A Frequency Based Model for Excess Wind in Property Ratemaking

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ABSTRACT

In some geographic areas the most significant cause of variation in total dollar losses are fortuitous, non-hurricane storms. Many of the models developed to address the issue of such excess wind losses use dollar loss data only. The traditional models may muddy the distinction between large loss procedures and excess wind models, particularly in territorial analysis. Additionally, as new models are developed which address the hurricane-type risks only, overlap between the hurricane and non-hurricane losses in the traditional procedure degrades the utility of the historical database. A frequency based model for excess wind is proposed. A frequency based model has the benefit of both providing an appropriate load for non-hurricane excess wind, and making the company's internal property data more suitable for trend analysis.

A Frequency Based Model for Excess Wind in Property Ratemaking

OVERVIEW

Increasingly, property coverages are having a portion of their catastrophic losses estimated through the use of loss simulation procedures. These modeling procedures provide the long term expected losses for major catastrophic events, like hurricanes. However, they generally make no provision for smaller wind catastrophes which can represent a more significant component of a line's annual expected catastrophic losses on an ongoing basis.

As the hurricane models become more widely accepted, a data gap can exist between the historical excess wind model, which generally considered non-hurricane events along with hurricane losses, and the hurricane only loss procedure. This paper provides a procedure to develop a catastrophe or excess wind provision for non-hurricane losses. It develops a catastrophe load based upon the non-hurricane wind loss frequency. The model as developed enables data in a property book to be used for loss trend analysis.

CURRENT PROCEDURES

There are currently a number of procedures used. Most applications are variants of a procedure described by Homan [1]. He describes a procedure which ratios wind losses to total losses excluding wind. He takes historic losses over a long period (27 years) and determines the median ratio of wind to non-wind losses over the period. If a year's wind to non-wind losses are 150% or greater than the median ratio, then the excess wind ratio for the particular year is calculated as the difference between the year's excess wind ratio and the median. The excess wind ratios are totaled and divided by the number of years (27) to produce an average excess wind factor. This average excess wind factor is used to develop the excess wind loading for the year's under review.

Many excess wind procedures are variations on Homan's procedure. Chernick [2] describes a procedure where catastrophe events are identified in the database, and a catastrophe loading is developed with the defined catastrophe losses. Fitzgerald [3] provides an example where the total losses for each calendar year are ratioed to premium.

Problems with the Current Procedures

There are a number of problems with the current procedures. Among the problems are:

1. Hûrricane Losses Included in the Data
2. Mix of Different Policy Forms
3. Historical Premium Adequacy
4. Changing Definitions of Historical Catastrophes
5. Geographic Distribution Changes

6. Application to Territorial Analysis

7. Applicability of the Procedure to New Products

Hurricane Losses Included in the Data

The excess wind losses using the traditional 30 year catastrophe period include hurricane (major catastrophic wind) losses which are increasingly accounted for in rate development with modeled hurricane losses. A company, with an exposure base which is susceptible to both frequent wind / hail storms and hurricane losses, may have lost some of the value of an excess wind database if it is unable to separate hurricanes from the remainder of wind losses. While such segregation may be possible for most recent years, frequently the detail from older years no longer is available. Fitzgerald [3] notes that the ISO historical database lacks information for removing hurricanes from older years.

Mix of Different Policy Forms

Coverage changes occur over time, and the applicability of the traditional excess loss procedure to older years is unknown. For example, in Homeowners many companies had a different distributional mix of Actual Cash Value (ACV) policies and Replacement Cost Coverage (RCC) policies in older years than exist during the experience period under review. Do RCC policies produce proportionally larger or smaller losses than ACV policies, given the fundamental coverage differences?

Historical Premium Adequacy

The ISO excess procedure for Extended Coverage ratios losses to premiums. When excess loss ratios are used, problems can exist with the historical premium base. How does the adequacy of the historical premium base compare with current adequacy? That is, does a particular year appear to have excess losses solely due to the inadequacy of the premiums? Even if the historical premiums were adequate, if companies have been reducing expenses over time (including policyholder dividends), the older years' premiums are excessive at today's levels.

The Changing Definitions of Historical Catastrophes

In the procedure described by Chernick [2], catastrophes are described in the database. How are such catastrophes defined? If Property Claims Service (PCS) defined catastrophes are used, then the actuary needs to be sensitive to the long term definition changes of catastrophes. Prior to the 1980's an event was defined as a catastrophe if it produced over $1 million in insurance industry losses. Until recently a $5 million industrywide loss would be defined as a PCS catastrophe. Now, the storm must generate $25 million in losses to be defined as a catastrophe. A number of issues are raised by the use of such a standard.

1. **How does a company's distribution of risks compare to the industry's?** If it has a lesser concentration of risks than the industry, then the industrywide catastrophe may not have produced many losses for the company.

Contrariwise, a company with a much greater concentration of risks in a particular area may experience significant losses to its book, yet the storm may not qualify as an industry catastrophe.

2. **How well does a national catastrophe standard translate to state pricing?** This is a problem which is akin to the geographic issue raised above. The PCS catastrophe standard is a countrywide standard. A state on the periphery of the system generating an industry catastrophe may experience few losses. Similarly, a storm which generates relatively large losses for a particular state may not surpass the threshold for it to be defined as a countrywide industry loss.

3. **How does one redefine older catastrophes at the new total dollar level?** That is, under the PCS definition in 1993, a storm would have needed to generate losses of $5 million to qualify as a catastrophe. In 1997 the break point is $25 million. What should the level of losses have been in the 1993 storm to still qualify as a catastrophe? $25 million? Some interpolated dollar amount between the time of the last definition and the most recent definition?

Geographic Distribution Changes

The traditional method does not account for geographic distributional shifts which occur over time. Fitzgerald [3] notes that there has been a population shift to areas impacted by hurricanes over the last 30 years. Have shifts occurred to or away from areas impacted by wind, hail, and tornadoes? If so, then the historical excess loss model will not adequately reflect the prospective catastrophe risk being priced.

Application to Territorial Analysis

The traditional method advanced by Homan [1] performs territorial analysis by assuming that the excess catastrophes are distributed evenly across all territories. He does state that territorial catastrophe factors can be developed, but the specifics of such a procedure are not outlined in detail. Thus, the historical procedure does not allow for area catastrophic losses to be recognized in territorial analysis.

Applicability of the Procedure to New Products

The current procedures require the availability of many years of data since the variance is a function of a series of full years' losses. When a new product is introduced if its geographic spread or susceptibility to wind losses are different than other product lines, the applicability of the current procedures to the new product may be difficult to establish.

RECOMMENDED ALTERNATIVE

The proposed alternative is to develop a catastrophe procedure based on the wind claim frequency of particular dates of loss. Why use a frequency based model versus total dollars of loss?

While total dollars of loss produce the variation in the experience of any insurer, it is generally the variation in the underlying number of claims which generates the variation in the total dollars of loss. Catastrophe procedures, which rely upon the excess loss dollars to develop a catastrophe loading, are utilizing a surrogate for the variation in claim counts. By placing reliance upon the frequency, the surrogate is being replaced by a more accurate measure of the source of variation. If a frequency model more accurately accounts for catastrophic variation, then the accuracy of the actuarial model is enhanced.

Using a frequency based wind cause of loss procedure eliminates distortions to the catastrophe factor which can be generated by other causes of loss. That is, in many traditional methods, the wind claims are ratioed to the non-wind claims. Suppose that in a particular year the wind experience is somewhat worse than usual, but that theft and fire losses have declined considerably in the particular year. In such a year, the wind losses may be considered "excess" more by virtue of the good fire and theft experience than as a result of poor wind experience. The converse can hold, wherein all, or most, causes of loss deteriorating in a particular year can exclude that particular year's wind losses from consideration in the catastrophe factor development.

THE FREQUENCY MODEL

The proposed alternative is to consider the relative quarterly frequency of wind losses to determine the catastrophe loading. That is, summarize the wind claims and losses, by day of loss, over the experience period. Calculate the frequency of the wind losses by dividing each day's wind claim counts by the quarterly earned exposures. The 2.5% of days with the highest frequency are selected to be catastrophe days[1]. The losses associated with these claims are ratioed to the historical total losses excluding the catastrophe claims to develop a catastrophe factor.

Exhibit 1 provides an example of this procedure applied to a recently introduced product line which was introduced in 1988.[2] The underlying database contains all days with wind losses, the number of earned exposures (units insured) for the quarter, the number of claims generated on the day, and the cumulative paid losses for claims generated on the day through the most recent valuation quarter. The frequency and severity are calculated from the data on the exhibit. In the exhibit, 39 days are summarized, which represent the 2.5% of worst wind days. Over an approximate eight and a half year period (approximately 3,100 coverage days) the wind claims on these 39 days generated 14.3% of the total claims which represented 20.5% of the total loss dollars. From these data a catastrophe factor of 1. 2601 was generated.[3]

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[1] The derivation of this 2.5% criterion is discussed in the section "Catastrophe Cutoff" beginning on page 11.

[2] Only 8 and 1/2 years of data are reflected in this exhibit. The number of years used to develop a catastrophe factor generally can and should exceed this period. This exhibit reflects the experience for a recently introduced product line. This recently introduced product line was selected for this paper:

1. to show the applicability of the procedure to recently introduced product lines; and
2. to keep the example simple by including all the data on one page.

While more years are needed to develop a reliable excess wind factor, the specific length of experience to be examined has not been determined satisfactorily. One could argue that a period of approximately 15 years is reliable given that underwriting practices, coverage and geographic distributional changes render the applicability of data older than this suspect.

[3] If one examines the exhibit closely, he / she will notice that the seventh catastrophe date (1988-09-16) has only 5 claims. Because this is a recently introduced product line one could justify excluding the first or second year of data from the determination of the catastrophe load due to the instability which could be introduced to the frequencies from the rapid exposure growth. All data are

To price with this factor, the payments and reserves associated with the catastrophe days should be excluded from the calendar or accident years in the review. The factor should be applied to the incurred losses, without excess wind, to develop the prospective losses with catastrophes. Figure 1, below, demonstrates how the procedure would be applied to indications developed using calendar year data.[4] It summarizes the application of the catastrophe procedure to calendar year 1995 and 1996 incurred losses.

Figure 1[5]

Calendar Year	- - - Incurred Losses - - - Total	Excess Wind	Total Excl Excess Wind	Excess Factor	Total Adjusted Incurred
1995	12,519,591	3,611,313	8,908,278	1.2601	11,225,321
1996	7,403,814	681,212	6,722,602	1.2601	8,471,151
Total	19,923,405	4,292,525	15,630,088	N / A	19,696,472

There are additional adjustments which need to be made to the data to properly price a product.

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included in Exhibit 1 to emphasize the advantage of this procedure over the current procedures. That is, the catastrophes are selected not by the total losses they generate (which in the case of this particular date may seem to be ridiculously small), but based upon how many claims are generated by an event relative to the book's overall size.

[4] Exhibit 2 shows how the excluded excess losses are determined for calendar years 1995 and 1996. The example shown here is for illustrative purposes, and intended to show only how the catastrophe losses are removed from the experience period losses, and how the excess loss factor is applied. Application of trend, hurricane costs, and change in IBNR issues have been ignored. A more complete example would include the hurricane cost loading. Homan [4] discusses one such procedure. Finally, while calendar year losses are shown, the procedure can be applied to accident year losses.

[5] The data in the table are consistent with procedures used historically in the development of loss ratio indications. Following the section on trend, an alternative procedure using the application of the frequency based model with pure premiums is developed.

1. **Reinsurance** -- For an individual company, the excess wind losses which will be covered by an aggregate occurrence treaty should be excluded. This does not necessarily mean that losses which *were* covered by catastrophe reinsurance contracts should be excluded. If historically the company had a treaty which provided cover for losses excess $1 million, and in the prospective rate period aggregate losses excess $2 million will be covered, then losses exceeding the prospective coverage retention should be excluded from the calculation of the catastrophe loading. (This presupposes that the "cost" of such a reinsurance treaty is handled as cost of doing business.)

   Aggregate occurrence reinsurance issues complicate the analysis. Should the historical losses be trended so that aggregate occurrences be excluded? It will be necessary to have long term average coverage amounts to accomplish this.

2. **Use Multiple Days of Loss** -- Aggregate catastrophe contracts covering excess wind generally consider events generating losses which occur over a 72 hour period. Rather than selecting single days, one could aggregate the days into 3 or 4 day clusters. This would provide a better matching for the adjustment noted above.

3. **Incorporating with a Hurricane Model** -- Increasingly, expected losses from hurricanes are incorporated in pricing models. If the expected losses from hurricanes are included in the indications, then all hurricane losses should be excluded from this procedure. The pricing actuary needs to understand how the expected losses from hurricanes are estimated. If only hurricanes which make landfall are considered in the hurricane model, then hurricanes which do not make landfall, but which generate insurance losses, would need to be kept in the excess wind database used in this catastrophe model. Similarly, if the hurricane model considers only "true" hurricanes (e.g. Saffir - Simpson scale 1 or greater), then tropical storms need to be retained in the excess wind database.

Catastrophe Cutoff

How was the 2.5% of worst days cutoff criterion selected?

Initially, this value was selected arbitrarily as an acceptable cutoff point.[6] However, subsequent analysis tended to support this selection. The coefficient of variation between the frequency of wind losses, excluding catastrophes, was compared to the coefficient of variation on non-wind losses. If one assumes that once the variation in wind frequency due to catastrophes is removed, that the random variation in claims is the same between wind and non-wind losses, then the ideal percentage cutoff would

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[6] An alternative I have considered, but not employed, is to establish a cutoff frequency which is considered "catastrophic". That is, if the wind frequency for a particular day exceeds, say, 4% then that day would be considered catastrophic. Thus, the total catastrophic losses would be the sum of the losses, in this example, where the daily wind frequency exceeded 4%.

occur when the coefficient of variation was the same between the frequency for the wind losses excluding catastrophe losses and the non-wind losses.

Different cutoff percentages for various products were examined to determine the cutoff point. No ideal cutoff point has been developed. Although some such equivalence could be found at the 2.5% cutoff point, the ideal cutoff point has not been conclusively identified. The inability to develop a perfect match between these coefficients of variation probably result from a violation of the underlying assumption. That is, the randomness attributable to the non-cat wind claims and the non-wind claims are probably not the same. For example, if underwriting was concentrating on a reduction in fire losses over the experience period, then the company would have introduced a systematic influence on the random variation in fire claims while not simultaneously influencing the wind claims.

However, given the improvement in the loss trend data discussed in the next section that the 2.5% cutoff criterion generated, I believe a reasonable cutoff point has been established.

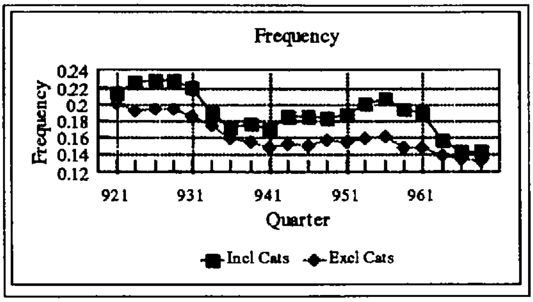
APPLICATION TO TREND

It is common for the trend used in property indications to be derived from external data. Homan [1] develops trend factors using Boeckh factors and the modified CPI. He states that these factors are surrogates for the historical and prospective changes to severity. He presents no procedure to consider changes in loss frequency.

ASB 13 [5] states that the most reliable data to be used in the development of trend is the data internal to the book of business. Historically, the use of internal data for pricing in property lines is complicated by the variance that excess wind and water introduce to the calendar year losses and claims. The frequency based catastrophe procedure eliminates much of the variance which generally makes internal data difficult to apply in the development of property loss trends.

Figure 2 below summarizes the historical calendar year frequency for the product whose catastrophe factor is developed in Exhibit 1.

Figure 2



Without analyzing any statistics associated with the chart above, it appears that the data excluding catastrophes are more stable than the data including catastrophes. Figure 3, below, summarizes the calendar year severity for the line.

Figure 3

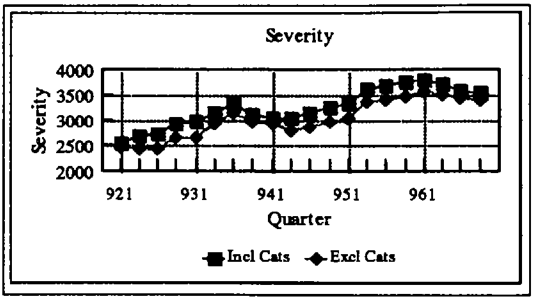


Figure 4, below, is a table which summarizes the R-squareds from linear regression performed on the data underlying the charts above.

Figure 4
R-Squareds Including and Excluding Catastrophes

	- - - Frequency - - -		- - - Severity - - -	
"Fit"	Incl Cats	Excl Cats	Incl Cats	Excl Cats
12 Point	0.2383	0.4362	0.6816	0.7804
20 Point	0.5134	0.8032	0.8399	0.8466

In each case above the quality of the fit is better using the data excluding catastrophes.

One might note that the severity has a "spike" in 1993. It should be noted that the data used in this regression include large non-catastrophic losses which are generally removed before the regression procedures are performed. They are not removed here as a complete discussion of the application of a large loss procedure is outside the scope of this paper.[7]

Analysis of the frequency excluding catastrophes may be providing insight here which is helpful in the development of equitable rates. This is a new product. Often the frequency on less mature business is greater than the frequency on mature business. The decline in frequency may be a reflection of a maturing in the book, so that developing rates which account for the lower frequency could produce lower and more equitable indications than would be developed with frequency being ignored.[8]

The more recent decline in frequency opens other areas of consideration in the development of indications. The actuary may wish to examine the source of these improvements. Has there been a shift to larger deductibles? If so, then the premium trend may need to make a provision for such a shift. Indeed, one of the advantages to using external loss trends based upon external indices which are linked to coverage amounts is that the premium trend analysis is greatly simplified. The use of internal

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7 Although a large loss procedure is not discussed in this paper, a general comment about the inclusion of such a procedure is in order. Large losses should be analyzed after the selection of the catastrophe days. If analyzed prior to the selection of the catastrophe days, then a large loss might be excluded twice if it is a large wind loss which occurs on a selected catastrophe date.

In the example above the 1993 large losses which would be excluded from the severity trend analysis are more than 120% greater than the 1992 and 1994 excluded losses. When the large loss procedure is employed the R-squared is increased.

8 Because this is a new, rapidly growing product, one may want to examine the impact the exposure base is exerting on the frequency. Frequency has been calculated using earned exposures in the denominator. For this product, the exposure base may be trailing the claim counts during the rapid growth. It may be more appropriate to use an exposure base which is a weighted average of in force policies and earned exposures during the period of rapid growth. Such a weighting may provide a more accurate reflection of the frequency. If one concludes that such a weighting is needed in developing the frequency trends, then one should revisit the exposures used in determining the catastrophe days.

data in property lines will require more sophisticated analysis of the premium trend so that there is a complete matching of the trended premiums and trended losses.[9]

If the internal data provide a more accurate projection of the current and prospective loss costs, then more accurate indications will be developed. For this product, the trends that are generated by the internal data are greater than those derived using the external indices commonly employed for the line. If the internal trends truly are more accurate, then a parameter error would have been introduced to the indications. If the relationship holds over time that the internal trends are larger than the trends developed using external indices, then a systematic downward bias would exist in property indications.[10]

AN ALTERNATIVE APPLICATION OF THE FREQUENCY BASED CATASTROPHE LOAD USING PURE PREMIUMS

Figure 1 showed how the application of frequency based catastrophe load could be applied to obtain untrended calendar year losses without the hurricane catastrophe

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[9] A discussion of all the analysis needed to develop the correct premium trend is outside the scope of this paper. However, it must be emphasized that if the internal trends are to be used in the development of the indications then the actuary must be aware that distributional shifts occurring in, say, deductibles, territory, and amount of insurance are contributing to the loss trend. Since each of the items is a rating variable, premiums are also being impacted by the distributional shifts.

Ideally, an analysis of the changes in the average relativities for each of the rating variables which can be impacting the loss trends should be performed. In the absence of time or data to adequately analyze how each relativity is impacting loss trend, the average premiums at present rates can be used to develop premium trend.

[10] A.M. Best [6] recently noted for the Homeowners line that "Although baseline costs (excluding catastrophe) would clearly show rate inadequacy, many regulators and even some companies are reluctant to increase rates." If companies' internal trends are generally greater than the trends developed using external data, then companies and regulators may be unaware of the full magnitude of rate deficiencies.

load. Figure 5 below provides summaries of the 1995 and 1996 calendar year incurred losses for the excess wind, non-excess wind, and non-wind causes of loss.

Figure 5

Year	Total	Excess Wind	Other Wind	Other Causes
1995	12,519,591	3,611,313	3,395,122	5,513,156
1996	7,304,814	681,212	2,859,190	3,764,412

In 1995 "Other Wind" losses (wind losses not defined to be catastrophic) were approximately $550 thousand greater than the 1996 "Other Wind" losses. The "Other Causes" losses (all losses other than those caused by wind) were approximately $1.75 million greater than the 1996 "Other Causes" losses. 1996's earned exposures were approximately 2% lower than the 1995 exposures. The catastrophe load as developed in Exhibit 1 is 26.01%. Should 1995's untrended, non-hurricane catastrophe loading be approximately $450 thousand ($1.75 million X 26.01%) greater than 1996's untrended catastrophe losses? Put differently, should increased non-wind related losses increase the level of the non-hurricane excess losses?[11] In general the answer is no. However, when one is developing indications using five years of data, the variation in the non-wind losses from year to year should offset sufficiently to limit the bias caused by this type of loading.

If one wishes to load the indications with a non-hurricane excess wind factor which is not a function of the non-excess losses, then a pure premium approach can be used.

[11] Note that the $450 thousand does not consider the non-excess wind losses. If they are considered then 1995's untrended non-hurricane excess wind losses are approximately $600 thousand greater than 1995's { ($1.75 million + $550 thousand) x 26.01% }.

The ability to develop long term severity trends with internal data enables a reasonable pure premium method to be developed. The table below outlines the pure premium approach.

Figure 6

(1) C.Y.	(2) Days of Loss	(3) Excess Pure Prem	(4) Severity Trend	(5) Trended Excess Pure Prem	(6) C.Y. Excess Pure Prem
1998	2	1.20	1.851	2.22	71.81
1989	11	175.48	1.714	300.77	77.55
1990	2	42.61	1.587	67.62	83.76
1991	2	48.88	1.469	71.80	90.48
1992	3	155.68	1.360	211.72	97.74
1993	5	81.52	1.259	102.63	105.58
1994	4	125.66	1.166	146.52	114.00
1995	7	217.98	1.080	235.42	123.07
1996	3	57.59	1.000	57.59	132.92
Average Excess Pure Premium:				132.92	

The pure premiums in column 3 are developed by taking the cumulative paid losses from the catastrophe dates within a year and dividing them by the year's earned exposures. An annual 8 percent severity trend has been developed from the internal data.[12] Column 5 contains the trended pure premiums. The average pure premium is

12 Because of the nature of the losses a stable non-hurricane excess wind trend cannot be obtained from the excess wind data. It is assumed that the non-hurricane excess wind losses will be impacted by the same inflationary influences which impact the non-excess wind losses and the long term non-excess severity trend has been selected.

Since the wind losses are fortuitous, generally one would anticipate only applying a severity trend to the pure premiums. However, if one believes that the policy mix at the beginning of the period is sufficiently different than the policy mix at the end of the period by a rating variable which would impact historical frequency of excess wind claims (such as a shift to higher deductibles), then one could apply a frequency adjustment to the severity trend.

calculated using the average pure premiums in column 5.[13] For each calendar year, multiply the calendar year earned exposures by the overall average excess pure premium to obtain the total non-hurricane excess wind losses at current levels. To obtain the total losses at current levels the non-catastrophe experience losses (trended to current levels) are added to the non-hurricane excess losses and the hurricane expected losses.

The pure premium based frequency load is not as critical for developing the overall statewide indication as one might initially believe. The table below summarizes the differences between the total non-hurricane losses before trending to current levels.

Figure 7

C.Y.	(1) Earned Exp	(2) CY. Excess Pure Prem	(3) [(1) x (2)] Excess Using Pure Prem	(4) Excess Derived w/ Factor	(5) Total Excl Excess Wind	(6) [(3) + (5)] Pure Prem Total Losses	(7) [(4) + (5)] Factor Total Losses
1995	16,280	123.07	2,003,580	2,317,043	8,920,587	10,924,167	11,225,321
1996	15,921	132.92	2,116,219	1,748,549	6,722,602	8,838,821	8,471,983
Total			4,119,799	4,065,864		19,762,988	19,696,472

The C.Y. Excess Pure Prem in Figure 7 (column 2) is taken from column 6 of Figure 6. The data in column 4 are derived from the loss data in Figure 1. There is an approximate 1/2% difference between the untrended losses developed using the factor derived in Exhibit 1 and the pure premium method just presented. When more years of

[13] To maintain consistency with the issues discussed previously, the 1988 pure premiums are shown here and trended. If 1988 were excluded from the average pure premium calculation, the average non-hurricane excess pure premium for 1989 through 1996 is $149.26.

data are considered and the expected losses are added into the above losses trended to current levels, the percentage difference between the two methods should decline.

An advantage to the pure premium excess process just introduced is that it eliminates the leveraging effect the non-wind and non-excess wind losses generate on the excess wind factor. A disadvantage is that the average pure premium is dependent upon the selected trend factor. In the example used thus far, less than 10 years of data are used to develop the catastrophe factor. If the catastrophe factor is developed with 15 to 20 years of data, any inaccuracy of the trend factor will greatly impact the older trended pure premiums. The more inaccurate the selected trend factor is, the more inaccurate the average pure premium will be.

However, in performing analysis for other rating variables, the non-wind losses can have a greater leveraging effect on the factor application of non-hurricane excess loss load within particular cells, and the pure premium method is probably preferable.

APPLICABILITY TO OTHER PRICING ISSUES

The catastrophe procedure developed here can enhance the equitable pricing of property rating variables.

Fitzgerald [3] notes that the application of the hurricane loss models in the development of property rates has eliminated some cross subsidization across property rating territories. Historically, the hurricane losses were apportioned throughout the state, whereas the new modeling techniques enable the loading of such losses to be more accurately assigned to the proper rating territory. This frequency based model similarly enables catastrophic non-hurricane losses to be more equitably assigned to the appropriate rating territory.

In performing territorial analysis, the same catastrophe dates selected for the statewide indication are selected in determining the catastrophe loads by territory. However, catastrophe loadings are developed for areas of territories separately using the ratios for the excess wind losses versus the total losses excluding excess wind within each rating territory. The determination of these area, excess wind factors is shown in Exhibit 3. The range of factors ranges from 1.0096 in Area 1 to 1.4646 in Area 3. In developing the territorial indications, the catastrophe dates are removed from the experience period and the area excess loss factors are applied following the same process shown in Figure 1. This should generate a more equitable distribution of catastrophes to the appropriate territories and a more accurate rate. Again, a hurricane loss loading is needed for each area or territory, but is not explored here.

The historical procedure had catastrophe losses removed proportionally from the losses in each territory and the same catastrophe load was applied to each territory. This produces inaccurate indications. Consider only those territories subject to higher long term catastrophic losses. If over the experience period in the review these territories had abnormally low losses (relative to the long term historical average) then loading the average statewide catastrophe load will understate the needed rate level in these territories.

Protection class relativities can be more equitably priced with this procedure. This is particularly important if the distribution of policies by protection class varies by territory. If catastrophe losses have not been removed, and then accounted for with a catastrophe load, then the protection classes are developed with the random error from catastrophes.

If the historical catastrophe procedure has been used, then the unprotected properties' relativity is too high. Since a higher protection class indicates an increased fire risk, applying the overall catastrophe factor overstates the total losses by protection class as the average catastrophe factor is being leveraged by the higher fire losses. Similarly, the lower fire losses in protected areas understate the catastrophe losses when the average statewide factor is applied. Developing catastrophe loadings by protection class using the frequency based procedure would produce more accurate protection relativities.

Finally, the use of the frequency based procedure could facilitate the application of accident year loss data in the development of indications. When the frequency catastrophe procedure is employed, the development factors for the 15 to 27 link ratios are generally smaller with less variance.

ADVANTAGES OF PROPOSED PROCEDURE OVER CURRENT PROCEDURES

A summary of the advantages and disadvantages of the proposed method to the methods currently employed is made below.

Advantages

1. The procedure enhances the usability of internal data for loss trend analysis.
2. Hurricane losses are not considered in the database, so that the proposed procedure can be used more readily with hurricane models than the current procedures.
3. The procedure enables catastrophe analysis to be performed on new product lines.
4. The development of the loading is not a function of other causes of loss, which have the potential to distort the loading.
5. The development of the loading is not a function of premium, which has the potential to distort the loading.
6. The development of the loading is not dependent upon multi-state industry catastrophe definitions, which can distort the loading.
7. The procedure enables territorial and protection class indications to have catastrophe loadings which can be developed for each analyzed cell.
8. The above advantages develop a more equitable rate.

Disadvantages

1. The proposed procedure is more complex than those currently employed.
2. The initial development of the database may be time consuming and costly. A company may not have data which goes back very far past the years used in developing indications. Thus, it will need to build the data prospectively. Even if the data exist in an electronic archive (most probably tape), system resources will need to be utilized to retrieve the archived data.
3. It is change. It will require time to explain to people within the company and outside it. It will require changes to spreadsheets and or programs used to develop indications and filings. These issues are time consuming and can sometimes create emotional upset with individuals who have taken pride in their past work product and perceive change not as an evolutionary improvement but as an indictment of their previous work product.

CONCLUSION

Although significant problems have been identified with the current excess wind methods used in property ratemaking, in the absence of available data and alternative procedures they served the ratemaking process well. The evolution of information technology has made the application of the theory presented herein practical. Prior to the 70's much of the available claim information was highly summarized. Even when more detailed information began to be stored, obtaining summarized data in a form usable for the actuary required extensive work with the data processing department. Because of the man-hours involved in establishing an initial report process revising reports to obtain better information was difficult to schedule. Only recently with inexpensive electronic storage costs and powerful computers, which enable direct analysis by the actuary, has the proposed procedure been feasible.

There are areas which need to be explored further.

1. When a geographic distributional shift is occurring how should this be accounted for in determining statewide excess losses? Should the exposure base be adjusted to reflect the distributional shift?
2. What are the optimal number of years to which this procedure should be applied? The historic use of thirty years of data was developed to account for both excess non-hurricane wind losses and excess hurricane losses. With the advent of modeling techniques which enable expected hurricane losses to be considered separately from non-hurricane losses are thirty years of data still needed? Does the optimal number of years vary by state?

The current procedures for developing excess wind losses for property losses are undergoing a transformation. The introduction of modeled hurricane losses into the rate development procedures necessitates some degree of revision to the non-hurricane excess wind procedure. The recommended procedure compliments the incorporation of modeled hurricane losses into rate development. It also provides the added benefit of making the internal data for the product line useful for loss trend analysis.

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Development of Excess Wind Factor
Accident Years 1988 through 1996
Evaluated as of March 31, 1997

QTR	D.O.L.	Payments	Claims	Exposure	Severity	Frequency
19922	1992-04-28	1,901,667	382	3,550	4,978.19	0.1076
19892	1989-05-04	445,312	137	1,672	3,250.45	0.0819
19892	1989-05-16	457,659	113	1,672	4,050.08	0.0676
19912	1991-04-29	562,473	167	3,427	3,368.10	0.0487
19892	1989-06-06	439,654	74	1,672	5,941.28	0.0443
19892	1989-06-07	191,922	74	1,672	2,593.54	0.0443
19883	1988-09-16	6,969	5	143	1,393.83	0.0350
19942	1994-04-25	767,533	131	3,830	5,859.03	0.0342
19952	1995-05-05	605,320	137	4,064	4,418.39	0.0337
19942	1994-04-26	565,209	125	3,830	4,521.67	0.0326
19952	1995-04-29	622,121	127	4,064	4,898.59	0.0313
19951	1995-01-18	534,098	115	3,951	4,644.33	0.0291
19952	1995-05-07	485,685	106	4,064	4,581.93	0.0261
19892	1989-05-05	114,283	42	1,672	2,721.03	0.0251
19934	1993-10-18	430,694	93	3,740	4,631.12	0.0249
19952	1995-05-28	692,207	97	4,064	7,136.16	0.0239
19902	1990-04-05	279,598	67	3,071	4,173.11	0.0218
19952	1995-06-27	312,902	87	4,064	3,596.57	0.0214
19902	1990-04-27	175,090	61	3,071	2,870.33	0.0199
19892	1989-05-13	117,219	33	1,672	3,552.08	0.0197
19931	1993-03-29	286,444	65	3,469	4,406.83	0.0187
19941	1994-03-27	246,397	69	3,712	3,570.97	0.0186
19934	1993-10-17	251,317	68	3,740	3,695.84	0.0182
19892	1989-05-15	119,477	30	1,672	3,982.55	0.0179
19942	1994-05-13	243,544	68	3,830	3,581.53	0.0178
19893	1989-07-02	138,967	40	2,266	3,474.19	0.0177
19962	1996-05-25	356,492	65	3,991	5,484.49	0.0163
19892	1989-04-29	67,829	27	1,672	2,512.20	0.0161
19892	1989-06-02	163,785	27	1,672	6,066.11	0.0161
19932	1993-05-05	295,454	57	3,560	5,183.41	0.0160
19911	1991-02-18	168,999	53	3,329	3,188.67	0.0159
19892	1989-05-01	96,471	26	1,672	3,710.40	0.0156
19931	1993-03-25	150,975	53	3,469	2,848.59	0.0153
19922	1992-04-29	229,651	54	3,550	4,252.80	0.0152
19951	1995-03-25	314,271	60	3,951	5,237.85	0.0152
19961	1996-01-17	132,113	61	4,020	2,165.79	0.0152
19884	1988-11-15	9,202	10	678	920.18	0.0147
19964	1996-10-21	228,517	57	3,936	4,009.07	0.0145
19922	1992-06-04	260,750	50	3,550	5,215.00	0.0141
"Excess"		13,468,271	3,113	NA	4,326.46	
Overall Wind		33,981,642	9,337	NA	3,639.46	
"Excess" / Overall Wind		39.63%	33.34%		118.88%	
Total All Causes		65,252,655	21,711		3,005.51	
"Excess" / Total		20.64%	14.34%		143.95%	

Excess Wind Factor = 1 + [13,468,271 / (65,252,655 - 13,468,271)] = 1.2601

Exhibit 2

Determination of Excess Wind Amounts
Calendar Years 1995 & 1996

Accident Date	--- C.Y. Paid --- 1995	1996	--- C.Y. Ending Reserves --- 1994	1995	1996	--- C.Y. Incurred --- 1995	1996
1993-05-05	10,559	0	0	0	0	10,559	0
1993-10-17	5,220	0	1,000	0	0	4,220	0
1993-10-18	2,733	2,188	2,995	3,500	0	3,238	(1,312)
1994-03-27	55,330	0	40,310	0	0	15,020	0
1994-04-25	16,495	1,080	46,615	0	0	(30,120)	1,080
1994-04-26	34,840	6,627	34,485	0	800	355	7,427
1994-05-13	12,661	0	31,270	0	0	(18,609)	0
1995-01-18	526,779	7,320	0	36,630	0	563,409	(29,310)
1995-03-25	309,636	4,635	0	24,840	0	334,476	(20,205)
1995-04-29	583,306	38,815	0	47,300	0	630,606	(8,485)
1995-05-05	581,170	24,150	0	54,080	0	635,250	(29,930)
1995-05-07	456,512	29,525	0	47,475	0	503,987	(17,950)
1995-05-28	590,584	100,736	0	45,105	1,495	635,689	57,126
1995-06-27	284,713	27,363	0	38,520	0	323,233	(11,157)
1996-01-17	0	134,298	0	0	7,140	0	141,438
1996-05-25	0	350,402	0	0	35,785	0	386,187
1996-10-21	0	174,468	0	0	31,835	0	206,303
Total	3,470,538	901,607	156,675	297,450	77,055	3,611,313	681,212

Development of Area Excess Wind Factors
Accident Years 1988 through 1996
Valued as of March 31, 1997

Total Paid Losses

Year	1	2	3	4	5	Total
			----- *Rating Areas* -----			
1988	7,294	25,251	92,205	60,309	26,072	211,131
1989	456,417	791,114	2,172,721	2,061,930	1,103,032	6,585,214
1990	191,891	642,777	2,081,750	1,242,218	716,310	4,874,946
1991	815,174	1,746,683	2,316,482	2,007,986	1,317,641	8,203,966
1992	491,388	1,336,373	3,831,662	2,373,489	1,814,160	9,847,072
1993	1,053,979	800,521	1,817,877	2,397,582	2,158,609	8,228,568
1994	989,041	871,581	2,755,530	3,121,772	1,412,900	9,150,824
1995	822,881	834,691	4,520,362	2,703,439	2,270,943	11,152,316
1996	393,363	846,549	2,101,594	1,566,133	2,090,981	6,998,620
Total	5,221,428	7,895,540	21,690,183	17,534,858	12,910,648	65,252,657

Excess Wind Paid Losses

Year	1	2	3	4	5	Total
			----- *Rating Areas* -----			
1988	3,122	2,128	9,135	779	1,007	16,171
1989	0	7,818	913,756	790,462	640,542	2,352,578
1990	5,923	51,108	378,241	16,764	2,653	454,689
1991	39,473	521,146	0	170,853	0	731,472
1992	0	0	1,726,972	404,767	260,330	2,392,069
1993	650	8,306	532,172	510,505	363,251	1,414,884
1994	0	4,203	1,131,626	638,350	48,503	1,822,682
1995	380	9,980	1,958,300	764,024	833,921	3,566,605
1996	0	11,636	229,922	108,175	367,390	717,123
Total	49,548	616,325	6,880,124	3,404,679	2,517,597	13,468,273
Excess Wind Factor	1.0096	1.0847	1.4646	1.2410	1.2422	1.2601