A Review of Historical Insurance Company Impairments[1] (1996 – 2010)

Report 4 of the CAS Risk Based Capital (RBC) Research Working Parties
Issued by the RBC Dependencies and Calibration Working Party (DCWP)

Abstract: The purpose of this paper is to study historical insolvencies with emphasis on patterns that can be related to risk factors relevant to the NAIC P&C RBC formula. This is one of several papers being issued by the Risk Based Capital (RBC) Dependencies and Calibration Working Party (DCWP). Conclusions are qualitative – company size, concentration by state and line of business, and reinsurance usage seem to be relevant to the understanding of historical impairment patterns.

Keywords. Insolvency, Solvency, Impairment, Risk-Based Capital, Capital Requirements, Insurance Company Financial Condition.

1. INTRODUCTION

1.1 Charge

This study supports the DCWP's charge as described in the committee's first report "Overview of Dependencies and Calibration in the RBC Formula"[2]: to "research how to handle dependencies and calibration in the NAIC P&C RBC formula (RBC or RBC formula), including the extent to which risk diversification should be reflected in the P&C formula."

1.2 Background

We have reviewed past insolvency studies and obtained data related to historical insolvencies. The objective is to observe patterns of past insolvencies and assess the consistency of the experience with risk factors considered important to DCWP's study of the RBC formula. The patterns of interest relate to the rate of insolvency within categories such as company size, concentration by state and line of business, reinsurance usage, and regional focus.

Note that observations are made on these categories individually but with the understanding that the categories are related. In fact, there can be considerable overlap between categories. Nonetheless, this study does not attempt to quantify the extent of interconnections between the categories or the extent to which one category has more or less impact on the rate of insolvency

[1] In this report, the majority of impaired companies are those identified in A.M. Best's 1969-2010 P/C Impairment Review – Appendix B. Some additional companies not found in A.M. Best's report are included in this report based on a review of National Conference of Insurance Guaranty Funds data and a list of inactive companies provided by the NAIC.

[2] Casualty Actuarial Society *E-Forum*, Winter 2012-Volume 1.

than other categories. Furthermore, this study does not assess statistical significance. Insolvencies are relatively rare and for some categories there are few observations (in some cases there are none).

Finally, a note on terminology—most of the identified "insolvent" companies are those identified by A.M. Best in its 2010 annual report on financial impairments. A.M. Best's definition of impairment is described in the report and is broader than technical insolvency. In the remainder of this paper, insolvencies and impairments will generally be referred to collectively as impairments.

1.3 Disclaimer

In this paper, references to "we," "our," "the working party," and "DCWP" refer to the CAS RBC Dependencies and Calibration Working Party.

The analysis and opinions expressed in this report are solely those of the authors, the Working Party members, and in particular are not those of the members' employers, the Casualty Actuarial Society, or the American Academy of Actuaries.

DCWP makes no recommendations to the NAIC or any other body. DCWP material is for the information of CAS members, policy makers, actuaries and others who might make recommendations regarding the future of the P&C RBC formula. In particular, we expect that the material will be used by the American Academy of Actuaries.

This paper is one of a series of articles prepared under the direction of the CAS RBC Dependency and Calibration Working Party and the Underwriting Risk Working Party (RBC Working Parties).

1.4 Outline

With this objective, we have taken the following steps:

1. Reviewed recent studies of company impairments:
    - A.M. Best – 1969-2010 P/C Impairment Review (May 2, 2011)
    - AAA – Property/Casualty Insurance Company Insolvencies[3] (September 2010)
2. Investigated the availability of information related to impaired companies.
3. Obtained lists of impaired companies from three sources: A.M. Best, the National Conference of Insurance Guaranty Funds (NCIGF) and the NAIC.

[3] Developed by the Financial Soundness/Risk Management Committee of the American Academy of Actuaries.

4. Merged the information on impairments with 15 years of industry statutory data.

We have produced charts showing industry data categorized by the selected categories with the impaired companies separately identified. This paper reviews the rates of impairment within these categories. The methods and observations are described below.

2. DATA

We compiled a list of impaired companies from three sources and then matched these to companies included in 15 years of industry statutory data provided by A.M. Best. This produced the following matches:[4]

- A.M. Best – 359 companies
- NAIC – 259 companies
- NCIGF – 190 companies

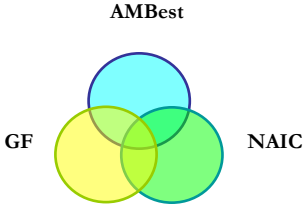
Using the A.M. Best list as the starting point with 359 company matches, the NAIC list adds 29 companies[5] and the NCIGF list adds 28 companies. This gives a total of 416 identified impaired companies. Note that A.M. Best's definition of impairment is described in its annual Impairment Review[6] and is broader than its financial strength "E" rating (under regulatory supervision). With this context, it makes sense that the A.M. Best list, having the broadest definition of impairment, is the largest.

There is considerable overlap between the different lists as shown in Table 1:

Table 1

Impairments - company on:	A.M. Best	NAIC	GF
A.M. Best List only	120		
all Lists	149	149	149
A.M. Best and NCIGF Lists Only	9		9
A.M. Best and NAIC Lists Only	81	81	
Subtotal A.M. Best	**359**	**230**	**158**
NCIGF and NAIC Lists Only	4	4	4
NAIC List only	25	25	
NCIGF List only	28		28
Grand Total	**416**	**259**	**190**

Figure 1



[4] The number of companies in each list before matching is larger: A.M. Best - 1,053 companies; NAIC – 624 companies, and NCIGF – 654 companies.
[5] This includes four companies also in the NCIGF list.
[6] See May 2011 P/C Impairment Review – page 9.

The seven rows in Table 1 correspond to the seven regions in the Venn diagram (not to scale) to the right in Figure 1.

An impairment attribute (a "flag") is then added to the industry data provided by A.M. Best. Also, for all companies, attributes related to the categories described above (company size, concentration, etc.) are added.[7] This category attribute is assigned at both a company and group level.[8] NAIC company code provides the key to add the impairment and category attributes to the companies in the A.M. Best industry data. Note that for some of the 416 companies identified by the above process, the data to assess their category attributes is not present in the industry database. The number of these companies is fairly small, generally less than 20.[9]

With these attributes added to the industry data, the sections that follow show impairment rates in table format. The impairment rate is the ratio of the number of impaired companies to the total number of companies, by category. In the remainder of the paper, this is referred to as the "mortality rate."

In total over the 15 years of experience, the 416 identified impairments out of 3,684 total entities represent roughly an 11% mortality rate or about a 0.7% rate per year. It is important to note that this rate is probably biased low since it is difficult to accurately identify all companies that became impaired from 1996 to 2010.

In addition, as stated previously, this study does not assess the statistical reliability of the observed mortality rates as estimates of population parameters. In particular, many of the observations relate to the differences in mortality rates of different categories. These observations are qualitative and statements regarding the statistical significance of these differences are out of our scope. Thus, the notion of reliability must be kept in mind when looking at the results. This is especially important for categories that are relatively small (few total companies) as well as categories where the rate of mortality is relatively rarer than others; both these factors affect reliability in a statistical context.

Finally, the results shown in the tables that follow are based on group level category assignments rather than individual company category assignments. For example, for state premium concentration, the direct earned premiums for all companies in a group are added together (keeping

[7] State and line attributes are developed using Annual Statement State Page data.
[8] Group is determined based on current data. As some impaired companies became part of other groups after their impairment, our grouping does not necessarily capture the category information prior to impairment.
[9] In the tables that follow, these 20 companies are identified in the line labeled "no data." Also, there is one company that is excluded from most tables because of some very unusual financial statements related to insolvency; so, in most cases the tables show a total of 415 impaired companies.

state detail) and the group's state premium concentration is then calculated from this total. In this example, the use of group categories eliminates the combining of single (or few) state companies that are part of a larger diversified group together with companies that are truly stand alone companies that are concentrated geographically.

2.1 State Concentration

Four state premium concentration categories are chosen: 0-25%, 25-50%, 50-75%, and 75-100%. To make company assignments to these categories, state page direct earned premiums for 15 years (1996-2010) are totaled by group and by state. The ratio of a group's largest state to its total is then calculated. This percentage specifies the concentration category to which all companies in a group are assigned.

The results are shown in the Table 2. The "mortality rate" is the ratio of impaired companies to total companies, by category. The "relativity" is the ratio of a category's mortality rate to the average mortality rate for all categories.

Table 2

State Premium Concentration Categories							
Concentration	**Impaired Companies**	**Unimpaired Companies**	**Total**	**Median RBC Ratio[10]**	**Mortality Rate**	**Relativity to Total**	**2010 Median RBC Ratio**
0-25%	94	1,273	1,367	9.1	0.069	**0.61**	11.1
25-50%	77	477	554	8.7	0.139	*1.23*	9.7
50-75%	39	264	303	8.5	0.129	*1.14*	10.4
75-100%	188	1,115	1,303	9.1	0.144	*1.28*	10.0
Subtotal	398	3,129	3,527	9.0	0.113	**1.00**	10.4
No Data	17	140	157	10.4			9.9
Total	415	3,269	3,684	9.0	0.113		10.4

Relativity to Total – bold for below average; italic for above average

The mortality rate of the least concentrated group (0-25%) is 40% below the total and less than half that of the most concentrated group (75-100%). Note that the mortality rate does not increase monotonically with increasing concentration, but this could be random noise or possibly other factor effects that are coming into play. Nonetheless, what stands out is the pronounced lower rate in the least concentrated group.

The table, and subsequent tables, show the all year "Median RBC Ratio," as more highly

[10] As reported in the Annual Statement, this is the ratio of total adjusted capital to authorized control level risk-based capital. In this column, the median is taken over all RBC ratios reported over the 15-year experience period.

capitalized companies would be expected to have lower "mortality rates" than less well capitalized companies. In this table the RBC ratios are relatively similar among the group and less likely to be a factor in differences in mortality rates between concentration groups.

2.2 Line of Business Concentration[11]

Four lines of business premium concentration categories are chosen: 0-25%, 25-50%, 50-75%, and 75-100%. The company assignments to these categories are made analogously to the state concentration assignments, but rather than totaling the 15 years of data by state, the totals are by line. The ratio of direct earned premium for a group's largest line to its total is calculated and this percentage specifies the concentration category to which all companies in a group are assigned. The results are shown in Table 3.

Table 3

Line of Business Premium Concentration Categories							
Concentration	**Impaired Companies**	**Unimpaired Companies**	**Total**	**Median RBC Ratio**	**Mortality Rate**	**Relativity to Total**	**2010 Median RBC Ratio**
0-25%	8	277	285	8.0	0.028	**0.25**	8.9
25-50%	87	932	1,019	9.0	0.085	**0.76**	10.8
50-75%	91	616	707	10.1	0.129	*1.14*	13.2
75-100%	213	1,307	1,520	8.4	0.140	*1.24*	9.3
Subtotal	399	3,132	3,531	9.0	0.113	**1.00**	10.4
No Data	16	137	153	10.7			9.7
Total	415	3,269	3,684	9.0	0.113		10.4

Relativity to Total – bold for below average; italic for above average

Here the mortality rates increase monotonically with increasing concentration, however, the caveats about reliability must be kept in mind. The least concentrated category in particular has a small number of companies and a relatively lower mortality incidence. Combining the two lower concentration categories and two higher concentration categories gives mortality rates of .073 and .137, respectively. Thus, the mortality rate of the lower concentrations is more than 40% lower than that of the higher concentrations.

We would expect that concentration by state and line are related to each other and related to size. Section 2.3 shows mortality experience by premium size; section 2.4 then displays a cross tabulation that adds a size dimension to the state and line concentration results.

[11] Lines of business are based on those shown on the Annual Statement State Page (Page 14). See Appendix 1 for line of business definitions.

2.3 Premium Size Differences

Size is based on group average annual direct earned premiums (the same as those used for the state and line concentration categories). Group percentiles are calculated and the related companies are assigned to quintile categories. The results are shown in Table 4.

Table 4

Premium Percentile Categories							
Percentile[12]	**Impaired Companies**	**Unimpaired Companies**	**Total**	**Median RBC Ratio**	**Mortality Rate**	**Relativity to Total**	**2010 Median RBC Ratio**
0-20%	40	306	346	14.2	0.116	*1.02*	10.7
20-40%	56	305	361	9.9	0.155	*1.37*	9.6
40-60%	78	304	382	8.0	0.204	*1.81*	7.5
60-80%	89	400	489	7.6	0.182	*1.61*	9.1
80-100%	135	1,814	1,949	9.2	0.069	**0.61**	11.5
Subtotal	398	3,129	3,527	9.0	0.113	**1.00**	10.4
No Data	17	140	157	10.4			9.9
Total	415	3,269	3,684	9.0	0.113		10.4

Relativity to Total – bold for below average; italic for above average

The pattern here is interesting in that the mortality rates do not follow a consistent pattern relative to size. The mortality rates of the middle three quintiles are high: the combined mortality rate is .181, 60% higher than the average. The top and bottom quintiles have much lower rates than the middle three. The top quintile especially stands out with a rate less than half that of the middle three.

The relatively more favorable experience in the smallest size group was not anticipated. This may be a result of the smaller companies holding more capital relative to their ACL capital than larger companies. This is evidenced by the higher median RBC ratio of the 0-20% quintile over the 15-year experience period: 14.2, compared to an average of 9.0 overall.

[12] Note that the company counts in the quintiles are not even. This is because the assignment to quintile is done on a group basis.

2.4 Cross Tabulation of Premium Size, Line, and State Concentration

The mortality rates and mortality rate relativities for the previous three categories are shown together in Table 5: state concentration, line concentration, and premium size. For premium size, the quintiles have been summarized to show the smallest 20%, the middle 60%, and the largest 20%:

Table 5

Mortality Rates

	By Group Line Concentration					By Group State Concentration				
by Group Premium Percentile Group	**75-100%**	**50-75%**	**25-50%**	**0-25%**	**Total**	**75-100%**	**50-75%**	**25-50%**	**0-25%**	**Total**
0-20%	0.116	0.122	0.000	0.000	0.113	0.104	0.080	0.286	0.105	0.113
20-80%	0.167	0.218	0.178	0.500	0.181	0.177	0.178	0.240	0.129	0.181
80-100%	0.110	0.065	0.062	0.025	0.069	0.092	0.072	0.079	0.061	0.069
Total	0.139	0.129	0.085	0.028	0.113	0.144	0.126	0.139	0.069	0.113

Mortality Rate Relativities

	By Group Line Concentration					By Group State Concentration				
by Group Premium Percentile Group	**75-100%**	**50-75%**	**25-50%**	**0-25%**	**Total**	**75-100%**	**50-75%**	**25-50%**	**0-25%**	**Total**
0-20%	*1.03*	*1.08*	**0.00**	**0.00**	1.00	**0.92**	**0.71**	*2.54*	**0.93**	1.00
20-80%	*1.48*	*1.93*	*1.58*	*4.44*	*1.61*	*1.58*	*1.58*	*2.13*	*1.14*	*1.61*
80-100%	**0.98**	**0.58**	**0.55**	**0.22**	**0.62**	**0.81**	**0.64**	**0.70**	**0.54**	**0.62**
Total	*1.24*	*1.14*	**0.76**	**0.25**	1.00	*1.28*	*1.12*	*1.23*	**0.61**	1.00

This display shows that the higher than average mortality rates observed in section 2.3 for the middle three premium size quintiles crosses all the line and state concentration categories. Also, for this middle 20-80% category, there is no consistent pattern of the mortality rate relative to concentration.

In contrast, the largest 20% category shows a noticeable pattern of higher mortality rates at higher concentrations, particularly for line concentration: the mortality rate relativity of the highest line concentration category, 0.98, is over four times the mortality rate of the lowest line concentration category, 0.22.

The next tables show the numbers of impaired and total companies in each cell of the table above. Table 6A shows the number of impaired companies by size group/line concentration group and by size group and state concentration group. Table 6B shows the same information for all companies.

Table 6A

	Number of Impairments									
	By Group Line Concentration					By Group State Concentration				
by Group Premium Percentile Group	**75-100%**	**50-75%**	**25-50%**	**0-25%**	**Total**	**75-100%**	**50-75%**	**25-50%**	**0-25%**	**Total**
0-20%	34	5	0	0	39	29	2	6	2	39
20-80%	124	61	37	1	223	135	27	43	18	223
80-100%	53	25	50	7	135	24	9	28	74	135
Total	211	91	87	8	397	188	38	77	94	397

Table 6B

	Total Companies									
	By Group Line Concentration					By Group State Concentration				
by Group Premium Percentile Group	**75-100%**	**50-75%**	**25-50%**	**0-25%**	**Total**	**75-100%**	**50-75%**	**25-50%**	**0-25%**	**Total**
0-20%	293	41	10	1	345	280	25	21	19	345
20-80%	742	280	208	2	1,232	761	152	179	140	1,232
80-100%	480	386	801	282	1,949	262	125	354	1,208	1,949
Total	1,515	707	1,019	285	3,526	1,303	302	554	1,367	3,526

These tables show the degree of overlap between the state and line concentration categories. For example, for the 397 impaired companies shown in Table 6A, 211 are in the most concentrated line category and 188 are in the most concentrated state category. A comparison (not displayed) of the 211 companies to the 188 companies shows that there are 126 companies that are common to both highest concentration categories.

Looking at all companies, Table 6B, the largest size company group of 80%-100%, with 1,949 companies, has the most distinctly different distribution of companies by concentration, state vs. line. For that size category, having a higher line concentration (480 companies) is much more common than having a higher state concentration (262 companies).

2.5 Reinsurance Usage

Four reinsurance usage categories are chosen: 0-25%, 25-50%, 50-75%, and 75-100%. To make company assignments to these categories, Underwriting and Investment Exhibit, Part 1B – Premiums Written, columns 1, 3, and 5 are used.[13] The all-lines written premiums for 15 years (1996-2010) are totaled by group. The ratio of a group's ceded written premium to its gross written premium is then calculated. This percentage specifies the ceded percentage category to which all companies in a group are assigned. The results are shown in Table 7.

Table 7

Written Premium - % Ceded to Gross Categories							
WP - % Ceded to Gross	**Impaired Companies**	**Unimpaired Companies**	**Total**	**Median RBC Ratio**	**Mortality Rate**	**Relativity to Total**	**2010 Median RBC Ratio**
0-25%	226	2,394	2,620	9.4	0.086	**0.76**	11.3
25-50%	105	525	630	7.7	0.167	*1.47*	8.0
50-75%	54	175	229	7.2	0.236	*2.07*	7.5
75-100%	22	77	99	7.6	0.222	*1.95*	6.1
Subtotal	407	3,171	3,578	8.9	0.114	1.00	10.4
No Data	8	98	106	15.5			14.1
Total	415	3,269	3,684	9.0	0.113		10.4

Relativity to Total – bold for below average; italic for above average

Here the mortality rate for the 0-25% category (least reinsurance usage) is only slightly more than half that of the next category, 25-50%. The two highest reinsurance usage categories have about twice the overall mortality rate.

We also observe that the RBC ratio is lower for companies with more reinsurance, and this lower RBC ratio may contribute to the higher mortality rate for the companies with higher reinsurance ratios.

[13] This excludes reinsurance with affiliates.

Breaking out size in the same way as section 2.4 shows:

Table 8

	Mortality Rates by Group Ceded Re % Category				
by Group Premium Percentile Group	**75-100%**	**50-75%**	**25-50%**	**0-25%**	**Total**
0-20%	0.067	0.029	0.110	0.140	0.116
20-80%	0.268	0.311	0.196	0.150	0.181
80-100%	0.364	0.211	0.146	0.048	0.070
Total	0.226	0.237	0.167	0.085	0.113

Corresponding relativities are shown in Table 9.

Table 9

	Mortality Rate Relativities by Group Ceded Re % Category				
by Group Premium Percentile Group	**75-100%**	**50-75%**	**25-50%**	**0-25%**	**Total**
0-20%	**0.59**	**0.25**	**0.97**	*1.24*	*1.02*
20-80%	*2.37*	*2.75*	*1.73*	*1.32*	*1.60*
80-100%	*3.21*	*1.87*	*1.29*	**0.42**	**0.61**
Total	1.99	2.09	1.47	0.75	1.00

Relativities – bold for below average; italic for above average

Recognizing that the number of companies in some cells is small (shown below in Table 10), what stands out quite dramatically in Table 9 above is the much lower relative mortality rate, 0.42, for the largest groups with lowest reinsurance usage (80-100% premium percentile; 0-25% reinsurance %): the rate for this cell is 58% (1-42%) lower than the overall average and 72% lower than the combined rate for all other cells in the table (value not shown). Also, within the largest size category, the mortality rate increases monotonically with increasing reinsurance usage.

Also notable is that within the smallest size category, the pattern is reversed. Within this category, the lowest reinsurance usage (0-25%) has the highest relative mortality rate, about 75% higher than the combined rate for the other cells in this size category.

Table 10 shows the number of companies used to calculate the ratio in Table 9.

Table 10

by Group Premium Percentile Group	Number of Impairments by Group Ceded Re % Category				
	75-100%	**50-75%**	**25-50%**	**0-25%**	**Total**
0-20%	2	1	8	29	40
20-80%	11	38	61	113	223
80-100%	8	15	35	77	135
Total	21	54	104	219	398

by Group Premium Percentile Group	Total Companies by Group Ceded Re % Category				
	75-100%	**50-75%**	**25-50%**	**0-25%**	**Total**
0-20%	30	35	73	207	345
20-80%	41	122	312	754	1,229
80-100%	22	71	239	1,608	1,940
Total	93	228	624	2,569	3,514

2.6 Regional Differences

This display is related to section 2.1 in that the state that determines a state concentration category is now used to assign a region designation to all companies in a group. Note that this does not correspond to state of domicile. The results are shown in Table 11.

Table 11

Largest State Region Categories							
Region[14]	**Impaired Companies**	**Unimpaired Companies**	**Total**	**Median RBC Ratio**	**Mortality Rate**	**Relativity to Total**	**2010 Median RBC Ratio**
Canada	0	8	8	7.6	0.000	**0.00**	10.8
Mid-Atlantic	91	785	876	8.1	0.104	**0.92**	9.4
Midwest	44	480	524	9.1	0.084	**0.74**	10.4
Northeast	13	98	111	10.9	0.117	*1.04*	14.5
Southeast	88	465	553	8.1	0.159	*1.41*	8.3
Southwest	53	293	346	11.3	0.153	*1.36*	13.2
West	109	1,000	1,109	9.2	0.098	**0.87**	12.2
Subtotal	398	3,129	3,527	9.0	0.113	1.00	10.4
No Data	17	140	157	10.4			9.9
Total	415	3,269	3,684	9.0	0.113		10.4

Relativities – bold for below average; italic for above average

The Southeast and Southwest regions stand out with higher than average mortality rates. Combined, these two regions have a mortality rate about 60% higher than the combined rate for the other regions (not shown).

Table 12 shows the breakout of mortality rates by size within region.

Table 12

	Mortality Rates by Group Region							
by Group Premium Percentile Group	**Canada**	**Mid-Atlantic**	**Midwest**	**Northeast**	**Southeast**	**Southwest**	**West**	**Total**
0-20%		0.070	0.122	0.143	0.069	0.194	0.159	0.116
20-80%	0.000	0.149	0.121	0.174	0.230	0.233	0.198	0.181
80-100%	0.000	0.083	0.032	0.069	0.091	0.051	0.070	0.070
Total	0.000	0.104	0.084	0.117	0.160	0.154	0.099	0.113

[14] See Appendix 2 for region definition.

Table 13 shows corresponding relativities.

Table 13

by Group Premium Percentile Group	Mortality Rate Relativities by Group Region							
	Canada	**Mid-Atlantic**	**Midwest**	**Northeast**	**Southeast**	**Southwest**	**West**	**Total**
0-20%	**0.00**	**0.62**	*1.07*	*1.26*	**0.61**	*1.71*	*1.40*	*1.02*
20-80%	**0.00**	*1.31*	*1.07*	*1.54*	*2.03*	*2.06*	*1.75*	*1.60*
80-100%	**0.00**	**0.73**	**0.28**	**0.61**	**0.80**	**0.45**	**0.62**	**0.61**
Total	**0.00**	**0.92**	**0.74**	*1.03*	*1.41*	*1.36*	**0.87**	1.00

Relativities – bold for below average; italic for above average

The relativities highlight that the high mortality rates in the Southeast and Southwest regions are concentrated in the middle-size quintiles where the rates are twice the average. However, within this size category the higher than average rates are spread broadly across all regions with the possible exception of the Midwest whose rate is only modestly above average. Outside of the middle-size quintiles the rates by region are quite variable, although for the largest premium quintile, the rates are lower than average across all regions. For the smallest premium quintile, the rates by region are more variable relative to the average.

The number of companies in each size/region cell is shown in Table 14.

Table 14

by Group Premium Percentile Group	Number of Impairments by Group Region							
	Canada	**Mid-Atlantic**	**Midwest**	**Northeast**	**Southeast**	**Southwest**	**West**	**Total**
0-20%		7	9	1	4	12	7	40
20-80%		45	28	8	65	34	43	223
80-100%		39	7	4	19	7	59	135
Total	0	91	44	13	88	53	109	398

by Group Premium Percentile Group	Total Companies by Group Region							
	Canada	**Mid-Atlantic**	**Midwest**	**Northeast**	**Southeast**	**Southwest**	**West**	**Total**
0-20%	0	100	74	7	58	62	44	345
20-80%	2	303	232	46	283	146	217	1,229
80-100%	6	469	217	58	209	136	845	1,940
Total	8	872	523	111	550	344	1,106	3,514

2.7 Selected Financial Information by Year

This section shows selected financial information by year for all identified impaired companies and also for a subset of the impaired companies where impairments identified in 2002 and prior are excluded. The latter display thereby shows pre- and post-impairment financial information for a group of companies now known to have become impaired, but where the 1996-2002 years in the bold box include no known impairments. Table 15 shows the numbers of companies included in each of these displays:

Table 15

	Impaired Companies (all sources)			Impaired Companies (A.M. Best) excluding 2002 & Prior Impairments		
Annual Statement Year	Total Entity Count	Count of Reporting Entities	Count by Year of First Impairment (A.M. Best)	Total Entity Count	Count of Reporting Entities	Count by Year of First Impairment
1996	415	345	55	**136**	**94**	**0**
1997	415	329	23	**136**	**97**	**0**
1998	415	330	11	**136**	**103**	**0**
1999	415	306	13	**136**	**107**	**0**
2000	415	279	37	**136**	**107**	**0**
2001	415	259	43	**136**	**111**	**0**
2002	415	227	40	**136**	**107**	**0**
2003	415	202	31	136	101	31
2004	415	189	16	136	96	16
2005	415	182	10	136	86	10
2006	415	171	14	136	79	14
2007	415	171	5	136	80	5
2008	415	170	12	136	78	12
2009	415	155	15	136	65	15
2010	415	131	16	136	49	16
		Total:	341			119
		2011 Impairments:	17			17
		Total from A.M. Best:	358			136

The total entity count reflects all impaired companies included in the 15-year period regardless of whether financial information was reported in any particular year. The count of reporting entities only includes companies that reported financial information (note that this number goes down over time). The count by year of first impairment only includes companies on the A.M. Best list since only that list includes year of impairment. This last count is the only one that corresponds to impairments by year.

On the right of the Table 15, the counts reflect the removal of companies that became impaired in 2002 and prior. Only companies on the A.M. Best list are included in this display.

Tables 16A and 16B show the medians of selected financial amounts from the Annual Statement for impaired vs. unimpaired companies. These tables include all identified impairments.

Table 16A

Annual Statement Year	Annual Statement Data							
			$millions					
	Number of Companies Reporting		Median Total Net Loss & Exp Unpaid		Median Net Admitted Cash & Invested Assets		Median RBC Ratio	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
1996	345	2,335	5.9	6.5	18.2	25.7	5.1	7.7
1997	329	2,388	5.5	6.7	18.6	27.5	5.4	8.1
1998	330	2,418	5.0	6.1	19.6	27.1	5.9	8.8
1999	306	2,415	5.9	5.9	18.3	27.7	5.6	9.1
2000	279	2,411	4.6	5.7	15.7	28.5	4.8	9.4
2001	259	2,429	4.2	5.4	16.5	28.9	5.2	9.3
2002	227	2,450	4.1	5.8	17.8	31.0	5.0	8.4
2003	202	2,496	4.2	6.5	20.1	32.5	5.4	8.3
2004	189	2,541	3.4	6.4	18.1	34.4	5.5	8.5
2005	182	2,584	2.0	6.1	20.2	34.7	5.7	9.2
2006	171	2,619	2.8	6.2	21.7	37.1	6.2	9.9
2007	171	2,652	2.6	6.1	23.3	38.3	6.1	10.4
2008	170	2,671	3.9	6.7	25.2	37.4	5.5	10.3
2009	155	2,674	7.2	7.5	26.0	38.2	6.2	10.7
2010	131	2,659	7.3	8.3	28.7	40.1	6.9	10.6

Table 16B

Annual Statement Year	Number of Companies Reporting		Median Direct Premiums Written		Median Surplus as Regards Policyholders		Premium to Surplus Ratio	
	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
1996	345	2,335	9.3	13.8	7.6	14.0	1.2	1.0
1997	329	2,388	10.1	14.5	8.5	15.5	1.2	0.9
1998	330	2,418	10.5	14.4	9.2	15.9	1.1	0.9
1999	306	2,415	11.2	15.1	9.2	16.6	1.2	0.9
2000	279	2,411	15.2	16.9	8.5	17.5	1.8	1.0
2001	259	2,429	12.1	18.9	7.2	17.6	1.7	1.1
2002	227	2,450	12.1	21.2	7.0	17.6	1.7	1.2
2003	202	2,496	9.8	22.6	8.3	18.5	1.2	1.2
2004	189	2,541	6.1	21.8	8.6	19.2	0.7	1.1
2005	182	2,584	5.6	21.6	9.9	19.9	0.6	1.1
2006	171	2,619	6.1	21.8	10.5	21.1	0.6	1.0
2007	171	2,652	7.4	22.6	11.3	22.6	0.7	1.0
2008	170	2,671	7.6	22.5	11.4	22.4	0.7	1.0
2009	155	2,674	7.3	21.6	12.0	23.5	0.6	0.9
2010	131	2,659	8.4	22.6	16.0	24.3	0.5	0.9

Tables 16A and 16B suggest that the impaired companies tend to be smaller than the unimpaired companies as measured by surplus/reserves/assets. Also noticeable is the ratio of direct written premium to surplus. For the unimpaired companies, it hovers near 1.0. For the impaired companies, it starts out a little above 1.0, increases to around 1.7-1.8 nearer to the impairment date, and then falls sharply in 2003. Presumably, the sharp fall reflects the decline in premium as the adverse effect of impairments reduced the companies' ability to conduct business. Similarly, the median RBC ratios are much lower for the impaired companies as one would expect.

Table 17 shows the same information but excludes all companies known to be impaired prior to 2002. Thus the 1996-2001 rows show the pre-impairment characteristics of the companies that become impaired in 2002 and subsequent compared to the characteristics of the remaining companies that did not become impaired in 2002 and subsequent.

Table 17

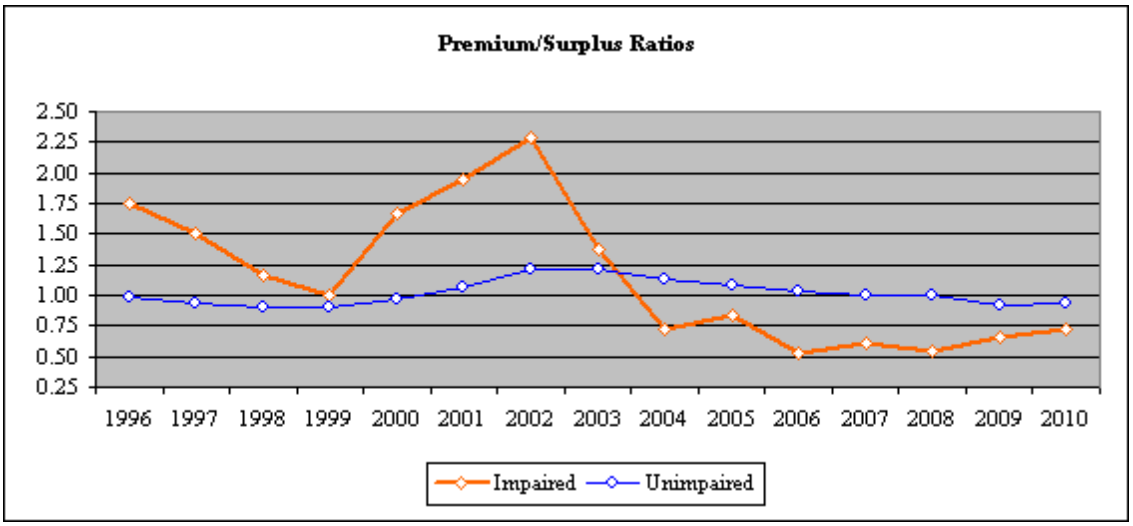
AS Year	Annual Statement Data - Excluding Companies Impaired Prior to 2003							
			$millions					
	Number of Companies Reporting		Median Total Net Loss & Exp Unpaid		Median Net Admitted Cash & Invested Assets		Median RBC Ratio	
	Impaired*	Unimpaired	Impaired*	Unimpaired	Impaired*	Unimpaired	Impaired*	Unimpaired
1996	94	2,335	4.8	6.5	20.3	25.7	5.9	7.7
1997	97	2,388	4.9	6.7	19.1	27.5	5.3	8.1
1998	103	2,418	4.0	6.1	20.4	27.1	6.2	8.8
1999	107	2,415	3.3	5.9	17.8	27.7	6.2	9.1
2000	107	2,411	3.3	5.7	17.2	28.5	5.5	9.4
2001	111	2,429	4.1	5.4	17.3	28.9	5.6	9.3
2002	107	2,450	4.2	5.8	19.0	31.0	3.9	8.4
2003	101	2,496	3.9	6.5	21.0	32.5	4.2	8.3
2004	96	2,541	2.3	6.4	13.6	34.4	3.9	8.5
2005	86	2,584	0.9	6.1	20.2	34.7	4.3	9.2
2006	79	2,619	1.1	6.2	21.1	37.1	4.8	9.9
2007	80	2,652	2.2	6.1	19.9	38.3	4.5	10.4
2008	78	2,671	2.5	6.7	21.2	37.4	3.6	10.3
2009	65	2,674	9.2	7.5	22.8	38.2	4.1	10.7
2010	49	2,659	12.1	8.3	23.6	40.1	4.6	10.6
			$millions					
AS Year	Number of Companies Reporting		Median Direct Premiums Written		Median Surplus as Regards Policyholders		Premium to Surplus Ratio	
	Impaired*	Unimpaired	Impaired*	Unimpaired	Impaired*	Unimpaired	Impaired	Unimpaired
1996	94	2,335	13.3	13.8	7.6	14.0	1.8	1.0
1997	97	2,388	12.6	14.5	8.4	15.5	1.5	0.9
1998	103	2,418	11.4	14.4	9.7	15.9	1.2	0.9
1999	107	2,415	10.2	15.1	10.2	16.6	1.0	0.9
2000	107	2,411	15.3	16.9	9.2	17.5	1.7	1.0
2001	111	2,429	15.3	18.9	7.8	17.6	2.0	1.1
2002	107	2,450	17.0	21.2	7.4	17.6	2.3	1.2
2003	101	2,496	12.1	22.6	8.8	18.5	1.4	1.2
2004	96	2,541	5.2	21.8	7.1	19.2	0.7	1.1
2005	86	2,584	8.2	21.6	9.8	19.9	0.8	1.1
2006	79	2,619	5.2	21.8	9.7	21.1	0.5	1.0
2007	80	2,652	5.8	22.6	9.4	22.6	0.6	1.0
2008	78	2,671	4.8	22.5	8.9	22.4	0.5	1.0
2009	65	2,674	5.2	21.6	7.9	23.5	0.7	0.9
2010	49	2,659	7.0	22.6	9.7	24.3	0.7	0.9

* Includes only A.M. Best impairments with year of first impairment.

A couple of the observations relating to the previous table appear more pronounced in Table 17, in particular the increase and sharp fall in the premium to surplus ratio. Also, the difference in RBC ratios is bigger and the ratio for 2002 (the year before the emergence of these impairments) shows a bigger drop for the impaired companies - about 30% vs. a 10% drop for unimpaired companies.

Figure 2 shows the premium-to-surplus ratios from the Table 17.

Figure 2

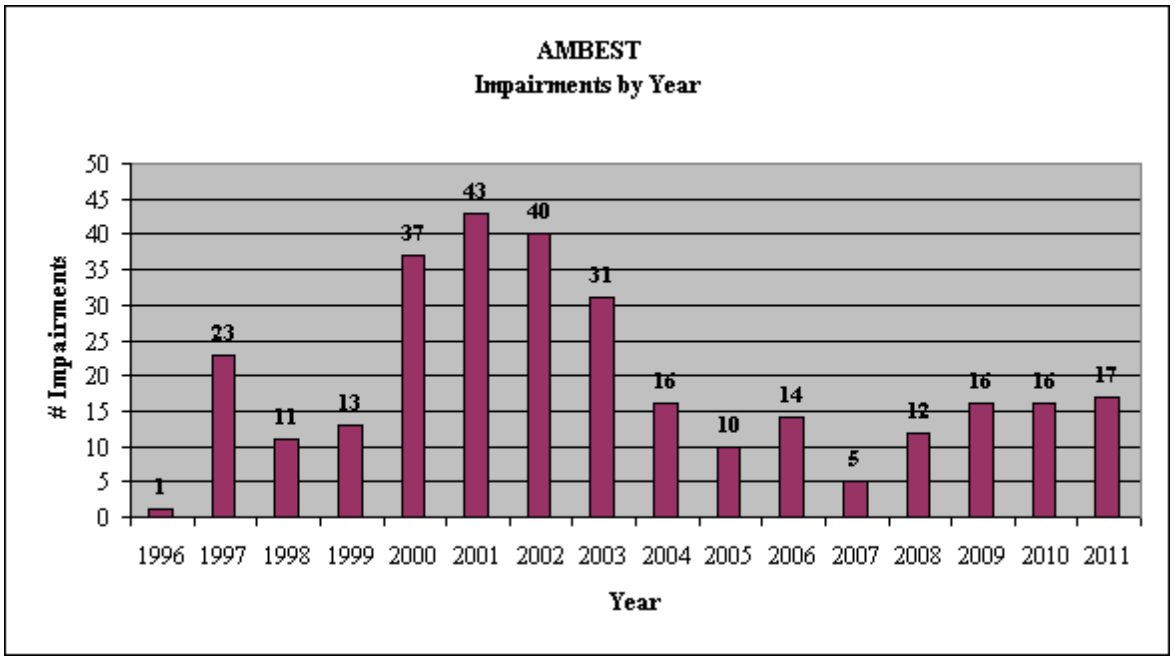


2.8 Other Observations

The primary source of this paper's impairment information comes from A.M. Best. It is a subset of the data included in A.M. Best's annual impairment review that includes more companies and extends back into the 1970s. Nevertheless, we consider the sample of impaired companies included in this study large enough to be useful for the purpose of the study—to make qualitative observations about historical patterns of insolvencies within categories of interest to the DCWP work.

Figure 3 shows A.M. Best impairments included in the study by year of first impairment, from 1996 - 2011.

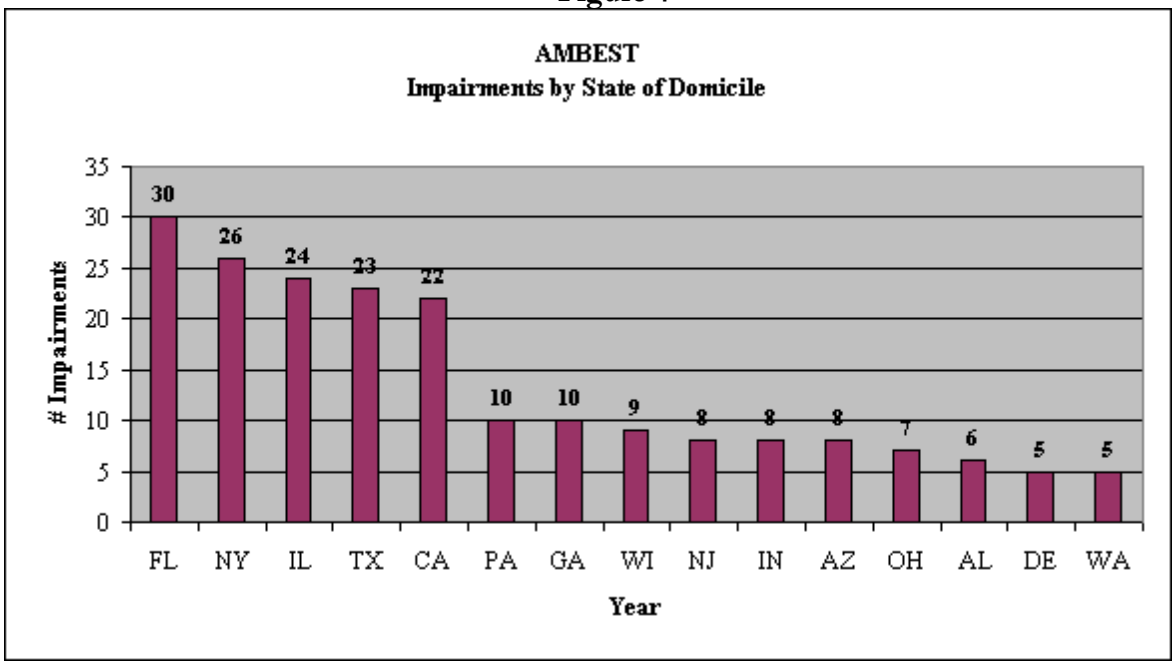
Figure 3



Note that this graph shows a total of 305 companies (out of the A.M. Best total of 359). The remaining A.M. Best companies have impairment years before 1996 and are not shown. Also, there are 17 companies included in the study that were identified as impaired in 2011. Even though the industry data used for the study is 1996 – 2010, the 17 companies are reflected in the various tables and figures presented in this study.

Figure 4 shows impairments by state of domicile for the top 15 states. These 15 states account for 201 of the 305 companies shown in Figure 3.

Figure 4



Finally, another relevant question is to what extent the impairments studied in this paper are of a particular kind or relate to specific notable events such as the California workers compensation crisis, Florida windstorm events, or the financial crisis. To address this, Figure 5 uses the state and line concentration categories described earlier.

Figure 5

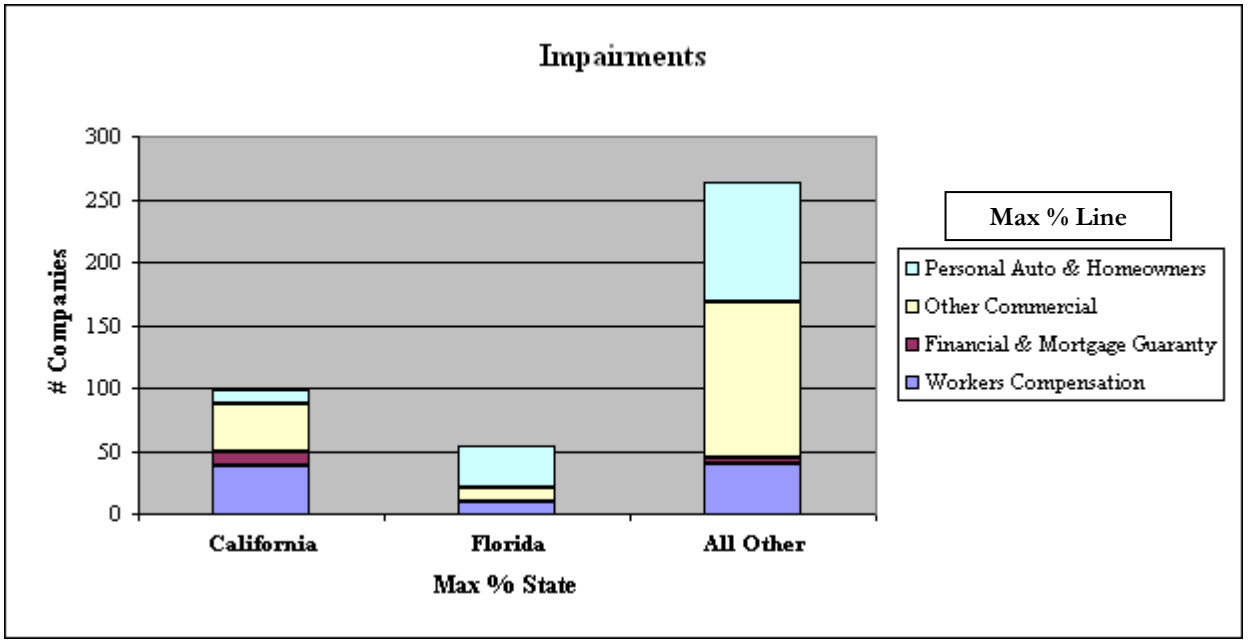


Table 18

	by Group Max % Line				
by Group Max % State	**Workers Compensation**	**Financial & Mortgage Guaranty**	**Other Commercial**	**Personal Auto & Homeowners**	**Total**
California	**38**	12	37	11	98
Florida	9		**12**	**33**	54
All Other	39	6	124	94	263
Total	86	**18**	173	138	415

Table 18 and Figure 5 show that the number of impairments in categories that would be expected to have a high exposure to these notable events is substantial, particularly for California workers compensation and Florida windstorm, however, these events do not appear to dominate the sample of impairments included in this study. The study includes these events and all other factors contributing to company impairments.

3. CONCLUSIONS

Wikipedia describes the scientific method as follows:

> The chief characteristic which distinguishes a scientific method of inquiry from other methods of acquiring knowledge is that scientists seek to let reality speak for itself, supporting a theory when a theory's predictions are confirmed and challenging a theory when its predictions prove false.[15]

This paper contributes to the study of insolvency by presenting "reality" through a qualitative review of historical impairment patterns.

In reviewing these patterns, note that they are the outcomes of possibly many factors contributing to company impairments. The study does not attempt to determine the underlying causes. Furthermore, the study does not attempt to differentiate the relative importance of the various categories presented.

Nevertheless, the study shows that size, concentration and reinsurance usage seem to be relevant to the understanding of historical impairments. The scientific method is an on-going process and, clearly, more work needs to be done.

4. AUTHORS

Principle Author – Eduardo Marchena
Other Work stream members – Allan Kaufman, Ji Yao.
Work Supported and reviewed by DCWP working party as follows:

[15] http://en.wikipedia.org/wiki/Scientific_method (Accessed November 15, 2012).

Allan Kaufman, Chair	**Glenn Meyers**	**CAS Staff:**
Jess Broussard	**David Rosenzweig**	**Karen Sonnet**
Robert Butsic	**David Ruhm**	**David Core**
Joe Cofield	**Ji Yao**	
Ed Marchena	**Christina Zhou**	
James McNichols		

5. REFERENCES

A. M. Best Company, Inc., "Special Report: U.S. Property/Casualty – 1969-2010 P/C Impairment Review," May 2011.

American Academy of Actuaries, "Property/Casualty Insurance Company Insolvencies," September 2010.

CAS Research Working Party on Risk-Based Capital Dependencies and Calibrations, "Report 1: Overview of Dependencies and Calibrations in the RBC Formula," Casualty Actuarial Society *E-Forum,* Winter 2012-Volume 1.

National Conference of Insurance Guaranty Funds, "Financial History and Assessment Liability Information,"www.ncigf.org/assessment (Excel spreadsheets).

Abbreviations and Notations:

ACL	Authorized control level
DCWP	Dependency and Calibration Working Party
NAIC	National Association of Insurance Commissioners
NCIGF	National Conference of Insurance Guaranty Funds
RBC	Risk-Based Capital

Appendix 1
Line of Business Definitions
(based on Annual Statement State Page lines)

Fire & Allied Lines 1 - Fire 2.1 - Allied lines 2.2 - Multiple peril crop 2.3 - Federal flood 12 - Earthquake	**Homeowners/Farmowners** 3 - Farmowners multiple peril 4 - Homeowners multiple peril
Commercial Multiple Peril 5.1 - Commercial multiple peril (non-liability portion) 5.2 - Commercial multiple peril (liability portion)	**Financial & Mortgage Guaranty** 6 - Mortgage guaranty 10 - Financial guaranty
Inland/Ocean Marine 8 - Ocean marine 9 - Inland marine	**Medical Professional Liability** 11 - Medical professional liability
Accident & Health 13 - Group accident and health 14 - Credit A&H (group and individual) 15.1 - Collectively renewable A&H 15.2 - Non-cancelable A & H 15.3 - Guaranteed renewable A & H 15.4 - Non-renewable for stated reasons only 15.5 - Other accident only 15.6 - Medicare Title XVIII exempt from state taxes or fees 15.7 - All other A & H 15.8 - Federal employees health benefits program premium	**Workers Compensation** 16 - Workers compensation
Other & Products Liability 17.1 - Other liability - occurrence 17.2 - Other liability - claims made 17.3 - Excess workers compensation 18 - Products liability	**Private Passenger Auto** 19.1 - Private passenger auto no-fault (personal injury protection) 19.2 - Other private passenger auto liability 21.1 - Private passenger auto physical damage
Commercial Auto 19.3 - Commercial auto no-fault (personal injury protection) 21.2 - Commercial auto physical damage 19.4 - Other commercial auto liability	**Aircraft** 22 - Aircraft (all perils)
Fidelity & Surety 23 - Fidelity 24 - Surety	**Other Commercial Lines** 26 - Burglary and theft 27 - Boiler and machinery 28 - Credit 30 - Warranty 34 - Aggregate write-ins for other lines of business

Appendix 2
Region Definitions

Northeast	Mid-Atlantic	Midwest	Southeast	Southwest	West	Canada
CT	DC	IA	AL	CO	AK	Canada
MA	DE	IL	AR	LA	AZ	
ME	MD	IN	FL	NM	CA	
NH	NJ	KS	GA	OK	GU	
RI	NY	KY	MS	TX	HI	
VT	PA	MI	NC	UT	ID	
	PR	MN	SC		MT	
		MO	TN		NV	
		ND	VA		OR	
		NE	VI		WA	
		OH	WV		WY	
		SD			Other	
		WI			Alien	