is used rather than the

current curve because it will give a more accurate reading of future trend.

Next, the exposure distribution is projected to the average date of earnings, i.e., twelve months past the effective date of the rate change. In this case, the effective date is 1/1/90. The distribution can be projected by applying a straight percentage growth factor to each amount of insurance.

The growth factor can be determined by a two-part procedure. First, look at the change in Coverage A amounts over time:

	Coverage A Amount	Percentage Change from Prior Year
1984	$65,178	---
1985	71,351	9.5%
1986	78,135	9.5%
1987	84,816	8.6%
1988	92,708	9.3%

From the above, a good selection for a growth factor would be 9.0%.

Second, review either leading economic indicators or the automatic renewal increases associated with the inflation guard endorsement (roll-up factors) to modify our selection for a future change in the trend. In this example, we compare roll-up factors. Each factor below represents the roll-up amount that will be applied to each policy that renews in the designated quarter.

	1Q-88	2Q-88	3Q-88	4Q-88	1Q-89	2Q-89	3Q-89
Roll-up factors	8.0%	8.0%	8.2%	8.2%	8.2%	5.0%	5.0%

	4Q-89	1Q-90
Roll-up factors	5.0%	4.5%

From this, assuming the roll-up factors will continue to be approximately 5.0% through the effective period, the growth factor from the second quarter of 1989 on could be projected as 6.0%. (Note that the roll-up factors are about 5.0% and there is a 1.0% difference between the historical Coverage A increases of about 9.0% and the 1988 roll-up factors of about 8.0%.) Averaging the 9.0% for the first quarter of 1989 with 6.0% for the rest of the effective period produces a total growth factor of 6.5%.

See Exhibit III for an example of projecting the premium distribution. Column (4) is projected using the 6.5% growth factor raised to the power of 2.5 (the number of years from the midpoint of 1988 to one year past the effective date of 1/1/90). Column (5) is then adjusted using judgement, in this case, the knowledge that the company is revising the minimum Coverage A limit to $30,000. Other considerations might be a push for higher valued homes, assuming anothers carrier's book of business with a different distribution, or introducing inflation guard.

Once we have the projected distribution in Column (5), we can compute the average Coverage A relativity during the effective period. We then use the ratio of the projected average relativity to the historical average relativity in Line (2) of Exhibit I.

Tempering in the premium trend calculation is not needed unless the projected distribution is inaccurate or the loss trend used assumes a static book of business (e.g., an external trend). In the latter case, if new business is coming in at higher Coverage A amounts, premium trend using exposures for new and renewal business would be overstated relative to loss trend that only reflected renewals.

EXCESS WIND LOSS PROCEDURE

In homeowners ratemaking, a wind procedure is used to insure stability in rate levels while maintaining adequacy in the event of large, infrequent wind losses. This procedure excludes wind losses from the experience period and employs a long term factor to account for these losses. The reason that wind losses are handled this way, and not any other cause of loss, is that these are potentially the most erratic types of losses. Exhibit IV shows countrywide company data by cause of loss for dwelling forms.

The excess wind method used here combines the ISO methodology and data with individual company data. First, assess whether the ratio of wind to non-wind losses in the ISO data is less than 25% for each year from 1959 through the present. If this is the case, no wind losses are excluded and a factor of 1.000 is used as the long-term factor in line (7) of Exhibit I. If this is not the case, proceed as follows:

Use the ISO excess wind circular to determine a "median" and a long-tail factor. An exhibit showing the ISO calculation is included as Exhibit V. Column (4) shows wind losses divided by total losses less wind losses, i.e., the

proportion of wind losses to non-wind losses. The median, or middle value, of that column is .108. A median is used, rather than an average, because an extremely large wind to non-wind ratio could heavily weigh into the average, whereas the median better represents a typical year's ratio.

Column (6) shows excess wind ratios, which are the portions of the wind to non-wind ratios above 1.5 times the median. The 1.5 factor was chosen as a result of a 1979 ISO study that showed that 5% of the losses would be greater than 1.5 times the median. In Exhibit V, 1.5 times the median is .162. For this state, there are excess wind losses in only 4 years. The dollars of wind losses are calculated in column (7).

Column (8) is used to calculate the long-term factor. First, the ratio of total losses to excess wind losses is taken for each year. These ratios are summed to get 29.636. This is then divided by 29 (the number of years of data) to get the factor of 1.022, which is used in Line (7) of Exhibit I.

The next step, as shown in Exhibit VI, is to calculate the amount of excess wind losses to exclude from company loss data. These excess wind losses are removed in Line (5) of Exhibit I. Note the ISO median developed in Exhibit V is used as the median for company data.

Here, the two step procedure was employed due to lack of the volume of data or the number of years of data that ISO has. Other companies may have the necessary data or may have a significantly different distribution of exposures than is represented by ISO data. Those companies could do the excess wind adjustment using solely their own data.

LOSS DEVELOPMENT

Incurred losses captured in a company's system may include paid or incurred allocated loss adjustment expense (ALAE). Loss development factors are applied to losses and ALAE in order to bring them to an ultimate settlement basis as reflected in lines (8) and (9) of Exhibit I. See Exhibit VII for the calculation of the loss development factors. Losses are settled relatively quickly in homeowners and therefore, as shown in the exhibit, the loss development factors are rather small.

The development pattern for property losses is quite different than that for liability losses, as shown in Exhibit VIII. If the mix of property and liability losses is changing significantly over time, or if we are using countrywide factors for a state that has a different mix than countrywide, loss development factors should be applied to property and liability losses separately to produce more accurate results.

LOSS ADJUSTMENT EXPENSE

Ultimate incurred losses and ALAE are then multiplied by a loss adjustment factor to include unallocated loss adjustment expenses (ULAE) in Line (10) of Exhibit I. This factor is calculated by taking a three year average of the ratio of calendar year incurred ULAE to ultimate accident year incurred losses and ALAE. Calendar year incurred ULAE is used since ULAE isn't available directly on an accident year basis.

LOSS TREND

Loss trending is necessary to project past experience to what it would be

during the period in which the proposed rates will be in effect. Inflation typically has the largest impact on severity trend, while changing demographic patterns have a significant influence on frequency. Changes in weather patterns affect both severity and frequency; however, because of their erratic nature, wind losses are excluded from the trend calculation.

Loss trend can be developed from either actual severity, frequency or pure premium data, or an external index. The actual data, either company data or that of ISO, is better because it reflects what is happening in a particular state. The external index that has been used historically consists of countrywide figures; portions of the Consumer Price Index (CPI) weighted with the Boeckh Residential Construction Cost Index.

Exhibit IX shows the exponential trending of statewide incurred severity and frequency. Combining the severity trend factor of +10.4% with the frequency trend factor of -5.3%, we get a pure premium trend factor of +4.5%. This annual trend factor is projected by the number of years from the midpoint of each year in the experience period to one year past the effective date of 1/1/90.

In Exhibit I, loss trend is applied in Lines (11) through (13). Line (11) contains losses eliminated by the deductible, i.e., the number of non-liability claims multiplied by the average deductible. If there are any years with excess wind losses, the number of claims is further reduced by the proportion of excess wind losses to non-liability losses. Line (12) contains the loss trend factors. Then, in Line (13), we have the full trend calculation, where losses are trended from the first dollar by adding eliminated losses to incurred losses, trending, and then subtracting eliminated losses.

ACCIDENT YEAR WEIGHTS

The resulting annual rate level loss ratios are weighted together to produce the trended loss and LAE ratio on line (15) of Exhibit I. The weights are selected judgmentally. If, for instance, there was very stable experience or a random pattern in loss and LAE ratios, .20 might be appropriate for each year. If we saw a trend in premium or loss ratios, increasing weights of .10, .15, .20, .25, and .30 would be more appropriate. (Note that this might also indicate poor selections for either the premium or loss trend.) If we knew that the earlier data was very different from the later data because of extreme premium growth, reunderwriting, or acquisition of a book of business from another carrier, we could give no weight to the earlier years and substantial weight to the later years.

CREDIBILITY

The credibility formula used is based on the belief that the greater the stability in the loss ratios, the more predictable they are. The formula assumes that the loss ratios are 100% credible when the probability is 90% that the observed mean is within plus or minus 5% of the expected mean. The partial credibility formula is:

square root of (5/N),

where 5 = the number of observations,

and $N = \dfrac{1082 \times \text{variance of the 5 observations}}{\text{square of the mean of the 5 observations}}$

Note that N varies for each set of observations. See Exhibit X for the derivation of this formula.

EXPECTED LOSS AND LAE RATIO

The Expected Loss and LAE Ratio (ELR), shown on Line (17) of Exhibit I, is 1.000 minus the expense ratio and an underwriting profit and contingency factor.

The expense ratio is comprised of the commission ratio, the contingent commission ratio, the ISO state tax provision, and the general expense and other acquisition ratio developed from the IEE. The underwriting profit and contingency factor of 6% is used.

BALLAST FOR CREDIBILITY

The ballast for credibility is the loss and LAE ratio applied to the complement of credibility as part of the calculation of the credibility weighted loss and LAE ratio. See Lines (18) and (19) of Exhibit I for this calculation. The ballast historically used in homeowners is the ELR. Since the credibility weighted loss and LAE ratio is divided by the ELR to compute the indicated change, using the ELR as a ballast is equivalent to weighing the indication based on actual experience with no change. Thus, the smaller the credibility, the closer the indicated change will be to zero. This may be inappropriate in states where the entire industry has rates that are vastly inadequate or overpriced, yet a particular company has a small volume of experience. A better ballast would be one that measured industry profitability. However, at this time, no such ballast has been developed. Therefore, the ELR is used here.

INDICATED RATE LEVEL CHANGE

The credibility weighted projected loss & LAE ratio described above is divided by the ELR to yield the indicated rate level adjustment. This indication, which

can be interpreted as the percentage amount of inadequacy or redundancy in our current rate level, is shown on line (20) of Exhibit I.

INVESTMENT INCOME PROVISION

An allowance for investment income is worked into the ratemaking formula in the states that require it by dividing 1.000 plus the indicated rate change by 1.000 plus the investment income provision. The purpose of the allowance is to account for the fact that investment income is generated during the time between collecting premiums and paying out losses. Generally, the factor is about 2% for homeowners.

TENANT AND CONDO FORMS

For forms 4 and 6, the statewide indications are developed in the same manner as dwelling forms, except that no excess wind procedure is deemed necessary due to the relatively small percentage of wind losses for these forms.

DEVELOPMENT OF INDICATED RATE LEVEL CHANGE BY TERRITORY

Exhibit XI distributes the indicated statewide rate level change among all territories. Basically, each territory's own experience for the latest five years is weighted with the average territorial relativity of three of the largest homeowners writers in the state. The three companies are chosen because they have the largest data bases in the state, and presumably their rates are based on those data bases. Hence, we are tapping into a considerably larger data base.

Column (3) contains the current rate relativities for the company. These are developed by weighing the territorial base rates with exposures(Column (2)) to

get a statewide average rate, and then dividing each territorial rate by the statewide average. Columns (4) through (8) are the actual on-level loss ratios by territory divided by the statewide loss ratio. The competitors' rate relativities are shown in Column (10). They are developed using company exposures weighted by competitor base rates.

Credibility in Column (11) is assigned to the territorial experience based on the consistency of the five annual territorial loss ratios divided by the corresponding statewide loss ratio. Thus, a territory with consistent results over time will be assigned more credibility than one with more variable results. Refer to Exhibit X for the theory behind the credibility formula.

To develop Column (12), the 5 year average loss ratio relativity (Column (9)) times the current rate relativity (Column (3)) is credibility weighted with the market rate relativities (Column (10), and an offset factor is applied to the result. The offset factor is needed to balance the relativities so that the statewide relativity is still 1.000.

Finally, Column (13), the indicated change by territory, is calculated by dividing the credibility weighted relativity (Column (12)) by the current rate relativity (Column (3)), multiplying the result by 1.000 plus the statewide change, and subtracting 1.000.

AREAS FOR FUTURE STUDY

Just as this paper has gone beyond the previous homeowners ratemaking paper in many ways, there are still areas for study. A few of these are finding a distribution for the exposure projection, developing a better loss trending

procedure, finding a good ballast for credibility, and developing different expense ratios for dwelling and tenants forms.

Exhibit I

Development of Indicated Rate Level Change
Homeowners - Forms 2 and 3

	1984	1985	1986	1987	1988	Total
1. On-level Earned Premium	10,971,756	11,760,491	13,206,470	14,718,666	16,441,362	
2. Premium Trend Factor	1.582	1.464	1.354	1.259	1.161	
3. Trended Earned Premium (1) x (2)	17,357,318	17,217,359	17,881,560	18,530,800	19,088,421	
4. Incurred Losses	5,543,471	7,319,454	9,980,490	7,336,107	5,928,106	
5. Excess Wind Losses	0	0	2,915,014	0	0	
6. Incurred - Wind Losses (4) - (5)	5,543,471	7,319,454	7,065,476	7,336,107	5,928,106	
7. Losses x Excess Wind Ftr (6) x 1.022	5,665,427	7,480,482	7,220,916	7,497,501	6,058,524	
8. Loss Development Factor	1.000	1.005	1.012	1.038	1.079	
9. Developed Incurred Losses (7) x (8)	5,665,427	7,517,884	7,307,567	7,782,406	6,537,147	
10. Incurred Losses & LAE (9) x 1.148	6,503,910	8,630,531	8,389,087	8,934,202	7,504,645	
11. Losses Eliminated by Deduc. (# Claims x Avg. Deduc.)	399,900	430,860	419,379	436,794	412,284	
12. Loss Trend Factor	1.331	1.274	1.219	1.167	1.163	
13. Trended Incurred Losses & LAE {[(10) + (11)] x (12)} - (11)	8,789,071	11,113,352	10,318,141	10,499,158	8,795,104	
14. Accident Year Weights	20%	20%	20%	20%	20%	
15. Loss and LAE Ratio (13)/(3)	0.506	0.645	0.577	0.567	0.461	0.551
16. Credibility						59%
17. Expected Loss & LAE Ratio						0.590
18. Ballast for Credibility						0.590
19. Cred. Wtd Loss & LAE Ratio [(15) x (16)] + {(18) x [1 - (16)]}						0.567
20. Indicated Rate Change [(19)/(17)] - 1.000						-3.9%

Calculation of Average Relativity and Coverage A Amounts
Homeowners - Forms 2 & 3

Amount of Insurance	Proposed Relativity Curve	Earned Exposures				
		1984	1985	1986	1987	1988
$25,000	0.373	566	406	283	199	155
30,000	0.407	1,056	751	482	311	234
35,000	0.441	1,339	1,143	944	687	503
40,000	0.474	2,729	1,796	1,296	1,171	1,030
45,000	0.511	3,905	2,834	2,021	1,593	1,238
50,000	0.547	4,453	3,787	3,097	2,296	1,865
55,000	0.593	4,569	3,912	3,346	2,895	2,324
60,000	0.641	4,179	4,116	3,644	3,312	2,795
65,000	0.686	3,433	3,851	3,886	3,346	2,975
70,000	0.732	2,653	3,310	3,729	3,585	2,967
75,000	0.777	2,337	2,711	3,129	3,267	3,221
80,000	0.823	1,760	2,150	2,814	3,209	3,223
85,000	0.868	1,357	1,730	2,308	2,678	2,838
90,000	0.912	1,064	1,438	1,825	2,273	2,514
95,000	0.957	702	1,053	1,506	1,813	2,075
100,000	1.000	898	976	1,341	1,816	2,138
105,000	1.048	482	708	919	1,287	1,792
110,000	1.098	386	600	946	1,104	1,406
115,000	1.145	304	441	593	889	1,107
120,000	1.193	245	406	573	740	983
125,000	1.241	208	311	444	681	926
130,000	1.286	159	256	401	553	757
135,000	1.329	142	206	302	399	616
140,000	1.374	125	186	278	399	523
145,000	1.418	109	124	198	290	383
150,000	1.461	140	177	275	400	540
155,000	1.511	61	109	140	221	419
160,000	1.559	100	128	165	277	355
165,000	1.607	50	82	124	151	269
170,000	1.655	66	94	131	162	226
175,000	1.704	44	94	121	184	231
180,000	1.752	34	53	89	123	196
185,000	1.800	37	50	67	134	183
190,000	1.848	25	42	94	114	162
195,000	1.897	15	43	55	72	121
200,000	1.945	55	60	76	123	192
225,000	2.190	138	235	373	551	821
275,000	2.680	44	81	143	198	306
325,000	3.170	12	30	42	73	138
375,000	3.660	6	15	22	32	47
425,000	4.150	1	1	12	18	30
475,000	4.640	0	4	4	5	14
615,000	6.012	0	2	6	7	21
		39,988	40,502	42,244	43,638	44,859
Average Cov. A Relativity		0.692	0.748	0.809	0.870	0.943
Average Cov. A Amount		$65,178	$71,351	$78,135	$84,816	$92,708

Note: The $25,000 Coverage A amount represents the range from $22,500 to $27,499; $30,000 represents $27,500 to $32,499, etc.

Projection of Exposure Distribution
Homeowners - Forms 2 & 3

Amount of Insurance Range	1988 Earned Exposures	Distr. of (2)	Projected Amount of Insurance Range	Adjusted Distr.	Coverage A Relativity
(1)	(2)	(3)	(4)	(5)	(6)
$22,500 - 27,499	155	0.3%	$26,336 - 32,188	0.0%	0.407
27,500 - 32,499	234	0.5%	32,189 - 38,040	0.9%	0.448
32,500 - 37,499	503	1.1%	38,041 - 43,893	1.1%	0.481
37,500 - 42,499	1,030	2.3%	43,894 - 49,746	2.3%	0.526
42,500 - 47,499	1,238	2.8%	49,747 - 55,598	2.8%	0.569
47,500 - 52,499	1,865	4.2%	55,599 - 61,451	4.2%	0.630
52,500 - 57,499	2,324	5.2%	61,452 - 67,303	5.2%	0.689
57,500 - 62,499	2,795	6.2%	67,304 - 73,156	6.2%	0.740
62,500 - 67,499	2,975	6.6%	73,157 - 79,008	6.6%	0.796
67,500 - 72,499	2,967	6.6%	79,009 - 84,861	6.6%	0.840
72,500 - 77,499	3,221	7.2%	84,862 - 90,713	7.2%	0.897
77,500 - 82,499	3,223	7.2%	90,714 - 96,566	7.2%	0.947
82,500 - 87,499	2,838	6.3%	96,567 - 102,418	6.3%	1.002
87,500 - 92,499	2,514	5.6%	102,419 - 108,271	5.6%	1.052
92,500 - 97,499	2,075	4.6%	108,272 - 114,123	4.6%	1.115
97,500 - 102,499	2,138	4.8%	114,124 - 119,976	4.8%	1.178
102,500 - 107,499	1,792	4.0%	119,977 - 125,829	4.0%	1.220
107,500 - 112,499	1,406	3.1%	125,830 - 131,681	3.1%	1.279
112,500 - 117,499	1,107	2.5%	131,682 - 137,534	2.5%	1.337
117,500 - 122,499	983	2.2%	137,535 - 143,386	2.2%	1.385
122,500 - 127,499	926	2.1%	143,387 - 149,239	2.1%	1.432
127,500 - 132,499	757	1.7%	149,240 - 155,091	1.7%	1.491
132,500 - 137,499	616	1.4%	155,092 - 160,944	1.4%	1.541
137,500 - 142,499	523	1.2%	160,945 - 166,796	1.2%	1.581
142,500 - 147,499	383	0.9%	166,797 - 172,649	0.9%	1.661
147,500 - 152,499	540	1.2%	172,650 - 178,501	1.2%	1.713
152,500 - 157,499	419	0.9%	178,502 - 184,354	0.9%	1.770
157,500 - 162,499	355	0.8%	184,355 - 190,206	0.8%	1.828
162,500 - 167,499	269	0.6%	190,207 - 196,059	0.6%	1.890
167,500 - 172,499	226	0.5%	196,060 - 201,911	0.5%	1.934
172,500 - 177,499	231	0.5%	201,912 - 207,764	0.5%	1.992
177,500 - 182,499	196	0.4%	207,765 - 213,617	0.4%	2.050
182,500 - 187,499	183	0.4%	213,618 - 219,469	0.4%	2.113
187,500 - 192,499	162	0.4%	219,470 - 225,322	0.4%	2.170
192,500 - 197,499	121	0.3%	225,323 - 231,174	0.3%	2.229
197,500 - 212,499	192	0.4%	231,175 - 248,732	0.4%	2.337
212,500 - 249,999	821	1.8%	248,733 - 292,626	1.8%	2.641
250,000 - 299,999	306	0.7%	292,627 - 351,151	0.7%	3.141
300,000 - 349,999	138	0.3%	351,152 - 409,676	0.3%	3.719
350,000 - 399,999	47	0.1%	409,677 - 468,202	0.1%	4.287
400,000 - 449,999	30	0.1%	468,203 - 526,727	0.1%	4.865
450,000 - 499,999	14	0.0%	526,728 - 585,253	0.0%	5.434
500,000 - 730,000	21	0.0%	585,254 - 854,470	0.0%	7.038
	44,859	100.0%		100.0%	
			Average Relativity		1.095

Note: Column (4) equals the ranges in Column (1) multiplied by the growth factor to the 2.5 power. The growth factor used is 1.065.

Countrywide Experience by Cause of Loss
Homeowners - Forms 2 and 3

Cause of Loss	Accident Year	Incurred Losses	Loss Distribution	Number of Claims
(1)	(2)	(3)	(4)	(5)
Fire	1984	14,812,006	37.5%	3,241
Lightning	1985	16,142,489	32.5%	3,623
Removal	1986	15,040,358	38.1%	3,389
	1987	15,127,814	36.2%	3,183
	1988	20,124,472	43.7%	3,396
	Total	81,247,139	37.5%	16,832
Wind &	1984	5,558,932	14.1%	5,841
Hail	1985	11,947,854	24.1%	10,462
	1986	4,537,572	11.5%	3,235
	1987	4,171,195	10.0%	3,439
	1988	4,539,863	9.9%	3,402
	Total	30,755,416	14.2%	26,379
Water	1984	4,695,372	11.9%	4,231
Damage &	1985	5,561,035	11.2%	4,279
Freezing	1986	4,849,621	12.3%	3,542
	1987	6,815,728	16.3%	4,519
	1988	6,742,701	14.6%	4,083
	Total	28,664,457	13.2%	20,654
Theft	1984	5,318,680	13.5%	5,219
	1985	5,676,481	11.4%	5,275
	1986	5,937,654	15.0%	5,137
	1987	6,572,524	15.7%	5,285
	1988	6,613,844	14.4%	4,964
	Total	30,119,183	13.9%	25,880
Other	1984	3,176,878	8.0%	3,134
Phys. Dam	1985	3,057,168	6.2%	3,069
Vandalism	1986	2,741,826	6.9%	2,806
Malicious	1987	4,245,708	10.1%	3,509
Mischief	1988	3,913,479	8.5%	3,119
	Total	17,135,059	7.9%	15,637
Liability	1984	5,965,732	15.1%	1,473
	1985	7,212,470	14.5%	1,567
	1986	6,398,064	16.2%	1,494
	1987	4,900,871	11.7%	1,584
	1988	4,152,781	9.0%	1,499
	Total	28,629,918	13.2%	7,617
All Causes	1984	39,527,600	100.0%	23,139
	1985	49,597,497	100.0%	28,275
	1986	39,505,095	100.0%	19,603
	1987	41,833,840	100.0%	21,519
	1988	46,087,140	100.0%	20,463
	Total	216,551,172	100.0%	112,999

INSURANCE SERVICES OFFICE, INC. Exhibit V

HOMEOWNERS - FORMS 1-3,5
DERIVATION OF EXCESS WIND FACTOR

YEAR	(1) H.O. WIND LOSSES	(2) H.O. TOTAL LOSSES	(3) (2)-(1) TOTAL-WIND	(4) # (1)/(3) WIND/ (TOTAL-WIND)	(5) (4) > 1.5M WIND/ (TOTAL-WIND) EXCESS YEARS	(6) (5)-M EXCESS WIND RATIO	(7) (6)*(3) EXCESS WIND LOSSES	(8) TOTAL/ (TOTAL-EXCESS)
12/59	4,465,194	33,492,706	29,027,512	0.154	.	0.000	0	1.000
12/60	4,162,031	19,151,427	14,989,396	0.278	0.278	0.170	2,548,197	1.153
12/61	4,480,473	23,757,105	19,276,632	0.232	0.232	0.124	2,390,302	1.112
12/62	2,631,261	22,073,979	19,442,718	0.135	.	0.000	0	1.000
12/63	4,643,242	31,158,870	26,515,628	0.175	0.175	0.067	1,776,547	1.060
12/64	4,263,919	32,259,190	27,995,271	0.152	.	0.000	0	1.000
12/65	3,465,173	36,111,745	32,646,572	0.106	.	0.000	0	1.000
12/66	4,288,391	45,157,988	40,869,597	0.105	.	0.000	0	1.000
12/67	6,359,129	56,662,208	50,303,079	0.126	.	0.000	0	1.000
12/68	6,051,096	62,090,321	56,039,225	0.108	.	0.000	0	1.000
12/69	3,200,195	52,009,537	48,809,342	0.066	.	0.000	0	1.000
12/70	3,930,374	58,375,107	54,444,733	0.072	.	0.000	0	1.000
12/71	8,676,294	74,788,119	66,111,825	0.131	.	0.000	0	1.000
12/72	8,665,256	78,766,600	70,101,344	0.124	.	0.000	0	1.000
12/73	7,645,952	87,953,119	80,307,167	0.095	.	0.000	0	1.000
12/74	12,747,131	103,627,437	90,880,306	0.140	.	0.000	0	1.000
12/75	13,851,443	122,413,982	108,562,539	0.128	.	0.000	0	1.000
12/76	19,918,227	151,805,762	131,887,535	0.151	.	0.000	0	1.000
12/77	10,964,069	151,051,299	140,087,230	0.078	.	0.000	0	1.000
12/78	16,629,179	153,260,574	136,631,395	0.122	.	0.000	0	1.000
12/79	13,958,921	150,170,638	136,211,717	0.102	.	0.000	0	1.000
12/80	11,346,127	187,711,109	176,364,982	0.064	.	0.000	0	1.000
12/81	6,717,482	173,602,872	166,885,390	0.040	.	0.000	0	1.000
12/82	9,939,466	185,024,446	175,084,980	0.057	.	0.000	0	1.000
12/83	12,727,598	179,319,168	166,591,570	0.076	.	0.000	0	1.000
12/84	15,824,492	177,117,629	161,293,137	0.098	.	0.000	0	1.000
12/85	79,433,351	254,802,286	175,368,935	0.453	0.453	0.345	60,502,283	1.311
12/86	8,697,903	172,208,876	163,510,973	0.053	.	0.000	0	1.000
12/87	10,728,037	176,414,871	165,686,834	0.065	.	0.000	0	1.000
TOTAL	320,411,406	3,052,338,970	2,731,927,564	3.686		0.706	67,217,329	29.636

MEDIAN (M) = 0.108

EXCESS WIND FACTOR = AVERAGE OF TOTAL DIVIDED BY TOTAL MINUS EXCESS
= 1.022

IF ALL RATIOS ARE LESS THAN .250,NO EXCESS FACTOR IS USED

Derivation of Excess Wind Losses to be Excluded
Homeowners - Forms 2 and 3

Year	Wind and Hail Losses	All Causes Losses	Wind/ Non-Wind (2)/ [(3)-(2)]	Excess Years (4)>1.5x Median	Wind Ratio (5)-M	Excess Wind Losses (6)x [(3)-(2)]
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1984	227,566	5,543,471	0.043	0.000	0.000	0
1985	651,008	7,319,454	0.098	0.000	0.000	0
1986	3,601,904	9,980,490	0.565	0.565	0.457	2,915,014
1987	577,862	7,336,107	0.086	0.000	0.000	0
1988	526,364	5,928,106	0.097	0.000	0.000	0

Notes: Median (M) = 0.108 from Exhibit V.

Calculation of Countrywide Loss Development Factors
Homeowners - Forms 2 and 3

Direct Incurred Losses and Paid ALAE:

Accident Year	evaluated as of: 15 mon.	27 mon.	39 mon.	51 mon.	63 mon.
1980	28,373,763	29,386,062	29,514,289	29,574,266	29,823,585
1981	32,618,991	34,186,987	33,760,949	33,885,442	33,998,100
1982	38,557,359	39,037,532	38,551,579	38,946,741	39,204,882
1983	39,689,433	40,121,118	40,942,858	41,125,165	41,134,034
1984	39,024,400	40,394,244	41,359,271	41,701,516	42,069,295
1985	48,770,402	50,711,664	51,822,516	52,247,514	
1986	38,781,212	40,685,787	41,915,212		
1987	43,203,629	44,522,158			
1988	49,029,321				

Loss Development Factors:

Accident Year	15 mon. to 27 mon.	27 mon. to 39 mon.	39 mon. to 51 mon.	51 mon. to 63 mon.	63 mon. to Ultimate
1980	1.036	1.004	1.002	1.008	
1981	1.048	0.988	1.004	1.003	
1982	1.012	0.988	1.010	1.007	
1983	1.011	1.020	1.004	1.000	
1984	1.035	1.024	1.008	1.009	
1985	1.040	1.022	1.008		
1986	1.049	1.030			
1987	1.031				
1988					
3 Year Avg	1.040	1.025	1.007	1.005	
4 Year Avg	1.039	1.024	1.008	1.005	
Selected	1.040	1.025	1.007	1.005	1.000
Selected to ultimate	1.079	1.038	1.012	1.005	1.000

Calculation of Countrywide Loss Development Factors
Homeowners - Forms 2 and 3 Liability

Direct Incurred Losses:

Accident Year	evaluated as of: 15 mon.	27 mon.	39 mon.	51 mon.	63 mon.
1980	2,309,433	2,662,268	2,924,675	2,970,612	3,118,497
1981	3,729,291	4,562,201	4,470,509	4,655,633	4,733,931
1982	4,507,795	5,130,676	4,892,521	5,097,787	5,299,838
1983	4,797,030	5,073,974	5,881,016	6,222,975	6,222,411
1984	4,041,250	4,940,978	5,878,421	6,340,594	6,612,158
1985	4,463,200	5,970,672	7,256,429	7,665,013	
1986	4,627,752	6,350,839	6,791,961		
1987	4,376,445	5,227,570			
1988	4,416,103				

Loss Development Factors:

Accident Year	15 mon. to 27 mon.	27 mon. to 39 mon.	39 mon. to 51 mon.	51 mon. to 63 mon.	63 mon. to Ultimate
1980	1.153	1.099	1.016	1.050	
1981	1.223	0.980	1.041	1.017	
1982	1.138	0.954	1.042	1.040	
1983	1.058	1.159	1.058	1.000	
1984	1.223	1.190	1.079	1.043	
1985	1.338	1.215	1.056		
1986	1.372	1.069			
1987	1.194				
1988					
3 Year Avg	1.302	1.158	1.064	1.027	
4 Year Av	1.282	1.158	1.059	1.025	
Selected	1.302	1.158	1.064	1.027	1.000
Selected to ultimate	1.648	1.267	1.094	1.027	1.000

Calculation of Countrywide Loss Development Factors
Homeowners - Forms 2 and 3 Property

Direct Incurred Losses:

Accident Year	evaluated as of: 15 mon.	27 mon.	39 mon.	51 mon.	63 mon.
1980	26,064,330	26,723,794	26,589,614	26,603,654	26,705,088
1981	28,889,700	29,624,786	29,290,440	29,229,809	29,264,169
1982	34,049,564	33,906,856	33,659,058	33,848,954	33,905,044
1983	34,892,403	35,047,144	35,061,842	34,902,190	34,911,623
1984	34,983,150	35,453,266	35,480,850	35,360,922	35,457,137
1985	44,307,202	44,740,992	44,566,087	44,582,501	
1986	34,153,460	34,334,948	35,123,251		
1987	38,827,184	39,294,588			
1988	44,613,218				

Loss Development Factors:

Accident Year	15 mon. to 27 mon.	27 mon. to 39 mon.	39 mon. to 51 mon.	51 mon. to 63 mon.	63 mon. to Ultimate
1980	1.025	0.995	1.001	1.004	
1981	1.025	0.989	0.998	1.001	
1982	0.996	0.993	1.006	1.002	
1983	1.004	1.000	0.995	1.000	
1984	1.013	1.001	0.997	1.003	
1985	1.010	0.996	1.000		
1986	1.005	1.023			
1987	1.012				
1988					
3 Year Avg	1.009	1.007	0.997	1.002	
4 Year Av	1.010	1.005	1.000	1.001	
Selected	1.009	1.007	0.997	1.002	1.000
Selected to ultimate	1.015	1.006	0.999	1.002	1.000

Calculation of Loss Trend
Homeowners - Forms 2 and 3

Accident Year Ended	Severity	Frequency
12/84	1926	0.081125
6/85	1902	0.079067
12/85	2228	0.074930
6/86	2313	0.069473
12/86	2036	0.068114
6/87	2055	0.066910
12/87	2107	0.067687
6/88	2720	0.065421
12/88	3075	0.064422
6/89	3020	0.063192
Annual Rate of change	10.4%	-5.3%
R-squared	0.690	0.898

Note: Data excludes wind and hail losses.

Exhibit X

Credibility Procedure

The credibility formula assumes that the five observations* are statistically distributed according to the normal distribution. We assume the observations are 100% credible when the probability is 90% that the observed mean relativity is within plus or minus 5% of the expected mean. (This is equivalent to the 1,084 credibility criteria.)

The formula would then be:

$$90\% \leq \text{Prob}\ (-.05\ \mu \leq \bar{x} - \mu \leq .05\ \mu),$$

where $\bar{x}$ = observed mean
and μ = expected mean.

Normalizing it would give us:

$$90\% \leq \text{Prob}\left[\frac{-.05\mu}{\sigma/\sqrt{N}} \leq \frac{\bar{x}-\mu}{\sigma/\sqrt{N}} \leq \frac{.05\mu}{\sigma/\sqrt{N}}\right],$$

where σ = std deviation of normal distribution
and N = number of observations required for full credibility.

Since $Z_{.95} = \frac{\bar{x}-u}{\sigma/\sqrt{N}}$ for the normal distribution at 90% prob,

we solve for $\frac{-.05\mu}{\sigma/\sqrt{N}} \leq Z \leq \frac{.05\mu}{\sigma/\sqrt{N}} \rightarrow$

$$Z \leq \frac{.05u}{\sigma/\sqrt{N}} \rightarrow N \geq \left[\frac{Z\sigma}{.05\mu}\right]^2$$

We know that $Z_{.95} = 1.645$.

We can approximate σ^2 with $s = \frac{\Sigma(\bar{x} - x)^2}{n}$, where n = 5 = number of sample observations.

We can also approximate μ with $\bar{x}$.

Each territory will have a different N.

Then, partial cred = $\sqrt{(n/N)}$, where n = 5.

* For the statewide credibility calculation, these are the annual trended loss and LAE ratios. For the territorial calculation, these are the annual territorial loss ratio relativities.

Development Of Territorial Indications
Homeowners - Forms 2 & 3

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	06/30/87 Earned	Current Rate	Territorial Loss Ratio Relativities						Market Rate	Hanover	Credibility Weighted	Indicated
Terr.	House Yrs.	Relativity	06/30/83	06/30/84	06/30/85	06/30/86	06/30/87	5 Year	Relativity	Cred.	Relativity	Change
3	1292	1.171	0.718	1.969	0.964	0.669	1.393	1.085	1.043	15%	1.081	-11.3%
4	2436	1.405	0.700	0.993	1.178	0.882	1.211	0.989	1.276	35%	1.320	-9.7%
5	7	2.611	0.647	0.122	0.995	0.000	0.000	0.334	1.723	0%	1.729	-36.4%
6	73	1.832	0.517	0.436	0.297	0.245	0.272	0.328	1.412	20%	1.254	-34.2%
7	214	1.901	1.963	1.611	0.625	0.590	0.288	0.889	1.536	9%	1.555	-21.4%
30	293	0.810	2.243	1.127	1.657	3.656	1.012	2.133	0.859	14%	0.984	16.7%
31	444	0.781	0.346	1.677	0.573	0.756	1.198	0.917	0.864	13%	0.848	4.3%
33	433	0.772	0.782	0.590	1.071	0.485	1.333	0.786	0.965	16%	0.911	13.4%
34	369	0.772	4.597	1.265	0.531	0.472	1.158	1.447	0.868	0%	0.871	8.4%
35	3063	0.732	0.793	0.809	0.794	0.495	0.746	0.710	0.816	40%	0.700	-8.1%
36	726	0.772	0.830	1.143	1.612	0.847	0.564	1.022	0.829	19%	0.824	2.6%
37	838	0.708	0.520	0.915	0.658	0.308	0.456	0.569	0.817	18%	0.745	1.1%
38	307	0.746	0.676	3.350	1.372	0.398	0.463	1.153	0.850	0%	0.853	9.9%
39	441	0.772	0.601	0.312	0.730	0.666	0.977	0.651	0.885	20%	0.811	1.0%
40	1239	0.746	0.812	0.800	0.606	0.417	1.871	0.834	0.859	11%	0.836	7.7%
41	69	0.772	1.054	1.704	1.180	3.056	0.611	1.766	0.859	13%	0.928	15.5%
42	230	0.746	0.640	3.040	2.411	1.328	0.844	1.636	0.841	12%	0.890	14.7%
43	743	0.752	1.084	0.860	2.760	0.401	1.262	1.166	0.899	9%	0.900	15.0%
45	1395	1.051	1.302	0.894	0.945	0.692	1.341	0.976	1.044	25%	1.043	-4.6%
46	9312	1.190	0.898	1.121	0.984	1.903	1.239	1.295	1.093	24%	1.205	-2.7%
47	176	1.190	0.482	0.407	0.266	1.173	4.274	1.235	1.117	0%	1.121	-9.5%
48	378	1.190	0.567	0.321	0.385	0.453	0.531	0.445	1.119	33%	0.928	-25.1%
49	1870	1.113	1.333	0.447	0.899	0.394	0.657	0.674	1.064	13%	1.027	-11.3%
50	7602	1.190	1.124	0.993	0.904	0.821	0.675	0.893	1.105	39%	1.092	-11.8%
51	1198	0.746	0.439	1.392	1.500	0.517	0.490	0.840	0.838	12%	0.816	5.1%
52	1018	0.772	0.826	0.879	1.012	0.843	1.492	0.989	0.864	26%	0.841	4.7%
53	1232	0.772	1.230	0.919	1.167	0.656	0.906	0.925	0.866	29%	0.825	2.7%
54	6978	0.746	1.230	0.919	1.167	0.656	0.906	0.925	0.885	29%	0.831	7.0%
55	679	0.746	0.826	0.879	1.012	0.843	1.492	0.989	0.864	26%	0.834	7.4%
Total	45055	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000		1.000	-3.9%