IMPLICATIONS OF VARIABILITY IN TIMING OF CASH FLOWS ON VALUATIONS

by: Susan E. Witcraft

BIOGRAPHY:

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ABSTRACT:

In valuing insurance companies, significant attention is paid to the adequacy of loss and loss adjustment expense reserves and loss and expense ratio assumptions. In most valuations, not only are the expected values of these variables reviewed, but also the impact on the value of variation from the stated expectations. A considerable volume of actuarial literature addresses the derivation of estimates of variability around expected losses. In addition, many actuaries have begun studying interest rate risk and its impact on the valuation of insurance companies. Less attention has been paid to the impact on valuations and the estimation of variability in the timing of payments.

This paper begins with a review of the expected timing of each major item of cash flow. Variability around these expectations is also discussed. An illustration, for a sample company, of the impact of relatively small changes in loss payment patterns and delays in reinsurance recoveries on the value of the company is then presented. The paper concludes with some random thoughts on how to evaluate the variability in the timing of loss payments.

IMPLICATIONS OF VARIABILITY IN TIMING OF PAYMENTS ON VALUATIONS

In the past, considerable attention has been paid to variability around estimates of ultimate losses. In addition, when estimating the value of a company, the sensitivity of the results is often tested as related to input assumptions regarding premium volume, losses, investment income, etc. In contrast, there has been much less focus on the variability in the timing of payments and collections. The purposes of this paper are, first, to identify causes of such variability; second, to estimate the impact of such variability on valuations of property and casualty insurance companies; and third, to outline three possible approaches for estimating the variability in the timing of loss payments.

As will be seen, errors in the estimated timing of loss payments that are within those reasonably expected, given today's actuarial methods, can cause significant distortions in the estimate of the value of a company. This valuation process is the basis of many financial transactions, such as the sale of insurance companies, private placements, and the issuance of stock. The variability in the timing of loss payments should be recognized and, to the extent possible, evaluated in these situations.

In the first section of this paper, reasonable assumptions regarding the expected timing of each major item of cash flow will be discussed along with differences in expectations by company. Some of the causes of differences between the actual and expected timing of payments will also be identified. The second section of the paper will include a discussion of the sensitivity of the present value of statutory earnings for a sample company to changes in the timing of payments. In the third and last section, ideas regarding possible methods of estimating the variability in the timing of loss payments, the most variable item of cash flow with regard to timing, will be presented.

Throughout this paper, it is assumed that the timing of payments within a given calendar period is less critical than the calendar year in which the payments are made. This is often the situation when valuations of companies are made in which the present value of future earnings are discounted as a component of the estimate of its value. The investment income during a year is more sensitive to the assets available for investment at the beginning of the year than to the actual month of collection within a year. This is because the investable assets at the beginning of the year are usually available for the entire year. Thus, for each dollar change in the total available, there will be a change in the investment income equal to the interest rate. On the other hand, a two-month delay in the timing of payments will only have an impact equal to one-sixth of the interest rate times the amount of the payment.

An important issue that will not be discussed in this paper is the impact on valuations of differences between the actual and expected amounts of cash flow. This includes uncollectible receivables, as well as errors in estimating reserves. These topics could be the subject of at least one separate paper.

SOURCES AND EXPECTED TIMING OF CASH FLOWS

The expected timing of each major item of cash flow by calendar year and within calendar year will be discussed along with reasons why expectations vary by company. Causes of variations from the expectations will then be presented.

Collected Premium

There are two sources of premium collections in a calendar year: uncollected premium on policies already written and premium on policies written during the year. In general, it can be assumed that premium receivable at the beginning of a calendar year will be collected during that year, with more being collected in the first half of the year than the second half. A reasonable

assumption regarding the timing of the collection of premium receivable would be that they are collected, on average, one and one-half months into the year. This is based on an assumption of a 90-day premium collection lag. Premium from October, November, and December of the previous year will be uncollected at the end of the year. This premium will be collected in January, February and March. If even premium writings by month are also assumed, the average collection date will be February 15. When premium collections on the premium written in the calendar year are included, it is reasonable to assume that premium will be collected, on average, one-half of the way through the year. That is, the high percentage of collections early in the year from the previous year's uncollected premium are usually offset by the later collection of the premium written during the year.

The timing of the collection of premium receivable at the prior year end will also be affected by the length of the policy term. Premium collections on quarterly policies would be expected much earlier, on average, than for, say, annual policies. Again, this will generally be offset by premium written during the year and an average collection date of mid-year is usually reasonable.

One exception to this assumption occurs when there are significant changes in premium volume. If premium volume decreases significantly from either changes in rates or the number of policies, the average collection date will be earlier in the year, and vice versa. Using integral calculus, the average collection date can be calculated given the assumptions regarding the shape of the written premium volume curve and the average collection lag.

Another exception occurs in companies that write policies with common anniversary dates. Many association-sponsored insurance companies renew all policies on the same date. Other than new insureds and cancellations, all of

the premium will be collected at approximately the time of the common renewal date.

Other factors that may affect the timing of premium collections are the timing of premium audits and retrospective premium adjustments. If these are performed throughout the year, the mid-year average collection date assumptions will usually still be reasonable.

Significant variation from the expected timing of collection of premium, that is, of more than a month or two, would not be expected except in rare situations. Such a situation might occur if an agency changes its premium submission procedures without notifying the company due to internal cash flow problems. Even then, it is unlikely that the average timing would be changed significantly.

Investment Income

Cash flows from investments consist of interest income, dividends, and proceeds and costs from the sale or purchase of assets. These cash flows also include those carried on the balance sheet as interest, dividends, and real estate income due and accrued. A reasonable assumption regarding the timing of these cash flows is that all investment income will be received evenly throughout the year. This, of course, assumes that interest or dividend receipts and gains and losses on the sale of assets are spread evenly throughout the year. If these assumptions are not true, in general, appropriate adjustments to the timing of cash flows must be made based on the actual investments held by the company.

As for collected premium, it is only infrequently that the actual timing of cash flows from investments will be significantly different from those expected. A possible situation when this might occur is an insurance company which owns a large number of equities that delay payment of interest or

dividends. Also, if the economic outlook shifts dramatically, such as the sharp decline in stock prices in October, 1987, then there could be a shift in the company's investment strategy that would create unexpected changes in the timing of cash flow, particularly from the sale or purchase of equities or bonds.

Reinsurance Recoveries

Generally, reinsurance recoveries due to a primary company at the end of a calendar year will be collected during the subsequent year. In addition, a certain percentage of reinsurance recoveries on payments made during a calendar year will be collected during that year. This percentage will be based on the lag between the date of payment by the primary company and the date that reimbursement is made by the reinsurance company. It is usually reasonable to assume that all recoveries made during the year will be made evenly throughout the year.

Exceptions could occur when there are significant changes in the reinsurance program, either through coverage changes or changes in reinsurers, or in the event of a catastrophe. When an event occurs causing a single very large claim or a large number of claims, such as Hurricane Alicia, the average date of reinsurance recoveries during the year will be skewed toward the time of year that the recoveries from the catastrophe are received.

Variations from expected timing of reinsurance recoveries are most likely to occur when one or more reinsurers are in financial difficultly. This will often result in delays in making payments on all of their liabilities, including those to primary insurance companies for claim payment recoveries.

Loss Payments

Based on historical company data, if available, or industrywide data, if company data are not available, an expected payment pattern can be estimated for loss payments. These payment patterns will vary by company and by line of business. In addition, different payment patterns can exist for a given company for a given line of business if there are changes in the mix of business or in claims-handling philosophy. Unlike the cash flow items already discussed, loss payments will extend over a period of years. It is still usually reasonable to assume that, within any one year, loss payments will be made evenly throughout the year. This will vary with significant changes in business, such as for a new program or a program in a runoff state.

The payment pattern can vary from expectations for a large number of reasons. These include:

- unidentified changes in claims-handling,
- unidentified changes in the mix of business,
- changes in the legal environment, such as changing backlogs in the court system or changes in the use of arbitration,
- differences in company operations from that underlying the industry data being used, and
- statistical random variability.

It should be noted that there is considerable literature already published discussing the estimation of payment patterns, identifying changes therein and adjusting for these changes in projecting loss reserves.[1]

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[1]Examples include:
James R. Berquist and Richard E. Sherman, "Loss Reserve Testing: A Comprehensive, Systematic Approach," Proceedings of the Casualty Actuarial Society Vol. LXIV (1977), pp. 123-184.
Kirk G. Fleming and Jeffrey H. Mayer, "Adjusting Incurred Loss for Simultaneous Shifts in Payment Patterns and Case Reserve Adequacy Levels," 1988 Casualty Actuarial Society Discussion Paper Program (1988), pp. 189-215.

Loss Adjustment Expense Payments

Loss adjustment expense payments are similar to loss payments. All of the comments regarding the loss payment patterns can be applied to allocated loss adjustment expense payments. In addition, changes in the manner in which attorneys' fees are paid can affect the timing of payments. These include a change to interim billings or a change in the billing schedule.

For statutory financial reporting purposes, it is assumed that 50% of unallocated loss adjustment expenses are paid in proportion to loss payments; 45% is assumed to be paid on current year claims and 5% on prior year claims. Most companies will have unallocated loss adjustment expense payment patterns that differ from this expectation due to differences in operating procedures. More sophisticated models have been developed from which unallocated loss adjustment expense payment patterns can be derived.[2] Once a payment pattern has been selected for unallocated loss adjustment expenses, most of the observations regarding loss and allocated loss adjustment expense payment patterns apply.

Underwriting Expenses

Most categories of underwriting expenses will be paid when incurred. Exceptions include commissions, which will be paid when the premium is collected, and premium taxes which will be paid during the quarter in which the premium is written. It is unlikely that the expected payment of underwriting

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[2]Examples include:
Wendy Johnson, "Determination of Outstanding Liability for Unallocated Loss Adjustment Expenses," 1988 Casualty Actuarial Society Discussion Paper Program (1988), pp. 301-314.
John Kittel, "Unallocated Loss Adjustment Reserves in an Inflationary Economic Environment," 1981 Casualty Actuarial Society Discussion Paper Program (1988), pp. 311-331.

expenses will vary significantly from these expectations except by specific agreements. Similarly, once the expected payment timing has been determined, it is unlikely that actual payments will vary from expectations. One exception is if premium collections do not meet expectations. The effect of variability in the timing of premium collections will be mitigated to some extent by simultaneous variations in commission payment rates. Another exception is assessments for guaranty funds or residual market mechanisms. In these cases, both the timing and amount of payments can be subject to significant variability.

Federal Income Taxes

Once Federal Income Taxes have been determined, the timing of payments is determined by law. Estimated income tax payments must be made in an amount at least as great as the lesser of 90% of the current year's liability or 100% of the taxes based on the prior year's income. The estimated payments are due in April, June and September of the tax year and January of the subsequent year. Any remaining balance is due in April of the subsequent year. If all of the taxes due in each year are made in four equal estimated payment installments, the average payment date will be on May 15, or approximately 37.5% of the way through the year.

Dividends

Usually dividends will be paid during the calendar year in which they were declared or the following year unless stated differently in the declaration. To the extent that dividend declaration and payment patterns are expected to be similar to those in the past, the timing of historical dividend payments during the calendar year should be reviewed. Once dividends have been declared, variations from expectations regarding the timing of their payment are unlikely.

IMPACT OF SHIFTS IN TIMING OF PAYMENT PATTERNS ON VALUATIONS

For this paper, the present value of statutory net income plus statutory surplus will be used to estimate the value of a sample company. The impact of unexpected changes in the loss payment pattern and delays in collecting reinsurance recoveries will be estimated, using a financial projection model.

The assumptions regarding premium volume, loss and expense ratios, and reinsurance are detailed in Appendix A. The sample company has been designed to be typical of a multi-line property-casualty insurance company. Its business has been divided into five lines of business: Automobile Liability (approximately 27.5%), General Liability (also approximately 27.5%), Workers Compensation (approximately 18%), Medical Malpractice (approximately 9%), and Multiple Peril (approximately 18%). All of the business is reinsured on a 50% quota share basis. The ceding commission is assumed to offset the expenses on the ceded premium. The loss and expense ratios were selected to be typical of those seen in the insurance industry. The evaluation of the impact of timing differences on the company's value will be from the perspective of a potential buyer. That is, timing of loss payments will be earlier than expected in the alternate scenarios and the timing of reinsurance recoveries will be delayed.

With the exception of the loss payment pattern and the lag in collecting reinsurance recoveries, all assumptions are held constant in each of the four scenarios. This includes the amount of loss reserves. For this example, we will assume that the errors in the loss payment pattern are due to unexpected external forces rather than errors in the ultimate loss estimates upon which the payment patterns were derived. This eliminates the need to make changes to the loss reserve and loss ratio assumptions. The company exists in a very stable

market. While this is not true in the real world, the impact of changes in payment and collection rates are more easily identified.

In the first scenario, to be used as a basis for comparison, the loss payment patterns are assumed to be similar to those seen, on average, in the insurance industry. It is also assumed that the lag between payment of ceded losses and collection from the reinsurance company is approximately two months. The detailed projections for the company as a whole are shown in Exhibit 1. The estimated statutory net income (before and after taxes) for the sample company for each of the next five years are summarized in Table 1. Appendix B includes an explanation of the resulting projections and the tax implications.

Table 1: Expected Timing

	Projected Income	
Year	Pre-Tax	After Tax
1989	$ 8,308	$ 4,207
1990	9,503	5,547
1991	10,371	6,197
1992	11,352	6,817
1993	12,372	8,242
1994+		$178,454

Notes:
1. Amounts in thousands.
2. 1989 - 1993 estimates are undiscounted. Estimates for 1994 and subsequent are trended at 9.2% and discounted to 1994 at 15%.

In order to minimize the varying impact of income taxes and the transition from historical data to projections, the trend rate for net income after taxes is calculated using pre-tax income for 1990 through 1993. For this first scenario, an annual trend rate of 9.2% is, thus, expected after five years. We will assume that company management has selected a 15% rate of return to be used for discounting future income. This rate was selected as the middle of the range of rates presented by Sturgis.[3] The amount shown for 1994 and subsequent is the

[3]Robert W. Sturgis, "Actuarial Valuation of Property/Casualty Insurance Companies," Proceedings of the Casualty Actuarial Society Vol. LXVIII (1981), pp. 146-159.

present value in 1994 of the future estimated earnings.[4] The present value of all future earnings is $104 million. By adding the beginning surplus of $50 million, the value of the company is estimated to be approximately $154 million.

In the second scenario, the payment pattern from the first scenario is assumed to be understated by approximately 10% at each stage of development. This could be due to a shift in payment patterns that has not been identified or to the use of ultimate loss projections in estimating the incremental payment pattern that are approximately 10% high. As discussed earlier, for this example, the former is assumed to be true and no changes have been made to the loss reserves or loss ratios. As can be seen by comparing Table 2 with Table 1, both the pre-tax and after-tax income are significantly lower for all but the first year, during which taxes are affected by the large increase in payments relative to reserves. As a result, Federal Income Taxes are lower and net income after taxes is higher.

Table 2: Faster Payout

	Projected Income	
Year	Pre-Tax	After Tax
1989	$ 7,862	$ 4,446
1990	8,398	5,161
1991	8,878	5,388
1992	9,564	5,728
1993	10,316	6,966
1994+		$110,099

Notes:
1. Amounts are in thousands.
2. 1989-1993 estimates are undiscounted. Estimates for 1994 and subsequent were trended at 7.2% and discounted to 1994 at 15% per year.

[4]The present value of 1994 and subsequent net income after taxes in 1994 is calculated using an infinite series, where the terms are in the form of: $(1+t)^{i+1} / (1+d)^{i}$, where t is the trend rate and d is the discount rate. If $y=(1+t)/(1+d)$, then we have (1+t) times the sum as i goes from zero to infinity of y^{i}. When t<d, y is less than one and this sum is equal to (1+t) times 1/(1-y). This is then multiplied by the 1993 net income after taxes to get the present value in 1994 of the 1994 and subsequent net income after taxes.

A comparison of Exhibits 1 and 2 shows that the only differences on the income statement are in investment income and Federal Income Taxes. The estimated trend rate is lower, at 7.2% annually. The resultant present value of future income in the second scenario is only $70 million, bringing the estimated value of the company to approximately $120 million or 22% lower than in the first scenario.

Table 3: Comparison of Estimates

Payment Pattern	Reinsurance Recoveries	Estimate	Percent Error in Expected
Expected	Expected	$154	0%
Fast	Expected	120	28%
Expected	Slow	151	2%
Fast	Slow	115	34%

Note: Dollar amounts in millions.

The third and fourth scenarios, the results of which are on Exhibits 3 and 4, correspond to the first two scenarios with the exception that there is an additional ten-month delay in collecting reinsurance recoveries. Table 3 summarizes the estimates of the value of the company in the four different scenarios, including the percentage error in the expected value estimate given the unforeseen changes anticipated in each scenario.

The percentage errors in the estimates of the value of a company will vary significantly between companies due to differences in company operations, reinsurance, trend rates and discount assumptions. The purpose of this example was to illustrate the possible estimation errors. As can be seen, significant errors in the estimates of the value of a company can result from seemingly small errors in estimating the timing of payments or receipts.

VARIABILITY IN THE TIMING OF LOSS PAYMENTS

As previously discussed, the two biggest sources of variability in the timing of payments (receipts) are often reinsurance recoveries and loss and LAE payments. The errors in the estimates of the timing of these transactions can have significant effects on the valuation of property-casualty insurance companies. Delays in receiving recoveries on ceded losses may be anticipated through a continuing review of the financial condition of the company's reinsurers. It is most likely that delays will occur when a reinsurer's financial position deteriorates. Delays can often be a precursor of insolvency or, if the financial condition is improved, could be a short-term phenomenon. While many delays will still be unexpected, a thorough review of the reinsurance program of a company can often identify potential sources of delays.

Variations in the timing of loss and LAE payments, referred to subsequently as loss payments, can be due to both estimation (parameter) error and random (process) error. That is, actual payments may differ from expected payments due to either errors in estimating the true payment pattern, random variability around the expected payment pattern, or both. For financial projections, long-term estimates are usually being made and, in most cases, random variability in the timing of payments will be reduced because of the combining of several years' payments. As a result, in these projections, estimation errors are likely to be of more importance. If an analysis of a single year is being performed, random errors become of greater significance.

In this section, some "random thoughts" regarding methods of quantifying the potential error in loss payment pattern estimates are presented. The beginnings of three possible methods will be discussed. Since we, as actuaries, have yet to identify the best methods of quantifying variability in loss reserve

estimates, determination of a best method for estimating variability around payment pattern projections is likely to be a long process.

All three of the methods discussed herein assume that a paid loss triangle is available and that estimates of ultimate losses have been made. The paid loss triangle is divided by the ultimate loss estimates to calculate the estimated percentage of losses paid through each evaluation date for each accident or report year. An example of these calculations is shown in Table 4 on the next page. If an incremental payment triangle is available, the incremental payments percentages in each calendar period will be derived and can be summed to get the cumulative percentages.

For the remainder of this paper, the term "confidence level" will be defined in the statistical sense. That is, it will refer to the likelihood that the true mean falls within the stated range around the sample mean. "Probability level," on the other hand, will be used to refer to what most actuaries call confidence level, i.e., the range in which the stated percentage of possible results are likely to fall.

First Idea

The first idea for a method of estimating variability is based on applications of statistical theory, specifically, the Normal distribution. For each stage of development, the expected percentage paid is calculated as the mean of the indications. The standard deviation around the sample mean can also be calculated. These estimates are shown for each stage of development in Table 5 (shown after Table 4) for the example payment data in Table 4. One portion of parameter risk can then be estimated by assuming that the true mean is distributed Normally with mean equal to the sample mean and standard deviation equal to the sample standard deviation divided by the square root of the number

Table 4: Calculation of Indicated Payment Patterns

Cumulative Paid Losses and Ultimate Loss Projections

Accident Year	Months of Development								
	12	24	36	48	60	72	84	96	Ultimate
1980	$138	$214	$ 294	$ 485	$ 664	$ 830	$ 876	$ 930	$1,250
1981	225	316	631	797	1,154	1,356	1,356		1,356
1982	209	325	549	688	747	980			1,471
1983	273	354	600	1,007	1,355				1,596
1984	333	504	701	975					1,732
1985	333	633	1,099						1,879
1986	259	589							2,039
1987	232								2,212

Note: Dollar amounts are in thousands.

Indicated Payment Patterns by Accident Year

Accident Year	Months of Development							
	12	24	36	48	60	72	84	96
1980	11.0%	17.1%	23.5%	38.8%	53.1%	66.4%	70.1%	74.4%
1981	16.6	23.3	46.5	58.8	85.1	100.0	100.0	
1982	14.2	22.1	37.3	46.8	50.8	66.6		
1983	17.1	22.2	37.6	63.1	84.9			
1984	19.2	29.1	40.5	56.3				
1985	17.7	33.7	58.5					
1986	12.7	28.9						
1987	10.5							

Examples: 11.0% for Accident Year 1980 at 12 months = $138/$1,250.
50.8% for Accident Year 1982 at 60 months = $747/$1,471.

Table 5: Sample Mean and Standard Deviation

	Months of Development						
	12	24	36	48	60	72	84
Sample Mean:	14.9%	25.2%	40.7%	52.8%	68.5%	77.7%	85.1%
Sample Standard Deviation:	3.3%	5.6%	11.6%	9.8%	19.1%	19.3%	21.1%

of observations in the column. Additional elements of parameter risk must be judgmentally added for the error caused by errors in the ultimate loss projections and unforeseen changes in payment patterns.

Process risk can be evaluated by assuming that, given an expected mean, the actual observations will be distributed Normally with mean equal to that expected mean and standard deviation equal to the sample standard deviation. Because of the assumptions of Normality, these two distributions can be combined if we make the additional assumption that the parameter risk and process risk distributions are independent. The resulting distribution of the possible payments through a stage of development is distributed Normally with mean equal to the sample mean and variance equal to the sample variance times the sum of one and the reciprocal of the number of observations. The 90% probability level estimates are summarized in Table 6.

As an extension of this, variability around discount factors can also be estimated for a given interest rate. Statistical theory states that, given a linear function of random variables, say the sum of $k_i * X_i$, where each of the X_i are Normally distributed, the combination of these variables is also Normally distributed with mean equal to the sum of $k_i * mu_i$ (mu_i are the means of the X_i) and variance equal to the sum of $k_i^2 * s_i^2$ (s_i^2 are the variances of the X_i). Applying this to the discount factor calculation, the k_i are equal to $(1+r)^{-i+.5}$,

Table 6: Sample Mean and Standard Deviation

	Months of Development				
	12	24	36	48	60
(1) Sample Mean:	14.9%	25.2%	40.7%	52.8%	68.5%
(2) Sample Variance:	0.106%	0.315%	1.34%	0.966%	3.65%
(3) n:	8	7	6	5	4
(4) 90% Probability Level: $(1)+1.282x[(2)x\{1+1/(3)\}]^{.5}$	19.3%	32.9%	56.7%	66.6%	95.9%

Note: All probability levels beyond 60 months equal 100%.

(where r is the interest rate) and mu_i equals the sample mean for the i^{th} column. s_i^2 equals the sample variance for the i^{th} column divided by the number of observations in the column (n) if only parameter risk is being evaluated and is equal to the sample variance times one plus the reciprocal of the number of observations if total risk is being evaluated.

Considerations

There are three important considerations that need to be evaluated in applying the method to payment patterns:

- What is the appropriate distribution? Is a Normal model reasonable or is a Lognormal model better?
- Should the cumulative or incremental payment pattern be used?
- How should parameter risk from the ultimate loss estimates and unforeseen changes be included in the model?

The biggest problem with this method appears to be the assumption that the percentage paid at each evaluation date is independent of the percentages at other evaluation dates. I propose that, if incremental payment percentages are used, the overall variability will be overstated (if that is possible). In many

situations, where there is a high incremental payment in one period, it will be followed by a low payment in the next period. If each of these incremental payments are treated individually, considerable variability will be added to the model when, in truth, the cumulative percentages paid are more predictable. These individual aberrations will still have a distorting effect on the indicated cumulative payment pattern, but to a lesser degree. Therefore, for this method and the second method discussed below, my inclination is to use the cumulative payment pattern.

With regard to the question of Normal versus Lognormal, the existing actuarial literature indicates that the Lognormal distribution provides a convenient model to quantify uncertainty in development factor projections.[5] If this is the case, then the percentage payments, which are equal to the complement of the inverse of the development factors, would also be distributed Lognormally. That is, -ln(percentage paid) would have the same distribution as ln(development factor). Thus, at least for estimating process risk, the Lognormal distribution could be more appropriate.

For evaluating and measuring the probability level around the estimated payment pattern including process risk, I do not believe that the transformation can be made using a Normal table from the distribution of the natural logarithms to the distribution of the percentages. That is, if the natural logarithms of the percentages are taken and assumed to be Normally distributed, one can make inferences regarding the probability level of the mean of the logarithms of the percentages. These inferences do not necessarily translate directly to the mean of the actual observations.

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[5]Roger M. Hayne, "An Estimate of Statistical Variation in Development Factor Methods," Proceedings of the Casualty Actuarial Society Vol. LXXII (1985), pp. 25-43.

Second Idea

The theory underlying the first method applies when the percentages paid are reasonably assumed to be Normally distributed. This can be tested by reviewing the actual data. When this is not a reasonable assumption, a Monte Carlo simulation model could be used. The simulations could be performed by selecting independently for each stage of development an expected percentage paid from a parameter risk distribution and an observed percentage from a process risk distribution. The simulated payment patterns can then be ranked using the present value of the payment pattern. This process is summarized in Figure 1.

Figure 1: Monte Carlo Simulations for Payment Pattern

1. Randomly select expected mean for each stage of development from the distribution evaluating estimation errors.

2. Randomly select actual mean for each stage of development from the distribution estimating random errors given the expected mean selected in Step 1.

3. Calculate present value of payment pattern.

4. Repeat Steps 1 through 3 a very large number of times.

5. The payment pattern at the a% probability level is payment pattern with present value greater than a% of the calculated present values.

The considerations that arise in applying this method are similar to those raised for the first method with the exception that, in addition, a discount rate is needed. As does the first method, this method assumes independence of the percentages between columns. All of the methods presented herein assume independence between accident years, an assumption which is fairly easily satisfied on an intuitive basis.

Third Idea

The third method avoids the problem of independence between columns, but introduces some practical problems in its application. It also has the drawback that it only evaluates parameter risk and then only that portion which is reflected in the sample payment patterns by accident year. Additional variability would need to be introduced to account for the variability in the ultimate loss estimates and unforeseen changes.

This method is based on the application of multivariate statistical analysis. The percentage of losses paid during each period (i.e., the incremental payments) are assumed to be Jointly Normally distributed. Using vector notation, the payment pattern at the 90% confidence level is any payment pattern that solves the equation:

$$(x-u)'S^{-1}(x-u) < p(N-1)F/(N-p),$$

where

x = 90% confidence level payment pattern (a vector of length n)
u = sample mean payment pattern (a vector of length n)
S = sample covariance matrix between columns (an n x n matrix)
N = number of observations used in calculating u
p = number of columns
F = F-statistic with N,p degrees of freedom
n = number of periods in the payment pattern

The first practical problem is that there are usually an infinite number of solutions.

To try to solve this, I propose estimating the 90% confidence level for the first column using the first method described above, excluding process risk. The estimates at the 90% confidence level for the second period can then be estimated by solving the above equation with vectors of length two and using the first two columns of data. The process can be performed iteratively to estimate the remaining percentages at the 90% confidence level. In this case, the covariance matrix for each iteration could be set equal to the sample covariance

matrix of the upper left-hand rectangle of the payment percentages triangle. The first three estimates at the 90% confidence level for the example are 19.0%, 34.7%, and 64.6%.

Three problems arise with this approach: (1) not all covariance matrices are invertible, (2) there may not be any real solutions to the resulting equation, and (3) this only works when the number of rows is greater than the number of columns. If a straightforward method for solving the entire equation could be found, there are adjustments that can be made to the stated formula to reflect the missing data in the lower right-hand portion of the triangle. These include an alternative method for calculating the covariance matrix (again, only when there are more rows than columns) which uses all of the data in each column. This method is described in Hayne.[6]

To reiterate the purpose of this section, my goal was to provide some insights into how the problem of estimating payment pattern variability can be approached. Hopefully, these thoughts will lead to further research. The results of the previous sections of this paper illustrate, that at least for a company similar to the sample company, the effect of errors in estimating the payment pattern can be as devastating as errors in the ultimate loss projections. It is therefore important that this variability not be ignored.

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[6]Roger M. Hayne, ibid., p.32.

SAMPLE INSURANCE COMPANY
ALL LINES OF BUSINESS COMBINED
EXPECTED VALUE SCENARIO

INCOME STATEMENT	1989	1990	1991	1992	1993
Direct Written Premium	182,000	200,200	220,200	242,200	266,400
Ceded Written Premium	91,000	100,100	110,100	121,100	133,200
Net Written Premium	91,000	100,100	110,100	121,100	133,200
Direct Earned Premium	174,400	192,090	211,280	232,400	255,620
Net Earned Premium	87,200	96,045	105,640	116,201	127,811
Direct Incurred Losses	119,057	131,170	144,274	158,696	174,554
Ceded Loss Paid	49,945	54,431	60,328	66,284	72,894
Change in Unpaid Ceded Losses	9,581	11,156	11,809	13,063	14,383
Net Incurred Losses	59,531	65,583	72,137	79,349	87,277
Direct Incurred LAE	21,931	24,105	26,517	29,168	32,076
Ceded LAE Paid	6,156	6,765	7,534	8,277	9,101
Change in Unpaid Ceded ALAE	1,818	2,008	2,118	2,340	2,573
Net Incurred LAE	13,957	15,332	16,865	18,551	20,402
Total Net Loss & LAE Incurred	73,488	80,915	89,002	97,900	107,679
Agents' Commissions	18,110	19,921	21,908	24,101	26,511
Other Underwriting Expenses	18,260	20,086	22,098	24,301	26,724
Premium Taxes	5,379	5,916	6,507	7,159	7,872
Reinsurance Commission	-27,300	-30,030	-33,030	-36,331	-39,960
Total Underwriting Expenses	14,449	15,893	17,483	19,230	21,147
Underwriting Income	-737	-763	-845	-929	-1,015
Investment Income	11,745	13,266	14,516	15,881	17,387
Other Income	0	0	0	0	0
Dividends to Policyholders	2,700	3,000	3,300	3,600	4,000
Pre-tax Income	8,308	9,503	10,371	11,352	12,372
Federal Income Tax Incurred	4,101	3,956	4,174	4,535	4,130
NET INCOME	4,207	5,547	6,197	6,817	8,242
CHANGES IN SURPLUS					
Change in Statutory Reserve	0	0	0	0	0
Capital Paid In	0	0	0	0	0
Dividends to Stockholders	0	0	0	0	0
TOTAL SURPLUS ADJUSTMENTS	4,207	5,547	6,197	6,817	8,242

Note: Dollar amounts are in thousands.

SAMPLE INSURANCE COMPANY
ALL LINES OF BUSINESS COMBINED
EXPECTED VALUE SCENARIO

BALANCE SHEET	1988	1989	1990	1991	1992	1993
Investments & Cash						
Taxable Bonds		111,976	122,674	134,134	146,832	161,103
Non-taxable Bonds		44,790	49,070	53,654	58,732	64,441
Stocks - Preferred		11,198	12,268	13,414	14,683	16,110
Stocks - Common		11,198	12,268	13,414	14,683	16,110
Cash		44,790	49,070	53,654	58,732	64,441
Real Estate		0	0	0	0	0
Other Income Producing Assets		0	0	0	0	0
Total Investments & Cash	191,082	223,952	245,350	268,270	293,662	322,205
Premium Receivable	27,500	27,583	30,341	33,375	36,708	40,374
Receivables from Reinsurers	9,940	9,348	10,195	11,304	12,421	13,659
Other Assets	5,000	5,000	5,000	5,000	5,000	5,000
TOTAL ASSETS	233,522	265,883	290,886	317,949	347,791	381,238
Loss Reserves	115,925	125,560	136,747	148,570	161,644	176,036
Net LAE Reserve	26,347	28,869	31,468	34,214	37,246	40,575
Statutory Reserve	0	0	0	0	0	0
Unearned Premium Reserve	36,750	40,550	44,605	49,065	53,964	59,353
Expenses Payable	200	355	643	959	1,308	1,691
Income Taxes Payable	0	1,025	989	1,043	1,133	1,032
Dividends Declared and Unpaid						
Policyholders	2,300	2,700	3,000	3,300	3,600	4,000
Stockholders	0	0	0	0	0	0
Balances due Reinsurers	0	10,617	11,680	12,847	14,128	15,541
Other Liabilities	2,000	2,000	2,000	2,000	2,000	2,000
TOTAL LIABILITIES	183,522	211,676	231,132	251,998	275,023	300,228
Capital	10,000	10,000	10,000	10,000	10,000	10,000
Unassigned Funds	40,000	44,207	49,754	55,951	62,768	71,010
POLICYHOLDER SURPLUS	50,000	54,207	59,754	65,951	72,768	81,010
TOTAL LIABILITIES & SURPLUS	233,522	265,883	290,886	317,949	347,791	381,238

Note: Dollar amounts are in thousands.

SAMPLE INSURANCE COMPANY
ALL LINES OF BUSINESS COMBINED
EXPECTED VALUE SCENARIO

CASH FLOW	1989	1990	1991	1992	1993
Direct Premium Collected	181,917	197,442	217,166	238,867	262,734
Premium Ceded	75,833	98,583	108,434	119,268	131,183
Net Premium Collected	106,084	98,859	108,732	119,599	131,551
Reinsurance Commissions	22,750	29,576	32,531	35,780	39,356
Investment Income	11,745	13,266	14,516	15,881	17,387
Capital Received	0	0	0	0	0
TOTAL COLLECTED	140,579	141,701	155,779	171,260	188,294
Direct Losses Paid	99,841	108,827	120,642	132,559	145,779
Loss Recoveries Received	50,422	53,684	59,346	65,291	71,793
Net Losses Paid	49,419	55,143	61,296	67,268	73,986
Direct LAE Paid	17,591	19,498	21,653	23,796	26,174
LAE Recoveries Received	6,271	6,665	7,407	8,153	8,964
Net LAE Paid	11,320	12,833	14,246	15,643	17,210
Total Underwriting Expenses Paid	41,594	45,635	50,197	55,212	60,724
Federal Income Tax Paid	3,076	3,992	4,120	4,445	4,231
Stockholder Dividends Paid	0	0	0	0	0
Policyholder Dividends Paid	2300	2700	3000	3300	3600
TOTAL PAID	107,709	120,303	132,859	145,868	159,751
NET CASH INFLOW	32,870	21,398	22,920	25,392	28,543

LOSS RATIO SUMMARY	1989	1990	1991	1992	1993
Direct: Loss & LAE Ratio	80.8%	80.8%	80.8%	80.8%	80.8%
Expense Ratio	24.4%	24.4%	24.4%	24.4%	24.4%
Combined Ratio	105.2%	105.2%	105.2%	105.2%	105.2%
Net: Loss & LAE Ratio	84.3%	84.2%	84.3%	84.3%	84.2%
Expense Ratio	18.8%	18.9%	18.9%	18.9%	18.9%
Combined Ratio	103.1%	103.1%	103.2%	103.2%	103.1%

SURPLUS STATISTICS					
Premium/Surplus Ratio	1.68	1.68	1.67	1.66	1.64
Target	0.00	0.00	0.00	0.00	0.00
Cap. Needed to Achieve Target	0	0	0	0	0
Reserve/Surplus Ratio	2.85	2.82	2.77	2.73	2.67

Note: Dollar amounts are in thousands.

SAMPLE INSURANCE COMPANY
ALL LINES OF BUSINESS COMBINED
FAST PAYMENT PATTERN SCENARIO

INCOME STATEMENT	1989	1990	1991	1992	1993
Direct Written Premium	182,000	200,200	220,200	242,200	266,400
Ceded Written Premium	91,000	100,100	110,100	121,100	133,200
Net Written Premium	91,000	100,100	110,100	121,100	133,200
Direct Earned Premium	174,400	192,090	211,280	232,400	255,620
Net Earned Premium	87,200	96,045	105,640	116,201	127,811
Direct Incurred Losses	119,057	131,170	144,274	158,696	174,554
Ceded Loss Paid	61,383	61,580	64,828	69,466	75,752
Change in Unpaid Ceded Losses	-1,857	4,007	7,309	9,881	11,525
Net Incurred Losses	59,531	65,583	72,137	79,349	87,277
Direct Incurred LAE	21,931	24,105	26,517	29,168	32,076
Ceded LAE Paid	7,435	7,692	8,213	8,809	9,610
Change in Unpaid Ceded ALAE	539	1,081	1,439	1,808	2,064
Net Incurred LAE	13,957	15,332	16,865	18,551	20,402
Total Net Loss & LAE Incurred	73,488	80,915	89,002	97,900	107,679
Agents' Commissions	18,110	19,921	21,908	24,101	26,511
Other Underwriting Expenses	18,260	20,086	22,098	24,301	26,724
Premium Taxes	5,379	5,916	6,507	7,159	7,872
Reinsurance Commission	-27,300	-30,030	-33,030	-36,331	-39,960
Total Underwriting Expenses	14,449	15,893	17,483	19,230	21,147
Underwriting Income	-737	-763	-845	-929	-1,015
Investment Income	11,299	12,161	13,023	14,093	15,331
Other Income	0	0	0	0	0
Dividends to Policyholders	2,700	3,000	3,300	3,600	4,000
Pre-tax Income	7,862	8,398	8,878	9,564	10,316
Federal Income Tax Incurred	3,416	3,237	3,490	3,836	3,350
NET INCOME	4,446	5,161	5,388	5,728	6,966
CHANGES IN SURPLUS					
Change in Statutory Reserve	0	0	0	0	0
Capital Paid In	0	0	0	0	0
Dividends to Stockholders	0	0	0	0	0
TOTAL SURPLUS ADJUSTMENTS	4,446	5,161	5,388	5,728	6,966

Note: Dollar amounts are in thousands.

SAMPLE INSURANCE COMPANY
ALL LINES OF BUSINESS COMBINED
FAST PAYMENT PATTERN SCENARIO

BALANCE SHEET	1988	1989	1990	1991	1992	1993
Investments & Cash						
Taxable Bonds		104,290	110,949	119,539	129,867	141,758
Non-taxable Bonds		41,716	44,380	47,816	51,947	56,704
Stocks - Preferred		10,429	11,095	11,954	12,987	14,176
Stocks - Common		10,429	11,095	11,954	12,987	14,176
Cash		41,716	44,380	47,816	51,947	56,704
Real Estate		0	0	0	0	0
Other Income Producing Assets		0	0	0	0	0
Total Investments & Cash	191,082	208,580	221,899	239,079	259,735	283,518
Premium Receivable	27,500	27,583	30,341	33,375	36,708	40,374
Receivables from Reinsurers	9,940	11,469	11,545	12,172	13,044	14,224
Other Assets	5,000	5,000	5,000	5,000	5,000	5,000
TOTAL ASSETS	233,522	252,632	268,785	289,626	314,487	343,116
Loss Reserves	115,925	114,089	118,105	125,420	135,301	146,823
Net LAE Reserve	26,347	27,021	28,336	30,168	32,505	35,183
Statutory Reserve	0	0	0	0	0	0
Unearned Premium Reserve	36,750	40,550	44,605	49,065	53,964	59,353
Expenses Payable	200	355	643	959	1,308	1,691
Income Taxes Payable	0	854	809	872	958	836
Dividends Declared and Unpaid						
Policyholders	2,300	2,700	3,000	3,300	3,600	4,000
Stockholders	0	0	0	0	0	0
Balances due Reinsurers	0	10,617	11,680	12,847	14,128	15,541
Other Liabilities	2,000	2,000	2,000	2,000	2,000	2,000
TOTAL LIABILITIES	183,522	198,186	209,178	224,631	243,764	265,427
Capital	10,000	10,000	10,000	10,000	10,000	10,000
Unassigned Funds	40,000	44,446	49,607	54,995	60,723	67,689
POLICYHOLDER SURPLUS	50,000	54,446	59,607	64,995	70,723	77,689
TOTAL LIABILITIES & SURPLUS	233,522	252,632	268,785	289,626	314,487	343,116

Note: Dollar amounts are in thousands.

SAMPLE INSURANCE COMPANY
ALL LINES OF BUSINESS COMBINED
FAST PAYMENT PATTERN SCENARIO

CASH FLOW	1989	1990	1991	1992	1993
Direct Premium Collected	181,917	197,442	217,166	238,867	262,734
Premium Ceded	75,833	98,583	108,434	119,268	131,183
Net Premium Collected	106,084	98,859	108,732	119,599	131,551
Reinsurance Commissions	22,750	29,576	32,531	35,780	39,356
Investment Income	11,299	12,161	13,023	14,093	15,331
Capital Received	0	0	0	0	0
TOTAL COLLECTED	140,133	140,596	154,286	169,472	186,238
Direct Losses Paid	122,750	123,147	129,650	138,934	151,507
Loss Recoveries Received	59,953	61,547	64,287	68,694	74,705
Net Losses Paid	62,797	61,600	65,363	70,240	76,802
Direct LAE Paid	20,718	21,709	23,246	25,023	27,334
LAE Recoveries Received	7,336	7,649	8,127	8,709	9,477
Net LAE Paid	13,382	14,060	15,119	16,314	17,857
Total Underwriting Expenses Paid	41,594	45,635	50,197	55,212	60,724
Federal Income Tax Paid	2,562	3,282	3,427	3,750	3,472
Stockholder Dividends Paid	0	0	0	0	0
Policyholder Dividends Paid	2300	2700	3000	3300	3600
TOTAL PAID	122,635	127,277	137,106	148,816	162,455
NET CASH INFLOW	17,498	13,319	17,180	20,656	23,783

LOSS RATIO SUMMARY	1989	1990	1991	1992	1993
Direct: Loss & LAE Ratio	80.8%	80.8%	80.8%	80.8%	80.8%
Expense Ratio	24.4%	24.4%	24.4%	24.4%	24.4%
Combined Ratio	105.2%	105.2%	105.2%	105.2%	105.2%
Net: Loss & LAE Ratio	84.3%	84.2%	84.3%	84.3%	84.2%
Expense Ratio	18.8%	18.9%	18.9%	18.9%	18.9%
Combined Ratio	103.1%	103.1%	103.2%	103.2%	103.1%

SURPLUS STATISTICS					
Premium/Surplus Ratio	1.67	1.68	1.69	1.71	1.71
Target	0.00	0.00	0.00	0.00	0.00
Cap. Needed to Achieve Target	0	0	0	0	0
Reserve/Surplus Ratio	2.59	2.46	2.39	2.37	2.34

Note: Dollar amounts are in thousands.

SAMPLE INSURANCE COMPANY
ALL LINES OF BUSINESS COMBINED
SLOW REINSURANCE RECOVERY SCENARIO

INCOME STATEMENT	1989	1990	1991	1992	1993
Direct Written Premium	182,000	200,200	220,200	242,200	266,400
Ceded Written Premium	91,000	100,100	110,100	121,100	133,200
Net Written Premium	91,000	100,100	110,100	121,100	133,200
Direct Earned Premium	174,400	192,090	211,280	232,400	255,620
Net Earned Premium	87,200	96,045	105,640	116,201	127,811
Direct Incurred Losses	119,057	131,170	144,274	158,696	174,554
Ceded Loss Paid	49,945	54,431	60,328	66,284	72,894
Change in Unpaid Ceded Losses	9,581	11,156	11,809	13,063	14,383
Net Incurred Losses	59,531	65,583	72,137	79,349	87,277
Direct Incurred LAE	21,931	24,105	26,517	29,168	32,076
Ceded LAE Paid	6,156	6,765	7,534	8,277	9,101
Change in Unpaid Ceded ALAE	1,818	2,008	2,118	2,340	2,573
Net Incurred LAE	13,957	15,332	16,865	18,551	20,402
Total Net Loss & LAE Incurred	73,488	80,915	89,002	97,900	107,679
Agents' Commissions	18,110	19,921	21,908	24,101	26,511
Other Underwriting Expenses	18,260	20,086	22,098	24,301	26,724
Premium Taxes	5,379	5,916	6,507	7,159	7,872
Reinsurance Commission	-27,300	-30,030	-33,030	-36,331	-39,960
Total Underwriting Expenses	14,449	15,893	17,483	19,230	21,147
Underwriting Income	-737	-763	-845	-929	-1,015
Investment Income	10,394	10,570	11,610	12,716	13,882
Other Income	0	0	0	0	0
Dividends to Policyholders	2,700	3,000	3,300	3,600	4,000
Pre-tax Income	6,957	6,807	7,465	8,187	8,867
Federal Income Tax Incurred	0	0	176	1,494	1,493
NET INCOME	6,957	6,807	7,289	6,693	7,374
CHANGES IN SURPLUS					
Change in Statutory Reserve	0	0	0	0	0
Capital Paid In	0	0	0	0	0
Dividends to Stockholders	0	0	0	0	0
TOTAL SURPLUS ADJUSTMENTS	6,957	6,807	7,289	6,693	7,374

Note: Dollar amounts are in thousands.

SAMPLE INSURANCE COMPANY
ALL LINES OF BUSINESS COMBINED
SLOW REINSURANCE RECOVERY SCENARIO

BALANCE SHEET	1988	1989	1990	1991	1992	1993
Investments & Cash						
Taxable Bonds		89,462	98,684	107,907	117,870	128,660
Non-taxable Bonds		35,785	39,474	43,163	47,148	51,464
Stocks - Preferred		8,946	9,869	10,791	11,787	12,866
Stocks - Common		8,946	9,869	10,791	11,787	12,866
Cash		35,785	39,474	43,163	47,148	51,464
Real Estate		0	0	0	0	0
Other Income Producing Assets		0	0	0	0	0
Total Investments & Cash	191,082	178,924	197,370	215,815	235,740	257,320
Premium Receivable	27,500	27,583	30,341	33,375	36,708	40,374
Receivables from Reinsurers	9,940	56,101	61,196	67,862	74,561	81,995
Other Assets	5,000	5,000	5,000	5,000	5,000	5,000
TOTAL ASSETS	233,522	267,608	293,907	322,052	352,009	384,689
Loss Reserves	115,925	125,560	136,747	148,570	161,644	176,036
Net LAE Reserve	26,347	28,869	31,468	34,214	37,246	40,575
Statutory Reserve	0	0	0	0	0	0
Unearned Premium Reserve	36,750	40,550	44,605	49,065	53,964	59,353
Expenses Payable	200	355	643	959	1,308	1,691
Income Taxes Payable	0	0	0	44	373	373
Dividends Declared and Unpaid						
Policyholders	2,300	2,700	3,000	3,300	3,600	4,000
Stockholders	0	0	0	0	0	0
Balances due Reinsurers	0	10,617	11,680	12,847	14,128	15,541
Other Liabilities	2,000	2,000	2,000	2,000	2,000	2,000
TOTAL LIABILITIES	183,522	210,651	230,143	250,999	274,263	299,569
Capital	10,000	10,000	10,000	10,000	10,000	10,000
Unassigned Funds	40,000	46,957	53,764	61,053	67,746	75,120
POLICYHOLDER SURPLUS	50,000	56,957	63,764	71,053	77,746	85,120
TOTAL LIABILITIES & SURPLUS	233,522	267,608	293,907	322,052	352,009	384,689

Note: Dollar amounts are in thousands.

SAMPLE INSURANCE COMPANY
ALL LINES OF BUSINESS COMBINED
SLOW REINSURANCE RECOVERY SCENARIO

CASH FLOW	1989	1990	1991	1992	1993
Direct Premium Collected	181,917	197,442	217,166	238,867	262,734
Premium Ceded	75,833	98,583	108,434	119,268	131,183
Net Premium Collected	106,084	98,859	108,732	119,599	131,551
Reinsurance Commissions	22,750	29,576	32,531	35,780	39,356
Investment Income	10,394	10,570	11,610	12,716	13,882
Capital Received	0	0	0	0	0
TOTAL COLLECTED	139,228	139,005	152,873	168,095	184,789
Direct Losses Paid	99,841	108,827	120,642	132,559	145,779
Loss Recoveries Received	8,800	49,945	54,431	60,328	66,284
Net Losses Paid	91,041	58,882	66,211	72,231	79,495
Direct LAE Paid	17,591	19,498	21,653	23,796	26,174
LAE Recoveries Received	1,140	6,156	6,765	7,534	8,277
Net LAE Paid	16,451	13,342	14,888	16,262	17,897
Total Underwriting Expenses Paid	41,594	45,635	50,197	55,212	60,724
Federal Income Tax Paid	0	0	132	1,165	1,493
Stockholder Dividends Paid	0	0	0	0	0
Policyholder Dividends Paid	2300	2700	3000	3300	3600
TOTAL PAID	151,386	120,559	134,428	148,170	163,209
NET CASH INFLOW	-12,158	18,446	18,445	19,925	21,580

LOSS RATIO SUMMARY	1989	1990	1991	1992	1993
Direct: Loss & LAE Ratio	80.8%	80.8%	80.8%	80.8%	80.8%
Expense Ratio	24.4%	24.4%	24.4%	24.4%	24.4%
Combined Ratio	105.2%	105.2%	105.2%	105.2%	105.2%
Net: Loss & LAE Ratio	84.3%	84.2%	84.3%	84.3%	84.2%
Expense Ratio	18.8%	18.9%	18.9%	18.9%	18.9%
Combined Ratio	103.1%	103.1%	103.2%	103.2%	103.1%

SURPLUS STATISTICS					
Premium/Surplus Ratio	1.60	1.57	1.55	1.56	1.56
Target	0.00	0.00	0.00	0.00	0.00
Cap. Needed to Achieve Target	0	0	0	0	0
Reserve/Surplus Ratio	2.71	2.64	2.57	2.56	2.54

Note: Dollar amounts are in thousands.

SAMPLE INSURANCE COMPANY
ALL LINES OF BUSINESS COMBINED
FAST PAYOUT - SLOW RECOVERY SCENARIO

INCOME STATEMENT	1989	1990	1991	1992	1993
Direct Written Premium	182,000	200,200	220,200	242,200	266,400
Ceded Written Premium	91,000	100,100	110,100	121,100	133,200
Net Written Premium	91,000	100,100	110,100	121,100	133,200
Direct Earned Premium	174,400	192,090	211,280	232,400	255,620
Net Earned Premium	87,200	96,045	105,640	116,201	127,811
Direct Incurred Losses	119,057	131,170	144,274	158,696	174,554
Ceded Loss Paid	61,383	61,580	64,828	69,466	75,752
Change in Unpaid Ceded Losses	-1,857	4,007	7,309	9,881	11,525
Net Incurred Losses	59,531	65,583	72,137	79,349	87,277
Direct Incurred LAE	21,931	24,105	26,517	29,168	32,076
Ceded LAE Paid	7,435	7,692	8,213	8,809	9,610
Change in Unpaid Ceded ALAE	539	1,081	1,439	1,808	2,064
Net Incurred LAE	13,957	15,332	16,865	18,551	20,402
Total Net Loss & LAE Incurred	73,488	80,915	89,002	97,900	107,679
Agents' Commissions	18,110	19,921	21,908	24,101	26,511
Other Underwriting Expenses	18,260	20,086	22,098	24,301	26,724
Premium Taxes	5,379	5,916	6,507	7,159	7,872
Reinsurance Commission	-27,300	-30,030	-33,030	-36,331	-39,960
Total Underwriting Expenses	14,449	15,893	17,483	19,230	21,147
Underwriting Income	-737	-763	-845	-929	-1,015
Investment Income	9,641	8,912	9,673	10,532	11,484
Other Income	0	0	0	0	0
Dividends to Policyholders	2,700	3,000	3,300	3,600	4,000
Pre-tax Income	6,204	5,149	5,528	6,003	6,469
Federal Income Tax Incurred	0	0	0	57	1,020
NET INCOME	6,204	5,149	5,528	5,946	5,449
CHANGES IN SURPLUS					
Change in Statutory Reserve	0	0	0	0	0
Capital Paid In	0	0	0	0	0
Dividends to Stockholders	0	0	0	0	0
TOTAL SURPLUS ADJUSTMENTS	6,204	5,149	5,528	5,946	5,449

Note: Dollar amounts are in thousands.

SAMPLE INSURANCE COMPANY
ALL LINES OF BUSINESS COMBINED
FAST PAYOUT - SLOW RECOVERY SCENARIO

BALANCE SHEET	1988	1989	1990	1991	1992	1992
Investments & Cash						
Taxable Bonds		76,067	82,555	89,612	97,832	106,194
Non-taxable Bonds		30,427	33,022	35,845	39,133	42,477
Stocks - Preferred		7,607	8,255	8,961	9,783	10,619
Stocks - Common		7,607	8,255	8,961	9,783	10,619
Cash		30,427	33,022	35,845	39,133	42,477
Real Estate		0	0	0	0	0
Other Income Producing Assets		0	0	0	0	0
Total Investments & Cash	191,082	152,135	165,109	179,224	195,664	212,386
Premium Receivable	27,500	27,583	30,341	33,375	36,708	40,374
Receivables from Reinsurers	9,940	68,818	69,272	73,041	78,275	85,362
Other Assets	5,000	5,000	5,000	5,000	5,000	5,000
TOTAL ASSETS	233,522	253,536	269,722	290,640	315,647	343,122
Loss Reserves	115,925	114,089	118,105	125,420	135,301	146,823
Net LAE Reserve	26,347	27,021	28,336	30,168	32,505	35,183
Statutory Reserve	0	0	0	0	0	0
Unearned Premium Reserve	36,750	40,550	44,605	49,065	53,964	59,353
Expenses Payable	200	355	643	959	1,308	1,691
Income Taxes Payable	0	0	0	0	14	255
Dividends Declared and Unpaid						
Policyholders	2,300	2,700	3,000	3,300	3,600	4,000
Stockholders	0	0	0	0	0	0
Balances due Reinsurers	0	10,617	11,680	12,847	14,128	15,541
Other Liabilities	2,000	2,000	2,000	2,000	2,000	2,000
TOTAL LIABILITIES	183,522	197,332	208,369	223,759	242,820	264,846
Capital	10,000	10,000	10,000	10,000	10,000	10,000
Unassigned Funds	40,000	46,204	51,353	56,881	62,827	68,276
POLICYHOLDER SURPLUS	50,000	56,204	61,353	66,881	72,827	78,276
TOTAL LIABILITIES & SURPLUS	233,522	253,536	269,722	290,640	315,647	343,122

Note: Dollar amounts are in thousands.

SAMPLE INSURANCE COMPANY
ALL LINES OF BUSINESS COMBINED
FAST PAYOUT - SLOW RECOVERY SCENARIO

CASH FLOW	1989	1990	1991	1992	1993
Direct Premium Collected	181,917	197,442	217,166	238,867	262,734
Premium Ceded	75,833	98,583	108,434	119,268	131,183
Net Premium Collected	106,084	98,859	108,732	119,599	131,551
Reinsurance Commissions	22,750	29,576	32,531	35,780	39,356
Investment Income	9,641	8,912	9,673	10,532	11,484
Capital Received	0	0	0	0	0
TOTAL COLLECTED	138,475	137,347	150,936	165,911	182,391
Direct Losses Paid	122,750	123,147	129,650	138,934	151,507
Loss Recoveries Received	8,800	61,383	61,580	64,828	69,466
Net Losses Paid	113,950	61,764	68,070	74,106	82,041
Direct LAE Paid	20,718	21,709	23,246	25,023	27,334
LAE Recoveries Received	1,140	7,435	7,692	8,213	8,809
Net LAE Paid	19,578	14,274	15,554	16,810	18,525
Total Underwriting Expenses Paid	41,594	45,635	50,197	55,212	60,724
Federal Income Tax Paid	0	0	0	43	779
Stockholder Dividends Paid	0	0	0	0	0
Policyholder Dividends Paid	2300	2700	3000	3300	3600
TOTAL PAID	177,422	124,373	136,821	149,471	165,669
NET CASH INFLOW	-38,947	12,974	14,115	16,440	16,722

LOSS RATIO SUMMARY	1989	1990	1991	1992	1993
Direct: Loss & LAE Ratio	80.8%	80.8%	80.8%	80.8%	80.8%
Expense Ratio	24.4%	24.4%	24.4%	24.4%	24.4%
Combined Ratio	105.2%	105.2%	105.2%	105.2%	105.2%
Net: Loss & LAE Ratio	84.3%	84.2%	84.3%	84.3%	84.2%
Expense Ratio	18.8%	18.9%	18.9%	18.9%	18.9%
Combined Ratio	103.1%	103.1%	103.2%	103.2%	103.1%

SURPLUS STATISTICS					
Premium/Surplus Ratio	1.62	1.63	1.65	1.66	1.70
Target	0.00	0.00	0.00	0.00	0.00
Cap. Needed to Achieve Target	0	0	0	0	0
Reserve/Surplus Ratio	2.51	2.39	2.33	2.30	2.33

Note: Dollar amounts are in thousands.

APPENDIX A
Summary of Input Assumptions - Expected Value Scenario

GENERAL ASSUMPTIONS

From Prior Year's Balance Sheet	1988
Assets	
Other Assets	5,000
Liabilities	
Expenses Payable	200
Income Taxes Payable	0
Dividends Declared and Unpaid	
Policyholders	2,300
Stockholders	0
Other Liabilities	2,000
Surplus	
Capital	10,000
Unassigned Funds	40,000
Regular Tax Loss Carryforward	0
Alternate Tax Loss Carryforward	0
1986 Ending Unearned Prem. Res.	65,000

	1989	1990	1991	1992	1993
Percent of Invested Assets by Type					
Taxable Bonds	50.0%	50.0%	50.0%	50.0%	50.0%
Non-taxable Bonds (pre 8/8/86)	15.0%	10.0%	5.0%	3.0%	2.0%
Non-taxable Bonds (post8/8/86)	5.0%	10.0%	15.0%	17.0%	18.0%
Stocks - Preferred	5.0%	5.0%	5.0%	5.0%	5.0%
Stocks - Common	5.0%	5.0%	5.0%	5.0%	5.0%
Cash	20.0%	20.0%	20.0%	20.0%	20.0%
Real Estate	0.0%	0.0%	0.0%	0.0%	0.0%
Other Income Producing Assets	0.0%	0.0%	0.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%
Expected Rate of Return by Type					
Taxable Bonds	8.0%	8.0%	8.0%	8.0%	8.0%
Non-taxable Bonds	6.0%	6.0%	6.0%	6.0%	6.0%
Preferred Stocks - Div. Yield	6.0%	6.0%	6.0%	6.0%	6.0%
Preferred Stocks - Cap. Gains	0.0%	0.0%	0.0%	0.0%	0.0%
Common Stocks - Div. Yield	3.0%	3.0%	3.0%	3.0%	3.0%
Common Stocks - Capital Gains	0.0%	0.0%	0.0%	0.0%	0.0%
Cash	0.0%	0.0%	0.0%	0.0%	0.0%
Real Estate - Gain/Loss	0.0%	0.0%	0.0%	0.0%	0.0%
Real Estate - Income	0.0%	0.0%	0.0%	0.0%	0.0%
Other Income Producing Assets	0.0%	0.0%	0.0%	0.0%	0.0%
Weighted Average	5.7%	5.7%	5.7%	5.7%	5.7%

Note: Throughout Appendix A, all dollar amounts are in thousands.

FIRST LINE OF BUSINESS NAME:
AUTOMOBILE LIABILITY

Previous Year's Information	1988
Direct Unearned Premium	22,500
Ceded Premium Not Yet Remitted	0
Net Unearned Premium	11,250
Direct Premium Uncollected	7,500
Losses Ceded on Ceded Unearned	8,000
Ceded Paid Losses Not Yet Coll.	800
Ceded Paid ALAE Not Yet Coll.	80
Reinsurance Comm. Not Yet Coll.	0

Previous Years' Loss Information

	1984	1985	1986	1987	1988
Direct Loss Reserve	1,125	2,250	5,250	10,500	22,000
Ceded Loss Reserve	560	1,125	2,625	5,250	11,000
Net Loss Reserve	565	1,125	2,625	5,250	11,000
Direct ALAE Reserve	113	225	525	1,050	2,200
Ceded ALAE Reserve	56	113	263	525	1,100
Net ALAE Reserve	57	112	262	525	1,100
Direct ULAE Reserve	30	50	130	250	550

Future Years' Information

	1989	1990	1991	1992	1993
Premium Data					
$ of Direct Written Premium	50,000	55,000	60,500	66,550	73,200
% Prem. Earned in Current Yr.	50%	50%	50%	50%	50%
Premium Collection Lag (mos.)	2	2	2	2	2
Policyholder Div. - Declared	0	0	0	0	0
Policyholder Div. - Paid	0	0	0	0	0
Loss Data					
Expected Loss Ratio (Direct)	71%	71%	71%	71%	71%
Direct ALAE (% of loss)	10%	10%	10%	10%	10%
ULAE (% of loss)	5%	5%	5%	5%	5%
Payout Pattern					
Years 1-5	35%	30%	15%	10%	4%
Years 6-10	3%	2%	1%	0%	0%
Expense Data					
Agents Commissions (% of DWP)	10%	10%	10%	10%	10%
Premium Tax Percent	3.00%	3.00%	3.00%	3.00%	3.00%
Other Underwriting Expenses	7%	7%	7%	7%	7%
Quota Share/Pro Rata Reinsurance					
% of Premium Ceded	50%	50%	50%	50%	50%
Lag in Ceding Premium (mos.)	2	2	2	2	2
% of Losses Ceded	50%	50%	50%	50%	50%
Lag in Coll. Ceded Loss (mos.)	2	2	2	2	2
Probability of Collection	100%	100%	100%	100%	100%
Commission	30%	30%	30%	30%	30%

SECOND LINE OF BUSINESS NAME:
GENERAL LIABILITY

Previous Year's Information	1988
Direct Unearned Premium	22,500
Ceded Premium Not Yet Remitted	0
Net Unearned Premium	11,250
Direct Premium Uncollected	7,500
Losses Ceded on Ceded Unearned	8,000
Ceded Paid Losses Not Yet Coll.	3,000
Ceded Paid ALAE Not Yet Coll.	450
Reinsurance Comm. Not Yet Coll.	0

Previous Years' Loss Information

	1984	1985	1986	1987	1988
Direct Loss Reserve	12,000	10,800	16,800	24,000	32,400
Ceded Loss Reserve	6,000	5,400	8,400	12,000	16,200
Net Loss Reserve	6,000	5,400	8,400	12,000	16,200
Direct ALAE Reserve	1,800	1,620	2,520	3,600	4,860
Ceded ALAE Reserve	900	810	1,260	1,800	2,430
Net ALAE Reserve	900	810	1,260	1,800	2,430
Direct ULAE Reserve	300	270	420	600	810

Future Years' Information

	1989	1990	1991	1992	1993
Premium Data					
$ of Direct Written Premium	50,000	55,000	60,500	66,550	73,200
% Prem. Earned in Current Yr.	50%	50%	50%	50%	50%
Premium Collection Lag (mos.)	2	2	2	2	2
Policyholder Div. - Declared	0	0	0	0	0
Policyholder Div. - Paid	0	0	0	0	0
Loss Data					
Expected Loss Ratio (Direct)	71%	71%	71%	71%	71%
Direct ALAE (% of loss)	15%	15%	15%	15%	15%
ULAE (% of loss)	5%	5%	5%	5%	5%
Payout Pattern					
Years 1-5	10%	15%	15%	15%	13%
Years 6-10	12%	7%	6%	4%	3%
Expense Data					
Agents Commissions (% of DWP)	15%	15%	15%	15%	15%
Premium Tax Percent	3.00%	3.00%	3.00%	3.00%	3.00%
Other Underwriting Expenses	7%	7%	7%	7%	7%
Quota Share/Pro Rata Reinsurance					
% of Premium Ceded	50%	50%	50%	50%	50%
Lag in Ceding Premium (mos.)	2	2	2	2	2
% of Losses Ceded	50%	50%	50%	50%	50%
Lag in Coll. Ceded Loss (mos.)	2	2	2	2	2
Probability of Collection	100%	100%	100%	100%	100%
Commission	30%	30%	30%	30%	30%

THIRD LINE OF BUSINESS NAME:
WORKERS' COMPENSATION

Previous Year's Information	1988
Direct Unearned Premium	6,000
Ceded Premium Not Yet Remitted	0
Net Unearned Premium	3,000
Direct Premium Uncollected	5,000
Losses Ceded on Ceded Unearned	1,900
Ceded Paid Losses Not Yet Coll.	2,000
Ceded Paid ALAE Not Yet Coll.	140
Reinsurance Comm. Not Yet Coll.	0

Previous Years' Loss Information

	1984	1985	1986	1987	1988
Direct Loss Reserve	5,000	3,400	5,200	8,500	15,750
Ceded Loss Reserve	2,500	1,700	2,600	4,250	7,875
Net Loss Reserve	2,500	1,700	2,600	4,250	7,875
Direct ALAE Reserve	350	240	360	600	1,100
Ceded ALAE Reserve	175	120	180	300	550
Net ALAE Reserve	175	120	180	300	550
Direct ULAE Reserve	125	85	130	200	400

Future Years' Information

	1989	1990	1991	1992	1993
Premium Data					
$ of Direct Written Premium	33,000	36,300	39,900	43,900	48,300
% Prem. Earned in Current Yr.	80%	80%	80%	80%	80%
Premium Collection Lag (mos.)	1	1	1	1	1
Policyholder Div. - Declared	2,700	3,000	3,300	3,600	4,000
Policyholder Div. - Paid	2,300	2,700	3,000	3,300	3,600
Loss Data					
Expected Loss Ratio (Direct)	63%	63%	63%	63%	63%
Direct ALAE (% of loss)	7%	7%	7%	7%	7%
ULAE (% of loss)	5%	5%	5%	5%	5%
Payout Pattern					
Years 1-5	25%	30%	13%	8%	6%
Years 6-10	5%	4%	4%	3%	2%
Expense Data					
Agents Commissions (% of DWP)	5%	5%	5%	5%	5%
Premium Tax Percent	3.00%	3.00%	3.00%	3.00%	3.00%
Other Underwriting Expenses	15%	15%	15%	15%	15%
Quota Share/Pro Rata Reinsurance					
% of Premium Ceded	50%	50%	50%	50%	50%
Lag in Ceding Premium (mos.)	2	2	2	2	2
% of Losses Ceded	50%	50%	50%	50%	50%
Lag in Coll. Ceded Loss (mos.)	2	2	2	2	2
Probability of Collection	100%	100%	100%	100%	100%
Commission	30%	30%	30%	30%	30%

FOURTH LINE OF BUSINESS NAME:
MEDICAL MALPRACTICE

Previous Year's Information	1988
Direct Unearned Premium	7,500
Ceded Premium Not Yet Remitted	0
Net Unearned Premium	3,750
Direct Premium Uncollected	2,500
Losses Ceded on Ceded Unearned	2,175
Ceded Paid Losses Not Yet Coll.	600
Ceded Paid ALAE Not Yet Coll.	300
Reinsurance Comm. Not Yet Coll.	0

Previous Years' Loss Information

	1984	1985	1986	1987	1988
Direct Loss Reserve	8,000	4,500	6,500	8,000	10,200
Ceded Loss Reserve	4,000	2,250	3,250	4,000	5,100
Net Loss Reserve	4,000	2,250	3,250	4,000	5,100
Direct ALAE Reserve	4,000	2,250	3,250	4,000	5,100
Ceded ALAE Reserve	2,000	1,125	1,625	2,000	2,550
Net ALAE Reserve	2,000	1,125	1,625	2,000	2,550
Direct ULAE Reserve	200	113	163	200	255

Future Years' Information

	1989	1990	1991	1992	1993
Premium Data					
$ of Direct Written Premium	16,000	17,600	19,400	21,300	23,400
% Prem. Earned in Current Yr.	50%	50%	50%	50%	50%
Premium Collection Lag (mos.)	2	2	2	2	2
Policyholder Div. - Declared	0	0	0	0	0
Policyholder Div. - Paid	0	0	0	0	0
Loss Data					
Expected Loss Ratio (Direct)	59%	59%	59%	59%	59%
Direct ALAE (% of loss)	50%	50%	50%	50%	50%
ULAE (% of loss)	5%	5%	5%	5%	5%
Payout Pattern					
Years 1-5	3%	10%	10%	13%	10%
Years 6-10	10%	8%	7%	6%	5%
Expense Data					
Agents Commissions (% of DWP)	0%	0%	0%	0%	0%
Premium Tax Percent	3.00%	3.00%	3.00%	3.00%	3.00%
Other Underwriting Expenses	25%	25%	25%	25%	25%
Quota Share/Pro Rata Reinsurance					
% of Premium Ceded	50%	50%	50%	50%	50%
Lag in Ceding Premium (mos.)	2	2	2	2	2
% of Losses Ceded	50%	50%	50%	50%	50%
Lag in Coll. Ceded Loss (mos.)	2	2	2	2	2
Probability of Collection	100%	100%	100%	100%	100%
Commission	30%	30%	30%	30%	30%

FIFTH LINE OF BUSINESS NAME:
MULTI-PERIL, ETC.

Previous Year's Information	1988
Direct Unearned Premium	15,000
Ceded Premium Not Yet Remitted	0
Net Unearned Premium	7,500
Direct Premium Uncollected	5,000
Losses Ceded on Ceded Unearned	5,250
Ceded Paid Losses Not Yet Coll.	2,400
Ceded Paid ALAE Not Yet Coll.	170
Reinsurance Comm. Not Yet Coll.	0

Previous Years' Loss Information

	1984	1985	1986	1987	1988
Direct Loss Reserve	2,000	1,350	2,250	4,050	10,125
Ceded Loss Reserve	1,000	725	1,125	2,025	5,065
Net Loss Reserve	1,000	625	1,125	2,025	5,060
Direct ALAE Reserve	140	100	160	280	700
Ceded ALAE Reserve	70	50	80	140	350
Net ALAE Reserve	70	50	80	140	350
Direct ULAE Reserve	50	35	60	100	250

Future Years' Information

	1989	1990	1991	1992	1993
Premium Data					
$ of Direct Written Premium	33,000	36,300	39,900	43,900	48,300
% Prem. Earned in Current Yr.	50%	50%	50%	50%	50%
Premium Collection Lag (mos.)	2	2	2	2	2
Policyholder Div. - Declared	0	0	0	0	0
Policyholder Div. - Paid	0	0	0	0	0
Loss Data					
Expected Loss Ratio (Direct)	70%	70%	70%	70%	70%
Direct ALAE (% of loss)	7%	7%	7%	7%	7%
ULAE (% of loss)	5%	5%	5%	5%	5%
Payout Pattern					
Years 1-5	55%	25%	7%	4%	3%
Years 6-10	2%	1%	1%	1%	1%
Expense Data					
Agents Commissions (% of DWP)	12%	12%	12%	12%	12%
Premium Tax Percent	3.00%	3.00%	3.00%	3.00%	3.00%
Other Underwriting Expenses	7%	7%	7%	7%	7%
Quota Share/Pro Rata Reinsurance					
% of Premium Ceded	50%	50%	50%	50%	50%
Lag in Ceding Premium (mos.)	2	2	2	2	2
% of Losses Ceded	50%	50%	50%	50%	50%
Lag in Coll. Ceded Loss (mos.)	2	2	2	2	2
Probability of Collection	100%	100%	100%	100%	100%
Commission	30%	30%	30%	30%	30%

Appendix B

Discussion of Modeled Results

In this appendix, the calculations underlying the financial projections shown in Exhibits 1 through 4 and Appendix A will be outlined, including a brief discussion of the differences in the results between the different scenarios.

Income Statement

Direct written premium is shown as entered. The ceded written premium is calculated as 50% of the direct written premium, as per the reinsurance assumptions. Net written premium is then the difference between direct and ceded written premiums. Earned premium is calculated, both direct and net, using the entered percentages of written premium. For all lines except workers' compensation, this is 50%. Due to the deposit and audit premiums for workers' compensation, it is assumed that approximately 80% of premium is earned in the year in which it written.

Direct losses are calculated as the entered percentages of direct earned premium. Total ceded losses are equal to 50% of direct losses. Ceded losses are separated into payments made by the sample company of losses to be ceded and the change in outstanding losses to be ceded. This highlights the relationship between the payment by the insurance company of the losses to be ceded and the collection of these losses from the reinsurance company shown on the cash flow statement. The rate of payment of ceded losses is assumed to be approximately equal to the rate of payment of net losses. Net losses are direct losses minus ceded losses.

Direct loss adjustment expenses (LAE) are calculated as the entered percentages times direct losses. Only allocated LAE (ALAE) are assumed to be ceded. Thus, net LAE is direct LAE minus ceded ALAE.

Expenses are calculated as a percent of premium, as entered in the input assumptions. Reinsurance commissions are calculated as the entered percentage of ceded written premium.

Underwriting income is calculated as net earned premium minus net incurred losses and LAE minus underwriting expenses net of reinsurance commissions. Investment income is calculated as the average rate of return times the sum of the invested assets at the beginning of the year and 50% of the net cash flow during the year.

Federal Income Taxes are calculated approximately as they would be under the Tax Reform Act of 1986. The slight decrease in the relative taxes between 1989 and 1990 is due to the fact that not all of the reserves for the historical years have reflect the same loss payment rates as the projected years. This causes a distortion in the discounted reserves and therefore taxable income in 1989 is slightly higher relative to 1990. The much larger relative decrease between 1992 and 1993 is due to the end of the six-year period in which 20% of the 1986 unearned premium reserve is brought into taxable income as part of the revenue offset provision.

Net income after taxes is calculated as underwriting income plus investment income minus policyholder dividends minus Federal Income Taxes.

Balance Sheet

The balance sheet reflects the differences between balances incurred and those paid. The calculations are performed in a manner consistent with those on a statutory accounting statement.

Cash Flow Statement

The cash flow statement is derived using the balances incurred on the income statement and the payment assumptions entered. The premium collection

lag is applied to written premium and commissions. The loss payment pattern is applied to direct losses and LAE, with the exception that 50% of unallocated LAE (ULAE) is assumed to be paid out in the first two years, as an approximation of the Schedule P payment pattern.

The reinsurance premium ceded lag is applied to reinsurance premium ceded and reinsurance commissions collected. The reinsurance loss collection lag is applied to ceded paid losses and ALAE.

Federal Income Taxes are assumed to be paid 75% in the year incurred and 25% in the following year. All other income and expenses are assumed to be collected or paid as incurred.

Differences in Results between Scenarios

As can be seen by comparing Exhibits 1 through 4, the only differences on the income statement are investment income and Federal Income Taxes. The differences in investment income result because losses are paid out more quickly or reinsurance recoveries are made more slowly, thereby reducing the amount of funds available for investment. The magnitude of these differences can be identified by comparing the total invested assets, loss and LAE reserves, and receivables from reinsurers accounts on the balance sheet between the four exhibits.

The difference in investment income will, of course, affect Federal Income Taxes. In addition, if payments are made more quickly, the loss and LAE reserves will be lower which reduces the discount in the loss reserves for tax purposes. This slightly offsets the impact of the reduction of investment income in the tax calculation.