An Actuarial Advantage

Maximizing the Benefit of an Actuarial Analysis

Prepared by:

SIGMA Actuarial Consulting Group, Inc.

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Special thanks to:
Al Rhodes, ACAS, MAAA
for his significant contribution to this book.

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Introduction

Effective utilization of an actuarial resource can prove to be a powerful advantage for brokers, chief financial officers (CFOs), and risk managers. Unfortunately, this advantage is often unrealized due to the complexity of the risk management process. This book provides a straightforward and easy to understand discussion of actuarial topics with the following specific goals:

- Present a clear explanation of fundamental actuarial topics.
- Discuss the most effective ways to utilize an actuary for a competitive advantage.
- Identify common problems encountered by brokers, CFOs, and risk managers when working with actuaries, and present strategies for preventing these problems.
- Provide specific examples of real world applications of actuarial analyses.

An Actuarial Advantage has been prepared by the staff of SIGMA Actuarial Consulting Group, Inc. With a client base covering all fifty states and many foreign countries, SIGMA is one of the nation's fastest-growing actuarial consulting firms. SIGMA produces analyses in a uniquely useful format with excellent customer service.

More About SIGMA Actuarial Consulting Group, Inc.

SIGMA's founding actuarial partner and president is Al Rhodes, ACAS, MAAA. SIGMA's staff has a unique blend of experience which includes credentialed actuaries, MBAs and computer professionals. The staff also has a diverse educational background in engineering, finance, mathematics, economics, genetics, computer

science, and actuarial science. A majority of the staff have advanced academic degrees.

SIGMA is an actuarial resource and not just an actuarial consulting firm. As a resource, the company provides analytical software tools, educational material, unique working relationships such as our "private label" services, and a variety of analytical solutions. This resource attitude extends to the unique presentation of a SIGMA analysis – readable and packed with easy-to-interpret graphics. It also drives our staff's commitment to individualized service and relationships that SIGMA clients enjoy on a long term basis.

Actuaries as a Competitive Advantage

Understanding and utilizing a consulting actuary provides a competitive advantage for risk management professionals. This book will help you better understand actuarial opportunities and improve your ability to incorporate the actuarial advantage in the way you do business. During the past few years, there have been significant changes in our industry that encourage the effective utilization of an actuarial resource. These changes impact the following risk management professionals in unique ways.

Brokers – As brokers increasingly move toward a fee-based pricing system and away from commissions, it is important to compete in a cost effective manner. This requires an understanding of the actuarial component and the best way to leverage it to win an account. For mid to large size accounts, the actuarial advantage is achieved when you have an established relationship with a firm that operates as if it is "in-house." This allows you to be prepared and proactive with actuarial resources when you're competing for new business.

Chief Financial Officers (CFOs) – With the Sarbanes-Oxley legislation, the actuarial function has become independent from the

audit function. This requirement for public companies gives you an opportunity to select an actuarial consultant. Understanding the issues relating to actuarial topics is critical to this decision.

Self-Insureds – Proper financial reporting and estimation of balance sheet liabilities is under scrutiny by shareholders and regulatory agencies alike. An understanding of the actuarial process is required to ensure proper estimates are made. While being self-insured can offer a competitive advantage, it can also become a serious liability. The actuarial advantage is obtained through an actuarial consultant who can assure your sufficient understanding of the applicable issues.

Third Party Administrators (TPAs) – As margins grow thinner for these organizations, proactive TPAs explore and develop additional services to offer their clients. TPAs warehouse a vast amount of data that can yield valuable insights to clients. The actuarial advantage for TPAs comes from the right relationship with an actuarial firm that can help build valuable incremental services to offer clients.

Certified Public Accountants (CPAs) – For publicly-held corporations, Sarbanes-Oxley dictates that the actuarial function be separate from the auditing function. Private companies are also following this guideline, although it is not mandated. As an independent CPA, you can benefit from a long-term relationship with an actuarial firm which provides personal service to answer your questions. You can in turn recommend required services to your clients with confidence.

Governmental Entities – The Governmental Accounting Standards Board Statement No. 10 (GASB 10) requires actuarial techniques to be utilized when estimating liabilities. An actuary is trained to make these estimations. The actuarial advantage for a public entity comes through proper estimation of liabilities.

Special Notes About This Book

This book is divided into short chapters which focus on specific topics. There are numerous formats and methodologies that an actuarial analysis may follow. In this book, we have selected topics that we believe will benefit you the most and are commonly utilized by actuaries. A brief explanation of the chapter's importance is provided at the beginning of each chapter. Several icons are used throughout the book to highlight important or interesting concepts.

The Actuarial Advantage icon draws your attention to specific ways to gain a decision making or competitive advantage.

The Tip icon points out practical insights you don't want to miss.

The Warning icon alerts you to some of the common misconceptions and mistakes relating to actuarial topics.

The Remember icon indicates information that is important to your overall understanding of actuarial concepts.

We anticipate that the knowledge of risk management terms may vary greatly among readers. Therefore, many words utilized in this book are defined in the glossary. The first usage of each word found in the glossary will be marked in ***bold italics***.

To discuss any aspect of this book or your own specific issues relating to actuarial topics with a SIGMA consultant, contact Al Rhodes, President, at 866-228-8279 x 202 or AL@SIGMAactuary.com.

Chapter 1

Defining the Actuary

This chapter is important because…

Actuarial professionals combine education, data and experience from many disciplines to arrive at the art and science of their analyses. Since your organization may depend on actuaries to complete its financial forecasts, we hope you'll take a moment to appreciate their background, training and capabilities.

The Process for Becoming an Actuary

Most actuaries have a college degree in either mathematics or actuarial science. A limited number of colleges and universities provide an actuarial science major. A larger number of institutions provide introductory actuarial classes.

Obviously, actuaries study math, but they also study business law, insurance, risk management, and economics. After completing an undergraduate degree with the appropriate academic emphases, a person interested in becoming a credentialed actuary can obtain employment as an actuarial student. Actuarial students are not yet credentialed actuaries but are studying to complete the actuarial exams. Their knowledge grows as they work and learn on the job, and most employers also provide work-week time for studying.

Actuarial Designations

There are two main types of actuaries: property/casualty and life/health/benefit. *An Actuarial Advantage* focuses on topics relating to property and casualty actuarial consulting services. Throughout this book, the term "actuary" will refer to property and casualty actuaries.

The exam process required to become a credentialed actuary is one of the most difficult professional accomplishments of any career. A summary of the exam subject areas is shown below.

Subjects Covered on Actuarial Exams

- Mathematical foundations of actuarial science
- Interest theory, economics, and finance
- Actuarial models
- Actuarial modeling
- Introduction to property and casualty insurance and ratemaking
- Reserving, insurance accounting principles, and reinsurance
- Nation-specific: annual statement, taxation, and regulation – Canada or U.S.
- Investments and financial analysis
- Advanced ratemaking, rate of return, and individual risk rating plans

Actuarial students typically spend more than twenty hours per week studying for exams. The exams require a broad knowledge of the subject matter. Due to the rigorous testing and grading standards, a significant percentage of students do not pass each exam. The typical actuarial student invests seven or more years of studying to pass the required exams. Credentialed actuaries use the following professional designations:

ACAS – Associate of the Casualty Actuarial Society

FCAS – Fellow of the Casualty Actuarial Society

MAAA – Member of the American Academy of Actuaries, an organization which serves the profession and the public through the enforcement of high professional standards and representation to legislators, regulators, and others at the state, national and international levels.

Before hiring an actuary, know what type of actuary you need. Consult a property/casualty actuary for workers compensation, general liability, auto liability, products liability, health professional liability, medical malpractice, asbestos, and other coverages.

Typical Duties of an Actuary

The job duties of an actuary may vary across different types of organizations.

Within an insurance company, the actuary sets rates, forecasts losses, and is a key advisor to the CFO and CEO of the company. About fifty percent of all actuaries are employed by insurance companies.

Within an independent actuarial consulting firm, the actuary deals with the most diverse set of analytical challenges. Typical projects include loss projections and reserve analyses for self-insured groups, captive insurance companies, large self-insured entities, and other organizations. Less typical projects include expert testimony in a legal setting, pricing of unusual insurance coverages (i.e. pet insurance), or assistance with development of a totally new risk financing product.

Within an insurance brokerage firm, the consulting actuary functions similarly to an independent consulting actuary. However, the project scope tends to be limited to the needs of the firm's large clients and focuses mainly on loss projections and reserve analyses.

Within a security and commodity brokerage, actuaries analyze financial statements, forecast financial risks, and evaluate the impact of mergers and acquisitions on risk-related financial obligations. The financial impact of such obligations is significant enough for some securities brokerages to justify the employment of actuaries.

Within local, state, and federal governmental agencies, actuaries forecast and evaluate risk-related exposures and their impact on financial health.

When working with actuaries, don't assume their knowledge is limited to the "numbers." Use their knowledge gained from other analyses to help your decision making process. Actuaries generally have more exposure to a large variety of industries and client challenges than any other insurance professional. You can benefit from their experience.

A Forecaster, Not a Fortune Teller

While an actuary's methods can result in very accurate analyses, various legal, economic and other factors beyond the historical data can affect the ultimate accuracy of a study. It is important to remember that an actuary is providing a forecast, not a statement of absolute fact regarding future financial situations. Quantifying the potential variability in the forecast (see chapter 6) is an important part of a complete actuarial analysis. This book will help you understand the components of an actuary's analysis and prepare you to communicate effectively with an actuary to ensure the most complete and usable analysis possible.

Chapter 2

Understanding Loss Development Factors

This chapter is important because…

Loss development factors are a critical part of any actuarial analysis. The process for determining appropriate loss development factors is often misunderstood or viewed as a mysterious "black box." But the selection of a loss development factor involves definable mathematical and philosophical aspects which we will explain and which will have a significant impact on forecasted losses or estimated loss reserves.

Whether you are a broker, CFO, or risk manager, you have probably heard the terms ***loss development triangle, loss development factor, and IBNR (incurred but not reported losses).*** These are often included in the first analytical step of an actuarial analysis. Yet a survey of insurance professionals would likely result in a long list of contradictory definitions for these terms. Because of the importance of this topic and the confusion it causes, we have selected it for the first technical chapter. Loss development is one of the most challenging actuarial topics for non-actuaries. For those familiar with the topic, this chapter will be a good review and perhaps provide some new insight. For those unfamiliar with loss development or any of the terms mentioned above, don't worry. We will walk through an example, explain every term, and unlock the "black box" of loss development factors, loss triangles, and even IBNR.

Loss Development: Some Old Claims Never Die, They Just Get Adjusted

It may take several years for all claims in a given policy period to be reported and closed. New information pertaining to existing claims can impact the total losses long after the end of a policy period. Unfortunately, even new claims are sometimes reported after the close of the policy period. Therefore, a ***snapshot***, or summarized evaluation of the losses, is generally made at least once a year. The ***development*** in the losses is the quantitative change in this evaluation from year to year.

A loss development triangle is a unique way of arranging the annual loss evaluations for several past policy periods. By arranging the loss evaluations for past years in a table, we can analyze the change in losses from one evaluation to the next. The standard format is shown below. Note how the evaluations are aligned in columns according to the length of time since the inception of the policy period.

Figure 2.1 Setting up the Loss Development Triangle

Incurred Loss Development Triangle					
Period	Months of Development				
	12	24	36	48	60
2011	12/31/11	12/31/12	12/31/13	12/31/14	12/31/15
2012	12/31/12	12/31/13	12/31/14	12/31/15	
2013	12/31/13	12/31/14	12/31/15		
2014	12/31/14	12/31/15			
2015	12/31/15				

*When completed, this table will contain estimates of total **incurred losses** at various points in time. The highlighted cell will show the total incurred losses for the 2011 loss period as evaluated on 12/31/2015.*

The purpose of arranging data this way is to estimate the development, or change in estimated losses, from one evaluation to the next. The table should include as many years of historical data as available. There are two primary reasons that development occurs:

- Sometimes losses that occur during a certain period are not reported until a later date. These additional loss dollars are referred to as incurred but not reported losses. A common abbreviation for this term is IBNR.

- ***Case reserves***, amounts set aside for future payments on a claim, must sometimes be adjusted as more information about a loss becomes available. Adjustments are also made to claims that have been closed and reopened. For example, a back injury that occurred a few years ago may have been established with a $50,000 reserve, but later data shows that the actual costs have reached $80,000 and are anticipated to grow to $100,000 due to ongoing treatments related to the original injury. This "growth" in the claim results in loss development.

When you look at several years of data and snapshots of the loss reserves, you may begin to see a trend. Once development between evaluations has been estimated, the total anticipated development can be computed for any evaluation date. An example is provided later in this chapter.

One of the most dangerous mistakes to make when preparing financial statements is to use an estimate of loss liabilities that does not include IBNR. This is an easy mistake to make because insurance companies or internal reports often highlight the total outstanding reserves for all open claims. However, without an actuarial analysis, the total future liability may be significantly understated because case reserves do not include IBNR.

Insurance professionals often include development on known claims within the definition of IBNR.

The Required Data

Data is usually gathered on both paid and reported losses. ***Paid losses*** are the total losses actually paid during a policy period. ***Reported losses*** (also referred to as incurred losses) include paid losses plus any loss reserves for open claims. Reported losses are always greater than or equal to paid losses. There are pros and cons as to which type of data is more useful when generating a loss triangle:

- A reported loss triangle is most useful when the claim reporting pattern and reserving philosophy are consistent for each loss period. Development patterns based on reported losses tend to be less volatile than patterns based on paid losses. This is because the initial reported amount of a claim, as compared to the initial paid amount, is usually closer in value to the ultimate amount. Therefore, the reported loss amount varies less than the paid amount over time.

A claim incurred in 2012 is always assigned to 2012 even if payment or reserve changes occur in 2015.

- A paid loss triangle is most useful when the claim payment pattern and claim settlement philosophy are consistent for each loss period. In addition, since case reserves are excluded, development patterns are not skewed by changes in reserving philosophies.

The terms "reported losses" and "incurred losses" are often used interchangeably.

If both paid and reported loss information is available, it is common to create a loss triangle using both methods and then decide which method produces the most reliable results. This decision is based primarily on the volatility of the development patterns.

The data should be segregated between lines of coverage such as auto, general liability, workers compensation and others. The data can be limited to a certain per occurrence loss limit, but only if all claims for all periods are limited to the same value. For example, you may want to use limited losses if you are projecting losses within a certain range, like under $100,000. This might occur if an insurance program is being considered with a $100,000 deductible. There may be other reasons why you might want to forecast losses under a specific loss limit.

The number of loss periods you will need to create a credible analysis varies based on a number of factors. Five to ten years of data is often sufficient. You will also need industry development factors as a standard to measure against. These are available through various data gathering organizations such as the National Council on Compensation Insurance (NCCI) and the Insurance Services Office (ISO), publications such as Best's Aggregates & Averages. They can also be found through brokers, actuaries, insurance companies and state rating bureaus.

Calculating and utilizing unique loss development factors based on your own loss experience will give you an actuarial advantage by providing a more accurate analysis than what industry average factors can provide.

Completing the Loss Triangle and Selecting Factors

In most cases, losses increase from one evaluation to the next. Once we have our data gathered and the loss information entered into the loss triangle, the next step is to measure the increase.

Figure 2.2
Loss Triangle with Incurred Losses at Various Evaluation Dates

Loss Triangle with Incurred Losses					
Period	Months of Development				
	12	24	36	48	60
2011	$1,175,025	$2,232,548	$2,679,057	$2,813,010	$2,869,270
2012	$985,750	$1,823,638	$2,133,656	$2,283,012	
2013	$1,250,750	$2,751,650	$3,494,596		
2014	$1,325,750	$2,850,363			
2015	$1,225,750				

Figure 2.2 shows the loss triangle with incurred losses as of each evaluation date. The highlighted value is the 12/31/15 evaluation of the 2014 losses.

After we complete the table shown in Figure 2.2, we are ready to compute the development between each evaluation.

Figure 2.3 Computation of Development Between Evaluations

Computation of Development					
Period	Months of Development				
	12 to 24	24 to 36	36 to 48	48 to 60	60 to Ult.
2011	1.90	1.20	1.05	1.02	
2012	1.85	1.17	1.07		
2013	2.20	1.27			
2014	2.15				
Average	2.03	1.21	1.06	1.02	N/A

The loss development factor is calculated as the ratio of the losses for one evaluation to the losses for the prior evaluation. For example, the highlighted value of 1.17 is computed by dividing $2,133,656 (the 36 month evaluation of the 2012 losses) by $1,823,638 (the 24 month evaluation of the 2012 losses).

In the footer of Figure 2.3, averages of the factors are computed. The average is the straight average of each column. When the data is more volatile, other averages such as a weighted average, two or three year averages, or an average that excludes the high and low points could be used. These average values are carried forward to Figure 2.4 along with industry factors.

Figure 2.4 Computation of Selected Factors

Computation of Selected Factors					
	Months of Development				
	12 to 24	24 to 36	36 to 48	48 to 60	60 to Ult.
Average	2.03	1.21	1.06	1.02	N/A
Industry	1.80	1.30	1.15	1.05	1.10
Selected	2.00	1.25	1.10	1.03	1.10
Cumulative	3.12	1.56	1.25	1.13	1.10

The average factors were derived in Figure 2.3. The industry factors come from various industry or actuarial sources. The selected factors are determined by the person creating the table based on average factors, industry factors, and judgment.

*The yellow highlighted cumulative factor 1.25 represents the development factor that applies to losses that are evaluated at 36 months. This is the "36 to Ultimate" development factor. It is computed by multiplying the following selected factors together (60 to Ult), (48 to 60) and (36 to 48). These values are highlighted in green. The calculation is: 36 to Ultimate = 1.25 = 1.10 * 1.03 * 1.10.*

Selected factors are usually a combination of the unique averages and industry factors. Additional information concerning the losses, changes in reserve practices, implementation of loss control or prevention programs, or other considerations may also influence the determination of the selected factors. Careful consideration of such subjective data is where actuarial judgment, beyond simply following a formula, enters the process of selecting factors.

Using the Results

We now have a completed loss development triangle and ***selected loss development factors***. The next step is to apply the information. The ***ultimate incurred losses*** for each loss period can now be estimated. For example, the 2015 12-month evaluation of $1,225,750 is multiplied by the 12-month-to-ultimate loss development factor of 3.12 to yield an estimated ultimate loss amount of $3,824,340. See Figure 2.5 below.

Figure 2.5
Incurred Losses, Selected Factors and Estimated Ultimate Losses

Incurred Losses

Period	Months of Development 12	24	36	48	60
2011	$1,175,025	$2,232,548	$2,679,057	$2,813,010	$2,869,270
2012	$985,750	$1,823,638	$2,133,656	$2,283,012	
2013	$1,250,750	$2,751,650	$3,494,596		
2014	$1,325,750	$2,850,363			
2015	$1,225,750				

Selected Factors

	Months of Development 12 to 24	24 to 36	36 to 48	48 to 60	60 to Ult.
Average	2.03	1.21	1.06	1.02	
Industry	1.80	1.30	1.15	1.05	1.10
Selected	2.00	1.25	1.10	1.03	1.10
Cumulative	3.12	1.56	1.25	1.13	1.10

Estimated Ultimate Incurred Losses			
Period	Incurred Losses	Loss Development Factor	Estimated Ultimate Incurred Losses
2011	$2,869,270	1.10	$3,156,197
2012	$2,283,012	1.13	$2,579,804
2013	$3,494,596	1.25	$4,368,245
2014	$2,850,363	1.56	$4,446,566
2015	$1,225,750	3.12	$3,824,340

The development factors applied to incurred losses are selected based on the time that has passed between the beginning of a loss period and the evaluation date of the loss. In most cases, the closer the evaluation date is to the period effective date, the larger the loss development factor will be. This reflects the significant amount of unknown factors which may affect relatively new claims. Conversely, as the period matures, the loss development factors approaches 1.00.

Loss development factors are a key component of an actuarial analysis. Developing unique factors based on historical data provides for more accurate estimates. Understanding loss development factors lays the foundation for a more in-depth explanation of IBNR, which is explored in the next chapter.

Remember, the analytical work an actuary completes does not come out of a black box. If you are working with an actuary who does not provide a straightforward explanation for each step of the analysis - find another actuary!

Chapter 3

Reserve Analysis and the ABC's of IBNR

This chapter is important because…

An evaluation of IBNR (incurred but not reported) losses is often required for regulatory, financial reporting or external audit purposes. It is an important but often misunderstood component of establishing loss reserves. A complete comprehension of IBNR and how it is estimated will improve communication with consulting actuaries and ensure sufficient reserves are established.

Typical Uses of an IBNR Loss Analysis

In the previous chapter, we introduced IBNR losses as those losses which occur during a loss period but are not reported until a later date. The definition of IBNR also typically includes development of known claims. In this chapter, we look further at the significance and calculation of IBNR losses.

An insurance program analysis includes a calculation of outstanding liabilities for all incurred claims. These liabilities are a key component of the costs associated with funding the program. The outstanding liabilities almost always exceed the reserves found on a loss run. The reserves are an estimate of future payments for each individual claim. The sum of the reserves does not equal outstanding liabilities because this sum excludes the impact of IBNR.

An IBNR analysis is most frequently prepared for a self-insured trust, a captive insurance company, a corporation that uses a loss-sensitive cash flow plan, or as part of the due diligence process for

mergers/acquisitions or divestitures. Specifically, an IBNR analysis is often used as part of

- An actuarial reserve certification
- Satisfaction of self-insurance requirements
- Negotiation of security requirements and letters of credit
- Acquisition due diligence
- Evaluation of expected liabilities for financial statements

Basic Methodology

The calculation of IBNR can be summarized as follows.

- Ultimate loss estimates are calculated for each policy period using one or more actuarial techniques.
- The ultimate loss estimates from each technique are compared and a selection of ultimate incurred losses is made.
- Paid losses and case reserves are subtracted from the estimated ultimate incurred losses to calculate the IBNR losses.

estimated ultimate incurred losses – (paid losses + case reserves) = **IBNR losses**

Gathering and Analyzing the Data

In this chapter and in Chapter 4, we will use a new set of sample data and walk through the IBNR loss analysis (Chapter 3) and a loss projection (Chapter 4) using the same set of data. An IBNR analysis requires three major steps:

Step 1: Gather the necessary data. Required data includes incurred losses and paid losses summarized by policy period. The losses should be limited to ***per occurrence*** and ***aggregate limits***.

Any actuarial analysis is only as good as the data utilized. A credible IBNR analysis requires good data in several areas. First, you need a current loss run. This allows the calculation of ultimate losses without relying on industry average severities and frequencies. Second, you need prior annual evaluations of losses for past policy periods. This information is used to calculate unique loss development factors as discussed in Chapter 2. Finally, you will want information pertaining to the policy limits for the past years. This includes per occurrence (individual loss limits stated in the policy) and aggregate limitations (maximum aggregate liability for the insured). With this information, you can correctly limit the losses and more accurately calculate the IBNR losses.

Step 2: Adjust the limited losses determined in step 1 to an ultimate cost level. The most common technique is to use loss development factors (see "Sources of Loss Development Factors" in the next section). These factors quantify the late developing aspects of certain losses. They also account for losses that occurred during a period but are not reported until a later date.

The additional data and time required to compute unique loss development factors is well worth the effort. The selection of an estimate for loss reserves will significantly impact the balance sheet, have financial implications, and influence loss financing decisions.

The ultimate losses for each period are estimated by multiplying the development factors by the reported losses for each period. If you are using both incurred and paid losses, then you will have to select a weighted average of the two estimates of ultimate losses for each period. As shown in Figure 3.1, estimated ultimate incurred losses are defined as the amount needed to provide for the cost of claims relating to events that occurred during each period.

Figure 3.1 Computation of IBNR

Computation of IBNR					
Period Start	Estimated Ultimate Incurred Losses	Reported Paid Losses	Estimated Required Reserves	Case Reserves	IBNR
01/01/09	$1,330,000	$1,115,094	$214,906	$100,294	$114,612
01/01/10	$1,110,000	$881,856	$228,144	$120,000	$108,144
01/01/11	$1,590,000	$1,050,780	$539,220	$366,000	$173,220
01/01/12	$1,780,000	$1,218,360	$561,640	$269,562	$292,078
01/01/13	$1,470,000	$684,510	$785,490	$473,338	$312,152
01/01/14	$1,270,000	$285,986	$984,014	$436,118	$547,896
Total	$8,550,000	$5,236,586	$3,313,414	$1,765,312	$1,548,102

Step 3: Subtract reported paid losses from the estimated ultimate incurred losses to arrive at the ***estimated required reserves***, which is the amount that will be required for future payments on

1. claims that have been reported and
2. claims that have occurred but have not been reported as of the evaluation date.

The estimated required reserves can then be segregated into case reserves and IBNR. Case reserves are computed as the difference between the incurred losses (not shown in Figure 3.1) and the paid losses. Therefore IBNR includes development on known claims as well as a provision for claims that have occurred but not been reported as of the evaluation date.

The estimate of IBNR losses for recent years can be substantial in some cases. IBNR for older years should be substantially less than for recent years.

Sources of Loss Development Factors

There are a number of sources of loss development factor data. Actuaries, brokers, insurance companies and risk management consultants all gather this information. But the information received from an external source may not be appropriate for every situation. If historical data is available, unique loss development factors should be calculated (see Chapter 2) since they will allow for a more accurate reflection of specific loss development patterns. Theoretically, the use of unique factors instead of industry averages produces a more accurate projection of ultimate incurred losses.

The loss development factors are typically larger when the evaluation date is close to the period effective date.

Financial statements which reflect the most complete estimate of outstanding liabilities have an actuarial advantage. Determining IBNR is an important step in developing such a complete estimate and minimizes future financial statement adjustments.

Requirements for a Credible IBNR Analysis

While we discussed data gathering in step 1 at the beginning of this chapter, it is important to emphasize the need for sufficient and quality data. Occasionally, analyses are completed with less than sufficient data when an actuary is not involved. Actuaries typically have methodologies or industry data that can be used in situations where the quantity or quality of data is not ideal. If you do not have the necessary data for an IBNR analysis, be sure to contact an actuary for advice on how to complete the analysis.

Chapter 4

Forecasting Losses

This chapter is important because…

One of the key values necessary for risk management decision making is the projected losses for the coming policy period. These losses are usually the largest component of any alternative loss financing program. Many negotiations relative to loss finance will center on the projected loss amount. You need to understand the loss projection process to best defend your position.

Trending to the Future

In the previous two chapters, we discussed loss development factors and IBNR analysis. The IBNR analysis includes the estimation of ultimate incurred losses for past years. But what about future years? If we also have an estimate of ***exposures***, then we can compute ***pure loss rates*** (trended losses per some unit of trended exposure) which can ultimately be used to forecast losses for the coming period. For workers compensation, the most common exposure to analyze is payroll. Other lines of coverage use other exposures. For example, general liability may use sales or square footage. Automobile liability may use number of vehicles or miles driven.

The estimated ultimate incurred losses and the exposures must be trended, or adjusted for inflation, to today's dollars before pure loss rates are computed. Non-inflationary exposures, like vehicle counts, do not need to be trended.

Inflation trend factors are applied to historical incurred losses to more accurately reflect the expected cost level for the period being projected. The historical losses are adjusted from each

period to the midpoint of the projected period. In the set of factors for workers compensation shown in Figure 4.1a, the factor of 1.152 for 2013 indicates an increased average loss cost of 15.2 percent. These factors include changes in workers compensation benefit levels, indemnity trends and medical cost trends. You may see the term ***BLCF (benefit level change factor)*** in some actuarial reports. This factor, which quantifies increases in benefit levels attributable to changes in state workers compensation laws, is developed from individual state data. The ***medical factor*** is an inflation rate for medical costs. The ***indemnity factor*** is a wage inflation rate that reflects the inflation in the indemnity portion of the claim. The term "severity factor" may also be used to describe the medical and indemnity trend factors. The combination of all these inflation rates results in the inflation trend factor. For a liability coverage, the trend factor is based on changes in loss costs over time.

Once the trended losses and exposures are calculated, the final step, selecting a pure loss rate, involves judgment. In order to better understand this process, we will walk through a sample case involving workers compensation.

Include the consulting actuary early in the annual process of policy or coverage renewal. This will provide an opportunity for him to request necessary data or suggest analyses or options you may not have considered.

Sample Case – Trending Historical Losses and Exposures

Figures 4.1a and 4.1b show tables which reflect the trending steps in a typical actuarial analysis. The previous steps are the computation of loss development factors and the estimation of ultimate incurred losses discussed in prior chapters.

Figure 4.1a shows the estimated ultimate incurred losses and the loss inflation trend factor for past years. The trended losses for each year are then computed as the estimated ultimate incurred losses multiplied by the trend factor for that year.

Figure 4.1a Computation of Trended Losses

Computation of Trended Losses			
Period Start	Loss Trend Adjustments		
	Estimated Ultimate Incurred Losses	Loss Inflation Trend Factor	Trended Losses
01/01/09	$1,330,000	1.609	$2,140,000
01/01/10	$1,110,000	1.508	$1,670,000
01/01/11	$1,590,000	1.377	$2,190,000
01/01/12	$1,780,000	1.262	$2,250,000
01/01/13	$1,470,000	1.152	$1,690,000
01/01/14	$1,270,000	1.074	$1,360,000
Total	$8,550,000		$11,300,000

Having trended the historical losses in Figure 4.1a, the next step is to trend historical exposures to appropriate expected levels for the projected period. In this example, the exposure inflation trend factors are based on average hourly wages as measured by the United States Department of Commerce. Historical payroll amounts are adjusted to anticipated average wage levels for the projected period.

In Figure 4.1b, the exposure base (payroll in this case) is shown along with the exposure inflation trend factor. The trended exposures are then computed as the payroll multiplied by the trend factor for each year.

Figure 4.1b Computation of Trended Payroll

Computation of Trended Losses			
Period Start	Exposure Trend Adjustments		
	Payroll	Exposure Inflation Trend Factor	Trended Payroll
01/01/09	$79,187,885	1.304	$103,260,000
01/01/10	$83,939,158	1.251	$105,010,000
01/01/11	$88,975,507	1.188	$105,700,000
01/01/12	$94,314,037	1.144	$107,900,000
01/01/13	$99,972,879	1.093	$109,270,000
01/01/14	$105,971,252	1.046	$110,850,000
Total	$552,360,718		$641,990,000

Sample Case – Computing the Pure Loss Rates

The next step is to calculate pure loss rates based on the historical experience. This procedure uses past experience to determine a factor which, when applied to payroll, produces an estimate of ultimate incurred losses. In this case, the pure loss rate can be defined as the expected dollar loss cost per $100 of payroll. Trended losses are divided by trended exposures to yield pure loss rates based on the unique experience of each historical period. Each of the calculated pure loss rates is an estimate of the pure loss rate which could be charged for the projected period. A pure loss rate of $1.60 per $100 is selected for the projected period. This is shown in Figure 4.2a.

Figure 4.2a Computation of Pure Loss Rate

Computation of Pure Loss Rate				
Period Start	Pure Loss Rates Projected from Historical Data			
	Trended Losses	Trended Payroll	Pure Loss Rate (Per $100 Trended Payroll)	
01/01/09	$2,140,000	$103,260,000	$2.07	
01/01/10	$1,670,000	$105,010,000	$1.59	
01/01/11	$2,190,000	$105,700,000	$2.07	
01/01/12	$2,250,000	$107,900,000	$2.09	Note pure loss rate is trending downward
01/01/13	$1,690,000	$109,270,000	$1.55	
01/01/14	$1,360,000	$110,850,000	$1.23	
Total	$11,300,000	$641,990,000	$1.76	This is the average pure loss rate for all years
		2 Year Average = $1.39		
		4 Year Average = $1.73		
		6 Year Average = $1.77		This is the selected pure loss rate that will be used for the projection
		Selected Pure Loss Rate = $1.60		

An actuarial advantage occurs when you have a relationship with an actuary who understands your business operations and can bring judgment to the loss forecasting process. If you have an insurance company that is using an unreasonably high loss pick, your recent trends may not have been considered. The most convincing arguments to lower that forecast will come from a well informed actuary on your side!

Sample Case – Making the Projection

Finally, the selected pure loss rate of $1.60 per $100 of payroll is multiplied by the projected payroll to forecast losses of $1,760,000. This final number is often referred to as the ***loss pick***. This final computation is shown in Figure 4.2b

Figure 4.2b Computation of Projected Losses

Computation of Projected Losses			
Projected Period Start	Projected Losses		
	Projected Pure Loss Rate	Projected Payroll	Projected Losses
01/01/15	$1.60	$110,000,000	$1,760,000

The selection of the pure loss rate involves judgment. This is where good communication with the actuary is critical to the most accurate projection possible. The actuary has full access to the objective historical data. But subjective information pertaining to changes in business operations, safety programs, new product introductions, changes in manufacturing techniques, or other pertinent conditions may affect the selected pure loss rate. This is especially important when there is a "bad" year with a higher pure loss rate in the recent history. In Figure 4.2a, average rates for two, four, and six years are shown. The most recent two years show a significant trend downward in the pure loss rates. After discussions concerning new loss prevention programs that the client recently established, the actuary selected a pure loss rate of $1.60. This is lower than the average $1.76 and gives more weight to the recent year's experience.

Chapter 5

The Value of a Cash Flow Analysis

This chapter is important because…

A cash flow analysis, which considers both future payments and future investment income, helps to determine appropriate funding levels for an organization and is therefore one of the more valuable analyses that a broker, actuary or risk management consultant can provide to a client.

Timing Is Everything

Let's imagine that a loss analysis indicates that the loss pick — that is, the projected losses — for the next policy year is expected to be $1,000,000. Further analysis indicates that if the timing of payments and investment income is considered, only $860,000 is actually needed to fund the $1,000,000 loss pick! A conservative or risk averse company may still decide to set aside $1,000,000 rather than $860,000. However, a well-informed decision will consider both numbers and the full explanation of how those numbers were calculated.

The timing of loss payments can affect many aspects of an ***insurance program***, such as

- The premium on a guaranteed cost program
- The letter of credit requirement on a loss sensitive program
- The budgeting for a completely self-insured program

An actuarial analysis frequently ends with a single dollar estimate of either a loss pick or an IBNR loss calculation (sometimes called a ***point estimate***). But losses are usually settled over an extended period of time, so the point estimate is not necessarily the amount that needs to be funded. Some insurance programs have ***long-tail reserves*** — an extended payout period covering several years. In these cases, the recognition given future investment earnings can have an important bearing on adequate reserve levels. In other words, the bank deposit required to cover the future loss payments may be less if we consider the investment income earned.

Determining Loss Payout Percentages

The first step in a cash flow analysis is to calculate reserves for completed policy periods and/or a loss projection for a future policy period. For the example shown in Figure 5.1, we will assume projected losses are $1,000,000 for the upcoming policy period. Remember that this projection would be developed using the process described in the previous chapters.

The second step is to determine a ***payout schedule***, or timing of payments. A payout schedule unique to the program being analyzed is preferable, although an industry average obtained from a broker, TPA or actuary can also be used. There are also a number of sources which publish this type of information, such as NCCI, ISO, Best's Aggregates & Averages, insurance companies, and others. Figure 5.1 shows a simple example of how to calculate a unique payout schedule. An actual case will not be as straightforward and will typically involve more data manipulation and judgment than is required for this sample case.

Obtain an actuarial advantage by using a cash flow analysis to improve your budget and cash flow management.

Figure 5.1a Reported Paid Losses

Reported Paid Losses										
Period	12 Months	24 Months	36 Months	48 Months	60 Months	72 Months	84 Months	96 Months	108 Months	Estimated Ultimate Incurred Losses
2006	$140,000	$280,000	$330,000	$390,000	$410,000	$440,000	$470,000	$500,000	$520,000	$520,000
2007	$150,000	$300,000	$360,000	$420,000	$450,000	$480,000	$510,000	$540,000		$600,000
2008	$160,000	$330,000	$390,000	$460,000	$490,000	$520,000	$550,000			$650,000
2009	$180,000	$350,000	$420,000	$490,000	$530,000	$560,000				$700,000
2010	$190,000	$380,000	$450,000	$530,000	$560,000					$750,000
2011	$200,000	$400,000	$480,000	$560,000						$800,000
2012	$210,000	$430,000	$510,000							$850,000
2013	$230,000	$450,000								$900,000
2014	$240,000									$950,000

$$\frac{\$300,000}{\$600,000} = 50\%$$

Figure 5.1b Ratio of Paid Losses to Estimated Ultimate Incurred Losses

Ratio of Paid Losses to Estimated Ultimate Incurred Losses										
Policy Year	12 Months	24 Months	36 Months	48 Months	60 Months	72 Months	84 Months	96 Months	108 Months	120 Months
2006	25%	51%	60%	71%	75%	80%	85%	91%	95%	
2007	25%	50%	60%	70%	75%	80%	85%	90%		
2008	25%	51%	60%	71%	75%	80%	85%			
2009	26%	50%	60%	70%	76%	80%				
2010	25%	51%	60%	71%	75%					
2011	25%	50%	60%	70%						
2012	25%	51%	60%							
2013	26%	50%								
2014	25%									
Average	25%	50%	60%	70%	75%	80%	85%	90%	95%	
Selected	25%	50%	60%	70%	75%	80%	85%	90%	95%	100%

You may notice these figures look very similar to the loss development triangle in Chapter 2. However, the purpose here is to calculate payout percentages rather than loss development factors. With five to ten years of historical reported payment data, a relatively credible payout schedule can be calculated.

In Figure 5.1a, actual payments are summarized for each policy year at yearly evaluations. The estimated ultimate losses for each policy year are also displayed. In Figure 5.1b, the ratio of paid losses to estimated ultimate losses is calculated for each evaluation date. A payout percentage is then selected based on the yearly averages. In this example, the selected payout percentage is the same as the average payout percentage for each evaluation date. However, this would not be the case if the variance within each year's values was more pronounced. The selected payout percentages are used to allocate projected losses to periods in which they are expected to be paid.

Figure 5.2 Calculation of Payout Schedule

Calculation of Payout Schedule			
Year	Expected Payment Pattern	Expected Cumulative Payments	Expected Yearly Payments
1	25%	$250,000	$250,000
2	50%	$500,000	$250,000
3	60%	$600,000	$100,000
4	70%	$700,000	$100,000
5	75%	$750,000	$50,000
6	80%	$800,000	$50,000
7	85%	$850,000	$50,000
8	90%	$900,000	$50,000
9	95%	$950,000	$50,000
10	100%	$1,000,000	$50,000

The third step in our analysis is to calculate and distribute the expected payments over the next several years using the payout percentages developed in Figure 5.1. Figure 5.2 summarizes information from Figure 5.1 and shows an estimated schedule of cumulative and yearly payments for the projected policy period. For example, an expected payment pattern for the first three years of 25%, 50% and 60% would indicate that the cumulative total

of payments at the end of the first, second, and third years are expected to be $250,000, $500,000 and $600,000 respectively. The actual payments during the first three years are therefore expected to be $250,000, $250,000 and $100,000.

Figure 5.3 Discounted Payout Schedule

Discounted Payout Schedule				
Year	Expected Yearly Payments	Expected Yearly Payments Discounted at 3%	Expected Yearly Payments Discounted at 5%	Expected Yearly Payments Discounted at 7%
1	$250,000	$246,332	$243,975	$241,684
2	$250,000	$239,158	$232,357	$225,873
3	$100,000	$92,877	$88,517	$84,439
4	$100,000	$90,172	$84,302	$78,914
5	$50,000	$43,773	$40,144	$36,876
6	$50,000	$42,498	$38,232	$34,463
7	$50,000	$41,260	$36,412	$32,209
8	$50,000	$40,058	$34,678	$30,102
9	$50,000	$38,891	$33,026	$28,132
10	$50,000	$37,759	$31,454	$26,292
Total	$1,000,000	$912,778	$863,097	$818,984

For step four, we estimate the potential effect of investment income by ***discounting*** these payments to ***present value*** — that is, to determine how much principal is needed at a certain rate of interest to have enough assets to cover payments as they come due. In Figure 5.3, the estimated annual payments are discounted to reflect the timing of future loss payments at annual rates of investment interest of 1.0%, 3.0% and 5.0%. In this case, the discounting procedure assumes all losses will be paid in the middle of the year.

In our example, if this company can realize a 5.0% investment return (after taxes) on funds, it will need to invest approximately $863,000 to fund estimated liabilities of $1,000,000. This assumes that

payments follow the pattern selected in Figure 5.1. The selected discount rate should be appropriate for the organization based on operating and financial strategies.

An appropriate discount rate should be used for this analysis. The purpose of the cash flow analysis is to provide some recognition to the timing of the payments and the potential for investment income. However, this is not a net present value analysis for purposes of evaluating an investment decision where a higher discount rate might be utilized (such as in the capital asset pricing model — a discussion which is beyond the scope of this publication). Instead, use a conservative discount rate that is close to a risk free rate, such as a Treasury bill or money market rate.

Impact of Investment Income on Required Funding Levels

Two situations can affect the estimation of expected payouts on a discounted present value basis:

- First, the timing of future payments could differ from what is estimated due to random variations in the payments of large claims. Therefore, the principal available for earning interest could vary considerably from expected.
- Second, the future yield on the underlying assets is susceptible to significant changes in economic conditions.

While the recognition given future investment earnings is important, discounting adds uncertainty to a forecast that is already based on estimates. For this reason, an actuarial analysis will typically use a conservative (or low) discount rate.

Chapter 6

Understanding Confidence Intervals

This chapter is important because…

While projected losses generally represent the amount of losses that an organization can expect for a future period, it is important to recognize the possibility that actual losses may exceed this projected loss value. The *confidence interval* supports an informed decision that considers the potential for higher loss levels.

Seeing the Big Picture

While a loss pick or point estimate produced from accurate analysis by an experienced actuary is valuable information, its usefulness is tempered by the likelihood of how accurate the estimate is. That is, from a statistical standpoint, the loss pick has a certain probability of being correct. That probability, measured in a confidence interval, is another piece of data that can help the end user make an informed decision. While not a perfect mathematical analogy, consider knowing that the weather forecast calls for rain and how much more informed you are if you know that chance of rain is twenty percent or ninety percent.

At their best, confidence intervals demonstrate how actual losses may vary from the projection and enable decision makers to assess the risk involved with their loss pick. At their worst, confidence intervals can sway less informed decision makers away from a specific conclusion. With appropriate interpretation, confidence intervals are an important part of a complete actuarial analysis and help you see the "big picture" of the potential for loss.

The end user of an insurance program analysis is usually a risk manager or CFO, and the end use of the analysis is to help determine the type of insurance program that will best protect the company. This will depend on

1. expected losses,
2. when those losses will be paid, and
3. the company's risk tolerance.

Previously, we discussed the calculation of expected losses and the value of analyzing when those expected losses will be paid. The next step in the process is to determine the mathematical probability that expected losses will or will not be exceeded. This probability has a bearing on how attractive a certain proposed insurance program really is.

A confidence interval improves and informs your decision making process. Make sure that your actuarial analysis includes a confidence interval and therefore gives you an actuarial advantage.

Defining the Confidence Interval

The analysis of an insurance program involves either a retrospective look at the past (reserves) or a prospective look at the future (loss projection or loss pick). The example used in this chapter will involve a loss projection.

Often a loss projection is presented as the one and only answer. A company may analyze its historical loss experience and decide it will have $1,000,000 of losses to cover during the next policy period. This $1,000,000 is then used as input to the decision as to what type of insurance program should be constructed.

The $1,000,000 may not be the best number to use for decision making because the probability of the losses being

exactly $1,000,000 is very small. A more useful way to look at this projection is to define the probability, or confidence, that $1,000,000 will or will not be exceeded. For example, if a risk manager knows there is a 45% chance that $1,000,000 will be exceeded, then a self-insured program may not seem attractive or feasible.

At the lower levels of confidence, we find low loss levels that are not very probable. At the higher levels of confidence are high loss levels that are not likely to be reached. The true loss level lies somewhere within this confidence interval. A smaller or tighter confidence interval will make decision making easier as the range of potential loss levels is reduced. A broader confidence interval will make the decisions more difficult due to the potential for very high or very low loss levels. This range of losses and their probability is also referred to as the ***spread of loss***.

There are several methods that can be utilized to compute a confidence interval or spread of loss. As a starting point, a common method involves Monte Carlo simulation. By defining the frequency and severity of historical claims and fitting this information to certain probability distributions used within the insurance industry, a spread of loss can be calculated. Common frequency distributions include Poisson and negative-binomial. Common severity distributions include log-normal, Weibull and Pareto. These concepts move beyond the scope of this book, but it is important to understand that the actuary uses common mathematical techniques and models to complete the analysis.

A loss pick represents just one of many potential outcomes. Actual losses may vary significantly, and the decisions you make should take that into consideration.

For further explanation, let's look at what issues can arise when calculating a confidence interval around our theoretical $1,000,000 loss pick.

Don't let the complicated math behind a confidence interval affect your interest in understanding and using this important part of your actuarial study. A good actuary should be able to explain the confidence interval in a manner that is conversational and makes sense to the non-actuary insurance or finance professional.

The Issues

The first issue with confidence intervals is a concept known as ***parameter risk***. This risk is not included in the calculation of the confidence interval. Parameter risk is the risk associated with the possible incorrect estimate of the projected losses. There is always the possibility that the estimate of projected losses is wrong. However, an actuary will use a sound actuarial methodology to project the losses in order to minimize the impact of parameter risk.

The second issue involves the selection of an appropriate model for the loss variance. You can read textbooks or buy software to help, but what you really need is a good database of loss experience. For example, if you have three years of loss experience with about ten claims a year, there is not much value in calculating confidence intervals because you simply don't have enough data to be statistically significant. If you have five years experience with five hundred claims a year, then you have sufficient information to select an appropriate model. Most companies will have something between these extremes.

If there is enough data to generate a valid analysis, then a common approach is to select frequency and severity distributions that best fit

the historical data. Then a simulation can be built to generate 100 to 5,000 years of possible outcomes. Ordering the results of the simulation will give the confidence interval. There are also direct analytical methods for determining a confidence interval, which may look like the following.

Figure 6.1 – Typical Confidence Interval

Confidence Interval	Spread of Loss
20%	$450,000
30%	$650,000
40%	$800,000
50%	$950,000
55% (Expected)	$1,000,000
60%	$1,075,000
70%	$1,150,000
80%	$1,250,000
90%	$1,400,000
95%	$1,800,000
99%	$2,500,000

This chart indicates that the $1,000,000 loss pick will not be exceeded 55% of the time. However, this means that there is a 45% chance the $1,000,000 will prove to be low. 80% of the time, $1,250,000 will be adequate to fund the expected loss experience. And, 5% of the time, $1,800,000 will not be enough to fund the expected loss experience.

Risk adverse clients may be happy with a $1,000,000 loss pick. However, they may balk at the potential of a $1,250,000 loss year. This is where the value of an analysis of confidence intervals is critical to the decision making process.

There is no rule of thumb for selecting a loss level from the table for budgeting purposes. However, if you select a high level of confidence, then you increase the ability of your loss finance program, and budget, to withstand loss costs greater than expected.

Elements That Determine the Confidence Interval Spread

The spread around a loss pick will vary by line of coverage, industry, geography, size of per-occurrence and aggregate limits and credibility of the inputs. Workers compensation usually has a fairly "tight" spread relative to products liability. But even within workers compensation, differences in the spread occur. For example, heavy manufacturing, with a higher probability of shock claims than many office operations, has a greater variability of potential loss. Because of varying distributions, it is important to utilize historical claim data similar in nature to the expected future claims.

Chapter 7

Real World Applications for Your Actuarial Analysis

This chapter is important because…

The value of an actuarial analysis isn't realized until you appropriately apply it to your decision making processes. This chapter helps you to become familiar with the numerous ways that an actuarial analysis is typically utilized and the broad application that an analysis can have to many aspects of business.

There are dozens of real world applications for your actuarial analysis. In this chapter, we focus on just a few of the common scenarios where an actuarial analysis serves an important role. An in-depth discussion of each type of analysis is beyond the scope of this publication, but our free resource portal has more information and articles relating to the topics below. If you would like to review a sample actuarial study, it can be found in our resource portal as well at **www.SIGMAactuary.com/resources.**

Budgeting and Setting Reserves

An actuarial analysis is imperative to appropriately account for outstanding liabilities relating to risk financing programs. First, an analytically sound estimate of ultimate incurred losses (including IBNR) is required to fully recognize the amount of the liability. Next, an estimate of the timing of the payments in a cash flow analysis is needed to appropriately budget the cash requirements. Budgeting without reference to an actuarial analysis can lead to significant financial mistakes for some organizations. Financial Accounting Standard 112 (FAS 112) requires that certain employment

benefits, such as workers compensation, be accounted for according to specific standards. An actuarial analysis is often used to meet these standards.

Gain an actuarial advantage by sitting down with your actuary and discussing how the actuarial analysis applies to your business operations and plans. You can miss both important information and potential financial advantage if you think an analysis is just something to check off of your list and file away.

Alternative Loss Financing Decisions

Selecting an appropriate loss financing plan involves a wide ranging set of issues. Entire text books address the process, sometimes with conflicting advice. But there is one point everyone agrees on: the losses are the largest and most significant piece of any plan. Since the losses are being financed, the loss estimate has the biggest impact on which program is the best option. Therefore, an actuarial analysis is a critical first step to any loss financing decision. Once a plan is selected, whether it is self-insurance, a captive, a large deductible program, or some other type of loss sensitive alternative, an actuarial analysis is commonly an annual — or in some cases more frequent — project.

Mergers and Acquisitions

Organizations considering a merger or acquisition typically go through a planning process which assesses the financial health of the post transaction entity. Financial projections for the future business plan and structure are completed to evaluate the viability of the transaction. Each party involved generally assembles a team of internal staff and outside consultants to assist in this evaluation. An actuary should be part of the team, and an actuarial analysis will

ensure that a complete estimate of risk financing liabilities is made prior to the acquisition. In several real life cases, we have seen an actuarial analysis be a deal breaker for a pending acquisition. The lesson deserves emphasis: don't acquire a business without first getting an actuarially sound estimate of the liabilities.

Loss Portfolio Transfers

In some situations, it is helpful for an organization to be able to transfer liabilities for past claims off its balance sheet. This is done with a loss portfolio transfer (LPT). In exchange for a negotiated price, the company transfers the liabilities to a third party. The negotiations will involve an actuarial analysis that determines the ultimate incurred losses and the net present value of those losses. Other administrative, risk, accounting, and profit issues will determine the final price for the transfer. But the actuarial determination of the net present value of the losses will be the key component in the negotiation.

Benchmarking

Determining the effectiveness of a loss control or loss prevention program can take years. But with the use of an actuarial analysis and pure loss rates (the dollars of loss per some unit of exposure, as discussed in Chapter 4), effectiveness of a program can be gauged much more quickly. An actuarial analysis can review data from years prior to the program implementation and determine an average pure loss rate to be used as a benchmark. Then a new pure loss rate can be computed soon after the completion of the first year of the program. Comparing the new pure loss rate against the benchmark will help you assess the effectiveness of the program, and this comparison can be updated annually for an ongoing assessment of the current pure loss rate versus the historical benchmark developed prior to program implementation.

Meeting GASB 10 Requirements

GASB 10 (the Governmental Accounting Standards Board Statement No. 10) establishes accounting and financial reporting standards for risk financing and insurance related activities of state and local governmental entities. It has changed the way public entities account for risk management and risk financing activities because it requires that "actuarial techniques" be utilized to evaluate liabilities. Since an actuarial analysis meets this requirement and actuaries are best qualified to utilize "actuarial techniques," governmental entities have become significant consumers of actuarial services.

Negotiating Security Requirements

The negotiation of security requirements is one of the most critical situations where an organization can benefit from a relationship with a consulting actuary. The methodology that an insurance company uses to establish the amount of a security requirement is not always obvious. The risk manager should work with a consulting actuary to complete a thorough actuarial analysis that considers the unique circumstances of the organization. This would include numerous factors such as changes in reserving philosophy, growth or downsizing, new loss control programs, mergers or divestitures, potential claim recoveries, unique characteristics of specific divisions within the company, and other factors. An actuarial analysis is the most powerful negotiating tool an organization can utilize when discussing security requirements with an insurance company.

Chapter 8

Your Checklist for Working with an Actuary

This chapter is important because…

Now that you understand the building blocks of an actuarial study and some examples of real world applications, you may want to prepare to work with a consulting actuary. This chapter explains how to define the project scope, what data you will need to collect, and even tips on how to save money.

As insurance programs increase in complexity, the responsibilities of risk managers, risk management consultants, accountants and brokers also increase. The experience of a casualty actuary is very significant to the successful management of these new responsibilities. Let's address several topics that arise when you consider acquiring the services of a casualty actuary.

Project Scope and Preparation

Actuaries are often seen only as technicians. But as we saw in Chapter 1, they are highly educated business professionals who should be viewed as management consultants with a technical focus. In order to utilize the full set of skills an actuary has to offer, be prepared to discuss all issues that impact your company. Before you consult with an actuary, consider the following questions. This groundwork will help you and your actuary better define the scope of the project.

- What are you trying to accomplish with an actuarial analysis?

- What are the lines of coverage (workers comp, general liability, auto liability, etc.) to be analyzed?
- What operational details of your company affect loss experience?
- Have there been any acquisitions or divestitures?
- Who handles the claims?
- Has there been a change in the organization or staff responsible for claims management?
- Has there been a change in reserving philosophy?
- When and what types of loss control programs have been implemented?
- Is your casualty program ***occurrence*** or ***claims-made***?

Typical Data Requirements

Actuaries add value in many ways, but the reason most people involve actuaries in a project is to take advantage of their technical expertise. This is best accomplished through the availability of as much data as possible. The following is a sample of the data needed to complete most actuarial analyses. Only some of this data terminology has been further explained in earlier chapters, but all of it should be familiar to your consulting actuary, who can assist you in determining the specific data requirements for your project.

- Historical first dollar loss experience in a loss triangle format for incurred losses, paid losses and claim counts. Further divisions may include pure loss/***allocated loss adjustment expenses (ALAE)***, indemnity/medical, bodily injury/property damage and total counts/counts with cost only.

- For workers compensation, a breakdown of losses by state is helpful due to varying benefit levels by state.
- A current loss run, preferably in a spreadsheet or database file.
- The exposure base (such as payroll, sales or number of vehicles) for all completed policy periods and projected policy periods.
- Policy periods for which data is available.
- Per occurrence and aggregate limitations for all policy periods.
- Information on whether ALAE data is included within or is in addition to the loss limitation.
- Information on whether salvage, subrogation, or other procedures that can offset the cost of a loss have an impact on losses.

Actuarial consulting services can be a valuable resource to your organization. Communication and preparedness will ensure the effectiveness of actuarial analyses as management tools. Use these actuarial checklists to maximize the benefit your organization receives from an actuarial consultant.

Tips for Saving Time and Money

Planning ahead is the most effective way to minimize the cost of an actuarial project. The following items should be considered early in the process.

- If a presentation is required, decide early in the project to minimize travel expenses. You may accomplish a significant portion of the project over the phone, thus saving considerable

cost, but do not discount the value of a face-to-face meeting when the results need to be discussed by several people.

- Coordinate with the data provider to streamline the delivery of data to the actuary. Data should be delivered in an electronic format whenever possible.

- Provide as much data at the start of the project as possible. Even if the project is months away, initiate the data gathering process early.

- Offer multi-year contracts to your actuarial provider. This will allow you to negotiate a budgeted expense that prevents unexpected increases in billable rates.

Glossary of Terms

Terms are listed alphabetically with the chapter of their first use indicated after the definition.

Aggregate limits – A limit on the total sum of individual claims during a policy period. This limit can apply in addition to a per occurrence limit. **(3)**

Allocated loss adjustment expenses (ALAE) – Expenses that can be attributed to or assigned to a specific claim. These include attorney fees, medical bills, expert witness charges, investigation related costs, and other expenses that can be assigned to a specific claim. **(8)**

Benefit level change factor (BLCF) – A factor which quantifies increases in benefit levels attributable to changes in state workers compensation laws. This factor is developed from individual state data. **(4)**

Case reserves – A specific amount of money budgeted for future payments for claims occurring in a past policy period. Also simply referred to as "reserves." **(2)**

Claims-made – A type of insurance policy that covers claims that are made or reported during a particular policy coverage period regardless of the date of the claim's occurrence. **(8)**

Confidence interval – A range of possible loss levels with a corresponding probability or confidence that the loss level will not be exceeded. **(6)**

Development – The quantitative change in losses from one year to the next due to unreported claims or claims that exceed the case reserves. **(2)**

Discounting – A method used to find the present value of a future stream of cash. **(5)**

Estimated required reserves – The actuarial determination of the required reserves for a historical policy period. This amount includes the case reserves plus an estimate of IBNR. **(3)**

Exposure – A measurement of the amount of risk for a policy year. The typical exposure used for a workers compensation analysis is payroll. **(4)**

Incurred But Not Reported Losses (IBNR) – This value includes losses that occurred during a policy period but were not reported until after the end of the period. IBNR may also include development on known claims. This occurs when future loss payments are expected to exceed case reserves. **(2)**

Incurred losses – A statement of the loss amount for a given time period that includes both paid losses and unpaid case reserves. **(2)**

Indemnity factor – An inflation factor used to adjust historical loss levels for wage inflation. **(4)**

Inflation trend factor – For workers compensation, a combined factor that represents changes in workers compensation benefit levels, indemnity trends and medical cost trends. For automobile and general liability, a factor that tracks changes in historical loss costs. **(4)**

Insurance program – Any program used to finance losses. **(5)**

Long-tail reserves – Claims that take a long period of time to close. These claims tend to occur in certain lines of coverage. **(5)**

Loss development factor (LDF) – A factor that is applied to the total incurred losses to estimate the ultimate incurred losses and reflect the impact of IBNR (incurred but not reported) losses. **(2)**

Loss development triangle – A manner by which an actuary formats data so as to compute the loss development factors. **(2)**

Loss pick – The amount of the loss projection for the coming policy period. **(4)**

Medical factor – A trend factor that reflects inflation in medical costs. **(4)**

Occurrence – A type of insurance policy that covers the insured for any claim that occurs during the policy period regardless of when the incident is reported. **(8)**

Paid losses – A statement of the loss amount for a given time period that includes only the amount actually paid on the claims. **(2)**

Parameter risk – The risk taken when you develop a confidence interval around a projected number (the loss pick) and assume that the projected number accurately reflects the underlying distribution. **(6)**

Payout schedule – An estimate of the timing of payments for projected losses or reserves over the coming months or years based on past payment patterns. **(5)**

Per occurrence - A limit on each individual claim in a policy period. An aggregate limit may also apply. **(3)**

Point estimate – A single value which is selected to represent an unknown parameter. **(5)**

Present value – The amount of money needed today to equal some future stream of money based on a selected interest rate. **(5)**

Pure loss rates – Trended losses per unit of trended exposures. **(4)**

Reported losses – A statement of the loss amount for a given time period that includes both paid losses and unpaid case reserves. **(2)**

Selected loss development factor – The loss development factors selected by the actuary to use in the actuarial analysis to estimate ultimate incurred losses. **(2)**

Snapshot – A term used to describe the best estimate of the historical losses at a given point in time. **(2)**

Spread of loss – Another term for confidence interval that describes the potential range of outcomes when forecasting losses. **(6)**

Ultimate incurred losses – The actuarial estimate of the losses for past policy periods that includes an estimate of IBNR. **(2)**

Appendix: Online Resources

SIGMA's Website: **www.SIGMAactuary.com**

SIGMA's Resource Portal: **www.SIGMAactuary.com/resources**

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