Extended Warranty Ratemaking

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TABLE OF CONTENTS

Abstract

The warranty business is a relatively new line of insurance in the property-casualty market. For the most part insurance coverage for warranties, extended warranties and service contract reimbursement policies has been introduced over the last thirty years. There is great opportunity in this line of business for the pricing actuary. It is an area where one can use his imagination and creativity in developing actuarially sound models to price and evaluate warranty business.

This paper starts with auto extended warranty ratemaking, where there is usually plenty of data to use the traditional actuarial approaches to ratemaking. From there the paper discusses a non-traditional rate-making approach when historical experience is not available. This "back-to-basics" approach focuses on developing the pure premium by independently deriving frequency and severity. The next topic is the inclusion of unallocated loss adjustment expense (ULAE) into the pricing equation. In this line of business, because of the long-term commitments, ULAE must be carefully analyzed and provided for. Lastly, the paper discusses a number of pricing pitfalls to avoid. Some of these errors have been made by the author, and it is in the hopes of exposing these pitfalls that they can be avoided by others.

Introduction

The warranty business is a relatively new line of business to the property/casualty market. It is generally within the last thirty years that insurance coverage has become an integral method to transfer this risk. Warranty coverage is basically mechanical breakdown insurance; if a product does not work due to some mechanical or component failure and it is covered under a warranty contract, than the product is either repaired or replaced, depending on the type of coverage in force.

Relatively speaking, there is very little actuarial literature on the topic of warranty business in general. Several that come to mind are the 1994 Proceedings paper by Roger Hayne, "Extended Service Contracts" and two papers in the 1993 CAS Forum Ratemaking Call Papers, "A Pricing Model for New Vehicle Extended Warranties" by Joseph S. Cheng and Stephen J. Bruce, and "The Use of Simulation Techniques in Addressing Auto Warranty Pricing and Reserving Issues" by Simon J. Noonan. Some of the topics addressed in those papers will be touched on in this paper.

The pricing of a warranty product lends itself to the pricing actuary's expertise. It is generally a line that has predictable frequencies and severities, given a credible amount of data. On the auto warranty class, there is usually a great deal of data available to analyze using traditional actuarial methods. Other product areas do not have large amounts of data and the actuary is forced to develop a price by deriving a value for frequency and severity.

The warranty market today can be divided up into five basic segments, each with its own set of distinguishing characteristics. These segments would be the automobile service contracts, commercial warranties (example; policies covering business equipment), home warranties (example; public service policies covering furnaces and air conditioners), retail warranties (example; policies covering VCRs) and Original Equipment Manufacturers (OEM) warranties. In this paper we will discuss auto extended warranty ratemaking and OEM warranty ratemaking, as well as several general topics which touch all areas.

VEHICLE EXTENDED WARRANTY

The auto extended warranty concept dates back to the early 1970's. Prior to that the only warranties on automobiles were the manufacturer's warranties on new vehicles, which were generally limited to 12 months or 12,000 miles. Used cars were usually sold with no warranty.

In the early 1970's a few independent companies, generally not insurance companies but third party administrators (TPA) began to offer limited warranties on used cars. Soon there were a number of companies offering one, two and three year terms for these warranties.

Eventually these independents recognized another market could be extending the warranty beyond what was offered by the manufacturer. Covering new vehicles appeared to be a great cash flow bonanza, as the money for the coverage was paid up front, while claims would be delayed by the year's coverage under the manufacturer's warranty. Interest rates were very high in the early and middle of the 1980's, and investors were lured by the promise of high returns. Manufacturers began to offer their own extended warranties, forcing independent TPAs out or to reduce pricing. Some of these TPAs were backed by insurance companies; many were not.

The late 1980's saw a turmoil in this business as pricing on new vehicle service contracts (VSC) was woefully inadequate. During this time the manufacturers also began to lengthen the term of the underlying warranty to three years or thirty-six thousand miles. This posed an immediate pricing problem. Purchasers of an extended warranty would expect the pricing to go down as the manufacturer now covered more claims. However, actuarial studies indicated double digit rate increases necessary. Interest rates also were coming down, lowering the investment income.

TPAs that raised rates lost much of their volume almost overnight, as dealers had a choice of the manufacturers' or other independents' products. However, a number of independents did survive this period. Most of these are either owned by or closely affiliated with an insurance company for security reasons, as long-term promises of vehicle service are being made. The manufacturers control about 70% of the new vehicle extended warranty market with the independents sharing the rest. The independents have a greater share of the used vehicle market.

Insurance companies play an important role in the selling of the extended warranty product. The extended warranty is an after-market product, that is, the dealer and consumer will generally conclude the purchase of the vehicle before introducing the availability of the extended warranty. If the dealer is successful in selling the consumer an extended warranty or service contract, the dealer has then committed to a long-term relationship to service that vehicle.

In most states, the extended warranty service contract is not considered insurance and is not regulated by the insurance department. It is simply a contract between the dealer and the car buyer and is covered under contract law. What is considered insurance by most states and is regulated by the various insurance departments is the Service Contract Reimbursement Policy (SCRIP). If the dealer chooses to sell an independent TPA's VSC, the dealer needs to assure himself that the TPA will be there to fulfill the promises made to the consumer. The consumer also must satisfy himself that should he move from the area or the dealer goes out of business, covered repairs will still be made. The TPA must therefore show that he is secure; most TPA's, through an insurance company, therefore provide a SCRIP to the dealer. This SCRIP provides a guarantee to the dealer and the consumer that if a covered repair is necessary it will be done, either at the selling dealer or at an authorized repair shop.

The vehicle service contract

The vehicle service contract (VSC) has a number of options in terms of limits and coverage. The predominate products will be discussed here. The discussion will be broken into three segments; used vehicles, new vehicles and near-new vehicles. Used vehicles are those which are being resold to the consumer by a dealer and which no longer are covered by the manufacturer's warranty. New vehicles are those which have had no previous owners and have the full protection of the manufacturer's warranty. Near-new vehicles are those that have had a previous owner and are being resold by the dealer with some protection still under the manufacturer's warranty.

Used Vehicle Service Contracts - Limits

a. One-year term – The VSC coverage is limited to one year from purchase of vehicle. Mileage on the vehicle at time of purchase is also used as an eligibility factor, i.e., a vehicle with mileage beyond a certain limit will not be eligible for an extended warranty.

b. Two-year term – This VSC coverage is limited to two years from the purchase of the vehicle. Again a mileage limit as described above is in place, but it is usually lower than the one-year eligibility as the coverage lasts longer.

c. Three-year term – This VSC coverage is limited to three years from the time of purchase with an eligibility mileage limit in place. Again, this eligibility limit would normally be lower than that for the two-year term.

New Vehicle Service Contracts – Limits

The limits on a new VSC are almost always a combination of years and mileage. The most popular combinations are usually in multiples of whole years (5,6 or 7) and multiples of 10,000 miles, from 60,000 to 100,000. An example of how this is shown would be 5/100,000, which represents 5 years or 100,000 miles, whichever comes first. At one time an option for unlimited mileage was offered, but industrywide experience was so poor that this option is now very seldom seen. Coverage starts upon the purchase of the vehicle.

Near-new Vehicle Service Contracts – Limits

These limits would normally be expressed as those shown for new VSCs. In fact, until recently this group was not separated from the "new" grouping. A new VSC would be sold to a consumer as long as there was still coverage under the manufacturer's warranty, the theory being that there was very little exposure to loss anytime during the period under which the vehicle was covered by the manufacturer. Upon analysis, however, it was found that loss costs were higher for new VSCs sold 18 months after coverage started under the manufacturer's warranty than for new VSCs sold on vehicles within that 18 month period.

We initially began to study the loss costs of this group because we noted that a program which we underwrote for motorcycles had much higher loss experience for older bikes which were grandfathered into the program. These older motorcycles were only eligible for the new program if they had been purchased no more than one year prior to the inception of the program. The resulting loss costs on these bikes were significantly higher than the rest of the program; we guessed that there was some type of adverse selection taking place.

If adverse selection was taking place in our motorcycle program where we provided an option to purchase an VSC more than a year after the bike was bought, then it would be reasonable to assume that the same adverse selection was taking place when a car owner purchased a VSC more than a year after he bought the car. As noted above our subsequent analysis of the near-new group showed significantly higher loss costs in comparison to the new group, and we therefore created the near-new group with higher rates.

Before the two-year lease option became popular, this group of vehicles was very small. However, this group has grown substantially over the last five years as the two year lease became predominant. Remember, the most prominent manufacturer's warranty is now 3/36,000, so a vehicle coming off a two-year lease still has up to a year of underlying coverage, depending on mileage.

Coverage offered under a vehicle service contract

Coverage under the VSC is for mechanical breakdown due to failure of a covered component only, and perhaps some incidental coverage such as rental reimbursement and towing when a covered mechanical breakdown has occurred. No physical damage due to other perils is covered. For instance, an engine breakdown caused when a vehicle is caught in a flood is not covered.

There are usually several options available in terms of coverage. There are a myriad of components that make up the automobile, with some obviously being more essential to the actual running of the auto than others. Basic coverage would normally cover the powertrain of the vehicle, such as the engine and transmission. Other options could be offered, up to "bumper-to-bumper" which pretty much covers everything in and on the car.

Vehicle Service Contract Ratemaking

Before discussing the actual ratemaking for VSCs, it is important to understand the makeup of the total price paid by the ultimate consumer, the purchaser of the vehicle. The total price is comprised of:

$$P = I + A + T + M;$$

where P = total price,

I = Insurer cost,

A = Agents commissions,

T = TPA administrative costs, and

M = Dealer markup.

To clarify, let us build the ultimate price to the consumer from the bottom up. First, the insurer determines the expected loss costs and adds any internal company expenses. This is passed to the TPA as the insurer cost. The TPA has administrative costs (underwriting, claims, systems, etc) which then get added on to the insurer cost. For the most part the TPA has an independent agency force in place to sell the SCRIP to the dealer, thus agent's commissions must also be included. (Note that as we pointed out earlier, the dealer sells the consumer a VSC, which is not typically considered insurance, and thus the dealer is not an insurance agent.) All of the above

costs make up what is called the dealer's cost, to which the dealer then adds whatever markup he can to arrive at the total price. Since this markup is not regulated in any state but Florida, total price for the same VSC can vary from consumer to consumer, depending on the negotiating skills of the buyer and seller.

Dealer markup is not regulated in any state but Florida, and therefore is not included as a cost in filed rates anywhere but Florida. The remaining costs, however, may or may not be included in filed rates. Some companies file rates which only include insurer costs (I); the TPA will then collect a fee per VSC (T + A) from the dealer, which he will then have to use to pay the TPA's expenses as well as any commissions to his distribution force, if any. The filed rates may include I +T + A, in which case the insurer will pay out a commission to the TPA equal to T+A. In Florida, the filed rates include all costs. While these different scenarios do not present a problem for ratemaking, it does cause difficulty if one is trying to do a competitive rating study among various companies, as unless the costs included in the ratemaking are known, comparisons are almost worthless.

Insurer costs (I) are the next item of evaluation. Insurer costs are made up of expected loss costs and the insurer's expenses. The expected loss costs are a function of many variables, including but not limited to:

a. Manufacturer (Asian, US, European)

b. Coverage option

c. Make (Ford, Toyota, etc) and model (Explorer, Corolla, etc)

d. Term limit option

e. Mileage limit option

f. Deductible option

g. Underlying warranty (manufacturer's warranty)

h. Special factors (four-wheel drive, commercial use, advanced technology for example).

The company must decide what loss cost variables they would like to include in the ratemaking; the above would be a pretty standard method to analyze data. As the variables above are all important elements that differentiate rates, it is important that the data be captured in the same detail. It is also important that the data be analyzed on a policy year basis. Because of the multi-year terms of the policies, it is important to match the losses to the policies that generated those losses. It also avoids any distortions caused by improper earning of the premium.

The earning of the premium for a warranty product is not straightforward. In general, premium is earned over the policy period to reflect the exposure to loss during that policy period. For an annual policy the premium is usually earned pro rata as losses are assumed to be uniformly distributed over the policy period. This is not true in the extended warranty coverage.

For used VSCs losses generally come in faster than a pro rata distribution. A useful rule of thumb is that half of the losses have emerged when the term is one-third expired, and two-thirds of the losses are emerged when the term is half done. For example, on a two-year term used VSC, two-thirds of the losses have emerged one year into the term. One primary reason for this accelerated loss pattern is that mechanical problems on used vehicles can occur pretty quickly after the sale. Sometimes a used car dealer will use the extended warranty as a

maintenance program. (This will be discussed later in the dealer management section.) For used VSCs, the premiums should be earned accordingly.

On new VSCs the earning is somewhat trickier. First, very few losses are expected under the extended warranty while the underlying warranty has not expired. The only losses during this period would be towing or rental expenses over and beyond what the underlying covers. Once the underlying warranty has expired, losses emerge on the extended warranty cover. As the frequency and severity of repairs are expected to increase during the remainder of the service contract we would envision an ever-increasing loss payout pattern. This type of pattern is well described by the reverse sum of the digits function (see Exhibit E for definition and formula), and this pattern is often used.

However, in actuality, while loss emergence does accelerate for a period of time after the expiration of the underlying warranty, this emergence slows down considerably towards the end of the term. This variable is sometimes called the attrition factor. Several things may happen during the life of the VSC; the mileage limit could be hit before the term limit, the car may be sold and the warranty not transferred, the owner voids the warranty by poor maintenance, or even the owner just doesn't keep track of the warranty contract. In any event, this attrition factor does exist, and it causes the loss payout pattern to take an "S" shape, slow starting out, grows quickly in the middle and slows down at the end. Premiums should be earned in the same fashion.

The loss payout patterns are direct byproducts of the actuarial analysis of the policy year loss triangles. The actuary decides at what level the earnings should be done, and has the data collected in these levels. For instance, earnings may be done by term and mileage, so premiums and losses would be segregated into term and mileage subsets by policy year.

Losses are developed to ultimate using a variety of methods. Because the loss emergence is low in the beginning of the contract period, more recent policy years benefit from the use of the Bornhuetter/Ferguson (B/F)* and the Stanard/Buhlmann (S/B)** methods in addition to simply multiplying the selected loss development factor by the emerged losses. It is also valuable to use average claim costs to develop ultimate losses (See Exhibit A). Note that for more recent years the paid loss projection is erratic as there are few emerged losses.

We also calculate a pure premium projection of ultimate losses (columns 13-15 in Exhibit A.) We use the B/F annual projection to get an ultimate pure premium per contract (column 13.) The B/F projection is used as its values are between the paid and the S/B projections, and thus we hope to be neither too optimistic nor too conservative. In column 14 we convert the annual pure premium into a running cumulative pure premium. In this way we incorporate mature years' pure premiums which have minimal actuarial adjustments along with the more recent years' pure premiums which are very dependent on actuarial assumptions on development. We then multiply the number of contracts written (column 2) by the cumulative pure premium to obtain the pure premium projection in column 15.

* For definition and explanation of the B/F method, please see Foundations of Casualty Actuarial Science, pages 210-214.

** For definition and explanation of the S/B method, please see Foundations of Casualty Actuarial Science, pages 352-354.

Of course, the other actuarial adjustments must also be made. Premiums must also be developed to ultimate as well as put on current rate level, and losses must be trended from the midpoint of the experience period to the midpoint of the proposed policy period. Individual policy years are then averaged and compared against the expected loss ratio to compute the required rate level indication.

LOSS TREND

Loss trend is a function of change in frequency vs a change in severity. For auto warranty business, normally the frequency is high and the severity is low. Frequency is affected by changes to the underlying manufacturers' warranties, the quality of the vehicles, the changing mix of business, and the dealers' service departments' propensity to use the warranty coverage. Severity is affected by the change in technology, change in mix, change in labor rates, availability of parts and again the service departments' willingness to use the warranty product. Both internal and external sources of data should be used to finally select a trend factor. Exhibit B shows an internal measure by component for frequency and severity, as well as an external measure of change in severity, using the government's PPI index as a source. For the external measure, we have examined the PPI for auto parts, both new and rebuilt, and for labor charges. We have weighted these indices together to get a combined external index. As labor charges usually make up about half of the total repair bill, we have given it a weight of 50%. We have given auto parts new and rebuilt each a weight of 25%, which assumes that half the time new parts are used in the repair job and half the time rebuilt parts are used.

The selection of annual loss trend factors in auto warranty business is not straightforward. We include external indices in our determination as it is often difficult to explain why internal factors change. For instance, in Exhibit B we show a change in frequency for the new VSC group. This is counterintuitive as it is generally accepted that the quality of new vehicles has improved; shouldn't we then see a decrease in frequency? Perhaps our mix of vehicle make and model has changed. Let's say the we determine that our mix did change. Would we expect the same mix change in the next policy year for which we are projecting rates?

Another problem arises because of the multiyear policy terms. On the new and near-new groups we must wait several years before we become comfortable with projecting a true frequency and severity. We then must use a four or five year old trend factor to project lost costs for the upcoming policy year. We have current calendar year data, but that is a mix of claims from up to seven policy years. If the volume and mix of business is stable over the ratemaking experience, then calendar year trends can be useful, otherwise it can lead to distortions.

It is therefore necessary to include external factors to smooth the results of our internal trend analysis. It is appropriate to give a higher weight to the external factors as they are determined from an industrywide database. This is important because a SCRIP program will most likely get a spread of business from all makes and models. These industrywide or government indices are also important as they tend to smooth the results from internal analysis. As we are often projecting many older policy years in calculating the rate level indication, we must be conscious of the compounding effect of many years of trend to this calculation.

OLDER YEARS: CAN THEY BE USED IN RATEMAKING?

As is seen in Exhibit A, nine policy years have been used in the ratemaking study. We also know from the discussion above that there have been changes over that period of time, most notably the change in the underlying manufacturer's warranty from 1 year / 12,000 miles to 3

years / 36,000 miles. This shift would have a significant impact on the older years. Can these older years be used?

If the TPA or insurer keeps very detailed claim data, an actuary can "as if" the older years. Claims from those older years can actually be recast as if the new terms and conditions were in place. This is helpful not only in getting more accurate projection data but also in calculating loss development factors. Thus older years not only can be used but they are very valuable as they represent truly mature loss data.

IMPORTANCE OF RATEMAKING

The accuracy of the extended warranty rate level indication cannot be stressed enough. Remember, rates are being set on contracts that could be up to seven years in duration. These contracts are a single premium and are non-cancelable by the insurer. Oftentimes it is several years before the adequacy of the current rates can be ascertained, which means you may have written several years of inadequately priced business. If you lower the rates you will most likely lose business and thus revenue just when the claim activity is increasing. It is therefore very important to perform rate level analyses every twelve to eighteen months and make adjustments as necessary.

DEALER MANAGEMENT

The actuary, from the pricing analysis, especially the analysis of frequency, can often find some trouble spots. Notice above that both frequency and severity can be affected by the dealers, or more precisely, the dealers' service departments. It is important, therefore, to keep track of the frequency and severity for each dealer. It is a relatively simple matter to set up a test of significance for an individual dealer's frequency and severity. If either measure is significant, i.e., it is outside the normal range of frequency or severity, than appropriate dealer rehabilitation measures must be taken. By rehabilitation it is meant that the dealer must be put on a program in which frequency and severity are closely monitored, with special reporting done monthly. If within a prescribed time period the dealer's experience has not improved, then the SCRIP will most likely be cancelled. Of course, the TPA (and the insurer) are still responsible for the run-off of the inforce VSCs, which may last up to seven years.

As in any line of insurance, fraud must be guarded against. In the warranty business, you must be vigilant against increases in frequency because severity cannot be changed too drastically. A good dealer management program is a must in this business and the pricing actuary can certainly play an important role.

WHAT TO LOOK OUT FOR:

THE ONLY CONSTANT IS CHANGE

The vehicle service contract ("VSC") industry is young relative to most standard casualty lines of business. As such, it is still evolving. The programs offered by the various third-party administrators of VSCs are constantly changing. These changes in coverage terms and conditions, coverage term options, deductibles and eligibility guidelines are driven by two sets of factors: marketing requirements and changes in the environment of the marketplace. It is important to understand the dynamics of these evolutionary changes and to incorporate such understanding into the ratemaking process.

MARKETING REQUIREMENTS

Innovation is an important marketing tool in the VSC industry. A VSC administrator's need to take an offensive position, to capture or retain market share, generally results in program changes that increase risk. Most VSC administrators rely on a network of independent general agents to distribute their programs to their first-level customers, automobile dealers. Participating auto dealers employ after-sale specialists, finance and insurance ("F&I") managers, to sell VSCs to the second-level customers, automobile purchasers. All auto dealers sell VSCs.

A reasonably effective F&I manager will place a VSC on 30-40% of the retail sales transactions at the dealership. The average profit generated by a VSC sale can add 50-100% to the profit generated by the sale of the vehicle itself. Competition for the auto dealer's business is fierce. Any innovation gives the agent new ammunition to improve his sales pitch. The latest change might have enough impact to tip the account his way. Changes to VSC programs which expand vehicle or mileage eligibility can increase penetration rates at existing accounts. Expanded coverages or benefits give the F&I manager more reasons to justify higher retail pricing, increasing gross profit margins.

ENVIRONMENTAL CHANGES

In opposition to the pro-active nature of marketing-driven changes, environment-driven changes are reactive in nature. The impetus to these changes can come from many directions. Changes in the length or extent of an automobile manufacturer's warranty coverages can require changes in terms, coverages or vehicle rating. Innovations in parts or systems, especially high tech, electronic replacements for existing systems can require changes in coverages, exclusions and rating. Changes in vehicle purchasing patterns can change the makeup of an entire book of business. Ten years ago, a one, two or three year-old vehicle was the hardest used car to sell. Four years ago, such vehicles made up only 10% of VSC sales. Today, such cars account for more than 30% of the VSCs sold.

KNOW WHAT YOU ARE MEASURING

All of the foregoing is meant to illustrate one point. In order to ensure accuracy in ratemaking, especially when measuring trend, know the history of the block of business you are observing. In your due diligence study, prior to starting any rate adequacy study, pay special attention to the following:

Data Integrity – Have all data items, especially manually-coded indicators, been entered and maintained in a consistent manner throughout the history of the database? Are changes in coverage reflected in changes in plan/coverage codes? Run comparison tests on contracts and claims involving similar vehicles/repairs over multiple policy and accident years.

Vehicle Coverage – What changes in coverage options, term/mileage availability, deductible options, vehicle or mileage/age eligibility categories have taken place over the years? When were such changes introduced? Obtain copies of all contracts sold and highlight changes or additions.

Benefits - Have ancillary benefit packages (substitute transportation, towing, trip interruption) changed in composition or in the extent/nature of the benefits provided? Include benefit packages in your comparison of coverage, conditions, exclusions.

Claims Adjustment Policies – What changes have been made in the interpretations of coverages, conditions and exclusions over the years? When were such changes introduced? Obtain copies of all procedure manuals, both external and internal, as well as any pertinent policy memoranda.

Rate Structures – Have there been changes instituted in the method of rating vehicles? Have surcharges been added/dropped? Have vehicle classifications changed? Obtain copies of all rate charts and state premium filing exhibits.

Vehicle Mix – Has the mix of makes, models, equipment changed enough to affect trends in composite loss development patterns or ultimate losses? Has the geographic mix of business changed over the years under study? Obtain historical state/agent loss ratio reports.

IN CONCLUSION

Assessing the impact of change, and the rating provisions employed to offset change, is an essential ingredient in the vehicle service contract ratemaking process. By initially focussing your attention on this aspect of the ratemaking process, you will learn how to apply your analytical skills and techniques to the best advantage.

RATEMAKING WITHOUT HISTORICAL DATA

The most accurate ratemaking is done when there is credible historic program data with which to work. Many times, however, historic data is not available. It may be that the program is new. Oftentimes the program is immature; remember that extended warranty contracts are usually multiyear terms, thus it is usually a number of years before the first policy year is completely expired. It is in these situations that one must use a "back to basics" approach. To price a program properly, one must start with an accurate pure premium, which is the product of frequency times severity.

An interesting example of using a pure premium approach is the pricing of a new program such as the second generation of wind turbines. In the early 1980's, the U.S. government, in an effort to decrease our dependency on foreign oil, granted tax credits for the advancement of alternative energy sources. As part of this initiative, a number of wind turbines were hastily developed and deployed. Each of these machines had manufacturer's warranties, most of which were subsequently insured. Coverage included both mechanical problems and business interruption. Through the ensuing years, the wind turbines proved mechanically deficient and large losses were paid out by insurance companies.

In the mid-nineties, a second generation of wind turbines were being developed and coverage sought for manufacturer's warranties. As there had been problems in the past, the financial backers of these new wind turbines were asking for four specific warranties from the manufacturer; workmanship, efficacy, availability and design defect. Each of these coverages is described in more detail below.

Workmanship – This covers both mechanical breakdown of the machine and the installation of the machine, and would usually be limited to one year from start-up.

Efficacy - This would cover the buyer of the wind turbine for lost revenues as a result of the machine not reaching the promised power generation levels.

Availability – Coverage is given for lost revenues due to down-time in excess of a prescribed number of hours. Total hours functioning would be determined by average sustained wind speed at the field site.

Design Defect – This would cover the retrofitting and lost income due to failure of the wind turbines to perform due to faulty component design. Failure rate thresholds for various components would be established.

Each of the above coverages poses a challenge to the actuary with respect to developing frequency and severity. A thorough examination of the engineering of the new machine must be done. As the actuary is not usually suited for this role, an independent engineering analysis must be sought.

The U.S. and other governments often can provide data on failure rates of similar components (gears, generators, bearings, etc) used in the wind turbine. Deductibles must be established so this does not become a maintenance program and aggregates must also be in place so that a worst-case loss can be determined. Also, as variation exists about all expected values for variables such as failure rates, a risk premium must be considered.

Exhibit C shows a possible approach to determining the pure premium for the above coverages for year 1 of a multiyear manufacturer's warranty. Three separate calculations are made; revenue loss exposure per wind turbine, design defect loss exposure, and materials and workmanship loss exposure.

Revenue loss exposure/wind turbine – This calculation includes the business interruption coverage from both the efficacy and availability sections above. Potential downtimes are given for repairs or retrofits of various components along with the probability that failure of that specific component will occur. For example, given that downtime projected for normal maintenance is 274 hours annually and that 125% of those hours will be used, we can expect 342.5 hours to be used annually in normal maintenance. In total, we expect 1,396.1 hours of downtime; in this program we are allowed 10%, or 876, hours of downtime annually (876 hrs = 10% of 24 hr/day x 365 days) . This is shown at the bottom of Exhibit C, and is the deductible feature of the program. As noted above, about 40% of the deductible would be used for normal maintenance; the other 60% would be to reduce dollar-swapping as well as have the insured share in some risk. With a machine expected to produce 82 kwh/hour, and at $.08/kwh, a resultant loss of $3,412 is expected. A worst-case scenario is also provided, with the probability of occurrence increased by two standard deviations of the expected probability of failure.

Design defect loss exposure – This calculation includes the retrofit cost (severity) and the probability of failure (frequency) by component. Expected costs for each component are calculated; the expected cost per wind turbine for this coverage would be $1,040. The worst-case scenario include revised retrofit costs as well as increased frequencies as described above.

Materials and workmanship loss exposure – As above, a retrofit cost and probability of failure is assigned for each component resulting in an expected cost of failure for each component. The total expected cost for this coverage would be $544. Worst-case scenario is calculated as described above.

As mentioned above, consideration must be given to adding a risk premium to the above. A number of assumptions have been made which, if wrong, can materially affect the calculated pure premium. For instance, the wind turbine is expected to produce 82 kwh per hour. This has not been proven. Also, a rate of $.08 per kwh produced may vary widely in today's fluctuating energy market. Probabilities of failure for similar components tested in government studies might not be representative of the actual components used in the design and manufacture of the wind turbines. In place of a risk premium, a retrospective rating policy might be considered. In any event, while a determination of a pure premium can be made, its accuracy is only as good as the assumptions made. There can be a wide range into which the correct premium may fall.

HANDLING OF UNALLOCATED LOSS ADJUSTMENT EXPENSE

Unallocated loss adjustment expense (ULAE) can be defined as that part of loss adjustment expense which covers the creation and maintenance of a claims department, among other things. It has been overlooked in the past and is one of the reasons why entities have turned to insuring the warranty exposure. Consider the warranty product. The pure premium is typically made up of high frequency low severity occurrences, i.e., there are many small losses. Expected losses in this scenario are generally predictable, and in the early days of shorter-term (mostly annual) warranties the manufacturer kept this risk. As both manufacturer's warranties and extended warranties increased in length of policy term, problems were created. Manufacturers or retail outlets which sold warranties went out of business on occasion, leaving the consumer with a worthless warranty, one on which he most likely paid the premium up front.

A warranty is a promise to pay for a covered repair or replacement to a product; if the provider is not around at the end of a five or ten year policy term, that promise goes unfilled. This is one reason that the transfer of this risk by insurance is now so common. However, insurance companies may decide that they no longer want to be in the warranty business or may go out of business themselves, and non-recognition of ULAE costs can lead to financial difficulties in these instances.

Take for example the auto extended warranty provider. Typically a new-car buyer may purchase an extended warranty for up to seven years or one hundred thousand miles, whichever comes first. The warranty insurer gets the full premium at the time of purchase of the car and is now obligated for the full term of the contract. This means that if for whatever reason the insurer leaves the warranty business, some provision for the fulfilling of the warranty promise must be made. The creation and maintenance of a claims department to fulfill this promise falls under the heading of ULAE and is an important consideration for the actuary in pricing the warranty risk.

Exhibit D illustrates the calculation of ULAE by showing the cost of maintaining a claims operation for the duration of the inforce policies. The calculation starts with the number of claims expected annually, and then the determination of how many underwriters, claim adjusters, auditors and clerks would be needed to service those claims. Also factored in would be the cost of equipment, and facilities for these people. As can be seen, the total cost can then be reduced to a rate per contract and included in total price.

The most important calculation in Exhibit D may be the of distribution of claims. In this example warranty contracts are sold with terms varying from 1 year to 7 years. For policy year 1998, the contract sold on December 31st of that year will not expire until December 31, 2005. If no more contracts were ever written, there would be a need for a claims staff for seven more years. It is important that claims data can be linked to policy information in order to determine the claim development (it is not uncommon for warranty administrators to keep premium and claims data completely separated, though this is becoming less and less common). If no data is available, a distribution can be developed by working with sources knowledgeable with the product being warrantied. There may also be similar products being warrantied about which claim development data is available that can be used as a proxy.

The actual ULAE costs can be determined in one of two ways. The costs may be determined by viewing the claims operation either as an on-going business or as a run-off operation. Viewing it as a run-off operation would lower the costs as claim-paying standards would most likely drop. The insurer is no longer interested in maintaining a strong service image. For example, in an on-going operation the standard of issuing a claim payment from notice of claim may be five days; in a run-off operation this standard could be relaxed to two weeks or more. This philosophy would also influence the setting of a ULAE reserve.

ULAE can be collected in various ways, depending on the way an insurer provides the warranty product. If the insurer administers the settling of the claims it can be included in the warranty premium. If a third party administrator (TPA) handles the claims, it may be provided for by fees charged by the administrator to the dealer or retailer or it may be part of the commission structure. For example, the TPA may earn a commission of 25%, but only get 15% with the remaining 10% amortized over several years.

As can be seen, not recognizing the ULAE costs on a multiyear non-cancelable policy can have financial implications. At the very least, a liability should be shown in the financial statements. At the worst, it could lead to a claims department totally unprepared to handle the volume of claims in the future.

PITFALLS

Many companies have entered the insuring of manufacturers' and extended warranty market and many have failed, losing great amounts of money. Most often failures occur because the risk being transferred was not understood. Let's face it, at the outset, this business looks very attractive, as for the most part premiums are paid up front in full, and claims may occur years later. Just think of all the investment income to be made!

Vehicle Service Contracts

Vehicle service contracts ("VSCs") present us with a unique risk/exposure structure. In no other form of insurance is the insured, the producing agent and the service provider the same entity. This structure is akin to a doctor selling health insurance to his own patients. As you might imagine, such a structure is full of moral hazards and conflicts of interest.

As a companion function to careful ratemaking, account management is a necessity to ensure the success of any VSC program. Opportunities abound for unscrupulous dealership personnel to take advantage of a VSC program. Used car sales managers can increase gross profits by avoiding reconditioning expenses and having failed vehicles repaired under the VSC program. F&I managers can increase gross profits by posting incorrect issue mileages in order to reduce premiums below required levels, while maintaining high retail rates (retail rates are only controlled in Florida). Service departments can comb over each car in order to "discover" claims.

None of the previous examples can be controlled through underwriting or claims adjustment efforts or controls. Without effective account management systems, administrators are left with three, equally unpalatable alternatives: raise rates, post-claims underwrite or cancel bad accounts. If rates are raised beyond competitive levels, business will fall off. Generally, the greatest losses are among the lowest risk, most profitable vehicle makes. The artificially high rates become attractive only to high-risk dealers, selling high-risk cars, which will soon prove even the artificially high rates to be inadequate. Tightening claim adjustment policies can have the same effect – lost business. Cancellation of poorly-performing accounts, while eliminating the problem, can end up eliminating all of a company's problems.

Information flow is the cornerstone of a successful account management system. Situations can change quickly in the automobile business. A monthly exception report, listing and classifying all poorly-performing accounts, is absolutely necessary. Also necessary is an experienced, well trained staff to manage the recovery process. The overall concept of account management is to identify problem accounts, to identify the specific problem areas within the operation of such accounts and then to take corrective action.

Identifying problem accounts is simply a matter of generating a listing of accounts whose earned loss ratios exceed a specific target. The three major areas of VSC groupings involve new vehicles, near-new vehicles (or extended eligibility new vehicles) and used vehicles. If any or all of the target loss ratios for these groupings are exceeded, the account should show on the listing. If programming resources permit, it is also useful to develop some sort of ranking system, encompassing factors such as : newly acquired account shock losses, number of VSC grouping target loss ratios exceeded, overall loss ratio target loss ratio exceed, as well as the amount by which the targets have been exceeded.

Identifying problem areas within the operation of the targeted accounts is a more complex issue. In order to begin the analysis of specific problem areas, a more complex target set, or model, is necessary. This model needs to be constructed according to major franchise group (Standard Asian, luxury Asian, standard domestic, luxury domestic, standard European, luxury European)

and reflect acceptable frequency and severity targets for each VSC grouping (New, Near-New, Used, Total). Frequency and severity targets for this matrix can be calculated by averaging the results of several accounts within each franchise group whose loss ratios for all VSC groupings are at or below target levels.

Once the variances from frequency/severity targets are established, specific causes for such variances can be derived and solutions proposed. High rates of early used vehicle claims can be traced to less than adequate used vehicle reconditioning practices. Generally high claim severity (usually combined with high rates of multi-item repairs) usually point to highly incentivised service writers/technicians "discovering" failures that were not prompted by customer complaints. Generally, high frequency levels point to some type of customer incentive program, e.g. free inspections or other service specials.

In order to implement solutions, the internal systems and the state filings must be flexible enough to provide support for: reduced claim reimbursement (factory time and/or labor rates as opposed to retail) claim elimination periods (typically 30 days on used vehicles) premium adjustments (individual rate premium modifier factors) underwriting restrictions (high mileage used vehicles, long term new vehicle plans). Rate adjustments, elimination periods and underwriting restrictions are used to address selection and reconditioning issues, involving the sale of the VSCs. Reduced claim reimbursement is used to combat overzealousness in the service department. By focussing the solutions on the specific areas of the account's operation that is causing the problem, recovery is speeded and recovery rates are increased.

WARRANTY IN GENERAL

In the early days companies evaluated warranty business on a calendar year basis. Premiums on multi-year terms were earned evenly over the contract period. Unfortunately, losses tended to occur later in the term of the warranty. In Exhibit E, it can be seen how this combination understates the loss ratio in the first calendar year of the warranty term. Now, since the loss ratio is so low, an obvious albeit erroneous conclusion would be that not only should we write more of this business, we should reduce rates to help our marketers! It only takes a few years to dig a deep hole, as inadequately priced business has now been written for several years. Rate relief is essential. Of course, this leads to further problems. If the rate level increase needed is large, there may be difficulty getting approval from the various states. Even if approvals are finally received, implementing a large rate increase could lead to a very rapid drop-off in VSCs written, as dealers can use a competing program. A large drop-off in VSCs would mean a large reduction in revenue, just when the cash is needed to pay the claims from the old business. It is easy to see how this could become a run-off operation.

Earning premiums correctly is very important as can be seen above. Premiums should be earned in direct proportion to the loss payout pattern. Earning premiums in this fashion maintains the proper loss ratio for the life of the policy period, as shown in Exhibit E. Hopefully existing loss payout data is available in order to determine the payout pattern. In cases where the data is not available and the losses are expected to start out slowly in the beginning of the term and monotonically increase over the life of the contracts, the reverse sum of the digits rule can be used. Exhibit E shows the loss payout pattern described by this rule. As shown, we would earn 1/36 of the premium in the first year, 2/36 in the second year, and so on up to 8/36 in the last year. Note that this earning methodology is conservative; it does not recognize the aforementioned "attrition factor." The state of Louisiana actually requires that a non-insurance company that guarantees warranties or extended warranties earn its income no faster than the reverse sum of the digits rule. If the term of the contract period is annual, this rule is often referred to as the reverse rule of 78s (using monthly earnings).

Pricing of warranties or extended warranties should be done by product or at most by homogeneous classes of products. Do not make the mistake of giving one overall rate for a warranty program made up of many different products. Exhibit F, example 1, illustrates what can happen. Company A administers a warranty program for "brown and white goods" (basically electronics appliances, and office equipment.) Loss costs are available, and Company A is looking to transfer the warranty risk to insurance company B. Since B will insure the entire program, B decides to give a single program rate of $169. Unfortunately for B, A writes a new account which only sells refrigerators. This changes the mix of risks, thus changing loss costs and making the single rate of $169 inadequate as the new rate should be $193. Practically speaking, rates would not be modified every time a new account came on line, so it would be better to charge a rate by class to minimize the mix change problem.

Another pricing pitfall to avoid is basing the rate on the overall revenue an administrator gets for the warranty contract. Again in Exhibit F, example 2 Company A (the administrator) sells a warranty contract for $50, and Company B (the insurer) determines that the loss cost is $5. B than grosses the loss cost up for expenses and wants $7 in premium. B than sets a rate of 14% per revenue. Unfortunately for B, next year A decides to lower its selling price of the warranty to $40. Now B only gets $5.60 per contract, which barely covers his loss costs let alone his expenses.

Another problem often encountered by the pricing actuary on warranty business is the lack of quality data. To properly price a warranty product, policy year data must be used. Most administrators do not show data in policy year format; some cannot show it as losses cannot be tied back to the premium. Obviously in this type of operation there can be no verification of coverage; the claim is paid when it is presented. This type of account cannot be soundly priced. If triangular data is available, it must be reconciled with the TPA's audited financials. Again, many TPAs are not used to providing actuarial data, so a thorough checking of the data is required.

CONCLUSION

Ratemaking in the extended warranty line of business is well-suited to take advantage of the actuarial approach. The business is driven by frequency rather than severity so that it lends itself to actuarial modeling. For the vehicle extended warranty there is often credible data available. When there is not data available, the "back-to-basics" approach is best done by an actuary. The actuary is an essential member of the warranty pricing team.

AUTO EXTENDED WARRANTY **EXHIBIT A**

LOSS PROJECTIONS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Policy Year	Number of Contracts	Ultimate Written Premium	Average Premium	Paid Losses To Date	Paid Loss Ratio	Paid LDF	IBNR Factor	ELR	Paid Projection	Stanard-Buhlmann	B-F Projection	Pure Premium /Contract	Cumulative Pure Premium	Pure Premium Projection
1990	25,000	$ 5,000,000	$ 200	$ 4,800,000	96.0%	1.000	0.000	85.0%	$ 4,800,000	$ 4,800,000	$ 4,800,000	$ 192	$ 192	4,800,000
1991	25,000	$ 5,050,000	$ 202	$ 5,201,500	103.0%	1.000	0.000	85.0%	$ 5,201,500	$ 5,201,500	$ 5,201,500	$ 208	$ 200	$ 5,000,750
1992	30,000	$ 6,150,000	$ 205	$ 6,211,500	101.0%	1.030	0.029	85.0%	$ 6,397,845	$ 6,377,189	$ 6,363,757	$ 212	$ 205	$ 6,136,971
1993	35,000	$ 7,350,000	$ 210	$ 5,953,500	81.0%	1.140	0.123	85.0%	$ 6,786,990	$ 6,788,419	$ 6,720,737	$ 192	$ 201	$ 7,026,172
1994	40,000	$ 8,520,000	$ 213	$ 5,367,600	63.0%	1.450	0.310	85.0%	$ 7,783,020	$ 7,813,382	$ 7,615,117	$ 190	$ 198	$ 7,922,867
1995	45,000	$ 9,675,000	$ 215	$ 3,676,500	38.0%	2.300	0.565	85.0%	$ 8,455,950	$ 8,734,748	$ 8,324,707	$ 185	$ 195	$ 8,780,809
1996	50,000	$ 11,000,000	$ 220	$ 1,100,000	10.0%	5.400	0.815	85.0%	$ 5,940,000	$ 9,390,586	$ 8,718,519	$ 174	$ 191	$ 9,548,867
1997	55,000	$ 12,375,000	$ 225	$ 111,375	0.9%	27.700	0.964	85.0%	$ 3,085,088	$ 11,144,799	$ 10,250,387	$ 186	$ 190	$ 10,458,065
1998	60,000	$ 13,800,000	$ 230	$ 13,800	0.1%	432.000	0.998	85.0%	$ 5,961,600	$ 12,749,013	$ 11,716,647	$ 195	$ 191	$ 11,459,403

column	notes on calculation
4	col 3 / col 2
6	col 5 / col 3
8	1.00 - 1.00 / col 7
10	col 5 x col 7
11	====>
12	col 5 + col 3 x col 8 x col 9
13	col 12 / col 2
14	(sum of col 12 current and preceding years) / (sum of col 2 current and preceding years)
15	col 2 x col 14

Stanard / Buhlmann Calculation

	ELR est	prem	1-lag	premium x 1.0 - lag	IBNR	reported losses	ultimate losses
1990	92%	$ 5,000,000	0.000	$ -	0	$ 4,800,000	$ 4,800,000
1991	92%	$ 5,050,000	0.000	$ -	$ -	$ 5,201,500	$ 5,201,500
1992	92%	$ 6,150,000	0.029	$ 179,126	$ 165,689	$ 6,211,500	$ 6,377,189
1993	92%	$ 7,350,000	0.123	$ 902,632	$ 834,919	$ 5,953,500	$ 6,788,419
1994	92%	$ 8,520,000	0.310	$ 2,644,138	$ 2,445,782	$ 5,367,600	$ 7,813,382
1995	92%	$ 9,675,000	0.565	$ 5,468,478	$ 5,058,248	$ 3,676,500	$ 8,734,748
1996	92%	$ 11,000,000	0.815	$ 8,962,963	$ 8,290,586	$ 1,100,000	$ 9,390,586
1997	92%	$ 12,375,000	0.964	$ 11,928,249	$ 11,033,424	$ 111,375	$ 11,144,799
1998	92%	$ 13,800,000	0.998	$ 13,768,056	$ 12,735,213	$ 13,800	$ 12,749,013
totals		$ 78,920,000		$ 43,853,642		$ 32,435,775	

Calculation of ELR Estimate

sb ibnr = elr est x	$43,853,642			
elr est = [ibnr est +	$32,435,775	] /	$ 78,920,000	
ibnr est = elr est x	$78,920,000	-	$ 32,435,775	
elr est x	$43,853,642	= elr est x	$ 78,920,000	$ 32,435,775
	$32,435,775	= elr est x	$ 35,066,358	
	0.92	= elr est		

AUTO EXTENDED WARRANTY

EXHIBIT B

TREND ANALYSIS

INTERNAL REPAIR COST ANALYSIS

		1999					1998							
component	coverage	policy count	claim count	payment	frequency	severity	policy count	claim count	payment	frequency	severity	change in frequency	change in severity	loss trend factor
rental	new	75,000	15,000	$ 1,050,000	20.0%	$ 70	60,000	11,400	$ 855,000	19.0%	$ 75	5.3%	-6.7%	-1.8%
water pump	new	75,000	6,000	$ 1,050,000	8.0%	$ 175	60,000	4,200	$ 735,000	7.0%	$ 175	14.3%	0.0%	14.3%
air cond. compressor	new	75,000	3,750	$ 1,500,000	5.0%	$ 400	60,000	2,700	$ 1,012,500	4.5%	$ 375	11.1%	6.7%	18.5%
fuel pump	new	75,000	2,250	$ 528,750	3.0%	$ 235	60,000	2,100	$ 472,500	3.5%	$ 225	-14.3%	4.4%	-10.5%
transmission (automatic) internal parts	new	75,000	2,250	$ 1,743,750	3.0%	$ 775	60,000	1,500	$ 1,155,000	2.5%	$ 770	20.0%	0.6%	20.8%
transaxle (automatic) internal parts	new	75,000	2,250	$ 1,912,500	3.0%	$ 850	60,000	1,500	$ 1,275,000	2.5%	$ 850	20.0%	0.0%	20.0%
transaxle (automatic) assembly	new	75,000	1,125	$ 1,293,750	1.5%	$ 1,150	60,000	900	$ 1,080,000	1.5%	$ 1,200	0.0%	-4.2%	-4.2%
transmission (automatic) assembly	new	75,000	750	$ 750,000	1.0%	$ 1,000	60,000	600	$ 660,000	1.0%	$ 1,100	0.0%	-9.1%	-9.1%
engine assembly	new	75,000	450	$ 675,000	0.6%	$ 1,500	60,000	360	$ 522,000	0.6%	$ 1,450	0.0%	3.4%	3.4%
differential (rear) assembly	new	75,000	300	$ 157,500	0.4%	$ 525	60,000	180	$ 94,500	0.3%	$ 525	33.3%	0.0%	33.3%
transmission (manual) assembly	new	75,000	75	$ 62,250	0.1%	$ 830	60,000	60	$ 66,000	0.1%	$ 1,100	0.0%	-24.5%	-24.5%
subtotal	new	75,000	34,200	$10,723,500	45.6%	$ 314	60,000	25,500	$ 7,927,500	42.5%	$ 311	7.3%	0.9%	8.2%

EXTERNAL TREND ANALYSIS

Producer Price Index Data

	Annual Trend in Index				
	Parts New	Parts Rebuilt	Labor	Combined Annual	index
weights	0.25	0.25	0.5	Trend	1.000
1990	1.1%	0.0%	4.8%	2.7%	1.027
1991	0.6%	0.0%	3.8%	2.1%	1.048
1992	0.6%	2.2%	3.2%	2.3%	1.072
1993	0.4%	0.5%	2.7%	1.6%	1.089
1994	1.5%	1.3%	2.3%	1.9%	1.109
1995	0.2%	-0.4%	2.3%	1.1%	1.121
1996	-0.7%	-1.5%	3.8%	1.4%	1.136
1997	-0.6%	-0.8%	3.5%	1.4%	1.152

exponential trend = 1.8%

WIND TURBINES

EXHIBIT C

YEAR 1 EXPOSURE

revenue loss exposure/wind turbine

item	potential downtime (hrs/yr)	probability of occurrence	probable downtime hours	potential downtime (hrs/yr)	worst case probability	worst case downtime hours
normal maintenance	274	1.25	342.5	274	1.96	536.2
rotor blade repair	1440	0.08	115.2	1440	0.22	318.8
hub retrofit	1800	0.10	180.0	1800	0.52	943.6
teeter damper retrofit	96	0.15	14.4	96	0.77	74.1
gearbox retrofit	2160	0.15	324.0	2160	0.49	1057.0
generator retrofit	2160	0.10	216.0	2160	0.24	521.4
mainframe repair	96	0.15	14.4	96	0.49	47.0
yaw bearing retrofit	1800	0.10	180.0	1800	0.27	485.4
tower repair	96	0.10	9.6	96	0.58	55.8
totals			1396.1			4039.3
revenue loss @$0.08/kwh; 90% availability 876 hours allowable projected 82 kwh/hour			$3,412			$20,751

Design Defect loss exposure

item	retrofit cost	probability of occurrence	probable cost exposure	reasonable retrofit cost	worst case probability occurrence	worst case exposure
normal maintenance	n/a	1.00	$0	n/a	2.00	$0
rotor blade repair	$2,000	0.05	$100	$16,500	0.08	$1,292
hub retrofit	$5,000	0.06	$300	$6,500	0.30	$1,952
teeter damper retrofit	$2,500	0.08	$200	$4,000	0.45	$1,791
gearbox retrofit	$4,000	0.06	$240	$19,200	0.16	$3,052
generator retrofit	$1,000	0.04	$40	$7,000	0.07	$478
mainframe repair	$0	0.06	$0	$7,500	0.16	$1,192
yaw bearing retrofit	$4,000	0.04	$160	$5,500	0.15	$842
tower repair	$0	0.08	$0	$3,000	0.31	$919
totals			$1,040			$11,518

materials and workmanship loss exposure

item	retrofit cost	probability of occurrence	probable cost exposure	reasonable retrofit cost	worst case probability occurrence	worst case exposure
normal maintenance	n/a	n/a	$0	n/a	2.00	$0
rotor blade repair	$2,000	0.04	$80	$2,000	0.15	$306
hub retrofit	$2,000	0.04	$80	$2,000	0.22	$448
teeter damper retrofit	$700	0.04	$28	$700	0.29	$206
gearbox retrofit	$3,500	0.06	$210	$3,500	0.30	$1,051
generator retrofit	$1,200	0.04	$48	$1,200	0.15	$184
mainframe repair	$700	0.06	$42	$700	0.30	$210
yaw bearing retrofit	$2,800	0.02	$56	$2,800	0.08	$214
tower repair	$0	0.04	$0	$0	0.29	$0
totals			$544			$2,620

Oustanding ULAE Estimates
As of 10/97

Assumptions

Contract, Claims Development, & Frequency

	PY1991	PY1992	PY1993	PY1994	PY1995	PY1996	PY1997	PY1998
Number of Written Contracts	**85,000**	**90,000**	**95,000**	**100,000**	**105,000**	**110,000**	**115,000**	**120,000**
Processing Frequency Ratio	**110%**	110%	110%	110%	110%	110%	110%	110%
Projected Processed Claims	93,500	99,000	104,500	110,000	115,500	121,000	126,500	132,000
	1yr	2yr	3yr	4yr	5yr	6yr	7yr	8yr
Cumulative Claim Development Pattern	**25%**	**40%**	**55%**	**75%**	**85%**	**95%**	**98%**	**100%**
Incremental Claim Development Pattern	25%	15%	15%	20%	10%	10%	3%	2%

Projected Processed Claims

	CY1998	CY1999	CY2000	CY2001	CY2002	CY2003	CY2004	CY2005	Total O/S
PY98	33,000	19,800	19,800	26,400	13,200	13,200	3,960	2,640	132,000
PY97	18,975	18,975	25,300	12,650	12,650	3,795	2,530		94,875
PY96	18,150	24,200	12,100	12,100	3,630	2,420			72,600
PY95	23,100	11,550	11,550	3,465	2,310				51,975
PY94	11,000	11,000	3,300	2,200					27,500
PY93	10,450	3,135	2,090						15,675
PY92	2,970	1,980							4,950
PY91	1,870								1,870
PY91-97	86,515	70,840	54,340	30,415	18,590	6,215	2,530		269,445
PY98	33,000	19,800	19,800	26,400	13,200	13,200	3,960	2,640	132,000

Personnel & Plant Costs

	Adjuster	Underwriter	Auditor	Clerk
Average Salary	**40,000**	**45,000**	**50,000**	**25,000**
Avg No of Claims Processed per Day	**20**	**110**	**325**	**110**
Avg No of Claims Processed per Yr	**5,000**	**27,500**	**75,000**	**27,500**
Benefits(as %age of salary)	**17%**	**17%**	**17%**	**17%**
Rent per Square Foot	**15**	**15**	**15**	**15**
Square Feet Per Person	**200**	**200**	**200**	**200**
Total Rent Cost per Person	3,000	3,000	3,000	3,000
Equipment	**315**	**315**	**315**	**315**
Telephone per Claim Cost	**4.50**	**4.50**	**4.50**	**4.50**
Misc per Claim Costs(postage, electric, etc.)	**1.00**	**1.00**	**1.00**	**1.00**

Scenario Options

- ☑ Round Up Required Personnel
- ☑ Run off Mode

Personnel Effeciency Level

94.0%

Plant Cost Savings

0.0%

Inflation Factors

Annual Wage Inflation Rate	**5.0%**
Annual Plant Cost Inflation Rate	**2.0%**

Dates

Run Off Date
12/31/1997

Summary of Results

	Total	Avg/Clm	Avg/Pol
ULAE Estimate for PY91-97	**6,746,891**	**25.0**	**27.54**
ULAE Estimate for PY98	**2,956,620**	**22.4**	**24.64**

ULAE Projections

EXHIBIT D
PAGE 2

Prior Book

PY91-97	CY	Expected Claim Counts	Required Number of Personnel: Adjusters	Underwriters	Auditors	Clerks	Annual Personnel Costs: Adjusters	Underwriters	Auditors	Clerks	Benefits	Tot Wages & Benefits	Wage Inflation	Total
	1998	86,515	19.0	4.0	2.0	4.0	760,000	180,000	100,000	100,000	193,800	1,333,800	5.0%	1,333,800
	1999	70,840	16.0	3.0	1.0	3.0	640,000	135,000	50,000	75,000	153,000	1,053,000	5.0%	1,105,650
	2000	54,340	12.0	2.0	1.0	2.0	480,000	90,000	50,000	50,000	113,900	783,900	5.0%	864,250
	2001	30,415	7.0	2.0	1.0	2.0	280,000	90,000	50,000	50,000	79,900	549,900	5.0%	636,578
	2002	18,590	4.0	1.0	1.0	1.0	160,000	45,000	50,000	25,000	47,600	327,600	5.0%	398,200
	2003	6,215	2.0	1.0	1.0	1.0	80,000	45,000	50,000	25,000	34,000	234,000	5.0%	298,650
	2004	2,530	1.0	1.0	1.0	1.0	40,000	45,000	50,000	25,000	27,200	187,200	5.0%	250,866
	Totals	269,445	61	14	8	14	2,440,000	630,000	400,000	350,000	649,400	4,469,400		4,887,993

	Plant Costs							Total ULAE	Avg ULAE Per
CY	Telephone	Rent	Equipment	Other	Total	Plant Inflation	Total Plant	Estimate	Claim
1998	389,318	87,000	9,135	86,515	571,968	2.0%	571,968	1,905,768	22
1999	318,780	69,000	7,245	70,840	465,865	2.0%	475,182	1,580,832	22
2000	244,530	51,000	5,355	54,340	355,225	2.0%	369,576	1,233,826	23
2001	136,868	36,000	3,780	30,415	207,063	2.0%	219,736	856,314	28
2002	83,655	21,000	2,205	18,590	125,450	2.0%	135,791	533,991	29
2003	27,968	15,000	1,575	6,215	50,758	2.0%	56,040	354,690	57
2004	11,385	12,000	1,260	2,530	27,175	2.0%	30,603	281,469	111
Totals	1,212,503	291,000	30,555	269,445	1,803,503		1,858,897	**6,746,891**	**25**

New Book

PY98	CY	Expected Claim Counts	Required Number of Personnel				Annual Personnel Costs							
			Adjusters	Underwriters	Auditors	Clerks	Adjusters	Underwriters	Auditors	Clerks	Benefits	Tot Wages & Benefits	Wage Inflation	Total
	1998	33,000	7.0	2.0	1.0	2.0	280,000	90,000	50,000	50,000	79,900	549,900	5.0%	549,900
	1999	19,800	4.0	1.0	1.0	1.0	160,000	45,000	50,000	25,000	47,600	327,600	5.0%	343,980
	2000	19,800	4.0	1.0	1.0	1.0	160,000	45,000	50,000	25,000	47,600	327,600	5.0%	361,179
	2001	26,400	6.0	1.0	1.0	1.0	240,000	45,000	50,000	25,000	61,200	421,200	5.0%	487,592
	2002	13,200	3.0	1.0	1.0	1.0	120,000	45,000	50,000	25,000	40,800	280,800	5.0%	341,314
	2003	13,200	3.0	1.0	1.0	1.0	120,000	45,000	50,000	25,000	40,800	280,800	5.0%	358,380
	2004	3,960	1.0	1.0	1.0	1.0	40,000	45,000	50,000	25,000	27,200	187,200	5.0%	250,866
	2005	2,640	1.0	1.0	1.0	1.0	40,000	45,000	50,000	25,000	27,200	187,200	5.0%	263,409
	Totals	132,000	29	9	8	9	1,160,000	405,000	400,000	225,000	372,300	2,562,300		2,956,620

CY	Plant Costs							Total ULAE Estimate	Avg ULAE Per Claim
	Telephone	Rent	Equipment	Other	Total	Plant Inflation	Total Plant		
1998	148,500	36,000	3,780	33,000	-	2.0%	-	549,900	17
1999	89,100	21,000	2,205	19,800	-	2.0%	-	343,980	17
2000	89,100	21,000	2,205	19,800	-	2.0%	-	361,179	18
2001	118,800	27,000	2,835	26,400	-	2.0%	-	487,592	18
2002	59,400	18,000	1,890	13,200	-	2.0%	-	341,314	26
2003	59,400	18,000	1,890	13,200	-	2.0%	-	358,380	27
2004	17,820	12,000	1,260	3,960	-	2.0%	-	250,866	63
2005	11,880	12,000	1,260	2,640	-	2.0%	-	263,409	100
Totals	594,000	165,000	17,325	132,000	-		-	**2,956,620**	**22**

EXTENDED WARRANTY **EXHIBIT E**

EARNING OF PREMIUM IN POLICY YEAR X

LOSS PAYOUT PATTERN BY CALENDAR YEAR

X	X + 1	X + 2	X + 3	X + 4	X + 5	X + 6	X + 7	TOTAL
3%	7%	10%	12%	15%	20%	20%	13%	100%

For use with examples below:

POLICY YEAR WRITTEN PREMIUM = $ 100,000

EXPECTED LOSS RATIO = 75%

EXPECTED LOSSES = $ 75,000

EXAMPLE 1: PREMIUMS EARNED PRO-RATA

	X	X + 1	X + 2	X + 3	X + 4	X + 5	X + 6	X + 7	TOTAL
Earned Premium	$ 12,500	$ 12,500	$ 12,500	$ 12,500	$ 12,500	$ 12,500	$ 12,500	$ 12,500	$ 100,000
Cumulative Earnings	$ 12,500	$ 25,000	$ 37,500	$ 50,000	$ 62,500	$ 75,000	$ 87,500	$100,000	
Incurred Losses	$ 2,250	$ 5,250	$ 7,500	$ 9,000	$ 11,250	$ 15,000	$ 15,000	$ 9,750	$ 75,000
Cumulative Losses	$ 2,250	$ 7,500	$ 15,000	$ 24,000	$ 35,250	$ 50,250	$ 65,250	$ 75,000	
Policy Year X Loss Ratio	18%	30%	40%	48%	56%	67%	75%	75%	

EXAMPLE 2: PREMIUMS EARNED IN PROPORTION TO LOSS PAYOUT PATTERN

	X	X + 1	X + 2	X + 3	X + 4	X + 5	X + 6	X + 7	TOTAL
Earned Premium	$ 3,000	$ 7,000	$ 10,000	$ 12,000	$ 15,000	$ 20,000	$ 20,000	$ 13,000	$ 100,000
Cumulative Earnings	$ 3,000	$ 10,000	$ 20,000	$ 32,000	$ 47,000	$ 67,000	$ 87,000	$100,000	
Incurred Losses	$ 2,250	$ 5,250	$ 7,500	$ 9,000	$ 11,250	$ 15,000	$ 15,000	$ 9,750	$ 75,000
Cumulative Losses	$ 2,250	$ 7,500	$ 15,000	$ 24,000	$ 35,250	$ 50,250	$ 65,250	$ 75,000	
Policy Year X Loss Ratio	75%	75%	75%	75%	75%	75%	75%	75%	

EXAMPLE 3: PREMIUMS EARNED IN PROPORTION TO REVERSE SUM OF THE DIGIT RULE

Earnings done over 8 years, thus sum of digits = (n)(n+1)/2 = 8 x 9 / 2 = 36

	X	X + 1	X + 2	X + 3	X + 4	X + 5	X + 6	X + 7	TOTAL
Earned Premium Pattern	1/36	2/36	3/36	4/36	5/36	6/36	7/36	8/36	36/36
Earned Premiums	$ 2,778	$ 5,556	$ 8,333	$ 11,111	$ 13,889	$ 16,667	$ 19,444	$ 22,222	$ 100,000
Cumulative Earnings	$ 2,778	$ 8,333	$ 16,667	$ 27,778	$ 41,667	$ 58,333	$ 77,778	$100,000	
Incurred Losses	$ 2,250	$ 5,250	$ 7,500	$ 9,000	$ 11,250	$ 15,000	$ 15,000	$ 9,750	$ 75,000
Cumulative Losses	$ 2,250	$ 7,500	$ 15,000	$ 24,000	$ 35,250	$ 50,250	$ 65,250	$ 75,000	
Policy Year X Loss Ratio	81%	90%	90%	86%	85%	86%	84%	75%	

EXTENDED WARRANTY **EXHIBIT F**

RATING PROBLEM CAUSED BY CHANGE IN MIX

EXAMPLE 1: CHANGE IN LOSS COSTS DUE TO CHANGE IN MIX - TPA ADDS REFRIGERATOR ACCOUNT

ORIGINAL MIX OF RISKS

	number of contracts	loss costs per contract	total loss costs
VCRs	200	$ 80	$ 16,000
Refrigerators	200	$ 200	$ 40,000
copiers	200	$ 100	$ 20,000
totals	600	$ 127	$ 76,000

CALCULATION OF SINGLE RATE

Loss cost per contract	=	$ 127
Expected loss ratio	=	75%
Gross rate per contract	=	$ 169

NEW MIX OF RISKS

	number of contracts	loss costs per contract	total loss costs
VCRs	200	$ 80	$ 16,000
Refrigerators	400	$ 200	$ 80,000
copiers	200	$ 100	$ 20,000
totals	800	$ 145	$ 116,000

CALCULATION OF SINGLE RATE

Loss cost per contract	=	$ 145
Expected loss ratio	=	75%
Gross rate per contract	=	$ 193

EXAMPLE 2: GROSS RATE BASED ON REVENUE

	Price of Warranty	Loss Costs	Insurer Expenses	Insurance Costs	IC as % of Price		Insurance Premium
Year 1	$ 50.00	$ 5.00	$ 2.00	$ 7.00	14%		$ 7.00
Year 2 - rate still 14% of price	$ 40.00	$ 5.00	$ 2.00	$ 7.00	18%		$ 5.60