Profitability Targets: DFA Provides Probability Estimates

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Abstract

This paper will discuss the analysis we undertook to address the questions described below:

Background

During each of the past several years, an insurance company's actual experience has been much worse than the plan provided to its Board. A dynamic financial analysis was performed to address the following questions:

Questions

1. What is the probability that the insurance company will meet or exceed the earnings estimates for the following year provided to its Board?

2. Are the assumptions underlying the earnings estimates overly optimistic, or has the company had a run of bad luck?

3. What elements of the company's business are its source of greatest risk?

This paper will discuss the type of model we developed to address these questions, which risk variables (e.g., catastrophe losses, investment yield, expense ratios, etc.) were addressed in the model, the type of information that we collected from the company and from external sources for the model, and how the model results were interpreted to develop answers to the questions.

Results

The paper concludes with a presentation of the results of the analyses and a summary of management's actions. Briefly, these actions were:

1. Changed underwriting guidelines and pricing for general liability business.

2. Revised plan to be closer to findings of our analysis.

3. Developed monthly monitoring statistics reflecting key drivers identified in analysis.

Profitability Targets: DFA Provides Probability Estimates

Dynamic financial analysis (DFA) is currently used in many applications and will probably be used to address an even wider range of issues in the coming years. One application for which we[1] have used DFA is the evaluation of the likelihood that an insurer will achieve the profit levels projected in its financial plan. In this paper, we will describe the model and types of data used in the analysis, identify the risks that were specifically addressed by the model and those that were specifically considered outside of the scope of the project, and present illustrative model results. Finally, we will provide a discussion of how management used the findings of the analysis in its decision making process.[2]

Background Regarding the Company

The company for whom this engagement was performed is a medium-sized insurer that writes nationally, but has a regional focus. Its business is approximately 65% personal lines and 35% commercial lines. The company maintains excess of loss and catastrophe reinsurance to protect itself against large claims and property catastrophes. In addition, for one line of business (general liability for this discussion), it maintains an underlying quota share with a significant sliding scale commission.[3]

In recent years, the company has experienced a number of unexpected events, primarily affecting the general liability book of business, that have caused it to be unprofitable. The company maintains a net-written-premium-to-surplus ratio of about 1.5, so capitalization and solvency are not of serious

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[1] The author would like to thank David Appel for his contributions to this paper and his review of the draft.

[2] We note that, throughout this paper, the data, insurer characteristics, amounts and findings have been disguised to protect the confidentiality of the company for whom the actual project was performed.

[3] The ceding commission can range from 18% to 40% depending on the ceded loss ratio.

concern. The consistent lack of profitability, however, has led to a loss of credibility with the Board and with rating agencies.

The Questions

Company management was interested in increasing the credibility of its financial plan and the presentation thereof. We therefore performed a dynamic financial analysis to evaluate the probability that the net income and statutory surplus projections would come to fruition. If our findings were that it was unlikely that plan results would be achieved, management was interested in (1) the differences between our best estimate of the future results and its plan and (2) factors that are projected to lead to the most significant variation from our expected results.

As will be discussed later, there were significant differences between the initial plan and our best estimates. Reconciliation of those differences (including additional information being provided, changes in strategy and changes in projected results) was a significant portion of the engagement. Identification of the factors that are projected to lead to the most significant variation from expected results served two purposes: (1) identification of possible strategies to reduce the variability and (2) selection of statistics for monitoring interim results to determine whether actual experience was as expected or whether the adverse experience was continuing.

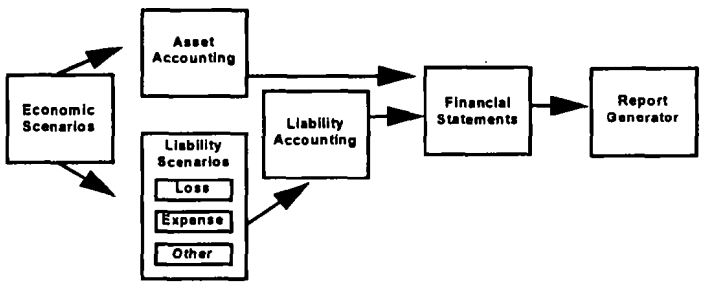
The Model Used

Overview

The model used to perform this analysis was a customized, early version of Milliman & Robertson, Inc.'s dynamic financial model software, FINANS©. The foundation of that model is a spreadsheet that maintains the computations for the liability projections and the financial statements. This spreadsheet is similar to the financial projection models that are typically used by many property-casualty insurance companies for financial planning and/or valuation. It includes projections of

statutory, GAAP, cash and tax financial statements and estimates risk-based capital and the IRIS tests.

In addition to the spreadsheet portion of the model, FINANS has a macroeconomic scenario generator, an asset accounting model and a report generator. The schematic below illustrates the major modules of the model:



The macroeconomic scenario generator is a multi-equation econometric model which develops quarterly projections of six economic and financial variables, namely, gross domestic product growth, inflation, long and short term interest rates, and stock returns and dividends. These projections are then used to drive both the asset and liability sides of the balance sheet.

The econometric model begins with a two stage autoregressive model of gross domestic product growth, where gross domestic product growth is a function of two lagged values of itself and a random error term. The remainder of the model is recursive, in that each subsequent variable is estimated as a function of a previously derived variable (and generally lagged values of itself). Thus, inflation is estimated as a function of gross domestic product growth (and lagged inflation), short term interest rates are a function of inflation (and lagged interest rates), long term rates are a function of short term rates, and so on.

The asset accounting model combines the output of the macroeconomic scenario generator with information regarding (1) the assets owned by the company on the valuation date, (2) the cash flows from underwriting derived from the spreadsheet, and (3) the company's investment strategy to project market, book and par valuations of assets by class at each year end, as well as interest, dividends, capital gains (realized and unrealized), amortization, maturities and other income and cash transactions occurring during each year. The output of the asset accounting model is fed to the spreadsheet portion of the model and is integrated into the financial statements.

At the time this project was performed, the report generator module simply collected information regarding each of the dynamic inputs and selected financial statement values and placed them in a data base. Analysis of results was accomplished using an Excel spreadsheet.

Inputs

The key inputs to the model can be separated into those related to the invested asset portfolio, those related to underwriting and other balances specific to the company as a whole.

With respect to the invested asset portfolio, the model requires information regarding:

(1) The book, acquisition and par values of each of government, municipal, corporate and high yield bonds by maturity and coupon.

(2) The book, acquisition and market values of other investment classes (stocks, real estate, mortgages, cash and short-term investments).

(3) The investment strategy - either the desired distribution of cash generated during the year among classes or the desired mix of assets at the end of the year. If the former approach is taken, the user must specify the manner in which assets are to be disposed in situations in which cash flows are negative.

For each modeled line of business, the user inputs information regarding premiums, losses, expenses and reinsurance. The company's business was divided into the following lines for modeling:

- Property. (Commercial and personal property exposures were combined due to limitations on catastrophe modeling in this version of the software.)
- General liability, including other liability, products liability and special liability.
- Workers' compensation.
- Commercial automobile, including liability and physical damage.
- Personal automobile, including liability and physical damage.

For premiums, information regarding direct written premium, earning patterns and collection lags are provided. For losses, information regarding loss, loss adjustment expense (LAE) and salvage/subrogation ratios, reserve strengthening (calendar year by accident year), and payment patterns are required. Expenses can be broken down into commissions, premium taxes, other variable expenses, fixed expenses and policyholder dividends. Information regarding each of quota share, excess of loss, catastrophe and annual aggregate reinsurance is provided to the model. Other information regarding the company as a whole, such as other income, stockholder dividends and capital infusions, can also be entered into the model.

Risks Modeled

The number of risks that can be made dynamic for any given company is endless. One of the important roles of the DFA actuary, in conjunction with company management, is to identify those risks that warrant inclusion in the model. For this application, many risks were identified, several of which were modeled dynamically as discussed below.

Investment Yields and Returns: Investment returns were derived from the macroeconomic scenario generator. That is, interest and dividends from investments held at the valuation date and through the projection period were calculated based on the characteristics of the assets. Market values of high yields bonds and stocks were calculated in the asset accounting model using standard valuation formulas. Bond defaults were derived based on the economic conditions as described by the output of the macroeconomic scenario generator.

Premium: Uncertainty regarding the growth of premium (combined exposure growth and rate changes) was introduced.

Losses: For each line, losses were modeled in three categories: catastrophes (only for property lines), large claims and the loss ratio resulting from small (all other) claims. For catastrophes, the number of catastrophes in excess of a certain size was modeled using a Poisson distribution. The sizes were drawn from a distribution derived from catastrophe modeling software. For large claims, the number of claims in excess of a selected threshold was modeled using a Poisson distribution with the average sizes (ground up) being selected from Pareto distributions.

Fixed expenses: The ratio of fixed expenses to direct earned premium was assumed to vary using a Normal error term. This error term was assumed to be constant across all lines of business (i.e., there was 100% correlation among lines) because the parameters of the error term distribution were derived from companywide historical expense data.

Statutory Assessments: With the relatively recent payment by some companies of Proposition 103 rollbacks, the risks emanating from statutory assessments were considered important by the company.

Risks Not Modeled

There were a large number of risks that were not modeled, as described below.

Mass torts: The company has not written any exposures that have generated claims from mass torts in the past. Having reviewed its current book of business, it does not believe that it has material exposure to any mass torts. This risk was therefore not explicitly modeled.

Loss payment patterns: Loss payment patterns were assumed to vary by line, but not accident year. As such, the model did not reflect the volatility in payment patterns from changes in inflation, mix of claims or other factors affecting payment patterns.

Reserve strengthening: The company has historically experienced favorable development of ultimate losses and ALAE between their initial report and the final estimates. For conservatism, the model assumed that the booked reserves as of December 31, 1996 did not contain any such margin. Because of the consistency of the reserve estimates, the risk related to changes in estimates was considered relatively small and was not modeled.

LAE ratios: Ratios of ALAE to loss and ULAE to loss, by line, were held constant across accident years and scenarios.

Reinsurance pricing: Reinsurance premium rates and contingent premium terms were held constant across the three-year projection period for all scenarios. With the relatively short time period covered by the analysis, it was believed that changes in reinsurance rates and terms would not be a significant factor relative to many of the other risks that were modeled.

Illiquid assets: The company has a number of illiquid invested assets, though they comprise only a small proportion of invested assets. The expected value of the interest income from these assets was used in all scenarios and the book value of these assets was held constant.

Reduction in Best's rating: A serious concern of the company is that it's Best's rating might be reduced in light of the recent unprofitability. A reduction in Best's rating could have a significant impact on the company's ability to maintain is current premium volumes and its ability to select risks in the marketplace. The company chose not to model the impact of this risk, so all results are conditional on the assumption that the company maintains its current Best's rating.

Data Used in Analysis

The data provided for our analysis included:

(1) Management's three-year financial plan.

(2) Five years of statutory annual statements.

(3) The company's analysis of direct ultimate losses and LAE by accident year and subline, along with corresponding payment triangles and earned premium. These estimates were accepted as best estimates. An independent evaluation of reserves was outside of the scope of the engagement.

(4) Development triangles of individual paid and incurred losses in excess of $500,000.

(5) Probability distributions of catastrophe losses for all property exposures in the aggregate.

(6) Policy limits profiles.

(7) A list of catastrophe losses exceeding $2 million for the past 10 years.

These data were used to develop the expected value assumptions for all inputs to the model and to derive the parameters of the distributions for each of the modeled risks.

Premium

For the expected value case, we accepted management's premium growth assumptions which anticipated approximately 5% per annum growth for personal lines and 0% per annum for commercial lines. A common premium growth rate was used for all commercial lines and a separate growth rate was used for personal lines. The premium growth rates were assumed to be Normally distributed with a standard deviation of 2.5%, a minimum of 0% for personal lines and -5% for commercial lines and a maximum of 10% for personal lines and 5% for commercial lines. The base case assumptions regarding direct written premium by line for each of the three projections years are shown in Exhibit 1. Also shown in that exhibit are the projected percentages of premium earned and collected in the year written.

Losses

As discussed previously, the model separates losses into the following categories: (1) catastrophes, (2) ground up losses on claims exceeding a selected size ($500,000 per claim for this analysis) and (3) small losses.

The historical loss experience by line and accident year was first decomposed into the three components. As indicated previously, data were available to remove the impact of catastrophe losses. The development of individual claims in excess of $500,000 per claim was used to derive projections of the ultimate cost of large claims. These projections and the catastrophe losses were subtracted from direct ultimate losses to estimate small losses. Exhibit 2 shows the decomposition of property and general liability losses into the three components. Similar analyses were performed for the other lines.

The expected number of catastrophe losses in excess of $5 million per event per year (0.25) was derived from the catastrophe model output. The distribution of these events was also derived from the catastrophe model output, as shown on Exhibit 3. Because there are only relatively small variability in premium volume projected, no adjustments were made to the catastrophe loss

parameters across iterations. These assumptions correspond to a ratio of catastrophe losses to property premium of approximately 9%.

The historical frequency and size of large claims was reviewed to derive assumptions for use in the projection period. Exhibit 4 shows the number, projected frequency and projected average cost of large general liability claims for Accident Years 1987 through 1996. Initially, we selected a frequency of large general liability claims of 0.30 claims per $1 million of general liability premium and an average cost per large claim of $1.2 million. These assumptions were much higher than those implicit in management's assumptions (which anticipated that the recent large claim experience reflected a run of bad luck, not a precursor of future losses) and much higher than would have been expected based on the excess of loss reinsurance pricing. In light of the relatively small number of claims, the lack of available industry information regarding large claims from the particular niches written by the company and the reinsurer's evaluation of the company's large loss exposure, we introduced uncertainty with respect to the expected frequency of large general liability claims. That is, the model assumed a 20% chance that the expected frequency of large general liability claims is 0.225, a 50% chance that it is 0.30 and a 30% chance that it is 0.35.

For all other lines, the frequency of large claims was much more stable, so a single expected frequency of claims was selected. A Poisson distribution was used to model the actual number of large claims for each line in each scenario using a mean equal to the expected number of large claims (frequency times direct earned premium). The expected frequencies of large claims for lines other than general liability are shown in Table 1.

Table 1: Large Claim Assumptions

Line	Expected Frequency	Expected Severity
Property	0.15	$1 million
Workers compensation	0.05	1.5 million
Commercial auto	0.25	700 thousand
Personal auto	0.01	600 thousand

Pareto size of loss distributions were used to model the cost of individual claims. For each line, the parameters of the Pareto distribution were selected after reviewing:

(1) The historical experience regarding large claims by size.

(2) The average claim cost implicit in reinsurance pricing (after consideration of the historical distribution of policy limits).

(3) Changes in the distribution of policy limits.

(4) The average claim costs implicit in insurance industry increased limits factors (assuming the company's large claim frequency is appropriate).

To simplify modeling, the Pareto parameters were selected so that the claim size distribution implicitly incorporated the policy limit distribution. That is, the claim sizes selected from the Pareto distribution are assumed to have already been capped by any applicable policy limits. The occurrence and size of large losses was assumed to be independent across lines and time.

Using cascading regression and applying judgment, models of the small loss ratios were derived. The formulas for the small loss ratios are as follows:

$$l/r_{j,k} = a + b(l/r_{j-1,k}) + \sum_{x \neq k} c_x(l/r_{j,x}) + \sum_{x \neq k} d_x(l/r_{j-1,x}) + f(i_j) + e_j$$

where l/r is loss ratio
j is the year,
x is line of business,
k is the specific line of business being modeled,
i is the interest rate,
a, b, c, d and f are constants and
e is a Normal random variable.

The resulting loss ratios (small, large, catastrophe and total) are summarized on Exhibit 5.

Expenses

We reviewed historical ratios of ALAE and ULAE to loss by accident year and line to select these ratios for use in the model. The selected ratios are shown on Exhibit 6.

For the base case, we accepted the company's assumptions regarding commissions and premium taxes. The base case assumptions are presented in Table 2.

Table 2: Base Case Assumptions

Type of Expense	Ratio to Written Premium
Commissions	17.3%
Premium Taxes	2.7%

Fixed expenses were projected from 1996 levels assuming that fixed expenses increased (1) with CPI inflation and (2) with 50% of any increase in direct earned premium. In addition, the ratio of fixed expenses to direct earned premium was assumed to have a random component. To incorporate this random component, we added a percentage drawn from a Normal distribution with a mean of 0 and a standard deviation of 1% of direct earned premium to the expenses otherwise derived for each line of business. (The same percentage was added for each line.) The standard deviation of the error term was derived after reviewing ten years of expense ratios (excluding premium taxes and agents' commissions) after adjustment for a change in accounting and a significant one-time expenditure.

Statutory Assessments

A discrete distribution of statutory assessments (including assigned risk and guaranty fund assessments, rollbacks, excess profits refunds and the like) was derived after considering the distribution of premium by state and a probability distribution of assessments as a percentage of direct

premium in a state. The resulting probability distribution of statutory assessments as a percentage of countrywide direct written premium is shown on Exhibit 7.

Reinsurance

The company purchases primarily excess of loss reinsurance. The attachment point is $1 million per claim for all lines, except general liability for which it is $5 million per claim. There is no ceding commission in any of the excess of loss contracts. It is assumed for modeling purposes that premiums are ceded and losses are recovered quarterly in arrears. The 1997 ceded premium for the excess of loss coverage is shown in Table 3.

Table 3: 1997 Ceded Excess of Loss Premium

Line	1997 Ceded Premium (000s)
Property	$ 360
General liability	1,440
Workers' compensation	600
Commercial auto	360
Personal auto	2

For general liability, the company also entered into a quota share agreement under which 75% of losses and premium are ceded. This contract has a significant slide on the ceding commission. The provisional commission is 25%. For each point increase in the pure ceded loss ratio above 55%, the commission is decreased by 0.8 percentage points, subject to a minimum of 18% and a maximum of 40%. The commission provision applies to each accident year individually.

For property, catastrophe reinsurance is also purchased in the layer $50 million excess of $10 million. The cost of the catastrophe reinsurance is $4.5 million. There are two reinstatements available at a rate on line[4] of 5%.

All reinsurance is assumed to be collectible; that is, credit risk from reinsurers is not modeled.

Illustrative Results

As was discussed earlier in this paper, the scope of the engagement entailed:

(1) Evaluation of the likelihood that actual results would equal or exceed those in the company's plan.

(2) Identification of differences in assumptions between us and the company.

(3) Identification of key drivers of results.

The dynamic financial model was used to derive 2,000 possible results based on the assumptions presented previously. The results of these iterations were used to address the company's questions.

Probability of Attaining Plan Results

Exhibit 8 shows the probability distribution of net income by year and 1999 projected surplus. Figure 1 shows the distribution of 1997 net income graphically. Also shown on Exhibit 8 are the income and surplus amounts in the company's three-year financial plan and our estimates of the probability of attaining those results. As can be seen, the analysis indicated that there is a relatively low probability that the company's targets will be attained.

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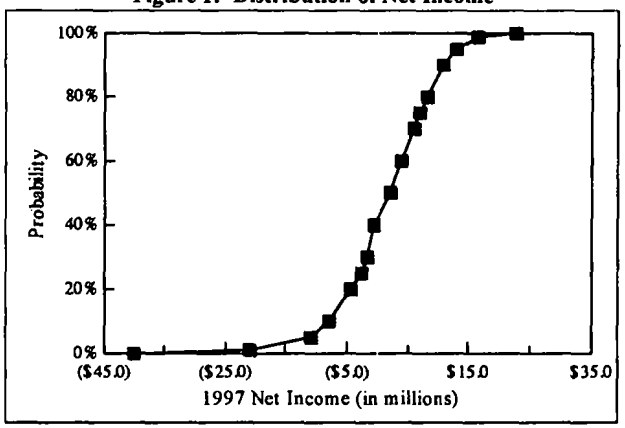
[4] For every dollar recovered from the catastrophe reinsurer for the first two catastrophes in excess of the attachment point, 5¢ is paid as reinstatement premium.

Figure 1: Distribution of Net Income



Differences in Assumptions

As was indicated in the discussion of assumptions, one significant difference in assumptions was the frequency of large general liability claims. We pointed out that the company had entered a new type of business in the early 1990s and that the earlier favorable experience with large general liability claims was not indicative of the future. We therefore calculated the probability that the actual number of large claims for 1994 through 1996 would have been observed using expected values of management's assumptions of 3 large claims per year and our three assumptions regarding the number of large claims of 7.2, 9.2 and 10.7. These probabilities are shown in Table 4.

Table 4: Probabilities

Expected Number of Large Claims	Probability of Last Three Year's Results
6.0	0.1%
7.2	1.3%
9.2	17.4%
10.7	46.0%

The other significant difference in assumptions relates to fixed expenses. The company had projected that fixed expenses related to commercial lines would remain constant, but planned to keep the same level of personnel. That is, the company did not reflect the impact of wage inflation on salaries and related expenses. After reviewing our model and seeing the impact of inflation, the company revised its expense projections.

Key Drivers

The process used to identify key drivers was:

(1) Identify all of the independent variables monitored in the analysis, as shown in Exhibit 9.

(2) Use a t-test to determine whether there was a statistically significant correlation between each variable and calendar year net income. (Several approaches, including stepwise regression, were used to ensure that correlation among independent variables did not distort the findings.) Those variables whose correlation with net income were not statistically significant were dropped from this list.

(3) Calculate the impact on net income if each of the statistically significant independent variables were at its 90th and 99th percentile. Those variables that were found to have statistically significant correlation with net income, but had much less than a $1 million impact on net income at the 90th percentile were excluded.

The remaining variables and several measures of their impact on net income are shown in Table 5.

Table 5: Impact on Net Income

Variable	Average 1997 Value	Net Income Impact if 10% Worse than Expected (thousands)	Probability of 10% Worse than Expected	Net Income Impact of 90th Percentile Adverse Deviation (millions)
Small Loss Ratio - General Liability	25.0%	$ 775	16%	$-1.0
Small Loss Ratio - Commercial Auto	45.0%	1,739	19%	-2.6
Small Loss Ratio - Personal Auto	68.0%	3,877	3%	-2.8
Small Loss Ratio - Workers' Compensation	67.5%	1,457	22%	-2.6
Small Loss Ratio - Property	43.0%	2,790	15%	-4.0
Number of Large Property Claims	9.7	970	36%	-3.3
Number of Large General Liability Claims	9.3	1,116	34%	-4.4
Number of Large Commercial Auto Claims	9.7	679	31%	-2.3
Number of Large Workers' Compensation Claims	1.1	165	30%	-2.9
Number of Catastrophes	0.25	141	25%	-2.5
Underwriting Expenses (Deviation from Expected)	0%	N/A	N/A	-2.8

Management Use of Results

Company management made a number of changes to its plan, its underwriting and its monitoring tools in response to our findings. The company first reviewed our report to identify those

assumptions for which our best estimate significantly differed from the assumptions underlying its plan. Three or four such assumptions were found, most of which related to the general liability book of business. The company therefore carefully reviewed its current book of business and made numerous changes to its underwriting guidelines. It also made several changes to the manner in which individual accounts are rated and will make increased use of facultative reinsurance to limit its exposure to large claims. The company presented these changes to us and its analyses supporting its estimates of the impact of these changes on the key assumptions underlying our model.

In addition to making these changes to operations, the company revised its plan to make it somewhat less favorable. We then evaluated the analyses and revised the assumptions underlying our model. Although we still project that there is less than a 50% change of attaining the plan results, our projections are much closer to the plan than was displayed on Exhibit 9.

Finally, management is using the information regarding key drivers to monitor results on a monthly basis. With the importance of attaining the results in the financial plan, the company wants to identify possible sources of adverse deviation as quickly as possible.

Exhibit 1

Sample Insurance Company

SUMMARY OF PREMIUM DATA

Line	Direct Written Premium 1997	1998	1999	Collection Lag	Percent Earned in Year
Property	$64,889	$65,668	$68,951	2.4	46.4%
General Liability	31,000	31,000	31,000	2.1	53.6%
Workers' Compensation	21,586	21,586	21,586	1.8	60.1%
Commercial Auto	38,638	38,638	38,638	2.2	51.0%
Personal Auto	57,018	60,636	64, 435	2.1	53.4%

Notes: 1. Dollar amounts are in thousands.
2. Premium collection lag is stated in months.

Exhibit 2

Sample Insurance Company

SUMMARY OF HISTORICAL LOSS DATA

General Liability and Property

Accident Year	(1) Ultimate Direct Losses	(2) Losses on Large Claims	(3) Catastrophe Losses	(4) Direct Earned Premium	(5) Small Loss Ratio [(1)-(2)-(3)]/(4)
			General Liability		
1987	$ 7,316	$ 0	$ 0	$28,640	25.5%
1988	9,668	0	0	32,736	29.5%
1989	10,752	2,800	0	36,340	21.9%
1990	14,000	4,000	0	41,396	24.2%
1991	11,368	0	0	42,244	26.9%
1992	15,240	4,000	0	38,992	28.8%
1993	13,860	3,200	0	36,240	29.4%
1994	19,788	12,000	0	36,636	21.2%
1995	16,276	7,200	0	35,124	25.8%
1996	21,012	13,200	0	32,336	24.2%
			Property		
1987	$13,172	$ 0	$ 0	$31,893	41.3%
1988	13,654	0	0	37,408	36.5%
1989	18,904	1,929	0	38,580	44.0%
1990	23,952	3,870	0	43,002	46.7%
1991	29,352	6,174	2,460	47,038	46.7%
1992	24,484	4,356	0	46,459	43.3%
1993	27,086	5,561	0	49,427	43.6%
1994	41,806	12,059	9,750	53,597	46.4%
1995	33,618	6,401	0	60,247	45.2%
1996	35,466	7,012	0	62,330	45.7%

Note: Dollar amounts are in thousands.

Exhibit 3

Sample Insurance Company

DISTRIBUTION OF CATASTROPHE LOSSES

Probability	Amount
0.5%	$200
3.0%	130
1.5%	110
1.5%	90
1.5%	70
2.5%	60
2.5%	50
2.5%	44
2.5%	38
2.5%	32
2.5%	26
2.5%	20
5.0%	18
5.0%	16
5.0%	14
5.0%	12
5.0%	10
9.5%	9
10.0%	8
10.0%	7
10.0%	6
10.0%	5

Note: Dollar amounts are in millions.

Exhibit 4

Sample Insurance Company

SUMMARY OF GENERAL LIABILITY LARGE CLAIMS

Accident Year	(1) Number of Large Claims	(2) Projected Frequency	(3) Projected Average Cost	(4) Losses on Large Claims (1)x(3)
1987	0	0.00	--	--
1988	0	0.00	--	--
1989	4	0.11	$ 700	$2,800
1990	4	0.10	1,000	4,000
1991	0	0.00	--	--
1992	4	0.10	1,000	4,000
1993	4	0.11	800	3,200
1994	12	0.33	1,000	12,000
1995	8	0.23	900	7,200
1996	12	0.37	1,100	13,200

Notes: 1. Large claims are those that exceed $500,000.
2. Frequency is per $1 million premium.

Exhibit 5

Sample Insurance Company

SUMMARY OF LOSS RATIO ASSUMPTIONS

Line	(1) Small Loss Ratio	(2) Large Loss Ratio	(3) Catastrophe Loss Ratio	(4) Direct Loss Ratio (1)+(2)+(3)
Property	43.0%	15.0%	8.7%	66.7%
General Liability	25.0%	36.0%	0%	61.0%
Workers' Compensation	67.5%	7.5%	0%	75.0%
Commercial Auto	45.0%	17.5%	0%	62.5%
Personal Auto	68.0%	0.6%	0%	68.6%

Sample Insurance Company

SUMMARY OF LOSS ADJUSTMENT EXPENSE RATIO ASSUMPTIONS

Line	ALAE/Loss Ratio	ULAE/Loss Ratio
Property	10.5%	6.0%
General Liability	15.0%	5.0%
Workers' Compensation	8.0%	4.5%
Commercial Auto	8.5%	7.0%
Personal Auto	8.0%	7.0%

Exhibit 7

Sample Insurance Company

STATUTORY ASSESSMENTS

Probability	Statutory Assessments/ Direct Written Premium
95%	0.5%
3%	1.0%
1%	2.0%
1%	5.0%

Sample Insurance Company

STATUTORY RESULTS

	Net After-Tax Income			1999
	1997	1998	1999	Surplus
Mean	$2,020	$1,740	$ 855	$120,852
Probability				
(Min) 0%	$-40,231	$-40,456	$-41,342	$ 64,729
1%	-21,026	21,320	22,116	86,912
5%	-10,998	-11,201	-12,089	101,731
10%	-8,020	-8,213	-9,118	106,444
20%	-4,305	-4,558	-5,508	112,337
25%	-2,754	-3,012	-3,887	114,765
30%	-1,647	-1,892	-2,808	116,562
40%	-432	-667	-1,589	119,668
50%	2,213	2,070	1,137	122,115
60%	3,874	3,609	2,707	125,816
70%	5,879	5,616	4,696	127,994
75%	6,992	6,612	5,698	128,275
80%	7,963	7,716	6,833	134,001
90%	10,720	10,529	9,628	136,349
95%	12,952	12,689	11,754	136,981
99%	16,341	16,028	15,117	142,560
(Max) 100%	22,616	22,327	21,472	147,783
Plan	4,000	4,500	5,000	131,500
P{x>Plan}	38%	35%	28%	15%

Note: Dollar amounts are in thousands.

Exhibit 9

Sample Insurance Company

LIST OF VARIABLES TESTED

Gross Written Premium
- Commercial Lines
- Personal Lines

Underwriting Expense Deviation

Statutory Assessments

Number of Catastrophes

Size of Each Catastrophe

Small Loss Ratio
- Property
- Commercial Auto
- General Liability
- Workers' Compensation
- Personal Auto

Number of Large Claims
- Property
- Commercial Auto
- General Liability
- Workers' Compensation
- Personal Auto

Average Cost of Large Claims
- Property
- Commercial Auto
- General Liability
- Workers' Compensation
- Personal Auto

Inflation

Short and Long Term Rates