CONTINGENCY MARGINS IN RATE CALCULATIONS

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Abstract

Most insurance rating laws require consideration of "a reasonable margin for underwriting profit and contingencies" as one of the factors in establishing insurance rates. The purpose of this paper is to examine the contingency margin. A "contingency" is defined to be an uncertain, unexpected or unforeseen event. Evidence of the existence of "contingencies" can be seen by examination of industry underwriting results over the last 30 years. These results show a consistent shortfall between the anticipated, or target, underwriting results and the actual results. A practical example of how the contingency provision may be calculated for a hypothetical company is discussed in detail. Other methods of calculating the contingency margin are also discussed. In conclusion, for a variety of reasons, contingencies do occur and result in significant shortfalls between expected and actual results. It is essential that anyone undertaking a determination of insurance rates take this factor into account as part of the ratemaking process.

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I. INTRODUCTION

Actuaries are directed by most state insurance laws to carefully consider "a reasonable margin for underwriting profit and contingencies" as one of the factors in establishing insurance rates. This paper has been written with the sole purpose of investigating the "contingency" element. Historically, the term has been given limited attention, being taken by many as merely part of the "profit" factor. Actually it encompasses a host of events which must be recognized by the ratemaker if he/she is to establish adequate insurance rates.

The discussion of "contingencies" in this paper will be entirely in the context of the profit and contingency margin to be considered in establishing insurance rates.

II. DEFINITION

A contingency may be defined as an uncertain, unexpected, or unforeseen event. In the insurance context, we are specifically concerned with events which impact, or may impact, an insurance company's underwriting results. These events do not occur with predictable regularity, yet do occur from time to time and have resulted in consistent shortfalls between the target underwriting profit allowance in the rates and the actual results.

The following are examples of things which would be included in this definition of a contingency:

Adverse court decisions

Legislative changes

Dramatic increase in inflation

Regulatory delay or reduction of the rate filing

Inadequate residual market rates

Catastrophic events not sufficiently recognized in the normal ratemaking process

The general definition of contingency which many courts agree upon is that it is something that may or may not happen. Butler vs. Attwood, C.A. Mich, 369F 2d 811. One court has interpreted "contingency" as implying the possibility of happening and as something that may or may not happen, not something that cannot happen. Commissioner of Corporations and Taxation vs. Bullard, 46 N. E. 2d 557, 313 Mass. 72.

A legitimate case could be made for including investment risk in the definition of a contingency. However, in this paper, I will restrict the definition to contingencies which affect the underwriting results.

Another possible example of a contingency might be the downward pressure on rates caused by competition and other market forces. A company may have an indicated rate need of 10%, but implement only 5% due to competitive pressure. The problem with including this as a "contingency" is that for any particular filing, the ratemaker will know whether or not such competitive adjustments are necessary. Therefore it would not seem to be a contingency at the time of the filing.

Using the above definition one might ask if it is possible to have a "negative contingency", i.e. an improvement in the results brought about by positive unforeseen events? The answer is that while this is theoretically possible, it is extremely unlikely to occur in practice. Despite the best intentions of the ratemaker or the rate approving regulators, there are just too many forces at work keeping premiums at the lowest possible levels. In addition, while it is possible for a court to interpret policy language in a more restrictive sense than was

drafted and priced, this is a pretty remote possibility, and unlikely to be brought into court in the first place. Most court cases involve situations where a more liberal interpretation of the policy contract is sought.

III. EVOLUTION OF THE CONTINGENCY MARGIN

Despite the importance of the margin for underwriting profit and contingencies, there is very little literature dealing directly with the contingency margin. The recent NAIC Investment Income Task Force Report speculates that the contingency provision began as a catastrophe allowance, and cites the 3% conflagration allowance which was to be added to the 5% profit provision in the original "1921 Standard Profit Formula". This conflagration allowance was subsequently reduced to 1% and, according to the report, has now been eliminated in most cases.

However, it is clear that as early as 1934, some actuaries recognized the need for a contingency margin in the rates. In a paper published in the Proceedings of the Casualty Actuarial Society[1], James Cahill described the need for a contingency loading in Workers' Compensation Insurance. The purpose was to ensure that, over a period of years, there would be neither an underwriting loss nor an underwriting profit. The mechanics of the calculation dealt with a comparison between target and actual results over a period of years. The contingency provision was subject to a maximum of 5% and a minimum of 0%.

Little mention of the provision was made for the next several years and the procedure was apparently discontinued after the war due to technical problems with the calculation formula.

[1] "Contingency Loading - New York Workmen's Compensation Insurance" James M. Cahill. PCAS Vol. XXVI, Part 1, 1939.

A recent paper by Mike Walters on Homeowners Insurance Ratemaking[2] discusses the need for an "extra contingency loading" in the profit and contingency factor for the catastrophe hazard because

> "no amount of actuarial smoothing or averaging of past loss data for prospective ratemaking purposes has any influence on the inherent risk of loss. *Since profit is essentially a reward for risk taking, increased* risk can be reflected in the profit provision independently of the average loss provision however calculated, i.e. through either long term averaging or no averaging."

Most recently, contingency provisions have been discussed in the NAIC Investment Income Task Force Report and in the Advisory Committee Report to that Task Force. Further discussion of issues raised in these reports will be taken up in a later section of this paper. The Florida Insurance Department has issued a rule regarding the contingency provision in Florida automobile insurance rates. This rule will be discussed in Section V.

IV. INDUSTRY RESULTS--THE SHORTFALL PROBLEM

Evidence of the existence of "contingencies" can be seen by an examination of industry results over the last 30 years. Attached Exhibit I shows the underwriting results for the Property-Casualty Lines, all insurance companies combined. As can be seen from this Exhibit, for the latest ten year period (1971-1980), the industry had a statutory underwriting loss of 0.1%, despite a target profit provision in the rates during that period of approximately 5%. Similarly, the underwriting results over the entire 30 year period aggregate to +0.3%, again despite a target of 5%.

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[2]Homeowners Insurance Ratemaking, Michael A. Walters, PCAS Volume LXI, 1974 p.28.

The above results are calculated on a statutory accounting basis. The Advisory Committee to the NAIC Investment Income Task Force recalculated the latest 10 year results using the Generally Accepted Accounting Principles (GAAP) basis on page 70 of the Appendices to their Report. The result was an underwriting loss of -0.7% as compared to the -0.1% statutory underwriting loss. Thus the adjustment to a GAAP basis has little effect on the shortfall in underwriting results.

Examination of Massachusetts results provides further insight. The attached Exhibit II is a comparison of the target underwriting profit with actual underwriting results for private passenger automobile insurance in the State of Massachusetts from 1978 to 1983. Over the six year period, actual results have been consistently worse than the target underwriting results. For the entire period, the actual underwriting profit was 6.1% worse than the target underwriting profit. Similarly, Exhibit III is a comparison of the permissible loss ratio to the actual loss ratio for workers' compensation insurance in Massachusetts from 1971 to 1980. Again, the shortfall is consistent, and averages over 14% for the ten year period.

Plotkin in his statement to the NAIC Investment Income Task Force cites Workers' Compensation experience in Minnesota demonstrating the shortfall phenomenon[3].

V. THE FLORIDA INSURANCE DEPARTMENT RULE

The Florida Insurance Department has recently issued a rule dealing directly with the contingency provision in automobile insurance rates. The rule states:

[3]Report of the Advisory Committee to the NAIC Task Force on Profitability and and Investment Income, Volume II. Statement by Irving H. Plotkin, page 3.

"All provisions for contingencies shall be derived utilizing reasonable actuarial techniques, and appropriate supporting material shall be included in the rate filing. Provisions for contingencies greater than 1.5% of premium are prima facie excessive and unreasonable until actuarially supported by clear and convincing evidence. Provisions for contingencies shall be added to the underwriting profit allowance, as determined under subsection (7) of this rule, in order to produce the percentage factor included in the rate filing for profit and contingencies."

As can be seen, this rule provides for a provision for contingencies in the rate calculated using "reasonable actuarial techniques". We shall next examine some reasonable methods of making this calculation. It is significant that the rule makes it clear that the contingency margin is a separate, identifiable element to be added to the underwriting profit allowance in determining the combined margin for "profit and contingencies".

VI. MEASUREMENT

How do you measure the "unmeasurable"? Some may argue that measurement of the contingency factor is impossible because, by their very nature, contingencies are events which are not susceptible to treatment in the normal ratemaking approach--*things you cannot plan for. This school of thought would suggest that* rather than measure the contingency element, you should add some reasonable safety loading into the rates to take care of the various adverse contingencies which may occur. Of course, this brings you right back to the question of what is reasonable.

One measure of the contingency factor can be derived by examining the industry results cited in Section IV of this paper. For example, based on the Massachusetts private passenger data, a contingency factor of 6.1% is indicated. The countrywide, all industry results indicate a contingency factor of approximately 5%.

Another approach would be to examine individual company results to determine a reasonable contingency provision. A practical example will illustrate this calculation.

In this example, we will compare the average anticipated, or target, provision for underwriting profit plus contingencies in the implemented rates with the average underwriting profit actually realized. As shown in Exhibit IV, over the last 10 years, the hypothetical XYZ Company had an average target provision for underwriting profit and contingencies of 2.4% in the state of Florida. Please note that the target has been adjusted for differences between the profit and contingency provision in the indicated rates as calculated by the XYZ Company, and the profit and contingency provision implicit in the rate changes actually implemented. For example, in 1975 the company implemented a smaller increase than was indicated. The target underwriting profit has therefore been reduced to account for this.

Of course, it may be that the reason that the XYZ Company implemented a smaller rate increase than indicated was that it planned some management action, such as reducing expenses, which the company felt would allow it to realize its filed target profit provision even with the reduced rate change. However, for the purpose of this example, it is assumed that no major changes in company operations were contemplated or implemented and that the lower rate change was selected for competitive reasons only.

As summarized in Exhibits IV and V, for the latest 10 years the company had an average profit/contingency target of +2.4% and actually realized +0.2%. The indicated contingency factor for the XYZ Company is therefore 2.2%.

A number of issues arise from the calculation. For example:

(1) What experience period should be used? The experience period selected should be long enough to eliminate short term fluctuations in the results from year to year. In this example a 10-12 year period is recommended (roughly two underwriting cycles).

(2) Should the actual results be before or after policyholder dividends? It has been argued that policyholder dividends are the result of voluntary action by the company, and not the result of any "contingency" or unforeseen event. On the other hand the dividend may have been "uncertain or unexpected" by the ratemaker at the time of the rate calculations and therefore fall within the definition of a contingency. Also, the exclusion of dividends would tend to "bias" the company's results downwards, i.e. dividends would reduce the profit in good years, with no compensating increase in the results during bad years. Dividends may also be paid in order to comply with excess profits statutes and therefore, perhaps, should be treated in the same fashion as excess profits refunds (see item (4) below). This example has been calculated before dividends.

(3) Should the calculation be made based on an arithmetic average of the 10 year results or should the average be weighted by the premium volume in each year? Of course, for a growing company the use of a weighted average would place more emphasis on the most current periods results. It seems inappropriate to give additional weight (or lesser weight for a company with declining business) to a contingency which occurred last year as compared to one which occurred five years ago. The better approach would therefore seem to be an unweighted or arithmetic average.

(4) Should the calculations be adjusted for any "excess profits" refunds? The Florida "excess profits" statute requires insurers who earn a profit during the test period in excess of the filed profit and contingencies provision, plus 5%, to refund such "excess profits" to policyholders. I have constructed a simple example, Exhibit VI, of how an excess profits provision might work for the ABC Company which had fluctuating results over a 12 year period. Please note that over the 12 year period, the results average out, before adjustment, to exactly the 0% target. As can be seen, the effect of the excess profits statute is to reduce the actual underwriting results to -0.3%. (For simplicity, a one year test period for application of the excess profits test has been assumed). Thus even though the rates were, on the average, correct in producing the target profit provision, the company actually realizes a lesser result due to excess profits refunds. Failure to adjust for excess profits refunds would bias the results downward.

An interesting point is raised with regard to this excess profits adjustment. If, in the above example, the excess profits adjustment causes the profit and contingency margin in the rates to be increased from 0% to 0.3%, this adjustment will result in moving the excess profits "threshold" up from 5.0% to 5.3%, presumably resulting in slightly less in excess profits refunds than was originally contemplated. Thus, it may be argued that such an excess profits adjustment is not appropriate.

The flaw in this argument is that if such an adjustment is made to the contingency provision, the rates would be increased by 0.3%, in effect raising the entire chart by 0.3%. Yes, the threshold is raised by 0.3%, but so is each year's actual profit, all other

things being equal. To put it another way, if a 0.3% contingency margin had been built into the rates for the entire 12 year period, the net result would be that the 0% target would, in fact, have been exactly achieved, no more and no less, after payment of the excess profits refunds.

(5) Should Florida or countrywide data be used? Most companies would not have sufficient data on a statewide basis to be credible. This would, of necessity, require a countrywide calculation. Where sufficient, credible data exists on a state basis, it should be reviewed along with the countrywide data in determining a reasonable contingency provision.

(6) Should the target profit be tested against calendar year results, accident year results or policy year results? In theory, the most accurate test would be a policy year. However, when the test is made over a sufficiently long period of time, any of the three bases should yield similar results. Calendar year results are usually the most readily available and have been used in the example. Please note that if a rate filing with a revised profit/contingency provision is made during the year, the profit target for the year should be pro-rated based on earned premium in order to test against calendar year results.

VII. MEASUREMENT--ANOTHER APPROACH

The previous section examined approaches for determining the indicated contingency provision by comparing actual results with target results. Another approach, which has been particularly favored by European actuaries, is to apply

risk theory principles to analyze the "probability of ruin" for an insurance company. Contingency margins ("safety loadings") are then derived in order to minimize the probability that the company will become insolvent due to adverse underwriting results.

Although a detailed discussion of these techniques is beyond the scope of this paper, they do provide additional evidence of the need for a contingency margin in insurance rates.

A special case occurs in states which limit the maximum profit an insurance company may realize via excess profits statutes. The following describes a calculation of an additional contingency margin for these circumstances.

Indicated Loading for the Capping of Profits

Assume that underwriting profits are normally distributed with Mean μ and Standard Deviation σ. If profits are limited to $\mu + k\sigma$, then the following loadings are needed to ensure the capped profits still average μ over the long run.

$$\text{Loading} = \int_{\mu+k\sigma}^{\infty} \frac{(x-\mu-k\sigma)}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}} dx$$

$$= \int_{k}^{\infty} \frac{\sigma(t-k)}{\sqrt{2\pi}} e^{-t^2/2} dt$$

$$= \sigma\left\{ \frac{e^{-k^2/2}}{\sqrt{2\pi}} - k\left(1-N(k)\right)\right\}$$

$$\text{where } N(k) = \int_{-\infty}^{k} \frac{1}{\sqrt{2\pi}} e^{-t^2/2} dt$$

which can be evaluated from Tables of the Standardized Normal Distribution. Setting $k\sigma = .050$, the following values are derived for the necessary loading.

σ	Loading
.050	.004
.100	.020
.150	.038
.200	.057

Thus, it may be seen that when profits are capped through an excess profits statute, an additional contingency loading is needed. This contingency loading varies with the standard deviation of the underwriting results. This loading is in addition to the normal contingency loading since it assumes that actual results vary around the mean μ, which typically is less than the target underwriting profit.

Applying this calculation to the ABC Company results previously referred to (Exhibit VI, page 2) gives an indicated additional contingency loading of approximately 0.4%. Of course, if the excess profits statute uses a rolling three year average for the test period, as does Florida's, underwriting results would have to be grouped in performing this calculation. This would tend to reduce the needed excess profits contingency loading somewhat.

VIII. THE NAIC INVESTMENT INCOME TASK FORCE REPORT

The NAIC Investment Income Task Force Report was adopted by the National Association of Insurance Commissioners in June of 1984. This report contains several references to the contingency margin in rate calculations.

On page 7 it is stated that:

> "An important point to make in connection with target returns based upon relative risk is that the total risk of the enterprise is reflected in the target. No additional provision for contingencies is necessary."

There are several problems with this rather simplistic view. Basically, this statement says that somehow you should take the contingency provision into account when you select the target, and since the target is selected using the relative risk of the enterprise, it will automatically be taken into account. Unfortunately there is no generally accepted method of determining the relative risk of the enterprise or the insurance industry. The Task Force Report acknowledged this on page 7 where it stated:

> "All of the techniques reviewed by the task force were subject to question and gave divergent views of the relative risk of the industry."

Even if you were to somehow determine the relative risk of the enterprise, this only accounts for the variation in earnings from year to year and not a consistent shortfall between the target and the actual results. The Task Force Report notes this problem later on in the Report and suggests that

> "If the estimate of losses and expenses is a priori biased one way or another, the method used to estimate losses and expense should be changed to remove that bias."

In effect, this would require an additional loading in the losses and expenses for shortfall bias. While such an approach would be feasible, it seems more appropriate to include this directly in the rates through the contingency loading.

The Report also suggests on page 25 that although the "shortfall" between target results and actual results has been significant, the indicated rates have been calculated using a 5% profit allowance, but lesser rates have been implemented. Discussion of this point was included in Section VI. Section VI also presents a method for adjusting the target for differences between the indicated rates and the rates actually implemented. Finally, this statement is inconsistent with the Massachusetts data, cited in Section IV where the industry did, in fact, implement the indicated rates, yet the shortfall still occurred.

In Vol. II of the "Report of the Advisory Committee to the NAIC Task Force on Profitability and Investment Income", Messrs. Hunter and Wilson discuss the contingency question on page 99. They suggest that target results might differ from actual results because a company might loosen its underwriting rules or become less efficient. The obvious flaw in this reasoning is that the industry as a whole couldn't "loosen its underwriting rules", so this fails to account for the industry shortfall demonstrated earlier in Section IV of this paper. It is also difficult to conceive of an individual company loosening its underwriting practices indefinitely over time. The efficiency problem also seems unrealistic. In a competitive industry, there is every incentive to increase efficiency and therefore become more profitable. If there were a question about a company's efficiency, this could be evaluated by comparing the company's expense ratio during the test period to see if there is any consistent trend.

IX. CONCLUSION

Any thorough study of industry results over the last 30 years will document the existence of a shortfall between anticipated underwriting results and the actual results. For a variety of reasons, contingencies do occur and produce these shortfalls. It is essential that anyone undertaking a determination of insurance rates take this factor into account as part of the ratemaking process.

Combined Property-Casualty Lines

Underwriting Results

1951-1980

(Amounts in Millions)

Year	Earned Premium	Underwriting Gain or Loss	%	Year	Earned Premium	Underwriting Gain or Loss	%
1951	$ 6,928	$ 216.6	3.1	1966	$20,272	$ 343.7	1.7
1952	7,765	418.8	5.4	1967	21,975	156.7	0.7
1953	8,738	627.9	7.2	1968	23,895	- 173.6	-0.7
1954	9,214	715.8	7.8	1969	26,571	- 506.8	-1.9
1955	9,672	543.3	5.6	1970	31,164	93.4	0.3
1956	10,271	66.4	0.6	1971	33,867	1409.1	4.2
1957	11,116	-143.5	-1.3	1972	37,561	1793.9	4.8
1958	11,863	175.6	1.5	1973	40,838	778.2	1.9
1959	12,884	380.0	2.9	1974	43,665	-1893.2	-4.3
1960	13,914	422.0	3.0	1975	47,829	-3623.6	-7.6
1961	14,590	439.3	3.0	1976	57,119	-1571.9	-2.8
1962	15,331	316.3	2.1	1977	68,823	1883.0	2.7
1963	15,835	-175.6	-1.1	1978	78,686	2508.4	3.2
1964	16,999	-338.3	-2.0	1979	86,855	- 25.7	-0.0
1965	18,415	-363.4	-2.0	1980	93,676	-1743.1	-1.9

		Earned Premium	Underwriting Gain or Loss	%
Totals:	1951-1960	$102,365	$ 3,422.9	3.3
	1961-1970	205,047	- 208.3	-0.1
	1971-1980	588,919	- 484.9	-0.1
	Grand Total	896,331	2,729.7	0.3

Source: Best's Aggregates and Averages, Property-Casualty, 1952-1981 Editions, Stock, Mutual and since 1970 Reciprocal Companies Combined, Statutory Basis, Before Dividends to Policyholders.

Exhibit II

Massachusetts Private Passenger Automobile Insurance

Comparison of Target Underwriting Profit with Actual Underwriting Results

1978-1983

Policy Year	Target Underwriting Profit	Actual Underwriting Profit	Shortfall
1978	+0.2%	- 2.5%	- 2.7%
1979	-2.5%	-13.7%	-11.3%
1980 (Remand)	-1.9%	- 9.6%	- 7.8%
1981	-2.0%	-12.9%	-11.0%
1982	-2.3%	- 7.5%	- 5.3%
1983	-7.7%	- 6.3%	+ 1.4%
Six Year Average	-2.7%	- 8.8%	- 6.1%

Source: Massachusetts Automobile Rating Bureau Underwriting Results.

Exhibit III

Massachusetts Workers' Compensation Insurance

Comparison of Permissible Loss Ratio to Actual Loss Ratio During Policy Year

	(1)	(2)	(3)	(4)
	Policy Year	Permissible Loss Ratio	Actual Loss Ratio	(2) - (3) Loss Ratio Deficiency
a.	1971	.640	.632	+.008
b.	1972	.640	.708	-.068
c.	1973	.640	.740	-.100
d.	1974	.640	.771	-.131
e.	1975	.622	.754	-.132
f.	1976	.610	.792	-.182
g.	1977	.610	.773	-.163
h.	1978	.666	.906	-.240
i.	1979	.685	.916	-.231
j.	1980	.733	.903	-.170

Exhibit IV

XYZ Company

Profit and Contingency Target

Year	Profit and Contingency Target	Comments
1973	5.0%	
1974	5.0%	
1975	2.8%	Implemented smaller increase than indicated. Pro-rata effect on profit/contingency target = -2.2%, so pro-rated target = 2.8%.
1976	5.0%	
1977	5.0%	
1978	5.0%	
1979	2.8%	Financial needs change; underwriting profit/ contingency target changes from 5.0% to 2.0%. Pro-rated target for the year is 2.8%.
1980	2.0%	
1981	-2.0%	Implemented smaller increase than indicated. Pro-rated target is lowered from +2.0% to -2.0%.
1982	-7.0%	Implemented smaller increase than indicated. Pro-rated target is lowered to -7.0%.
Average	2.4%	

Exhibit V

XYZ Company

Ten Year Profit Summary

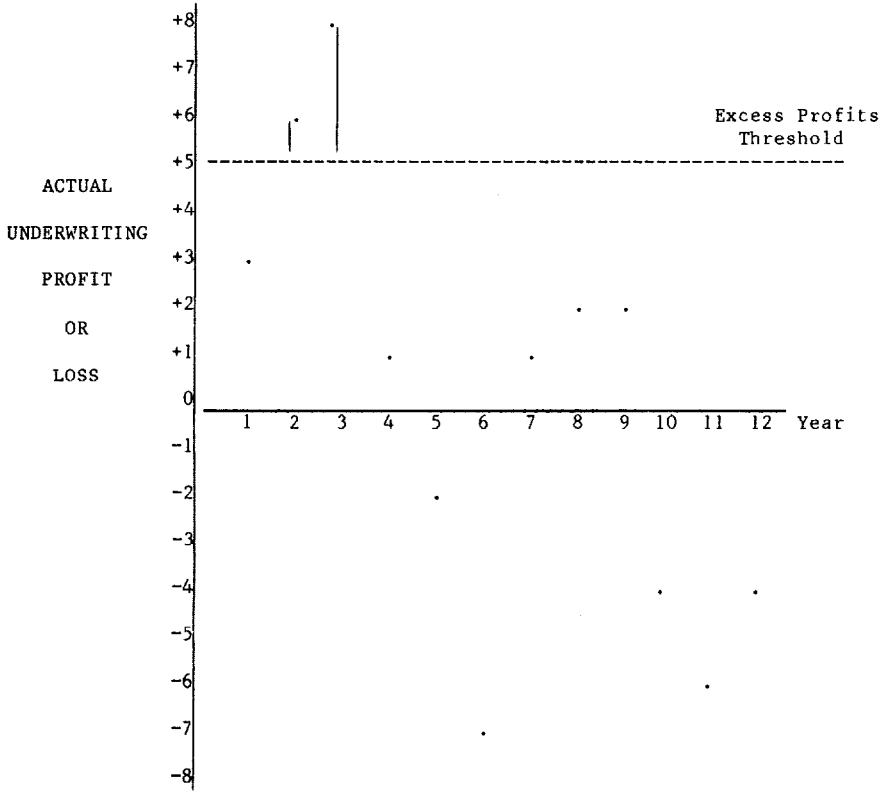
Florida

Year	Earned Premium (000)	Adjusted Profit or Loss* $ (000)	Adjusted Profit or Loss* %
1973	$101,914	-11,547	-11.3
1974	103,378	-17,349	-16.8
1975	122,749	-18,895	-15.4
1976	156,129	14,017	9.0
1977	179,952	60,907	33.8
1978	198,501	53,352	26.9
1979	218,112	14,750	6.8
1980	247,362	- 6,422	- 2.6
1981	289,560	-49,203	-17.0
1982	349,103	-40,366	-11.6
Average			+ 0.2

*Profit or Loss is before policyholder dividends and after excess profits refunds.

ABC COMPANY

Target Underwriting Profit	---	0%
12 Year Average Underwriting Profit (without Excess Profit Adjustment)	---	0%
12 Year Average Underwriting Profit (with Excess Profit Adjustment)	---	-0.3%



NOTE: See page 2 for actual numbers

ABC COMPANY

Underwriting Profit or Loss

Year	Before Excess Profits Adjustment	After Excess Profits Adjustment
1	3%	3%
2	6%	5%
3	8%	5%
4	1%	1%
5	-2%	-2%
6	-7%	-7%
7	1%	1%
8	2%	2%
9	2%	2%
10	-4%	-4%
11	-6%	-6%
12	-4%	-4%
Average	0.0%	-0.3%