Using the Public Access DFA Model: A Case Study

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Abstract

This paper describes the application of a publicly available property-liability insurance DFA model to an actual insurance company. The structure and key parameters of the model, as well as how to run the model, are explained in detail. A copy of the report to management of the company is included. The initial company reaction to this model was favorable. Management intends to use the model for such purposes as long term planning, capital allocation, reinsurance negotiations, competitor analysis and external communications with the regulatory and investment communities.

This paper describes the application of a DFA model to an actual insurance company. One goal of this work is to help actuaries learn about DFA by observing the use of a working model in a realistic setting. The model described in this paper is publicly available and accessible over the Internet. The company that generously allowed its data to be used in this exercise has asked to remain anonymous. Thus, minor modifications have been made to the data to help preserve the anonymity of this insurer. These changes do not affect the operation of the DFA model or obscure the data gathering process involved in running a DFA model.

Introduction

The DFA model used in this paper, termed Dynamo2, was developed by the actuarial consulting firm of Miller, Rapp, Herbers, & Terry, Inc. The model is accessible via their website (www.mrht.com) and requires only Microsoft Excel and @Risk in order to run. For those without access to @Risk, a limited version of the model can also be run solely in Excel. The Excel version is also useful for running a small number of iterations quickly to check the reasonableness of input values.

The general purpose of this model is to simulate a large number of possible outcomes from specific input data. By viewing the expected values and distributions of key variables, such as statutory surplus, premium-to-surplus ratios, and net income, the user can determine if these results are acceptable. If they are, then they validate the operating strategy of the company, subject to the general caveats of using DFA models. If not, then management can vary the input values to learn which changes would be effective in improving results to an acceptable level.

The model, when run using @Risk, allows the user to examine any of the stochastic parameters of interest determined as an @Risk function. Thus, users can view the randomly generated values for all of the unacceptable outcomes to see if any factor tended to be responsible for a significant number of these cases. For example, if a large percentage of the cases in which surplus falls below a minimum standard involved a high level of catastrophe losses, then the company may be able to reduce catastrophe exposure by revising its reinsurance arrangements or shifting its geographic distribution. Management could use the DFA model to test the effects these changes would have on the results by re-running the model with the revised input before deciding whether these approaches should be adopted.

The basic operation of the model is to generate insurance company cash flows and then evaluate the effect of these cash flows. The model integrates the cash flows from investments and underwriting, including catastrophes and taxes. The model consists of six different inter-related modules: underwriting, investments, catastrophes, taxation, an interest rate generator, and a payment

pattern generator. Values generated in one module are shared with the other modules in subsequent calculations.

This paper focuses on an application of DFA. In order to obtain a fuller understanding of DFA modeling, including the limitations of this approach, readers should refer to additional sources. Some useful sources are: D'Arcy, Gorvett, et. al. (1997), D'Arcy, Gorvett, Herbers and Hettinger (1997), CAS Committee on Valuation and Financial Analysis (1995), CAS DFA Handbook (1996) and the multi-part Actuarial Review series "How DFA Can Help the Property-Casualty Industry" (1996-1998).

The Test Company

The company used to test this model is a mid-sized property-liability insurer that operates nationwide. The major lines are private passenger and commercial automobile, commercial multi-peril, workers compensation and homeowners. The company has standard reinsurance contracts: excess of loss, quota share and catastrophe coverage. Since the company has been in operation for more than twenty years, enough historical information is available to generate loss payout triangles, frequency and severity trends, loss ratios by age of business, and the other input required for the DFA model.[1]

Once the company's data were received, they were input into Dynamo2. Results from the model were generated, and incorporated in a report which was transmitted to the company. That report is included as an Appendix to this paper -- in order to follow the progression of this project, the reader is advised to read the Appendix at this point. This initial report served as the basis for discussions on DFA at a meeting between the authors of this paper and representatives from the company; company personnel involved in these discussions included actuaries, investment personnel, and business planning staff. This report provides both an introduction to DFA and a starting point for a detailed dynamic financial analysis of the firm. The questions raised at that meeting will be covered later in this paper, after a detailed explanation of this DFA model.

The Model

The DFA model used in this paper starts with detailed underwriting and financial data showing the historical and current positions of the company, randomly selects values for 4,387 (!) stochastic variables, calculates the effect on the company of each of these selected values, and then produces summary

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[1] Generating and gathering the data needed to run this model required the efforts of many people at the company, including the Chief Financial Officer, the Chief Investment Officer and the Chief Actuary, as well as members of their staff. We are very grateful for their cooperation and willingness to supply us with their data; without their help, this paper could not have been written.

financial statements of the company for the next five years based on the combined effect of the random variables and other deterministic factors. All this represents a single iteration of the model. The model is set up to run multiple iterations of the model and analyze the distribution of the various outcomes.

Interest Rate Generator

The primary driver of this DFA model is the interest rate generator. Extensive work has been done in finance to develop sophisticated interest rate models. The interested reader is referred to Chan, Karolyi, Longstaff and Sanders (1992) and Hull (1997) for detailed descriptions of some of these models. In this DFA model, a relatively simple (in comparison with other interest rate models) single factor interest rate model is used, one derived by Cox, Ingersoll, and Ross (1985) (hereafter referred to as CIR). This simpler interest rate model was selected for two primary reasons. First, property-liability insurers are generally less exposed to interest rate risk than life insurers and banks, two industries for which much of the complex interest rate modeling has been performed. Thus, it is not quite as critical for property-liability insurers that interest rates be modeled as precisely. Second, and more importantly, it is vital that the users of the model fully understand the various components of the model. Actuaries are generally not very familiar with the terminology and approaches of interest rate modeling. Thus, beginning with a relatively straightforward interest rate model should allow the users to become more comfortable with the DFA model relatively quickly. Later, more sophisticated interest rate models can be incorporated and evaluated.

The CIR model describes the short term interest rate as a mean-reverting stochastic process. The CIR interest rate model was originally developed in a continuous-time framework; in that environment, the process dr for the instantaneous change in the level of the short-term risk-free interest rate is characterized by the equation

$$dr = \kappa(\theta - r)dt + \sigma\sqrt{r}dz$$

where θ = the long-run mean to which the interest rate reverts,
κ = the speed of reversion of the interest rate to its long-run mean,
r = the current (instantaneous) short-term interest rate,
σ = the volatility of the interest rate process (as expressed by the standard deviation), and
dz = a standard Wiener process (essentially, a random walk).

For purposes of this DFA model, a discrete-time version of this model is required. According to Cox, Ingersoll, and Ross (1985), the short-term interest rate, in discrete-time, follows a (non-central) chi-squared distribution with degrees

of freedom and non-centrality parameters being a function of the κ, θ, and σ parameters above. However, in this DFA model, we approximate the discrete-time form of the CIR model using the following formula:

$$\Delta r = a(b-r)\Delta t + s\sqrt{r}\,\epsilon$$

where Δr = the discrete-time (annual) change in the short-term interest rate,
Δt = the discrete time interval (one year), and
ϵ = a random sampling from a standard normal distribution.

The CIR model separates interest rate changes into two components, one deterministic component, $a(b-r)$, and one stochastic component, $sr^{0.5}\epsilon$. The deterministic component moves the current interest rate part way (represented by ***a***) back toward the long term mean ***b***. The further the current interest rate is from this long term mean, the greater the deterministic component of the interest rate movement. The stochastic component causes the interest rate to jump around this otherwise level trend back toward the mean. Since the stochastic component is multiplied by the square root of the current interest rate, when interest rates are low, the stochastic component is small. This reduces the likelihood that interest rates will become negative. (In the continuous time application of this model, interest rates cannot become negative because if the interest rate were ever to become zero, which a continuous line must cross before becoming negative, then the interest rate will have no stochastic component and will simply be pulled back toward the long term mean (it will actually become $a(b-r)$). However, in the discrete approximation of this model, negative interest rates can occasionally occur.)

In this interest rate model, the current interest rate is the actual short-term interest rate in the economy at the time the model is run. As of mid-March, 1998, 3 month Treasury bills, a common proxy for short term rates, were yielding 4.985%. Thus, in this model, $r(0)$ is set to 5%. The long-run mean, ***b***, is also set at 5%. (Empirical tests of the CIR model on historical data indicate a value for the long-run mean of approximately 8%. These tests are based largely on data from the 1980s. When ***b*** is set at 8% in this model, any investment strategy based on long-term bonds tends to under-perform a shorter-term portfolio, since interest rates would tend to move upward, depressing bond prices. To avoid introducing this bias, the long term mean was selected to be the same as the initial value of the short term interest rate. However, this is a variable that can, and should, be altered by the user to reflect individual views of interest rate movements, and to test the sensitivity of results to this variable.)

Since, under the above parameter value selections, the value of $b-r(0)$ is zero, the deterministic component of the interest rate change is zero in the first year. The stochastic component, then, determines the entire interest rate change.

In one run of the model, the value of ε in the first year was randomly selected by the model to be -1.00945. Thus, the calculation for the change in interest rates in that model run was:

$$\Delta r = s\sqrt{r}\,\epsilon = (0.0854)(\sqrt{0.05})(-1.00945) = -0.0193$$

Since the interest rate started at 0.05, the change of -0.0193 led to a new short-term interest rate of 0.0307, or 3.07%.

Once selected, the short term interest rate is used to generate the term structure of interest rates. Based on the interest rate model parameters selected, and upon the simulated short-term interest rate, rates on zero-coupon Treasury bonds are generated for each annual duration up to thirty years. This Treasury term structure is used to determine the market value of the company's bond holdings. The specific equations used to generate the term structure are taken from Cox, Ingersoll, and Ross (1985):

$$R(r,t,T) = \frac{rB(t,T) - \ln A(t,T)}{T - t}$$

where R is the yield-to-maturity at time t on a discount bond that matures at time T, and

$$A(t,T) = \left[\frac{2\gamma e^{[(\kappa+\lambda+\gamma)(T-t)]/2}}{(\kappa+\lambda+\gamma)(e^{\gamma(T-t)}-1)+2\gamma}\right]^{2\kappa\theta/\sigma^2}$$

$$B(t,T) = \frac{2(e^{\gamma(T-t)} - 1)}{(\kappa+\lambda+\gamma)(e^{\gamma(T-t)}-1)+2\gamma}$$

$$\gamma \equiv ((\kappa+\lambda)^2+2\sigma^2)^{1/2}$$

The short-term interest rate is also used to determine the general inflation rate, based on the following formula:

$$I_{CPI} = a+br+s\epsilon$$

where I_{CPI} is the general inflation rate,
a is a constant (set equal to 0),
b is a constant (set equal to .725),
r is the short term interest rate,
s is the standard deviation of the residuals (here 0.025), and
ϵ is a random sampling from the standard normal distribution.

The parameter values specified above were derived from regressions on the historical relationships between short-term interest rates and the consumer price index. Continuing the sample case illustrated above for the interest rate (3.07%), the value for $s\epsilon$ in one model run was randomly selected as -0.00459. Thus, the general inflation rate for this year was calculated as

$$I_{CPI} = 0.725(0.0307)-0.00459 = 0.0177$$

The inflation rate for each line of business is then calculated based on the simulated general inflation rate, according to the following formula:

$$I_{LOB} = a + b\, I_{CPI} + s\, \epsilon$$

where I_{LOB} is the line of business specific inflation rate,
a is a constant that varies by line,
b is a constant that varies by line,
I_{CPI} is the general inflation rate,
s is the standard deviation of the residuals, and
ϵ is a random sampling from the standard normal distribution.

The parameter values used to determine the line of business inflation rates in the DFA model are shown in the following table, along with a continuation of the sample model run described above, in which the short-term interest rate was 3.07% and the general inflation rate 1.77%. The parameter values were derived from regressions on the historical relationships between the consumer price index and line of business claims inflation rates.

Line of Business	Assumed Inflation in Payment Pattern	a	b	s	Sample Line of Business Inflation
Homeowners	0.052	0.032	.54	.0173	.037
PP Auto - Liability	0.067	0.047	.55	.0194	.060
PP Auto - Phys Dam	0.043	0.011	.88	.0307	.016
Comm Auto - Phys Dam	0.043	0.011	.88	.0307	.053
Comm Auto - Liab	0.067	0.047	.55	.0194	.074
CMP - Liab.	0.045	0.025	.55	.0147	.049
CMP - Prop.	0.045	0.025	.55	.0147	.028
Other Liab.	0.073	0.058	.40	.0206	.061
Other Liab. - Umbrella	0.073	0.058	.40	.0206	.101
WC	0.068	0.047	.58	.0250	.075

The line of business inflation rates are used for two purposes. First, they affect loss development. The initial loss reserves presume a specific inflation rate; the values selected for this run are listed on the above table. To the extent that the calculated line of business inflation rate differs from this value, loss payments will diverge from the initial loss reserves.

The second effect of the line of business inflation rates is on loss severity, which drives the need for future rate increases. In the present application of this model for this specific company, frequency was assumed to be stable, so the only factor that affects the projected pure premium is the severity trend. Thus, the line of business inflation rate determines the indicated rate level change.

Jurisdictional Risk

Each state poses unique advantages and disadvantages to the operation of an insurance company. Those advantages and disadvantages may take the form of judicial, legislative, or regulatory risk. For example, the likelihood of retroactive workers compensation benefit increases, mandated premium rebates, generous (for the policyholder) interpretations of contract provisions, and the ability to obtain rate increases all vary by state.

In this model, jurisdiction risk is reflected in two ways. First, each state has a range of "acceptable" rate changes -- that is, there is associated with each state

a range of rate changes that can be implemented without extraordinary company cost (in terms of time or money) and/or additional insurance department scrutiny. Generally, these ranges limit rate increases more than they do rate decreases, and the ranges are smaller in states with more restrictive regulation. The obvious effect of strict rate regulation is to prevent insurers from increasing rates to the degree they feel is necessary. However, a side effect of capping rate increases is to make companies more reluctant to lower rates as much as would be otherwise indicated if pure premiums are improving.

The other effect of jurisdictional risk is to introduce a lag in implementing indicated rate changes. This lag, shown in the model in terms of years, is longer in states with restrictive rate regulation. The lags indicated on the jurisdictional risk exhibit included in the Appendix are estimated averages for rate increases and decreases; the average lags in the model are multiplied by 1.50 for rate increases and by 0.50 for rate decreases.

The jurisdictional risk parameters are based on a Conning & Company study that ranks all states with respect to regulatory restrictiveness. States ranked as most restrictive were assigned the lowest acceptable rate ranges and the longest lags. The actual values were selected primarily based on the judgement of individuals with experience with rate filings in those states.

As an example of jurisdictional risk in this DFA model, the range of Homeowners rate changes in Massachusetts is from .85 to 1.06 (rates could be lowered by 15% or increased by 6% without significant additional company cost or regulatory scrutiny). Since the average lag is estimated to be ½ year, it would take 3 months to implement a decrease and 9 months to implement an increase. The company's distribution of writings countrywide is used to determine the overall impact of jurisdictional risk.

Aging Phenomenon

The model reflects the aging phenomenon by separating writings for each line of business into new business, first renewals, and then second and subsequent renewals. Under the aging phenomenon, loss ratios gradually decline with the length of time the policies have been in force with the company. For more details on this experience, see Woll (1987), D'Arcy and Doherty (1989), D'Arcy and Doherty (1990) and Feldblum (1996). One requirement that this approach introduces is the need for the company to supply exposures and losses broken down by age of the business. Although this allocation is not needed for any statutory or accounting reports, many firms maintain this information for internal reports, although not necessarily in the detail required for the DFA model. In this case, estimates of the loss frequency and severity by age of business can be tried and the resulting loss ratio indications checked for reasonableness, before finalizing these values. The overall result is that new business should have the highest loss ratio, first renewal business should have a slightly lower loss ratio,

and the remainder (second and subsequent renewals) should have the lowest loss ratio. Based on data published in D'Arcy and Doherty (1990), the loss ratio on new business ranged from 8 to 42 percentage points above the loss ratio on second and subsequent renewals.

In the model, the distribution of exposures by renewal category is determined as follows. For each line of business, renewal ratios are input that show what percentage of new, first renewal, and second and subsequent renewal business is renewed in the following year. Each renewal rate is applied to the appropriate business from the prior year to determine how many exposures are renewed. For example, for Homeowners, the new business renewal ratio is 60 percent, the first renewal business renewal ratio is 90 percent, and the second and subsequent renewal business is 95 percent. Thus, 60 percent of the exposures that were new business in 1997 become first renewal business in 1998 and 90 percent of first renewal exposures become second and subsequent renewal business in 1999. Thus, policy renewals are deterministic in this model. Since the company has a target growth rate, the number of new policies written in a given year is simply the number needed to achieve the growth target.

Underwriting Cycles

The premium level at which policies are written depends on the targeted growth rate and the position in the underwriting cycle. The property-liability insurance industry underwriting cycle has been the subject of extensive study and is recognized as being quite complex. In line with the goal of keeping this model as straightforward as possible, especially for this early version, the underwritng cycle is simpifled. However, it still reflects the different relationships of growth rates and price levels depending on the position of the cycle.

In this model, the underwriting cycle, which can vary /by line, is characterized as being in one of four conditions: mature hard, mature soft, immature hard and immature soft. In a hard market, rates can generally be increased somewhat and growth may still be obtainable. In a soft market, rates generally have to be reduced in order to grow. For each of the four cycle conditions, the probability of moving to another condition in the cycle (e.g., from mature soft to immature hard) is specified as an input. Thus, over the course of the simulation, the company moves through different phases in the underwriting cycle.

In the simulation described in the Appendix, Homeowners is initially in a soft market. Based on the parameters selected, there is a 70 percent chance of remaining in a soft market and a 30 percent chance of moving to an immature hard market in the next year. If the soft market continued and the company wanted to achieve a high growth rate, then the company would have to lower rates, or at least not fully implement any indicated rate increases, in the next year.

Catastrophes

A catastrophe is defined as any natural disaster causing in excess of $25 million in insured losses. The total number of catastrophes countrywide is simulated based on a Poisson distribution, and then assigned to a "focal point" state based on historical catastrophe experience. The size of each catastrophe is then simulated based on a lognormal distribution, the parameters of which vary according to the identity of the focal point state. For each simulated catastrophe, the contagion effect of the catastrophic losses from the focal point to other states, and by property line of business, is determined based on historical relationships. Finally, the effect of these catastrophes on the company is determined by the market share of the company in each state, by line of business.

For example, in Florida the probability of any number of catastrophes occurring is determined based on a Poisson distribution with a mean of 0.6667. This value, relative to the parameters for all other states, determines the likelihood of a catastrophe being assigned to Florida. For each simulated catastrophe, the size is then determined based on the lognormal distribution with a mean parameter of 2.7697 (in millions) and a variance parameter of 1.1563. For each catastrophe in which Florida is the focal point, 86 percent of the loss is assumed to be incurred in Florida, with the remaining 14 percent distributed to nearby states. All of these parameters were calculated based on data from Property Claim Services over the period 1949-1995. As an example, in one iteration of the model, no catastrophes occurred in Florida in 4 of the 5 years simulated; in the fifth year (2001), two catastrophes occurred, one causing $143 million in insured losses and the other $269 million in losses.

It should be noted that the catastrophe module in this DFA model is meant to produce reasonable estimates, and is not intended to replace the more rigorous catastrophe models that are available. In fact, it is possible that the results from other commercially available catastrophe packages could be used in this DFA model.

Investment Results

Investment results for both fixed income securities and equities are determined in the investment module. For bonds, both the statutory value and the market values are calculated for each category of bond (Government, corporate, municipal) and for each maturity segment indicated in the Annual Statement (e.g., one year or less, one to five years, etc.). The market value is determined based on the term structure of interest rates obtained in the interest rate generator module. The cash flows on bonds consider interest rates, coupon rates and default rates, generated stochastically based on historical patterns.

The market value of equities is determined from a simulation based on the Capital Asset Pricing Model. The rate of return on equities is determined in a two

step approach. The initial expected market return is the risk free rate, as obtained in the interest rate generator, plus a market risk premium of 8.5% (historical average for 1926-1996). The adjusted market return is the initial expected return minus 4 times the simulated change in the short term interest rate. A random component based on a normal distribution with a mean of 0 and a standard deviation of 15 percent is generated and added to the adjusted market return to determine the overall market return for each year. The return for the company is then determined by applying the equity beta, which is an input value.

Collecting Data

One decision that needs to be made is how to deal with multiple companies operating under the same management. Many insurers have subsidiaries, but operations are coordinated within the group. In this case, the model should be run on the group as a whole, rather than for each individual company. However, if more detail is needed, then each company can be modeled separately.

The primary source of input data for the model is the Annual Statement. However, additional information is also necessary, which requires the company to provide, or generate, some internal management reports. In addition, the company needs to provide information about exposure growth anticipated, by line for the next five years, and any shift in investment allocations that are contemplated.

Examples of the specific data requirements are illustrated on the exhibits included in the Appendix. In a typical application of this model, some of the more problematic data areas might potentially include exposures and rates by renewal category, historic loss ratios by renewal category, and various aggregation issues (the trade-off between data volume and its homogeneity when examining lines and types of business). Also, in order to generate more credible cash flows, or to deal with homogeneous data, Annual Statement lines of business can be aggregated or split into separate components, as needed.

Running the Model

The first step in running the model (after the company-specific data has been input) is to determine where the industry stands in the underwriting cycle for each line of business. It is presumed that the insurance industry follows a time dependent cycle of competitiveness. In a soft market, premium increases tend to significantly reduce market share. Conversely in a hard market, policyholders find it difficult to obtain insurance, so it is easier for an insurer to increase market share.

The next step is to determine the number of iterations to be run. The higher

the number of iterations, the more stable the distribution of outcomes is likely to be, but the program will take correspondingly longer to run. As a word of advice, when beginning to learn the program, this number should be kept small (5-10) to minimize the time needed to complete the run. Frequently, it will be apparent from even that limited output that something is amiss. After adjusting the input data and the parameters until the user feels confident that they are reasonable, a larger number of iterations (e.g., 1,000 or more) should be run to obtain the full benefit of the DFA model.

At this point, reasonability checks should be performed to make sure the input values are realistic. One check is to multiply frequency by severity and divide the product by the average premium, for each age of business, to see if the implied loss ratios had the appropriate relationship (new business highest, second and subsequent renewal the lowest). Another check is that the average catastrophe losses are within expected bounds.

The next step is to determine exactly what output is desired. Any value that appears in the sections of the model where calculations are performed, or any parameter generated by the model, is a potential output value. Premiums, surplus, loss and operating ratios, investment returns, catastrophe losses, interest rates, inflation rates, and regulatory ratios are all potentially useful output values. In some cases additional detail might be desired. For example, the loss ratio by line, by year and by age of business, direct, ceded, or net, could all be listed as output variables. To determine the cause of a potentially high loss ratio, the frequencies, severities, number of exposures and average premiums could also be listed. However, at some point the magnitude of the output data could become unmanageable. Since the model provides for ten lines of business forecasted for the next five years, and exposures are maintained for new business, first renewals, and second and subsequent renewals, if each value were shown for direct, ceded and net values, there would be 450 loss ratios (plus frequencies, severities, and exposures) for each iteration. Finding the cause of any adverse indications would be a major chore. Thus, care needs to be exercised to keep the output manageable, especially when the model is being fine-tuned. The exhibits included in the Appendix are indicative of the types of output that can be helpful.

Changing the Model's Parameters

Since the DFA model is built in a spreadsheet environment, changing the model's parameters is straightforward. The user merely needs to know which input screen contains the key variables. The following table lists some of these key variables, and their locations in the spreadsheet model.

Variable	Description	Sheet Location	Cell Reference
U/W Cycle Position	Users viewpoint on current market conditions.	General Input	C6 to C15
Growth Rates	Expected growth rates in exposures	Premium Input	Row 22
Renewal Ratio		Premium Input	Rows 30-32
Expense Provisions	Commissions, General, Other Acq., Taxes, Dividends, and Nonrecurring Expenses	Premium Input	Rows 42, 46, 50, 54, 57, 59
Q/S Ceding Commission		Premium Input	Row 62
Exposure Changes	Use to Change Exposures and Market Shares by State	Exposure Input	
Selected 1997 Severities		Loss Input	Rows 167 to 169
Selected 1997 Frequencies		Loss Input	Rows 196 to 198
Selected ULAE Provisions		Loss Input	Rows 227 to 233
Q/S Arrangements		Loss Input	Rows 255-259
XOL Arrangements	Includes Attachment Points and Cost of Reinsurance	Loss Input	Rows 268 to 297
Stop Loss Arrangements	Includes Attachment Points and Cost of Reinsurance	Loss Input	Rows 349 to 353
Cat. Re Arrangements	Includes Attachment Points and Cost of Reinsurance	Loss Input	Rows 359 to 363
Stock Betas		Investment Input	Rows 95 to 98
Capital Infusions		Investment Input	Rows 86 to 91
Reinvestment Allocations	How Investment Income is Reinvested	Investment Input	Rows 109 to 125
Long-Run Interest Rate		Interest Generator	C27
Current Interest Rate		Interest Generator	C29
General Inflation Parameters		Interest Generator	C35 to C37
LOB Inflation Parameters		Interest Generator	Rows 54 to 56

U/W Cycle Parameters	Includes Probability of Changing Market Condition and Supply/Demand Curves	U/W Cycle Generator	C7 to H34

Initial Reaction of the Company to the DFA Report

First Impressions

The company's first direct exposure to the DFA model occurred at a meeting between the authors and representatives of the company's actuarial, investment, and business planning departments. At this time the report included in the Appendix was delivered and a detailed explanation of the DFA model was presented. Many questions were raised at that point, a majority of which related to asking for an explanation of how the model worked. However, there were also a number of questions that will lead to model improvements and enhancements. Overall, company personnel were enthusiastic about the model and have hopes of using it in the future for strategic planning purposes. They also saw it as a tool to help the different divisions of the company -- actuarial, financial, investment, and planning -- work together. Finally, the company liked the software platform on which the DFA model is based. The Excel spreadsheet format makes the model user-friendly and simple to change and enhance, and allows the user to examine the inner workings of the model in a non-black box environment.

Concerns

The company expressed certain concerns regarding the model and the results that were initially supplied to them. It was evident that the **Base Case** indications were unacceptable (primarily due to the high growth goals of the company); however, the managers felt that constraining growth was not a viable alternative. Other options were explored, including increasing the new business renewal rate. For Homeowners this value was 60 percent. Raising it to 80-90 percent caused some improvement, but not enough to turn results around completely. Another change was to modify the maximum ceded under the aggregate reinsurance contract. This also had a favorable effect on forecasted results.

In order to gain a better understanding of what was causing the results, two additional values, the short term interest rate and catastrophe losses, were added to the output page and the simulation re-run during the meeting. The ability to modify the model and quickly see the impact of the changes was viewed very favorably.

Some of the questions raised indicated the need for enhancements in future versions of the model. One question related to prepayments on bonds and CMOs as a function of interest rate changes. Another wanted to examine the effect of changing growth patterns by state, to examine the effect on the company of

growing in a particular area, in this case a high catastrophic-risk state.

The company would like to use a DFA model for capital allocation. The current model examines the riskiness of the company as a whole. It was suggested that separate runs could be performed for separate business segments (commercial/personal lines or by regions) in order to determine capital needs.

Another question related to the ability to plug in output from sophisticated fixed income security and catastrophe software into the DFA model. When Dynamo2 was originally designed, it was anticipated that many users would have access to different catastrophe models and might want to use those instead of the catastrophe module built in to this model. It is apparent from this question that similar issues relate to the investment modules.

Several questions related to the investment allocation. Currently the investment allocation applies to new money. If the cash flow requires assets to be sold, this is done proportionally. The investment managers would like to be able to reallocate the entire investment portfolio and indicate which assets should be sold, if necessary.

Another issue raised was the ability to focus on the difference between the expected values indicated by running the model and actual results. Managers wanted to be able to see why results differed from what was projected, so that they could better understand what they did right if a year was better than projected, or what went wrong if actual results were worse than expected. This DFA model allows this to occur, but requires the user to retain detailed output from the projections.

In examining the DFA runs, many questions were raised about what might have been causing adverse experience. It was suggested that the program be revised to capture detailed financial data on any simulation where surplus fell below a certain level. Thus, the managers could look at what caused the problems in order to better avoid them.

Applications

In addition to expressing the desire to use the DFA model for capital allocation purposes, the company also discussed the possibility of using the model to look at other companies. This might allow them to gain insights into their competitive position in the industry. The company also sees the model as a significant strategic planning tool -- for example, in evaluating how growth in one particular state affects the overall company. Another use was in reinsurance contract negotiations, where the expected effect of different limits or other contract terms could be evaluated. Finally, the CFO of the company expressed an interest in using the model, not only internally, but also in external communications. The investment community was specifically mentioned in this regard, but other possibilities also include regulators, rating agencies, and reinsurers.

Variable Adjustments

During the presentation, several different computers loaded with the DFA model were available, allowing the managers to break into groups and test different DFA scenarios. For example, one group of managers adjusted the interest rate parameters. Specifically, they raised the long-run mean interest rate level to 10 percent and reduced the volatility parameter to 0, to observe the effect of increasing interest rates for a small sample of runs. Other groups ran the model after adjusting one or more of exposures, losses, the reinsurance program, catastrophe parameters, exposure growth assumptions, and investment variables. In still other cases, certain stochastic variables were "shut off" -- e.g., by setting the volatility parameter of the variable equal to zero. This allowed the user the opportunity to see the impact of certain stochastic variables without introducing additional "noise" from those variables that were turned off.

In general, this exercise was seen as beneficial by all the groups, not just the actuaries. Having a viable DFA model will serve to help the different areas of the company work more closely together, and facilitate coordinating the efforts of the various areas.

Presentation to Upper Management

Members of the group raised several questions about how this model should be presented to the upper management of the company. In addition to needing to get comfortable with the model, they also wanted to be able to focus on how actual results differed from the projections. To do this, it was suggested that they might use the model to project results for last year (run the model without including data for the latest year and then compare the actual results with the output from the model). In addition, they wanted to print out key financial exhibits for the situations that were unacceptable, so that they could focus on what went wrong in those cases. This feature is available in the @Risk version of the model, but currently not in the Excel version.

Examining the effect of a company's use of a DFA model is a long term prospect. Modifications and enhancements to the model would be expected, as the company asks new questions after seeing initial indications. While it is too early to provide any information about the final effect of this process, the initial meeting and response suggest that the DFA model will provide a very useful management tool.

Future Enhancements

Enhancement of the public-access DFA model is an on-going process. Input and suggestions from users and other interested parties are welcomed and encouraged. The following items represent some of the enhancements to the model which are currently being considered.

- Determine the impact of callability provisions and other options embedded in insurer bond holdings. This will require identification of those bonds in the insurer's portfolio that have such options, information regarding when during the life of the bond the option is exercisable, and the call premium or other parameters associated with the embedded option. The valuation framework already incorporated within the DFA model -- i.e., market valuation of fixed-income securities based on the simulated term structure of interest rates -- will form the basis for the endogenous decision whether or not to exercise the option.
- Explicitly value mortgage-backed securities. These securities are comprising ever-larger proportions of insurer portfolios. In particular, for example, the prepayment risk associated with collateralized mortgage obligations will be simulated using the Public Securities Association (PSA) model of monthly prepayments on residential mortgages, with the parameters of the PSA model being impacted by simulated general economic conditions.
- Add state and/or regional detail in the underwriting module to facilitate measuring the effect of, for example, a change in the growth rate for a particular state.
- Continue to develop the underwriting cycle module and the associated demand curves, including their impact on business retention rates and jurisdictional risk.
- Implement correlations for the frequency and severity figures for business of different ages within a given line and between lines of business.
- Add tax-loss carry-forwards and carry-backs to the tax module.
- Add a module which produces risk-based capital results.

Conclusion

DFA is becoming an important concept for property-liability insurers, and it is likely that actuaries will be called upon to participate in, if not lead, this endeavor. This paper describes one DFA model. This model is publicly available and its use is encouraged, and comments on its effectiveness, limitations and potential improvements are actively solicited. While DFA for property-liability insurers is in a nascent stage, the intial reaction of company management to the application of this model to their operations was very favorable and provided evidence that DFA will prove valuable to the industry.

References

CAS Valuation and Financial Analysis Committee, Subcommittee on the DFA Handbook, 1996, CAS Dynamic Financial Analysis Handbook, *Casualty Actuarial Society Forum*, Winter 1996, pp. 1-72.

CAS Valuation and Financial Analysis Committee, Subcommittee on Dynamic Financial Models, 1995, "Dynamic Financial Models of Property/Casualty Insurers," *Casualty Actuarial Society Forum*, Fall 1995, pp. 93-127.

Chan, K, G. Karolyi, F. Longstaff, and A. Sanders, 1992, "An Empirical Comparison of Alternative Models of the Short-Term Interest Rate," *Journal of Finance*, 48: 1209-1227.

Chen, R. and L. Scott, 1997, "Pricing and Hedging Interest Rate Risks with the Multi-Factor Cox-Ingersoll-Ross Model," Chapter 9 in Fabozzi (ed.), *Advances in Fixed Income Valuation Modeling and Risk Management*

Cox, J. J. Ingersoll, and S. Ross, 1985, "A Theory of the Term Structure of Interest Rates," *Econometrica*, 53: 385-407.

D'Arcy, S. and N. Doherty, 1989, "The Aging Phenomenon and Insurance Prices," *Proceedings of the Casualty Actuarial Society*, 76: 24-44.

D'Arcy, S. and N. Doherty, 1990, "Adverse Selection, Private Information and Lowballing in Insurance Markets," *Journal of Business*, 63:145-164.

D'Arcy, S. P., R. W. Gorvett, J. A. Herbers, and T. E. Hettinger, 1997, "Building a Dynamic Financial Analysis Model that Flies," *Contingencies*, Vol. 9, No. 6 (November/December 1997), pp. 40-45.

D'Arcy, S. P., R. W. Gorvett, J. A. Herbers, T. E. Hettinger, S. G. Lehmann, and M. J. Miller, 1997, "Building a Public Access PC-Based DFA Model," *Casualty Actuarial Society Forum*, Fall 1997, Vol. 2, pp. 1-40.

Feldblum, S., 1996, "Personal Auto Premiums: An Asset Share Pricing Approach," *Proceedings of the Casualty Actuarial Society*, 83: 190-296.

Hull, J. C. 1997, *Options, Futures, and Other Derivatives* Third Edition, Prentice Hall, Upper Saddle River, NJ.

Woll, R. G., 1987, "Insurance Profits: Keeping Score," *Financial Analysis of Insurance Companies,* Casualty Actuarial Society Discussion Paper Program, pp. 446-533.

Application of a Dynamic Financial Analysis Model to the Test Company: Report to Management

Introduction

The purpose of this report is to describe and explain a Dynamic Financial Analysis (DFA) model that represents a new management tool for insurance companies. The attached exhibits should be viewed as illustrative examples of output from running this model. These results are not a full blown dynamic financial analysis of the company, but represent a starting point for performing an analysis.

DFA, in essence, represents an enhanced approach to the traditional planning function undertaken by insurance companies. It provides a far more effective tool for forecasting future financial and operating conditions of an insurance company than prior methods for two primary reasons. First, the interactions between the underwriting and investment sides of the insurance business are formally integrated. Second, this approach utilizes advances in computer technology and modeling techniques to provide almost instantaneous feedback to decision makers, allowing for the evaluation of numerous operating alternatives.

The specific innovations to the planning process that are incorporated in DFA modeling are:

1) DFA provides a probability distribution of likely outcomes, rather than a single expected value forecast

2) DFA incorporates the correlations among lines of business, between loss reserve adequacy and rate adequacy, and between the investment and underwriting sides of insurance operations

3) by utilizing the technology of personal computers and common software, DFA models can be run by the users many times with different assumptions and different parameters, in order to see the effect that changes in the model or in operations can have on the results

Caveats

Although the output generated by a DFA model can look impressive, with detailed exhibits indicating the expected results for years into the future, and other exhibits indicating the probabilities of financial distress, the user must keep in mind

that the output is only as good as the model and the underlying assumptions. DFA modeling has several specific limitations. First, models are simplified representations of reality. Models must be simplified in order to be useful; if all the factors that could possibly affect an insurer were included in a model, then it would just be too complex to be a useful model. When developing a model, the most relevant factors at that time are included. However, if conditions were to change markedly, which is entirely possible, then other factors that were omitted from the model could become important, affecting the accuracy of the results of the model. For example, during the 1920s, insurance profit margins were established that effectively ignored investment income. At this time interest rates were low (1-2%) and most business was in the short-tailed property lines. However, by the 1960s, interest rates were much higher and long-tailed lines accounted for almost 2/3rds of written premiums. Thus, it was no longer feasible to ignore the effect of interest rates on underwriting profit margins.

Second, some factors are important, but because they are beyond the scope of an actuarial analysis, they are omitted from the model. For example, fraud by managers is a leading cause of insurance insolvency. However, all insurers are not equally exposed to fraudulent behavior. Whether fraud is likely to occur (or is currently occurring) at a particular insurer, is not something an actuary is qualified to ascertain. Thus, any financial effects from fraudulent behavior are simply omitted from the model. Other examples of omitted factors that definitely could have a significant effect on insurance operations include a change in the tax code, repeal of the McCarran-Ferguson Act, a major shift in the application of a legal doctrine or the risk of a line of business being socialized by a state, province or federal government. Thus, the range of possible outcomes from operating an insurance company is actually greater than a DFA model would indicate; the model is designed to account only for risks that can be realistically quantified.

Finally, the values used as input in the model are derived from past experience and current operational plans. To the extent that something happens in the future that is completely out of line with past events, the model will be inaccurate. For example, the size of a specific catastrophe is based on a lognormal distribution with the parameter values based on experience over the period 1949-1995 (adjusted for inflation). However, if this process had been used just prior to 1992, the chance of two events occurring within the next 2 ½ years, both of which exceeded the largest previous loss by a factor of more than 2, would have been extremely small. However, Hurricane Andrew caused $15.5 billion in losses in August 1992 and the Northridge earthquake caused $12.5 billion in insured losses in January 1994. The largest insured loss prior to that was Hurricane Hugo, which had caused $4.2 billion in losses in 1989. Also, if changes in any operations occur, then the results would not be valid. Thus, the proper use of a DFA model is to continue to update the model as conditions or operations change.

With these caveats in mind, let's proceed to a description of the DFA model.

Dynamo2

The specific DFA model that is applied to the company's financial data is termed **Dynamo2**, which is a public access DFA model developed by the actuarial consulting firm Miller, Rapp, Herbers & Terry, Inc. This model is designed to be run on personal computers with Microsoft Excel and @Risk, two widely available software programs. The model operates by running a large number of iterations, with each iteration representing a single possible outcome. Each iteration, in turn, reflects the results of hundreds of different, but sometimes correlated, random factors that affect different parts of the insurer's operations. Selected values from each simulation are stored and used to calculate the mean and the distribution of the indicated results.

The model consists of several different modules, each of which calculates a component of the model indications. Separate modules are included for investments, catastrophes, underwriting, taxation, the interest rate generator and loss reserve development. The model allows for ten different lines of business:

- Homeowners
- Private Passenger Auto Liability
- Private Passenger Auto Physical Damages
- Commercial Auto Liability
- Commercial Auto Physical Damage
- Commercial Multi-Peril - Liability (which includes Professional Liability)
- Commercial Multi-Peril - Property (including Special Property)
- Other Liability
- Other Liability - Umbrella
- Workers Compensation

For each line of business, the underwriting gain or loss is calculated separately for: 1) new business, 2) 1st renewal business and 3) 2nd and subsequent renewals. This division is provided to reflect the aging phenomenon, in which loss experience improves with the length of time a policyholder has been with a company. These three categories are then added to calculate underwriting results on a direct, ceded and net basis.

The values for each simulation are shared among the different modules. Thus, if the random number generator produces a high value for the short term interest rate, this high interest rate is used in the investment module as well as the underwriting module. Similarly, a high value for catastrophes in the catastrophe module carries through to the reinsurance and underwriting modules.

The primary risks that are reflected in the model are:

1) Pricing risk
2) Loss reserve development risk
3) Catastrophe risk
4) Investment risk

Pricing risk is composed of a number of interrelated components. First, loss frequency and severity are both subject to random variation. Second, inflation affects loss severity. This effect is correlated with the short term interest rate, and is line of business specific. The indicated rate level change depends on the relationship between the current premiums and the premium indicated by inflationary impact on loss severity by line. However, jurisdictional risk (which is state specific) affects the ability of an insurer to make rate changes. Jurisdictional risk is reflected in both a range of allowable rate changes (lower increases would be allowed in jurisdictions with stringent regulation) and the time lag for incorporating new rates (it would take longer to raise rates in a state with restrictive regulation).

Finally, pricing risk is subject to the underwriting cycle. The underwriting cycle is simplified to be represented by four distinct phases: mature hard market (price increases can be taken with a minimal effect on market share), mature soft market (price increases significantly reduce market share), immature hard market (the market is starting to harden) and immature soft market (the market is beginning to soften). For each phase, the supply/demand function for insurance is different. Also, for each phase, there is a different probability distribution that represents the chance of remaining in that stage or of moving to another stage for the next year.

The loss reserves input into the model should be the reserves indicated based on an actuarial analysis of loss development, not necessarily the carried reserves. For this project, we relied on the reserve analysis performed by the company without independent audit, review or verification. Assuming the reserve levels are accurate, the expected reserve development would be zero. However, reserve development is still subject to random variation and to inflation. The indicated loss reserves contain an implied inflation factor. To the extent that inflation differs from this level, there will be a systematic effect on reserve development. Even if inflation were to occur at the expected level, then remaining random errors will affect the development.

Catastrophe risk is included in the model by the use of a two step approach. A poisson distribution is used to generate the number of catastrophes (of all types) that occur in a given year. Then, each catastrophe that occurs is assigned, based on historical patterns, to a specific geographical area (one state that is the primary focus of the loss). Next, the size of each catastrophe is determined based on a lognormal distribution, with the parameters determined based on the primary state

in which the loss occurs. Finally, the contagion effect of the loss on other states, again based on historical patterns, is determined so that the total catastrophe loss for the year in each state can be determined. The amount of each loss that is ceded is determined based on the company's catastrophe insurance program, which allows calculation of the direct, ceded and net experience.

The investment risk reflects the combined effect of bonds and stocks. Statutory bond values are determined based on the interest rates in effect when the bond was purchased and the amortization schedule, plus defaults that occur randomly based on historical patterns. Market values of bonds are a function of the current interest rates as simulated. Stock market values are based on the starting values and the randomly generated rates of return. Equity returns are based on simulated changes in interest rates, and include significant random variation, with the parameters determined based on historical rates of return.

Model Input

The model requires extensive financial data as input. Some of the historical data required for input can be obtained from the Annual Statement, but in other cases direct, rather than net, data are preferable, which must be drawn from additional reports. In this case, the input was provided by the company, including reports on direct and net premiums, exposures by line and by age of business, and premium level, loss frequency, loss severity, market share and renewal rates by line. In addition, planned growth by line of business and the user's perception of the phase of the underwriting cycle by line is input. From the Annual Statement the input values include the statutory value of assets and liabilities and the current investment allocations. The expense provisions were taken from the Insurance Expense Exhibit. Loss development was developed based on direct triangles provided by the company. The company also provided a detailed listing of reinsurance contracts and the beta for equities.

Attached are copies of the data input for this program for the company as a whole and for the Homeowners line of business. This line of business data illustrates the by line information required to run this model. These exhibits include:

- **General Input** - selections for the current market conditions by line
- **Loss Triangle Input** - historical direct paid loss development by line
- **Underwriting Module Input** - new and renewal exposures written and premium levels for the last two years, projected growth rates for the next five years, renewal ratios by age of business and expense factors, all by line of business

- **Exposure Distribution** - current number of exposures written by state, by line and historic exposures written by line

- **Market Share** - market share estimates for property coverage (for catastrophe losses)

- **Loss Development Factor Selection** - the selected paid loss development factors based on the historic loss development patterns (used to generate cash flows)

- **Loss Information Input** - selected ultimate losses and allocated loss adjustment expenses and claim counts, direct and net paid losses and earned premium, loss frequencies and severities (in total and by age of business), unallocated loss adjustment expense factors, and reinsurance treaties, all by line of business

- **Investment Input** - statutory and market values of assets by annual statement category, coupon and dividend rates and equity betas

Model Output

The ability to generate an almost infinite number of reports from a DFA model is both a strength and a weakness of this approach. Care has to be taken to assure that the user is not overwhelmed with information and, therefore, unable to utilize the results of the model in any reasonable manner. Thus, the initial report focuses on a limited number of key variables for an insurer, and indicates the expected values as well as the distribution of outcomes from the model. Also, examples of more detailed reports for a few selected outcomes are shown to illustrate the potential of a DFA model to troubleshoot particular problems that contributed to adverse financial results.

The true benefit of a DFA model is the ability it gives to the decision makers in an insurance company to test out various financial and operating strategies and see what the indicated effect is on both expected returns and the distribution of results. Unlike the planning process that has previously been used by many insurers, which tended to be done annually or on some other regular schedule, a DFA model can be a regular management tool that can be rerun whenever a major decision needs to be made. Thus, the goal of our first meeting will be to demonstrate the use of this DFA model so that management can decide what values to change.

The output from the DFA model based on the initial input values (as shown on the input exhibits) for a run with 50 iterations using the Excel option are shown in the exhibits marketed **Base Case**. The results for each simulation, and the

average values, are shown for statutory surplus, the premium to surplus ratio, the operating ratio and the net loss ratio for all lines combined for each year 1998-2002. In this run, the average value of the surplus over all 50 iterations was $177 million for 1998, $173 million for 1999, $167 million for 2000, $150 million for 2001 and $133 million for 2002. Since the simulation included 50 iterations, it is difficult to draw conclusions from the individual results. The distribution of these results for surplus, premium to surplus ratio, operating ratio and loss ratio for the year 2002 are shown in the graphs. These illustrate the distribution of outcomes to allow the user to determine the likelihood of specific outcomes, either bad (surplus below a minimum level, premium to surplus ratio over an acceptable target, etc.) or favorable (operating ratio below a target level).

In addition, detailed data can be analyzed for selected outcomes. For example, the statutory balance sheet, the IRIS test results and the loss ratios on a direct, ceded and net basis by age of business are shown for an example of a single iteration. If desired, even more detailed data (frequency and severity, interest rate level, number, size and distribution of catastrophes, etc.) can be examined. This allows the user to troubleshoot the unfavorable outcomes to determine what strategies would work best to reduce the likelihood of their occurrence.

It is obvious from looking at the average values and the distributions from this initial run that the results are very unfavorable. The statutory surplus declines, on average, and the premium to surplus ratios increase to unacceptable levels. Loss ratios, especially in the latter years of the forecast period, increase to over 75 percent. These indications, while causing concern, are actually exactly what is needed to illustrate the potential benefits of a DFA model. Since the forecasted values are unacceptable, then changes should be made to generate more favorable indications. What changes should be made are up to management, and DFA is the tool to help management access the effect of particular changes.

For example, one cause of the increase in loss ratios is the amount of new business that is written to meet the growth rates initially input into the model. This growth, coupled with relatively low retention rates, requires the company to write a large amount of new business each year, with its corresponding high loss ratios. The **Base Case** model projects exposure growth of 5-10% for all lines of business for the years 2000-2002. This compares with a negative growth forecast for 1998 and low growth, 1-3.5%, for 1999. In this example, detailed loss and exposure results are shown for new Homeowners business so that the effect of rapid growth in exposures can be examined. In an effort to grow at a 10% rate, the number of new Homeowners exposures in 2002 is 16,119. (See the exhibit on New Business for Homeowners) Since the loss ratio on this new business is expected to be 26 percentage points higher than long term business (see last line on this sheet), this high growth imposes a significant penalty on the company.

The effect of reducing these growth rates can be seen in the exhibits

marked **Constrained Growth**. The only difference between the initial run and this run is that the growth rates were held to a maximum of 2 percent per year. The indications are much more favorable in this situation. In this case the average values of surplus are $176 million, $177 million, $183 million, $192 million and $203 million, for 1998-2002 respectively. Although the distributions illustrated on the graphs for 2002 still show unacceptable results in some situations, the average values are much more feasible than in the **Base Case**. The effect of constraining the growth can be seen on the New Business for Homeowners exhibit. In this case, the number of new exposures is only 7,177, compared to 16,119 at the 10 percent growth rate.

The output illustrated in the two cases discussed above was based on runs of 50 iterations each using the Excel option. The model also can be run using @Risk, which provides significant additional capabilities. The **Base Case** model was also run using @Risk with 1000 iterations. The numerical values of statutory surplus, displayed both in percentiles and graphically for 1998-2002, are shown as additional exhibits.

What other changes could or should be made? Such items as policy renewal rates, expense provisions, the rate at which premium is earned (which reflects policy term), exposure distribution by state, projected average frequencies and severities by age of business, reinsurance provisions (including attachment points, costs and ceding commissions) and investment provisions (including allocation of new investments, stock betas and surplus additions) can all be easily manipulated and evaluated by the use of this DFA model.

The primary point of this report is that DFA is a management tool. The decision makers in the company should take the initiative in proposing changes and analyzing the effects. The goal of the meeting with the company is to explain and demonstrate the DFA model so that managers can effectively use this tool. Much of the meeting will be devoted to hands-on work with the model so you can evaluate its effectiveness and we can see what works for you and in what ways the model needs to be improved to facilitate its use as a management planning tool.

Index of Exhibits

Exhibit A-1

Company Name: ABC Insurance Company

First Year to be Modeled: 1998

Current Market Conditions:

HMP	Mature Soft
PPAL	Mature Soft
APD-P	Mature Soft
APD-C	Mature Soft
CAL	Mature Soft
CMP-L	Mature Soft
CMP-P	Mature Soft
OL	Mature Soft
OL-U	Mature Soft
WC	Mature Hard

Simulation Technique

○ @Risk ◉ Excel

☐ Cat Module De-activated

General Input

Exhibit A-2

Loss Triangle Input

Paid Losses & ALAE Direct & Assumed

Line of Business: HMP

Accident Year	Evaluations in Months 12	24	36	48	60	72	84	96	108	120	132
1986	-	7,390,982	7,667,373	7,831,090	7,834,571	7,840,897	7,841,882	7,841,882	7,843,008	7,843,296	7,843,296
1987	4,782,601	5,948,892	6,074,429	6,200,184	6,503,498	6,210,370	6,210,489	6,211,047	6,212,269	6,212,269	6,212,269
1988	3,429,881	4,540,502	4,682,931	4,776,067	4,775,599	4,777,092	4,776,204	4,775,904	4,775,654	4,775,304	-
1989	4,428,674	6,216,163	6,302,820	6,338,508	6,320,451	6,319,874	6,320,461	6,278,231	6,278,447	-	-
1990	4,905,508	6,491,617	6,672,882	7,304,431	7,341,614	7,371,753	7,401,759	7,433,900	-	-	-
1991	6,136,783	8,546,891	8,735,593	8,828,725	8,868,053	8,875,065	8,875,733	-	-	-	-
1992	6,623,741	9,339,087	9,578,819	9,803,573	9,825,756	9,821,798	-	-	-	-	-
1993	9,318,694	12,752,572	13,100,827	13,345,650	13,355,820	-	-	-	-	-	-
1994	9,675,280	12,400,427	12,631,087	12,720,083	-	-	-	-	-	-	-
1995	10,819,650	15,166,286	15,813,794	-	-	-	-	-	-	-	-
1996	14,372,636	17,806,453	-	-	-	-	-	-	-	-	-
1997	19,593,642	-	-	-	-	-	-	-	-	-	-

Underwriting Module Input Page
Homeowners Multiple Peril

Exhibit A-3

	2nd Prior Year 1996	1st Prior Year 1997	1st Year 1998	2nd Year 1999	3rd Year 2000	4th Year 2001	5th Year 2002
Premiums Input							
1. Written Exposure Input							
a. New Business	10,740	9,569					
b. 1st Renewal	9,095	9,591					
c. 2nd & Subsequent Renewal	37,541	42,166					
d. Total	57,376	61,326					
2. Average Annual Rate Input							
a. New Business	388	377					
b. 1st Renewal	432	421					
c. 2nd & Subsequent Renewal	432	421					
3. Exposure Growth Rate							
a. Enter Growth Objectives			-1.0%	2.0%	7.5%	10.0%	10.0%
4. % of Premiums Earned in Year Written							
a. New Business	50%	50%	50%	50%	50%	50%	50%
b. 1st Renewal	50%	50%	50%	50%	50%	50%	50%
c. 2nd & Subsequent Renewal	50%	50%	50%	50%	50%	50%	50%
5. Renewal Ratio							
a. New Business	60%	60%	60%	60%	60%	60%	60%
b. 1st Renewal	90%	90%	90%	90%	90%	90%	90%
c. 2nd & Subsequent Renewal	95%	95%	95%	95%	95%	95%	95%
6. % of Written Premiums Held By Agents	13%	13%	13%	13%	13%	13%	13%
Expense Input							
1. Commissions							
a. ● % of Written Premium / b. ○ % of Earned Premium	1	14.1%	13.5%	14.0%	14.0%	14.0%	14.0%	14.0%
2. General Expense							
a. ○ % of Written Premium / b. ● % of Earned Premium	2	6.5%	6.3%	6.5%	6.5%	6.5%	6.5%	6.5%
3. Other Acquisition							
a. ○ % of Written Premium / b. ● % of Earned Premium	2	12.6%	11.8%	11.8%	11.8%	11.8%	11.8%	11.8%
4. Premium Taxes							
a. % of Written Premium		3.2%	3.3%	3.4%	3.4%	3.4%	3.4%	3.4%
5. Policyholder Dividends							
a. % of Earned Premium		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
6. Other Nonrecurring Expenses		-	-	931,848	-	-	-	-
7. Ceding Commission							
a. % of Earned Premium		0%	0%	0%	0%	0%	0%	0%

Premium Input

Exposure Input

1. Enter Your Distribution By State by Line:

State	HMP
AK	-
AL	-
AR	128
AZ	67
CA	529
CO	802
CT	2,492
DC	-
DE	-
FL	60
GA	-
HI	-
IA	511
ID	15
IL	1,886
IN	1,625
KS	390
KY	1,100
LA	2,436
MA	-
MD	-
ME	-
MI	-
MN	409
MO	1,866
MS	1,059
MT	-
NC	4
ND	-
NE	68
NH	-
NJ	-
NM	-
NV	-
NY	1,536
OH	-
OK	2,868
OR	251
PA	38
RI	-
SC	8
SD	-
TN	531
TX	3,980
UT	-
VA	-
VT	-
WA	416
WI	204
WV	-
WY	-
CW	25,279

2. Enter Historic Written Exposures By Line

Year	HMP
1985	-
1986	-
1987	-
1988	-
1989	-
1990	30,915
1991	34,730
1992	39,599
1993	44,257
1994	49,513
1995	53,563
1996	57,376
1997	61,326

3. Enter Your Market Share By State by Line:

State	HMP
AK	0.000%
AL	0.000%
AR	0.054%
AZ	0.016%
CA	0.017%
CO	0.165%
CT	0.521%
DC	0.000%
DE	0.000%
FL	0.003%
GA	0.000%
HI	0.000%
IA	0.240%
ID	0.016%
IL	0.172%
IN	0.294%
KS	0.122%
KY	0.375%
LA	0.341%
MA	0.000%
MD	0.000%
ME	0.000%
MI	0.000%
MN	0.089%
MO	0.354%
MS	0.406%
MT	0.000%
NC	0.001%
ND	0.000%
NE	0.044%
NH	0.000%
NJ	0.000%
NM	0.000%
NV	0.000%
NY	0.170%
OH	0.000%
OK	0.721%
OR	0.094%
PA	0.003%
RI	0.000%
SC	0.002%
SD	0.000%
TN	0.107%
TX	0.180%
UT	0.000%
VA	0.000%
VT	0.000%
WA	0.077%
WI	0.055%
WV	0.000%
WY	0.000%

Exposure Input

Exposure Input

Jurisdictional Risk Worksheet

Exhibit A-5

State	HMP		
	Low	Hi	Lag
AK	0.85	1.10	0.25
AL	0.85	1.10	0.25
AR	0.85	1.10	0.25
AZ	0.85	1.10	0.25
CA	0.85	1.06	0.50
CO	0.85	1.10	0.25
CT	0.85	1.10	0.25
DC	0.85	1.10	0.50
DE	0.85	1.10	0.25
FL	0.85	1.05	0.50
GA	0.85	1.099	0.50
HI	0.85	1.10	0.25
IA	0.75	1.20	-
ID	0.75	1.20	-
IL	0.75	1.20	-
IN	0.75	1.20	-
KS	0.85	1.10	0.50
KY	0.85	1.10	0.25
LA	0.85	1.06	0.50
MA	0.85	1.06	0.50
MD	0.85	1.10	0.25
ME	0.85	1.10	0.25
MI	0.85	1.06	0.50
MN	0.85	1.10	0.25
MO	0.85	1.10	0.25
MS	0.85	1.10	0.25
MT	0.75	1.20	-
NC	0.85	1.10	0.50
ND	0.75	1.20	-
NE	0.85	1.10	0.25
NH	0.85	1.10	0.25
NJ	0.85	1.06	0.50
NM	0.85	1.10	0.25
NV	0.85	1.10	0.25
NY	0.85	1.06	0.50
OH	0.85	1.08	0.25
OK	0.85	1.10	0.25
OR	0.85	1.10	0.25
PA	0.85	1.08	0.50
RI	0.85	1.10	0.50
SC	0.85	1.06	0.50
SD	0.85	1.10	0.25
TN	0.85	1.10	0.25
TX	0.75	1.20	0.50
UT	0.75	1.20	-
VA	0.85	1.10	0.25
VT	0.85	1.10	0.25
WA	0.85	1.10	0.50
WI	0.75	1.20	-
WV	0.85	1.10	0.25
WY	0.75	1.20	-
CW	0.82	1.13	0.30

Exposure Input

Loss Development Factor Selection
Homeowners

Exhibit A-6

Paid Losses and ALAE

Accident Year	Evaluations in Months 12	24	36	48	60	72	84	96	108	120	132
1986		7,390,982	7,667,373	7,831,090	7,834,571	7,840,897	7,841,882	7,841,882	7,843,008	7,843,296	7,843,296
1987	4,782,601	5,948,892	6,074,429	6,200,184	6,503,498	6,210,370	6,210,489	6,211,047	6,212,269	6,212,269	6,212,269
1988	3,429,881	4,540,502	4,682,931	4,776,067	4,775,599	4,777,092	4,776,204	4,775,904	4,775,654	4,775,304	
1989	4,428,674	6,216,163	6,302,820	6,338,508	6,320,451	6,319,874	6,320,461	6,278,231	6,278,447		
1990	4,905,508	6,491,617	6,672,882	7,304,431	7,341,614	7,371,753	7,401,759	7,433,900			
1991	6,136,783	8,546,891	8,735,593	8,828,725	8,868,053	8,875,065	8,875,733				
1992	6,623,741	9,339,087	9,578,819	9,803,573	9,825,756	9,821,798					
1993	9,318,694	12,752,572	13,100,827	13,345,650	13,355,820						
1994	9,675,280	12,400,427	12,631,087	12,720,083							
1995	10,819,650	15,166,286	15,813,794								
1996	14,372,636	17,806,453									
1997	19,593,642										

Accident Year	Report to Report Factors 12 / 24	24 / 36	36 / 48	48 / 60	60 / 72	72 / 84	84 / 96	96 / 108	108 / 120	120 / 132	132 / Ult.
1986		1.037	1.021	1.000	1.001	1.000	1.000	1.000	1.000	1.000	
1987	1.244	1.021	1.021	1.049	0.955	1.000	1.000	1.000	1.000	1.000	
1988	1.324	1.031	1.020	1.000	1.000	1.000	1.000	1.000	1.000		
1989	1.404	1.014	1.006	0.997	1.000	1.000	0.993	1.000			
1990	1.323	1.028	1.095	1.005	1.004	1.004	1.004				
1991	1.393	1.022	1.011	1.004	1.001	1.000					
1992	1.410	1.026	1.023	1.002	1.000						
1993	1.368	1.027	1.019	1.001							
1994	1.282	1.019	1.007								
1995	1.402	1.043									
1996	1.239										
1997											
3 Yr Simple Average	1.307	1.030	1.016	1.002	1.001	1.001	0.999	1.000	1.000	0.667	
5 Yr Simple Average	1.340	1.027	1.031	1.002	1.001	1.001	1.000	1.000	1.000	0.667	
Selected LDF's:	1.350	1.030	1.016	1.002	1.001	1.000	1.000	1.000	1.000	1.000	1.000
Cumulative LDF's:	1.417	1.050	1.019	1.003	1.001	1.000	1.000	1.000	1.000	1.000	1.000
Expected % Paid:	70.6%	95.3%	98.1%	99.7%	99.9%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Incremental % Paid:	70.6%	24.7%	2.9%	1.6%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%

Loss Information Input

Exhibit A-7-a

1. Selected Ultimate Losses & ALAE For Prior Years

Year	HMP
1985	7,489,604
1986	7,843,366
1987	6,212,235
1988	4,775,322
1989	6,279,003
1990	7,434,451
1991	8,880,880
1992	9,824,747
1993	13,356,276
1994	12,830,817
1995	16,136,340
1996	18,397,611
1997	24,422,398

2 Selected Ultimate Counts For Prior Years (Direct &

Year	HMP
1985	6,637
1986	6,331
1987	4,741
1988	3,353
1989	3,526
1990	4,427
1991	4,707
1992	5,281
1993	5,860
1994	6,336
1995	6,642
1996	8,956
1997	10,097

3. Direct Paid Loss and ALAE

Year	HMP
1985	
1986	7,843,296
1987	6,212,269
1988	4,775,304
1989	6,278,447
1990	7,433,900
1991	8,875,733
1992	9,821,798
1993	13,355,820
1994	12,720,083
1995	15,813,794
1996	17,806,453
1997	19,593,642

4 Net Ultimate Losses & ALAE

Year	HMP
1985	
1986	
1987	
1988	5,547,149
1989	7,171,961
1990	8,031,336
1991	10,616,599
1992	10,849,921
1993	12,916,739
1994	13,946,706
1995	17,177,712
1996	17,442,599
1997	23,968,647

5. Net Paid Losses & ALAE

Year	HMP
1985	
1986	
1987	
1988	5,547,212
1989	7,171,995
1990	8,030,936
1991	10,613,127
1992	10,849,326
1993	12,916,606
1994	13,832,267
1995	16,857,224
1996	16,785,003
1997	19,179,809

6 Earned Premiums (Direct & Assumed)

Year	HMP
1985	9,800,926
1986	926,774
1987	9,471,742
1988	8,326,726
1989	8,342,498
1990	9,345,453
1991	10,922,208
1992	13,022,473
1993	15,227,428
1994	17,168,201
1995	19,117,232
1996	22,694,060
1997	24,754,064

7. Net Earned Premium

Year	HMP
1985	
1986	
1987	
1988	8,950,000
1989	8,864,000
1990	10,428,000
1991	12,229,000
1992	14,007,000
1993	15,609,000
1994	17,027,350
1995	17,858,925
1996	19,982,000
1997	21,976,961

8 Selected Severities (Direct & Assumed)

Year	HMP
1985	1,870
1986	1,969
1987	1,996
1988	2,060
1989	2,494
1990	2,255
1991	2,429
1992	2,296
1993	2,697
1994	2,298
1995	2,643
1996	2,143
1997	2,419

Selected Severities	
a New Business	2,000
b 1st Renewal	2,000
c. 2nd & Subsequent Renewal	2,000
d. Weighted Average Severity	2,000
e. Standard Deviation of Historic Severities	192
	2,416
	2,339

9 Selected Frequency

Year	HMP
1985	
1986	
1987	
1988	
1989	
1990	0.143
1991	0.136
1992	0.133
1993	0.132
1994	0.128
1995	0.124
1996	0.156
1997	0.163

Selected Frequencies	
a. New Business	0.157
b. 1st Renewal	0.143
c 2nd & Subsequent Renewal	0.130
d Weighted Average Severity	0.136
e Standard Deviation of Historic Frequencies	0.01
	0.140

Reasonability Check

a. Loss Cost = Severity x Frequency	
New Business	315
1st Renewal	286
2nd & Subsequent Renewal	260
Total	273
b Average Premium (From Premium Input Sheet)	
New Business	377
1st Renewal	421
2nd & Subsequent Renewal	421
Total	414
c. Implied Loss Ratios = Loss Cost / Average Pre	
New Business	0.834
1st Renewal	0.679
2nd & Subsequent Renewal	0.618
Total	0.658
	0.704

10 Paid ULAE as a % of Paid Losses & ALAE

Calendar Year	HMP
1997	7.0%
1998	7.0%
1999	7.0%
2000	7.0%
2001	7.0%
2002	7.0%
2002 and Subsequent	7.0%

11 Quota Share Reinsurance Treaties

Year	HMP
1985	
1986	
1987	
1988	
1989	
1990	
1991	
1992	
1993	
1994	
1995	
1996	
1997	
1998	
1999	
2000	
2001	
2002	

Loss Input

12. Excess of Loss Treaties

Exhibit A-7-b

Year	HMP
Estimated Cost of XOL as a % of Earned Premium	0.041
1st Retention per Occurrence	
1996	500,000
1997	500,000
1998	500,000
1999	500,000
2000	500,000
2001	500,000
2002	500,000
Max Coverage From Reinsurers	
1996	26,000,000
1997	26,000,000
1998	26,000,000
1999	26,000,000
2000	26,000,000
2001	26,000,000
2002	26,000,000
Coefficient of Variation	3
Mean	HMP
1996	2,563
1997	3,125
1998	2,098
1999	2,357
2000	2,575
2001	2,587
2002	2,706
Standard Deviation	HMP
1996	7,688
1997	8,375
1998	6,294
1999	7,072
2000	7,726
2001	7,700
2002	8,119
Mu	HMP
1996	6.70
1997	6.90
1998	6.50
1999	6.61
2000	6.70
2001	6.70
2002	6.75
Sigma	HMP
1996	1.52
1997	1.52
1998	1.52
1999	1.52
2000	1.52
2001	1.52
2002	1.52
Excess Percentage	HMP
1996	0.0011%
1997	0.0020%
1998	0.0006%
1999	0.0009%
2000	0.0012%
2001	0.0012%
2002	0.0013%

13. Stop Loss Reinsurance

	Cost as a % of Premium	Max. Loss & ALAE Ratio	Max. Amount Ceded
1998	1.00%	77.50%	10,000,000
1999	1.00%	77.50%	10,000,000
2000	1.00%	77.50%	10,000,000
2001	1.00%	77.50%	10,000,000
2002	1.00%	77.50%	10,000,000

14. Catastrophic Reinsurance

	Cost as a % of Premium	1st Retention Per Occ.	Max. Amount Per Occ.
1st Retention Per Occurrence			
1998	5.00%	5,000,000	125,000,000
1999	5.00%	5,000,000	125,000,000
2000	5.00%	5,000,000	125,000,000
2001	5.00%	5,000,000	125,000,000
2002	5.00%	5,000,000	125,000,000

Loss Input

Investments Input

Exhibit A-8-a

1. Statutory Values as of 12/31/1997:

	Total	Bond Maturity: 1 Year or Less	1 - 5 Years	6 - 10 Years	10 - 20 Years	20 + Years
a. U.S. Government Bonds	91,134,188	5,530,471	35,797,026	37,150,075	8,026,081	6,630,535
b. Bonds Exempt From U.S. Tax	97,647,732	1,119,454	5,731,002	18,196,148	72,240,409	2,360,719
c. Other Bonds (Unaffiliated)	184,436,496	13,168,046	45,292,782	88,371,852	23,668,997	13,934,819
d. Bonds (Affiliated)	-	-	-	-	-	-
e. Preferred Stocks (Unaffiliated)	12,222,841					
f. Preferred Stocks (Affiliated)						
g. Common Stocks (Unaffiliated)	19,967,926					
h. Common Stocks (Affiliated)	72,455,000					
i. Mortgage Loans	196,144					
j. Real Estate	16,880,795					
k. Collateral Loans						
l. Cash on hand and on Deposit	30,951,773					
m. Short Term Investments						
n. Other Invested Assets	446,683					
o. Derivative Instruments						
p. Aggregate Write-Ins						
q. Subtotal	526,339,678					

2. Market Values as of 12/31/1997:
Please Enter Par Values for Bonds

	Total	Bond Maturity: 1 Year or Less	1 - 5 Years	6 - 10 Years	10 - 20 Years	20 + Years
a. U.S. Government Bonds	91,455,926	5,536,473	35,942,332	37,264,001	8,025,474	6,687,646
b. Bonds Exempt From U.S. Tax	98,063,451	1,122,383	5,747,795	18,218,170	72,602,239	2,372,864
c. Other Bonds (Unaffiliated)	184,723,128	13,125,017	45,372,699	88,641,989	23,701,093	13,882,330
d. Bonds (Affiliated)	-	-	-	-	-	-
e. Preferred Stocks (Unaffiliated)	12,325,625					
f. Preferred Stocks (Affiliated)						
g. Common Stocks (Unaffiliated)	19,967,926					
h. Common Stocks (Affiliated)	60,732,786					
i. Mortgage Loans	196,144					
j. Real Estate	16,880,795					
k. Collateral Loans						
l. Cash on hand and on Deposit	30,951,773					
m. Short Term Investments						
n. Other Invested Assets	446,683					
o. Derivative Instruments						
p. Aggregate Write-Ins						
q. Subtotal	515,744,247					

2. Number of Units as of 12/31/1997:

	Total	Bond Maturity: 1 Year or Less	1 - 5 Years	6 - 10 Years	10 - 20 Years	20 + Years
a. U.S. Government Bonds	214	14	60	100	20	20
b. Bonds Exempt From U.S. Tax	132	10	20	24	69	9
c. Other Bonds (Unaffiliated)	171	7	47	66	27	24
d. Bonds (Affiliated)	-	-	-	-	-	-
e. Preferred Stocks (Unaffiliated)	440,000					
f. Preferred Stocks (Affiliated)	-					
g. Common Stocks (Unaffiliated)	920,987					
h. Common Stocks (Affiliated)	832,000					
i. Mortgage Loans	1					
j. Real Estate	7					
k. Collateral Loans	-					
l. Cash on hand and on Deposit	1					
m. Short Term Investments	-					
n. Other Invested Assets	2					
o. Derivative Instruments	-					
p. Aggregate Write-Ins	-					
q. Subtotal	2,193,515					

3. Bond Coupon Rates:

	Total	Bond Maturity: 1 Year or Less	1 - 5 Years	6 - 10 Years	10 - 20 Years	20 + Years
a. U.S. Government Bonds	7.495%	6.913%	7.160%	7.315%	9.000%	9.435%
b. Bonds Exempt From U.S. Tax	6.735%	5.750%	6.831%	6.497%	6.773%	7.425%
c. Other Bonds (Unaffiliated)	7.742%	7.735%	7.878%	7.317%	8.652%	8.452%
d. Bonds (Affiliated)	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
e. Subtotal	7.416%	7.394%	7.513%	7.223%	7.341%	8.631%

Investment Input

4. Capital & Surplus

	As of Year End					
	1997	1998	1999	2000	2001	2002
a. Surplus as Regards to Policyholders						
b. Contributed Surplus						
c. Unassigned Surplus						
d. Special Surplus Funds						
e. Additions to Capital						
f. Contributions to Surplus						

5. Stock Betas

	1997	1998	1999	2000	2001	2002
a. Preferred Stocks (Unaffiliated)	-	-	-	-	-	-
b. Preferred Stocks (Affiliated)	-	-	-	-	-	-
c. Common Stocks (Unaffiliated)	0.70	0.70	0.70	0.70	0.70	0.70
d. Common Stocks (Affiliated)	-	-	-	-	-	-

6. Dividends as a % of Market Value

	1997	1998	1999	2000	2001	2002
a. Preferred Stocks (Unaffiliated)	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
b. Preferred Stocks (Affiliated)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
c. Common Stocks (Unaffiliated)	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
d. Common Stocks (Affiliated)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

7. Reinvestment Allocations

	1998	1999	2000	2001	2002
a. U.S. Government Bonds	20.9%	20.9%	20.9%	20.9%	20.9%
b. Bonds Exempt From U.S. Tax	22.4%	22.4%	22.4%	22.4%	22.4%
c. Other Bonds (Unaffiliated)	42.3%	42.3%	42.3%	42.3%	42.3%
d. Bonds (Affiliated)	0.0%	0.0%	0.0%	0.0%	0.0%
e. Preferred Stocks (Unaffiliated)	2.8%	2.8%	2.8%	2.8%	2.8%
f. Preferred Stocks (Affiliated)	0.0%	0.0%	0.0%	0.0%	0.0%
g. Common Stocks (Unaffiliated)	4.6%	4.6%	4.6%	4.6%	4.6%
h. Common Stocks (Affiliated)	0.0%	0.0%	0.0%	0.0%	0.0%
i. Mortgage Loans	0.0%	0.0%	0.0%	0.0%	0.0%
j. Real Estate	0.0%	0.0%	0.0%	0.0%	0.0%
k. Collateral Loans	0.0%	0.0%	0.0%	0.0%	0.0%
l. Cash on hand and on Deposit	7.1%	7.1%	7.1%	7.1%	7.1%
m. Short Term Investments	0.0%	0.0%	0.0%	0.0%	0.0%
n. Other Invested Assets	0.0%	0.0%	0.0%	0.0%	0.0%
o. Derivative Instruments	0.0%	0.0%	0.0%	0.0%	0.0%
p. Aggregate Write-Ins	0.0%	0.0%	0.0%	0.0%	0.0%
q. Total	100.0%	100.0%	100.0%	100.0%	100.0%

Base Case
50 Iterations Using Excel

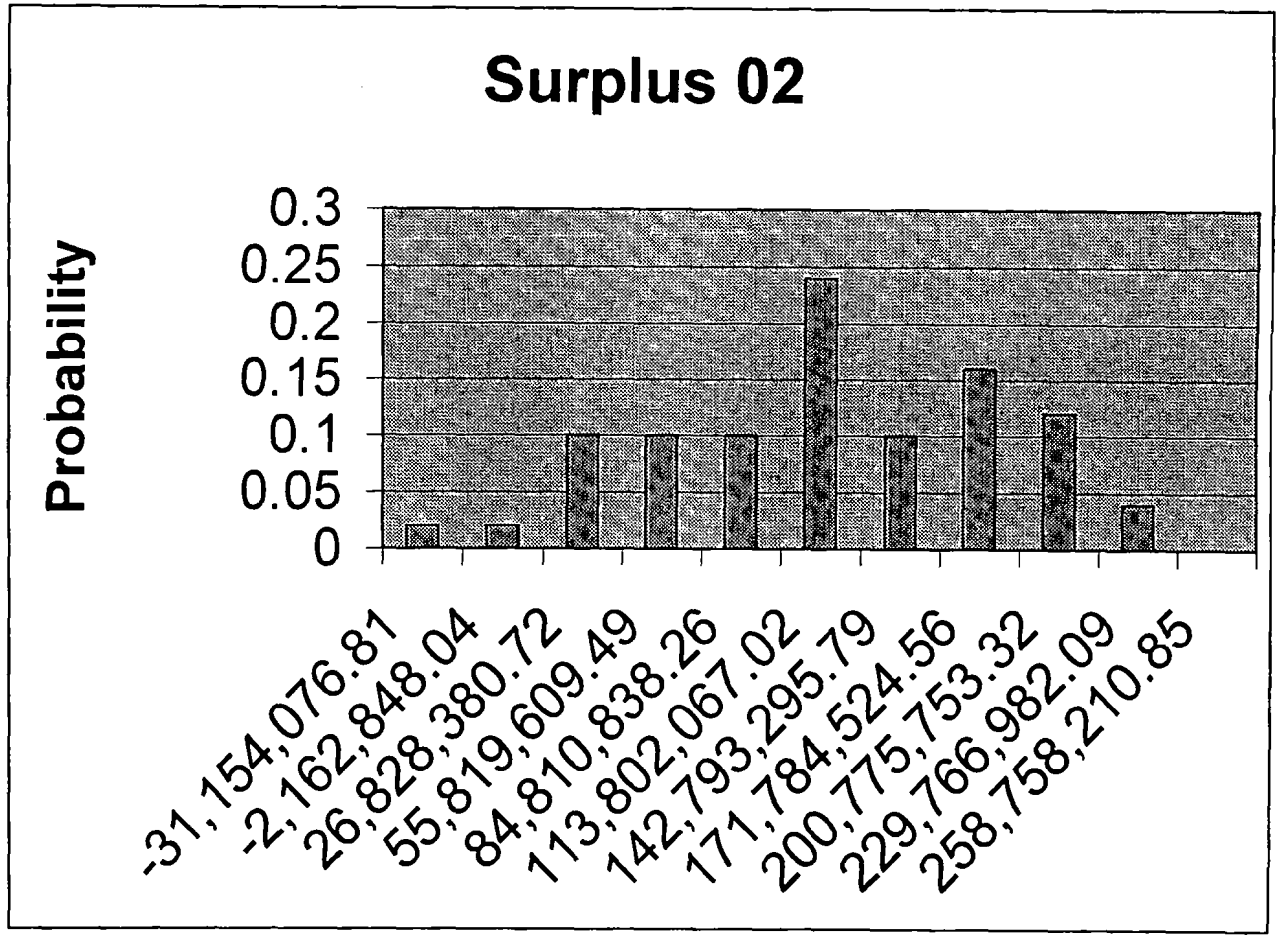
Exhibit B-1-a

	Output N19	Output o19	Output p19	Output q19	Output r19	Output n34	Output o34	Output p34	Output q34	Output r34
	No	No	No	No	Yes	No	No	No	No	Yes
	176,885,913	172,931,113	166,756,714	149,824,294	132,577,715	2.119	2.381	2.856	2.931	5.405
rial #	Surplus 98	Surplus 99	Surplus 00	Surplus 01	Surplus 02	P/S 98	P/S 99	P/S 00	P/S 01	P/S 02
1	155,056,836	136,285,644	125,884,389	104,845,572	98,080,612	2.440	3.080	3.882	5.383	6.504
2	163,754,761	164,156,925	144,163,294	132,106,526	114,403,000	2.307	2.527	3.275	4.008	5.245
3	151,004,758	143,401,131	123,512,074	82,674,485	43,919,839	2.506	2.900	3.894	6.710	14.021
4	158,066,626	150,059,705	130,380,788	87,954,798	31,342,920	2.387	2.706	3.375	5.500	17.071
5	180,817,284	160,571,798	116,639,827	127,270,793	106,137,941	2.049	2.541	4.047	4.279	5.962
6	176,983,630	182,229,470	190,321,674	198,105,573	226,929,915	2.074	2.159	2.342	2.596	2.549
7	185,484,837	195,865,894	196,972,524	170,517,586	137,203,363	2.019	2.080	2.247	2.852	4.001
8	187,493,323	187,965,994	210,107,085	227,230,199	226,201,991	1.990	2.168	2.190	2.268	2.584
9	190,786,885	194,824,479	209,767,197	196,742,871	174,560,266	1.964	2.097	2.201	2.647	3.322
10	181,063,632	179,046,371	188,441,033	191,629,135	163,677,384	2.085	2.292	2.432	2.732	3.634
11	189,282,966	187,621,214	185,556,317	192,830,503	144,997,562	1.940	2.106	2.416	2.658	4.010
12	179,097,951	162,374,018	155,255,449	140,497,037	107,179,405	2.083	2.508	2.949	3.672	5.599
13	206,334,170	194,066,840	197,795,911	185,398,822	198,001,975	1.809	2.102	2.341	2.838	3.023
14	192,256,361	206,374,790	225,257,082	244,173,354	258,758,211	1.914	1.891	1.935	2.055	2.198
15	158,998,375	109,413,710	76,951,202	83,456,665	30,107,692	2.323	3.612	5.742	5.792	17.571
16	192,084,556	182,903,839	156,457,909	113,565,527	42,527,958	1.951	2.237	2.905	4.450	13.188
17	171,950,680	175,119,712	149,272,187	139,904,590	153,390,005	2.171	2.311	2.990	3.548	3.570
18	207,597,698	198,800,845	190,262,222	185,336,538	190,838,068	1.828	2.104	2.483	2.881	3.181
19	176,493,821	180,685,552	174,268,247	176,909,483	132,801,741	2.136	2.321	2.823	3.233	4.770
20	182,658,307	184,898,173	193,440,919	207,590,082	229,871,495	1.999	2.110	2.273	2.315	2.307
21	187,487,132	214,477,613	206,325,925	190,953,858	175,161,950	1.984	1.871	2.240	2.794	3.462
22	163,680,557	149,439,027	144,444,143	141,325,295	138,566,626	2.223	2.566	2.954	3.364	3.790
23	193,520,995	184,894,747	182,415,965	150,931,468	130,138,577	1.926	2.174	2.473	3.357	4.238
24	153,782,040	127,467,851	115,007,869	97,667,136	70,325,247	2.443	3.224	4.044	5.382	8.355
25	183,487,333	198,015,640	192,622,658	176,697,964	221,398,154	2.018	2.021	2.382	3.035	2.798
26	169,338,793	161,756,742	168,158,619	144,618,216	115,463,692	2.222	2.581	2.844	3.723	5.140
27	185,015,192	209,155,500	195,231,303	(14,024,799)	(31,154,077)	1.986	1.860	2.193	(33.486)	(16.814)
28	181,845,495	174,372,734	176,337,321	163,885,783	133,105,197	2.045	2.325	2.583	3.169	4.435
29	168,615,142	169,250,925	173,305,072	178,631,918	227,036,866	2.179	2.313	2.514	2.775	2.472
30	198,122,884	211,810,902	217,971,663	216,242,550	197,739,136	1.829	1.801	1.942	2.120	2.555
31	155,731,666	170,520,332	157,007,686	124,886,640	73,787,220	2.414	2.385	2.852	3.994	7.672
32	183,408,593	175,962,461	214,637,325	225,412,309	229,507,272	2.033	2.317	2.160	2.302	2.508
33	182,025,276	200,334,032	186,474,096	210,463,473	227,212,542	2.059	2.024	2.468	2.513	2.623
34	161,045,484	164,901,955	148,997,362	122,288,617	120,832,684	2.302	2.419	3.031	4.253	4.928
35	167,276,583	166,237,313	144,692,366	155,948,891	129,097,889	2.232	2.426	3.203	3.379	4.464
36	168,512,868	149,471,240	136,427,445	70,512,535	26,147,276	2.235	2.761	3.381	7.309	21.718
37	179,375,319	188,935,446	189,557,632	172,942,609	145,737,563	2.062	2.118	2.321	2.805	3.711
38	190,009,685	194,852,965	185,751,255	144,019,398	133,396,459	1.975	2.087	2.504	3.729	4.517
39	166,521,814	138,654,639	143,176,677	112,504,436	94,448,703	2.290	3.026	3.260	4.603	6.131
40	163,610,201	153,976,150	130,036,669	97,867,105	98,148,871	2.269	2.578	3.410	5.127	5.863
41	183,157,866	174,488,792	158,635,585	151,195,898	131,481,945	2.032	2.330	2.892	3.423	4.464
42	173,326,400	173,494,789	178,721,577	123,152,381	64,039,502	2.149	2.330	2.513	4.094	8.943
43	168,080,564	138,058,395	141,283,166	130,695,817	120,033,406	2.219	2.917	3.186	3.845	4.705
44	174,260,205	157,411,765	131,399,467	130,187,575	81,084,619	2.110	2.496	3.397	3.910	7.141
45	193,984,194	188,461,064	190,868,617	182,792,446	174,750,214	1.916	2.114	2.355	2.822	3.398
46	177,859,480	154,758,503	118,209,155	97,034,841	66,015,851	2.074	2.561	3.733	5.114	8.292
47	175,667,670	175,577,383	138,132,421	88,572,711	48,797,283	2.109	2.269	3.316	5.930	11.959
48	171,160,931	161,253,876	172,409,914	155,134,017	154,034,124	2.169	2.457	2.547	3.188	3.623
49	160,233,927	168,965,639	192,132,697	210,109,166	189,041,905	2.341	2.441	2.487	2.644	3.426
50	150,113,410	143,524,775	144,600,010	163,104,227	195,157,803	2.501	2.849	3.235	3.402	3.414

Base Case
50 Iterations Using Excel

Exhibit B-1-b

	Output N27	Output o27	Output p27	Output q27	Output r27	Output W8	Output x8	Output y8	Output z8	Output aa8
	No	No	No	No	Yes	No	No	No	No	Yes
	1.035	1.004	1.005	1.030	1.027	0.726	0.745	0.747	0.771	0.766
Trial #	OR 98	OR 99	OR 00	OR 01	OR 02	Net LR 98	Net LR 99	Net LR 00	Net LR 01	Net LR 02
1	1.110	1.065	1.055	1.076	1.033	0.774	0.800	0.771	0.819	0.753
2	1.074	0.997	1.061	1.004	1.001	0.745	0.749	0.775	0.744	0.724
3	1.115	1.021	1.037	1.084	1.081	0.769	0.753	0.758	0.807	0.803
4	1.082	1.010	1.022	1.047	1.083	0.768	0.749	0.758	0.777	0.807
5	1.024	1.084	1.134	1.009	1.036	0.696	0.773	0.876	0.747	0.774
6	1.030	0.972	0.967	0.969	0.921	0.748	0.732	0.729	0.716	0.691
7	0.993	0.958	1.002	1.058	1.072	0.688	0.715	0.783	0.799	0.812
8	0.993	0.981	0.950	0.975	1.041	0.684	0.701	0.693	0.738	0.790
9	0.982	0.953	0.927	1.034	1.038	0.670	0.690	0.667	0.773	0.773
10	1.020	1.004	0.963	1.029	1.107	0.696	0.759	0.714	0.761	0.837
11	0.985	1.005	0.998	0.960	1.071	0.707	0.747	0.771	0.704	0.794
12	1.022	1.041	1.020	1.006	1.050	0.703	0.774	0.756	0.749	0.762
13	0.926	1.035	0.952	0.987	0.907	0.623	0.776	0.700	0.728	0.655
14	0.970	0.939	0.900	0.895	0.914	0.660	0.713	0.649	0.643	0.682
15	1.092	1.128	1.082	0.963	1.121	0.788	0.844	0.810	0.709	0.828
16	0.993	1.019	1.035	1.065	1.118	0.682	0.750	0.770	0.783	0.825
17	1.045	0.984	1.064	1.016	0.948	0.740	0.723	0.818	0.774	0.713
18	0.914	1.012	1.024	1.012	0.997	0.606	0.756	0.754	0.754	0.745
19	1.046	0.985	1.053	1.011	1.106	0.722	0.706	0.781	0.730	0.844
20	1.040	0.978	0.974	0.997	0.971	0.752	0.737	0.736	0.759	0.731
21	0.992	0.915	1.011	1.022	1.013	0.693	0.676	0.746	0.754	0.750
22	1.071	1.013	1.001	1.000	1.034	0.772	0.746	0.758	0.751	0.791
23	0.972	1.047	1.020	1.077	1.019	0.689	0.780	0.767	0.819	0.772
24	1.104	1.084	1.024	1.015	1.025	0.774	0.802	0.747	0.757	0.759
25	1.018	0.965	1.053	1.096	0.999	0.721	0.709	0.768	0.833	0.762
26	1.065	1.011	0.948	1.040	1.052	0.758	0.739	0.688	0.784	0.790
27	0.998	0.876	1.003	1.448	1.014	0.700	0.649	0.735	1.212	0.741
28	1.015	1.015	1.020	1.072	1.067	0.708	0.760	0.757	0.801	0.803
29	1.071	0.993	0.993	0.998	0.907	0.773	0.755	0.744	0.750	0.673
30	0.956	0.966	1.005	0.983	1.024	0.686	0.728	0.766	0.761	0.771
31	1.096	0.915	0.995	1.026	1.038	0.751	0.650	0.737	0.744	0.764
32	1.015	1.041	0.931	1.016	1.015	0.713	0.766	0.705	0.779	0.771
33	1.015	0.906	1.032	0.929	0.976	0.697	0.661	0.778	0.677	0.743
34	1.090	0.964	1.022	1.058	0.973	0.767	0.718	0.754	0.794	0.729
35	1.071	0.990	1.052	0.970	1.082	0.758	0.724	0.779	0.726	0.822
36	1.074	1.059	1.038	1.133	1.075	0.750	0.783	0.778	0.852	0.802
37	1.030	0.967	0.962	1.022	1.039	0.746	0.723	0.722	0.769	0.788
38	0.983	1.003	1.022	1.090	0.977	0.677	0.752	0.756	0.816	0.726
39	1.078	1.069	0.922	1.039	0.997	0.733	0.803	0.658	0.770	0.709
40	1.075	1.024	1.043	1.080	1.000	0.747	0.769	0.772	0.810	0.732
41	1.022	1.045	1.026	1.004	1.034	0.735	0.750	0.767	0.735	0.752
42	1.054	0.988	0.947	1.116	1.127	0.744	0.727	0.720	0.845	0.859
43	1.065	1.096	0.995	1.023	1.036	0.753	0.809	0.747	0.766	0.775
44	1.056	1.016	0.975	0.918	1.037	0.762	0.754	0.715	0.665	0.766
45	0.976	1.013	0.966	0.994	1.020	0.666	0.762	0.715	0.731	0.766
46	1.047	1.045	1.055	1.008	1.026	0.747	0.777	0.791	0.742	0.779
47	1.046	0.999	1.094	1.102	1.044	0.767	0.756	0.798	0.843	0.779
48	1.057	1.013	0.927	1.032	0.973	0.763	0.779	0.671	0.774	0.720
49	1.084	0.966	0.914	0.936	1.026	0.755	0.706	0.666	0.687	0.747
50	1.108	1.035	1.037	1.033	1.073	0.778	0.769	0.780	0.764	0.816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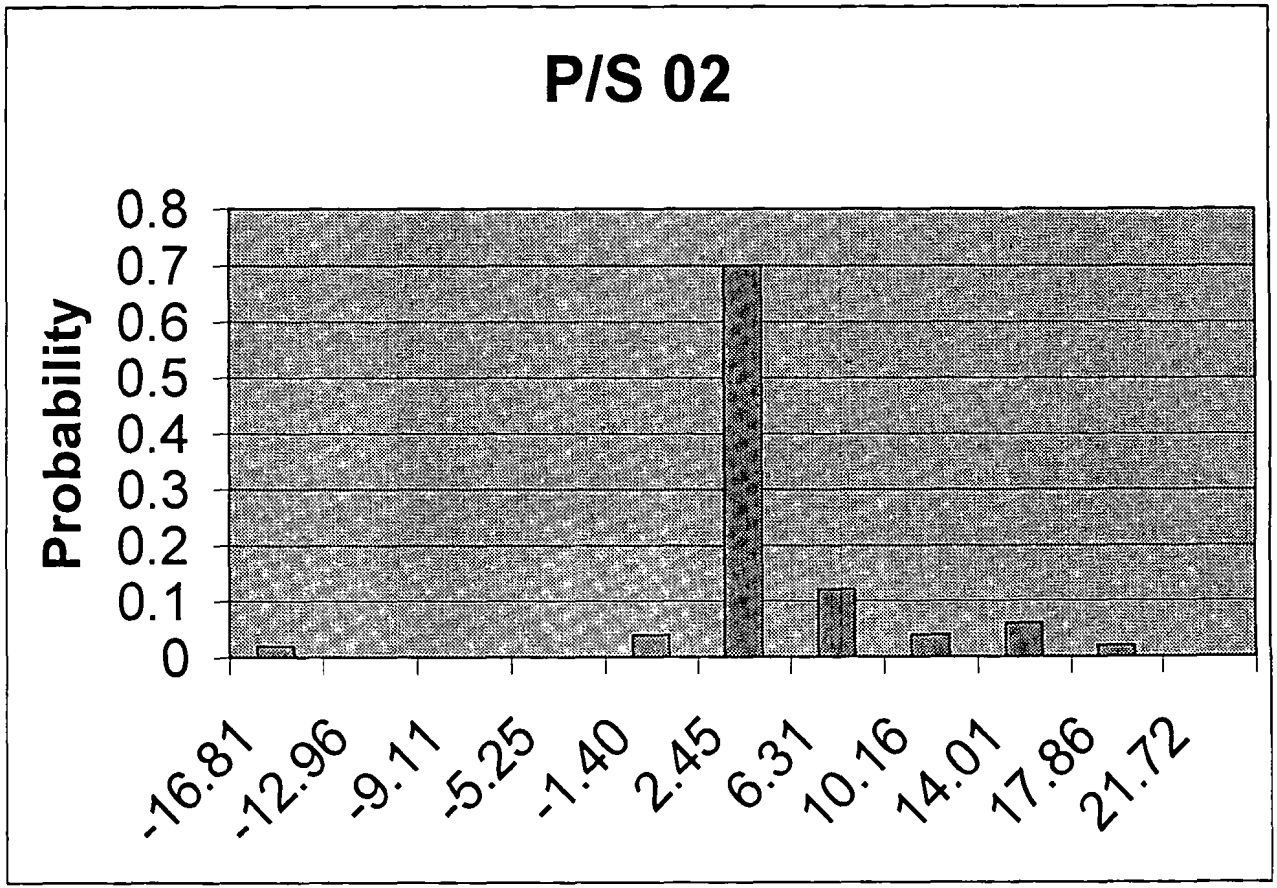
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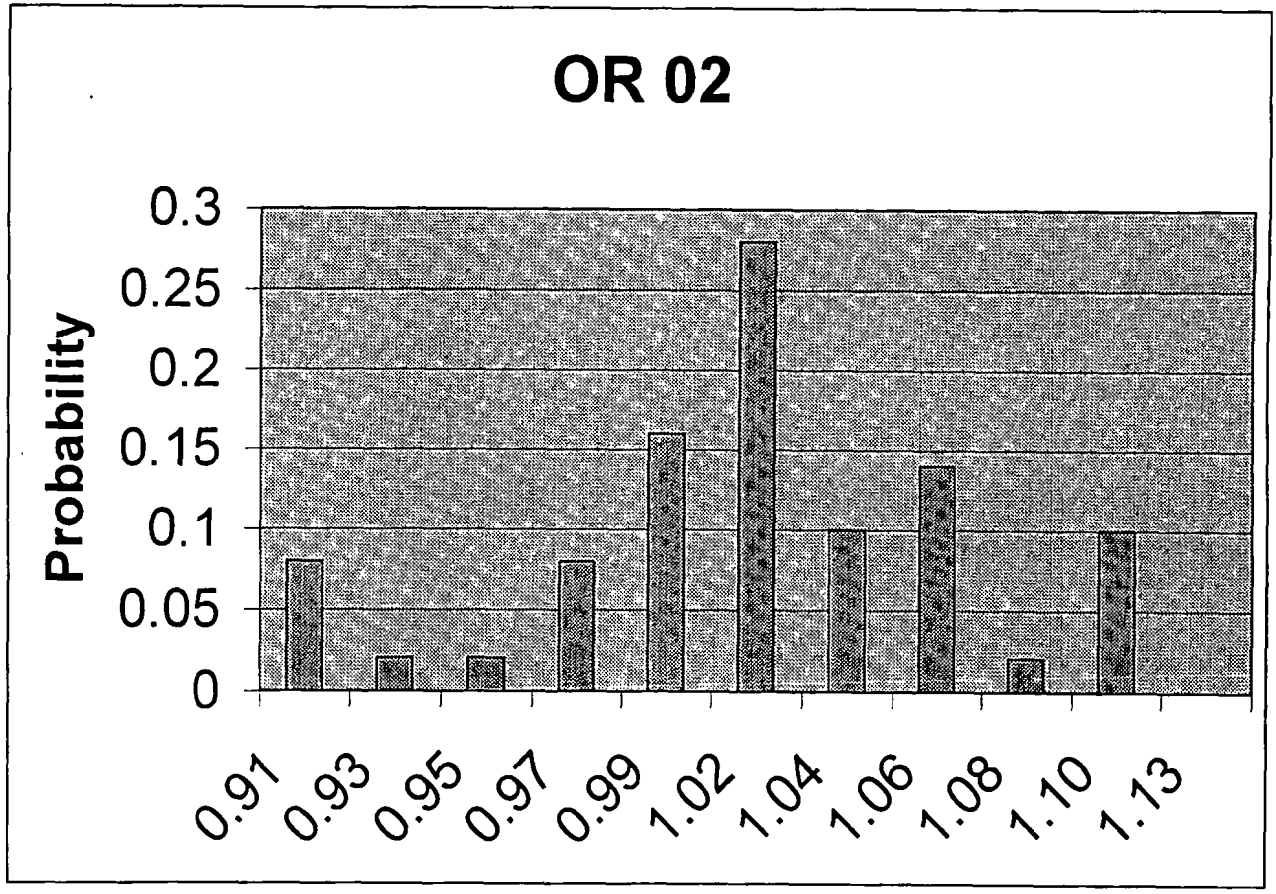
21.72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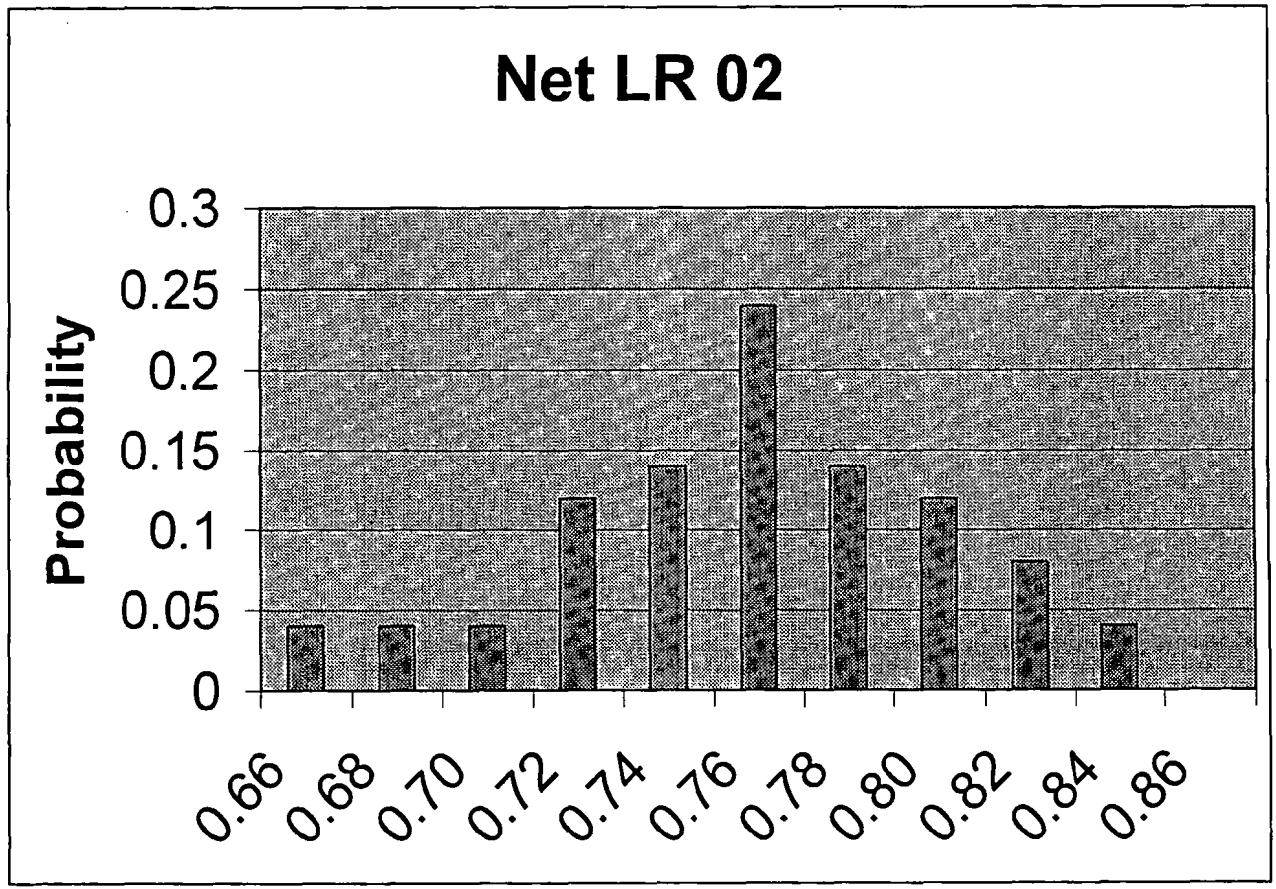
Net LR 02
Probability
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0
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0.74
0.76
0.78
0.80
0.82
0.84
0.86

Base Case
50 Iterations Using Excel

Exhibit B-6-a

ABC Insurance Company
Statutory Balance Sheet

		1998	1999	2000	2001	2002
ASSETS						
1.	Bonds	397,289,391	417,079,942	415,876,272	441,770,059	477,281,188
2.	Stocks:					
	2.1 Preferred stocks	14,414,504	16,591,024	18,437,526	21,489,014	24,487,902
	2.2 Common stocks	99,977,356	110,700,421	120,104,398	130,486,269	139,994,606
3.	Mortgage loans on real estate	196,144	196,144	196,144	196,144	196,144
4.	Real estate	16,880,795	16,880,795	16,880,795	16,880,795	16,880,795
5.	Collateral loans	-	-	-	-	-
6.	Cash	34,578,453	38,340,296	40,785,861	45,596,660	51,935,531
7.	Other Invested assets	446,683	446,683	446,683	446,683	446,683
8.	Aggregate write-ins					
9.	Subtotals, cash & invested assets	563,783,325	600,235,305	612,727,680	656,865,624	711,222,850
10.	Agents' balances or uncollected pr	48,846,694	53,406,225	59,581,118	68,346,149	78,074,692
11.	Funds held by reinsurer	210	210	210	210	210
12.	Bills receivable	-	-	-	-	-
13.	Reinsurance recoverables	5,818,016	6,999,378	6,873,290	7,867,660	9,239,345
14.	Federal income tax collectable		-	-	-	-
15.	Electronic data processing	2,992,030	2,992,030	2,992,030	2,992,030	2,992,030
16.	Interest, dividends & real estate	6,344,827	6,344,827	6,344,827	6,344,827	6,344,827
17.	Receivable from parent	1,107,674	1,107,674	1,107,674	1,107,674	1,107,674
18.	Equities and deposits in pools	-	-	-	-	-
19.	Amounts receivable relating to A&	-	-	-	-	-
20.	Other assets nonadmitted	-	-	-	-	-
21.	Aggregate write-ins	4,956,493	4,956,493	4,956,493	4,956,493	4,956,493
22.	Total assets	633,849,268	676,042,142	694,583,322	748,480,667	813,938,121

Base Case **Exhibit B-6-b**

50 Iterations Using Excel

			1998	1999	2000	2001	2002
LIABILITIES							
1.	Losses & LAE:	###	290,900,796	349,968,894	343,664,523	393,382,978	461,967,235
2.	Unearned premiums:		152,532,149	166,061,916	183,427,198	209,716,288	239,005,263
3.	Other expenses		6,041,971	6,451,916	7,163,253	8,111,683	9,268,363
4.	Taxes, licenses and fees		6,264,517	6,854,283	7,640,894	8,751,580	9,974,421
5.	Federal income taxes		149,581	-	1,215,947	128,632	386,520
6.	Other liabilities						
7.	Total liabilities		455,889,014	529,337,009	543,111,815	620,091,161	720,601,801
SURPLUS							
8.	Additions to surplus		-	-	-	-	-
9.	Surplus as regards to policyholders		177,960,255	146,705,134	151,471,507	128,389,506	93,336,320
	Net Income (Before taxes)		6,697,898	(15,003,510)	40,535,320	1,738,279	4,700,000
	Underwriting Gain/(Loss)		(42,530,250)	(70,175,534)	(20,340,994)	(62,290,287)	(60,828,051)
	Combined Ratio		1.111	1.167	1.035	1.110	1.093
	Operating Ratios		1.032	1.091	0.964	1.046	1.038
	Investment Income / Surplus		0.165	0.206	0.208	0.249	0.334
	Investment Income / Earned Premium		0.079	0.076	0.071	0.064	0.055

IRIS Ratios

1.	**Premium to Surplus**	**2.11**	**2.80**	**3.03**	**4.09**	**6.43**
2.	Change in Writings	1.3%	9.3%	11.6%	14.7%	14.2%
3.	Surplus Aid to Surplus	3.6%	5.2%	5.6%	7.7%	12.3%
4.	Two Year Overall Operating Ratio		108%	105%	104%	108%
5.	Investment Yield	5.4%	5.0%	5.1%	4.9%	4.4%
6.	Change in Surplus	11.1%	-15.0%	2.7%	-12.3%	-20.7%
7.	Liabilities to Liquid Assets	66%	72%	72%	76%	82%
8.	Agents Balances to Surplus	27%	36%	39%	53%	84%
9.	One Year Development	5.5%	1.3%	-2.1%	13.8%	-5.8%
10.	Two Year Development		7.1%	1.5%	2.4%	11.3%
11.	Estimated Current Reserve Deficiency to Surplus		#N/A	15.0%	27.4%	-8.1%

Base Case

50 Iterations Using Excel

Exhibit B-7

		Apriori Loss & ALAE Ratios				
		Accident Years				
Coverage	Subdivision	1998	1999	2000	2001	2002
All	Direct	0.65	0.78	0.72	0.68	0.72
	Ceded	0.13	0.39	0.76	0.11	0.26
	Net	0.72	0.83	0.72	0.75	0.78
HMP	New	0.70	0.72	0.83	1.09	1.11
	Renewal	0.42	0.48	0.77	0.91	1.08
	Renewal (2)	0.55	0.56	0.49	0.63	0.72
	Direct	0.59	0.70	0.62	0.75	0.84
	Ceded	0.00	0.18	0.47	0.00	0.00
	Net	0.65	0.75	0.63	0.83	0.92
PPAL	New	0.84	0.84	0.93	0.85	0.95
	Renewal	0.87	0.73	0.84	0.81	0.73
	Renewal (2)	0.95	0.89	0.71	0.67	0.68
	Direct	0.93	0.87	0.76	0.73	0.75
	Ceded	0.00	0.00	0.00	0.00	0.00
	Net	0.97	0.91	0.80	0.76	0.79
APD-P	New	0.71	0.84	0.75	0.81	0.74
	Renewal	0.57	0.61	0.81	0.84	0.83
	Renewal (2)	0.61	0.70	0.54	0.59	0.69
	Direct	0.65	0.84	0.63	0.69	0.73
	Ceded	0.00	0.23	0.36	0.00	0.00
	Net	0.69	0.88	0.65	0.73	0.78
APD-C	New	0.62	1.35	0.78	0.97	0.52
	Renewal	0.42	0.37	0.50	0.51	0.52
	Renewal (2)	0.59	0.37	0.45	0.56	0 44
	Direct	0.59	0.52	0.59	0.63	0.47
	Ceded	0.00	0.14	0.87	0.00	0.00
	Net	0.63	0.55	0.57	0.68	0.50
CAL	New	0.96	2.01	1.44	1.17	0.77
	Renewal	0.65	0.55	0.55	1.22	0.92
	Renewal (2)	0.50	0.99	0.69	0.38	0.39
	Direct	0.55	1.04	0.75	0.57	0.51
	Ceded	0.01	0.02	0.02	0.01	0.01
	Net	0.58	1.08	0.79	0.60	0.54
CMP-L	New	0.61	0.93	0.67	1.01	0.84
	Renewal	0.42	0.66	0.79	0.66	0.63
	Renewal (2)	0.61	0.52	0.45	0.63	0.67
	Direct	0.59	0.58	0.51	0.70	0.69
	Ceded	0.00	0.00	0.00	0.00	0.00
	Net	0.62	0.60	0.54	0.73	0.73
CMP-P	New	0.52	1.05	0.65	0.75	1.54
	Renewal	0.54	0.25	1.24	0.75	0.68
	Renewal (2)	0.49	0.74	0.70	0.52	0.74
	Direct	0.55	0.99	1.07	0.68	0.89
	Ceded	0.15	0.48	1.57	0.19	0.25
	Net	0.61	1.08	0.98	0.76	1.00
OL	New	0.56	0.39	0.49	0.54	0.31
	Renewal	0.38	0.20	0.34	0.29	0.39
	Renewal (2)	0.42	0.11	0.03	0.09	0.26
	Direct	0.43	0.14	0.13	0.20	0.29
	Ceded	0.00	0.00	0.00	0.00	0.00
	Net	0.45	0.15	0.14	0.21	0.30
OL-U	New	0.24	0.12	0.10	0.02	0.12
	Renewal	0.10	0.01	0.09	0.23	0.05
	Renewal (2)	0.35	0.06	0.17	0.24	0.24
	Direct	0.32	0.06	0.15	0.19	0.19
	Ceded	0.32	0.06	0.15	0.19	0.19
	Net	0.33	0.06	0.16	0.20	0.19
WC	New	0.63	1.02	0.77	0.77	0.61
	Renewal	0.58	0.50	0.81	0.99	0.71
	Renewal (2)	0.60	0.44	0.43	0.64	0.57
	Direct	0.60	0.49	0.50	0.70	0.60
	Ceded	0.00	0.00	0.00	0.01	0.00
	Net	0.62	0.50	0.51	0.72	0.61

New Business
Homeowners Multiple Peril
Direct Underwriting Module

Exhibit B-8

Description	2nd Prior Year 1996	1st Prior Year 1997	Accident Years 1st Year 1998	2nd Year 1999	3rd Year 2000	4th Year 2001	5th Year 2002
1. Premiums:							
a. Exposure Growth Rate			-1%	2%	8%	10%	10%
b. Number of Exposures	10,740	9,569	6,282	6,736	10,287	13,788	16,119
c. Average Rate Growth Rate			5%	11%	3%	2%	8%
d. Average Rate per Exposure	387.61	377.37	397.38	440.83	455.88	463.75	499.31
e. Written Premiums	4,162,984	3,610,877	2,496,361	2,969,449	4,689,613	6,394,149	8,048,344
f. Earning Ratio	0.50	0.50	0.50	0.50	0.50	0.50	0.50
g. Earned Premiums	4,162,984	3,886,930	3,053,619	2,732,905	3,829,531	5,541,881	7,221,247
h. Unearned Premium Reserves	2,081,492	1,805,438	1,248,180	1,484,724	2,344,807	3,197,075	4,024,172
i. Renewal Ratio	60%	60%	60%	60%	60%	60%	60%
2. Expenses:							
a. Commissions	585,760	486,894	349,491	415,723	656,546	895,181	1,126,768
b. General Expense	272,033	243,112	198,485	177,639	248,920	360,222	469,381
c. Other Acquisition	523,786	458,017	360,327	322,483	451,885	653,942	852,107
d. Premium Taxes	133,330	117,821	84,876	100,961	159,447	217,401	273,644
e. Policyholder Dividends	-	-	-	-	-	-	-
f. Other Nonrecurring Expenses	-	-	931,848	-	-	-	-
g. Subtotal (Expenses)	1,514,908	1,305,843	1,925,027	1,016,806	1,516,797	2,126,746	2,721,900
3. Losses:							
a. Initial Severity Mean	2,000	2,000	2,000	2,000	2,000	2,000	2,000
b. Initial Severity Std.	192	192	192	192	192	192	192
c. Severity Trend	0.959	1.000	1.043	1.115	1.105	1.171	1.248
d. U/W & Rate Adjustments							
e. Modeled Severity	1,719	1,781	1,846	2,633	1,894	2,219	3,002
f. Initial Frequency Mean	0.157	0.157	0.157	0.157	0.157	0.157	0.157
g. Initial Frequency Std.	0.014	0.014	0.014	0.014	0.014	0.014	0.014
h. Frequency Trend	1.000	1.000	1.000	1.000	1.000	1.000	1.000
i. U/W & Rate Adjustments	1.000	1.000	1.000	1.000	1.000	1.000	1.000
j. Modeled Frequency	0.15	0.15	0.17	0.13	0.17	0.13	0.16
k. a Priori Ultimate Losses & ALAE	2,795,926	2,561,872	1,914,826	2,390,620	3,275,774	4,068,293	7,605,820
l. a Priori Loss & ALAE Ratio	0.67	0.66	0.63	0.87	0.86	0.73	1.05
m. New Business Penalty	(0.14)	(0.33)	(0.03)	0.30	0.28	0.11	0.26

Constained Growth Case

50 Iterations Using Excel

Exhibit C-1-a

	Output N19	Output o19	Output p19	Output q19	Output r19	Output n34	Output o34	Output p34	Output q34	Output r34
	No	No	No	No	Yes	No	No	No	No	Yes
	175,804,947	177,290,291	182,504,379	192,153,293	203,398,666	2.128	2.302	2.458	2.572	2.737
Trial #	Surplus 98	Surplus 99	Surplus 00	Surplus 01	Surplus 02	P/S 98	P/S 99	P/S 00	P/S 01	P/S 02
1	177,841,779	167,912,331	168,844,782	179,295,863	212,021,245	2.069	2.323	2.462	2.466	2.178
2	181,059,869	187,173,731	185,287,185	200,046,953	221,523,361	2.032	2.096	2.300	2.272	2.218
3	166,966,791	149,474,454	140,715,199	147,634,907	121,635,939	2.270	2.780	3.164	3.218	4.308
4	192,635,204	209,507,227	209,709,103	220,156,166	264,713,480	1.884	1.820	1.924	1.959	1.712
5	171,116,002	154,671,307	167,894,973	151,567,761	140,269,784	2.158	2.560	2.576	3.040	3.553
6	165,479,513	184,319,389	173,127,374	168,013,654	203,180,933	2.264	2.185	2.528	2.848	2.523
7	183,332,162	183,675,934	189,911,787	233,546,717	277,009,685	2.013	2.176	2.333	2.127	1.989
8	170,990,389	165,399,172	156,883,024	157,326,334	163,498,520	2.175	2.438	2.825	3.092	3.128
9	166,219,582	176,014,335	194,302,088	187,946,530	195,213,865	2.247	2.311	2.286	2.613	2.740
10	167,549,849	170,272,178	163,200,039	157,833,112	133,012,541	2.213	2.316	2.536	2.804	3.582
11	181,989,043	175,721,582	181,291,022	193,981,472	219,868,778	2.044	2.234	2.323	2.403	2.277
12	171,173,909	171,489,352	165,795,558	188,518,302	204,182,589	2.181	2.338	2.640	2.518	2.529
13	187,218,190	202,499,309	215,812,659	227,802,009	233,368,315	1.966	1.908	1.893	1.931	2.087
14	174,554,551	178,557,958	183,769,330	186,220,807	234,376,888	2.119	2.234	2.412	2.660	2.315
15	163,605,439	157,051,627	161,536,361	176,364,972	191,007,728	2.268	2.525	2.663	2.658	2.673
16	174,687,514	169,203,255	191,150,328	250,344,258	288,986,500	2.136	2.424	2.387	2.007	1.889
17	186,363,932	198,662,672	212,179,904	189,277,418	182,227,624	1.978	1.983	2.011	2.493	2.818
18	180,357,986	173,817,775	189,970,611	206,837,028	239,280,898	2.066	2.337	2.299	2.287	2.181
19	199,678,781	213,265,100	236,976,237	259,981,632	247,071,935	1.842	1.817	1.758	1.720	1.937
20	154,142,665	162,509,036	185,054,667	205,015,116	231,133,529	2.423	2.500	2.347	2.279	2.249
21	155,221,003	118,718,197	92,886,218	78,669,964	55,478,453	2.394	3.421	4.875	6.342	9.896
22	175,247,353	184,870,219	190,839,173	192,707,442	196,359,498	2.120	2.164	2.243	2.354	2.462
23	165,738,288	129,422,352	146,643,228	165,293,737	172,175,738	2.257	3.155	3.017	2.824	2.853
24	188,367,238	212,822,053	227,044,964	265,479,686	296,200,982	1.983	1.893	1.938	1.820	1.796
25	179,013,070	184,596,877	195,657,567	184,165,528	181,694,094	2.045	2.134	2.208	2.476	2.604
26	162,119,150	162,399,400	156,024,363	118,100,922	116,516,157	2.304	2.438	2.688	3.804	4.070
27	197,293,489	214,106,548	224,820,661	232,681,325	233,141,728	1.910	1.931	1.996	2.098	2.237
28	166,821,963	161,029,300	154,493,557	156,015,553	145,959,338	2.236	2.501	2.865	3.083	3.595
29	192,919,927	194,954,825	201,447,824	232,288,838	285,751,895	1.922	2.045	2.148	2.028	1.770
30	167,274,874	153,646,410	152,881,964	177,887,239	206,060,179	2.237	2.634	2.794	2.513	2.338
31	161,172,142	171,102,588	191,640,480	216,988,209	263,704,092	2.317	2.390	2.385	2.307	2.057
32	158,229,833	147,982,570	158,106,954	156,149,224	152,057,763	2.396	2.774	2.753	2.939	3.149
33	190,861,707	221,047,612	254,435,227	261,244,340	260,722,050	1.947	1.829	1.673	1.678	1.757
34	176,386,326	186,603,421	220,228,631	228,437,423	254,584,475	2.105	2.135	1.935	1.980	1.913
35	188,698,228	196,972,298	201,538,134	195,616,576	157,858,918	1.981	2.071	2.233	2.432	3.200
36	152,363,410	140,578,639	157,474,700	157,070,679	156,579,559	2.450	2.913	2.867	3.106	3.311
37	190,039,899	207,857,645	232,091,596	248,277,009	250,383,091	1.968	1.971	1.941	1.968	2.169
38	184,363,321	186,687,410	186,932,473	205,737,487	203,362,673	1.976	2.030	2.180	2.172	2.398
39	178,958,213	208,166,934	199,078,688	217,182,852	214,074,617	2.072	1.918	2.204	2.212	2.421
40	188,911,722	175,829,627	171,477,115	184,375,749	209,054,244	1.974	2.259	2.539	2.637	2.543
41	163,221,155	175,395,082	180,854,923	157,710,730	169,908,087	2.295	2.324	2.489	3.175	3.235
42	180,852,903	175,439,975	192,045,808	175,663,109	187,755,230	2.045	2.257	2.213	2.564	2.532
43	182,714,124	180,445,572	180,889,033	199,618,725	200,390,796	2.066	2.281	2.481	2.472	2.708
44	166,435,215	172,961,456	186,831,678	249,789,424	311,488,334	2.245	2.344	2.356	1.904	1.635
45	198,691,266	194,024,781	183,725,795	183,243,534	167,210,103	1.901	2.108	2.407	2.552	2.888
46	156,146,480	149,628,366	139,393,175	128,571,645	115,688,005	2.427	2.763	3.218	3.662	4.214
47	181,822,715	176,811,631	199,487,704	224,282,332	243,874,670	2.036	2.223	2.094	1.992	1.977
48	191,453,368	200,425,847	167,487,942	177,224,928	183,034,215	1.911	1.883	2.392	2.403	2.468
49	156,140,880	151,498,912	122,842,747	157,326,157	171,881,494	2.424	2.718	3.654	3.122	3.045
50	189,913,004	225,044,188	245,884,995	302,084,201	423,838,881	1.970	1.796	1.802	1.634	1.295

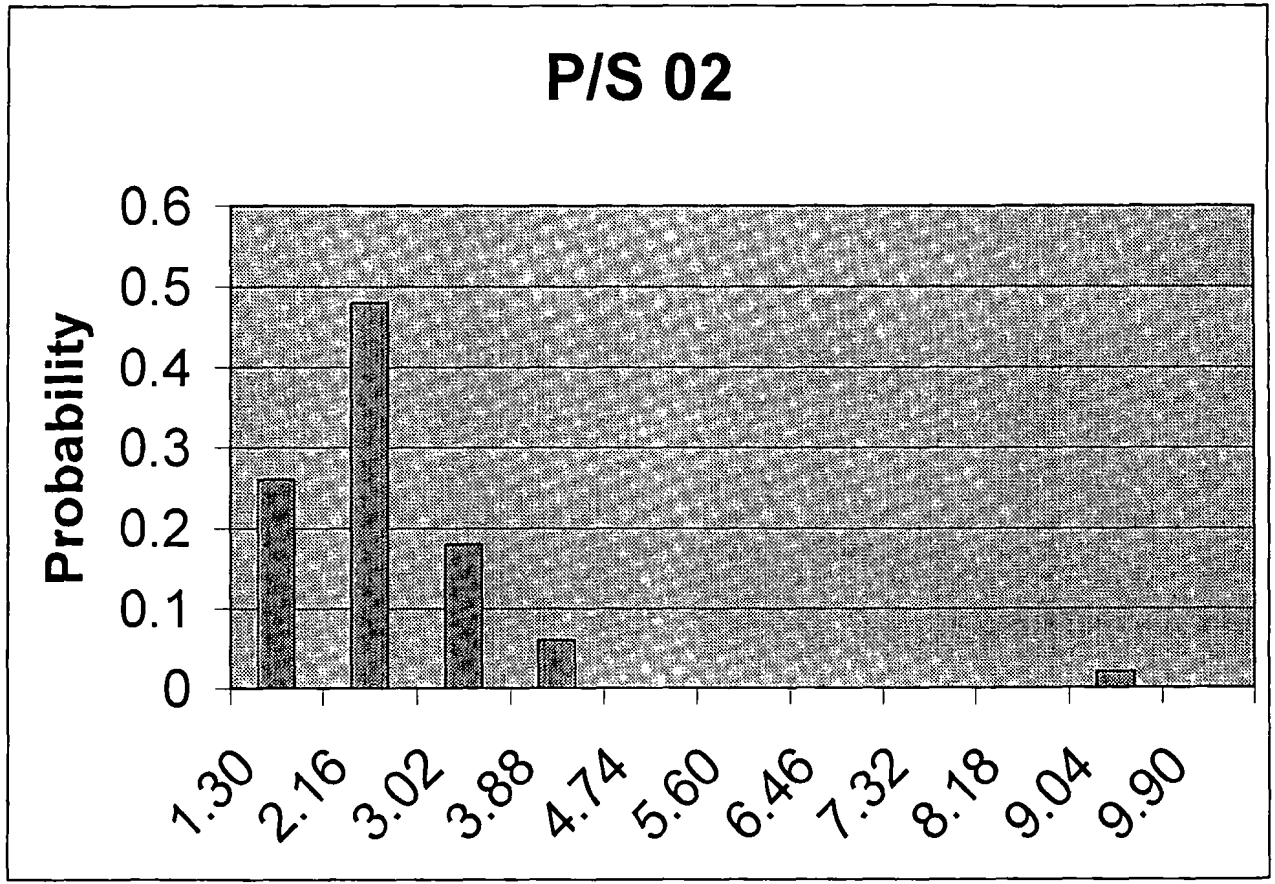
Constained Growth Case
50 Iterations Using Excel

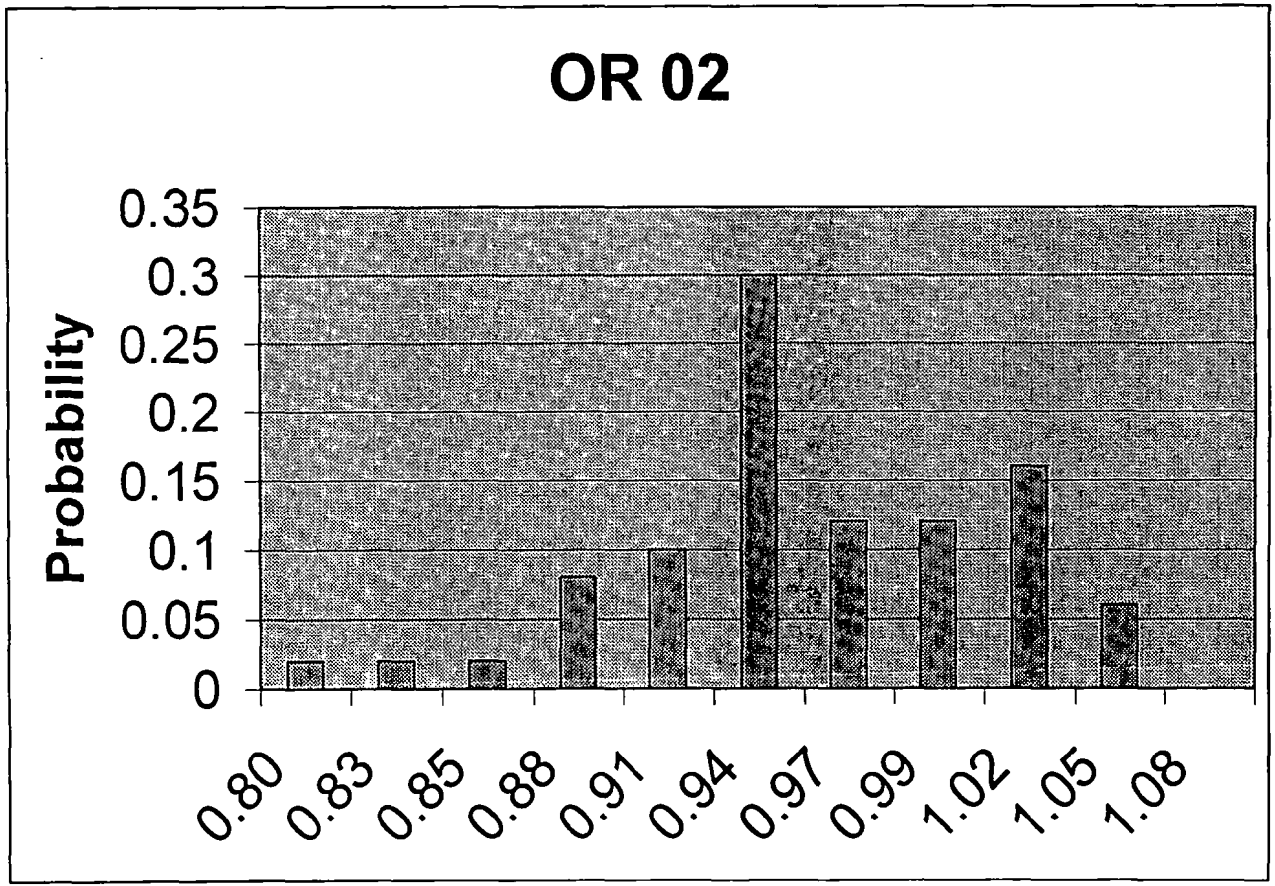
Exhibit C-1-b

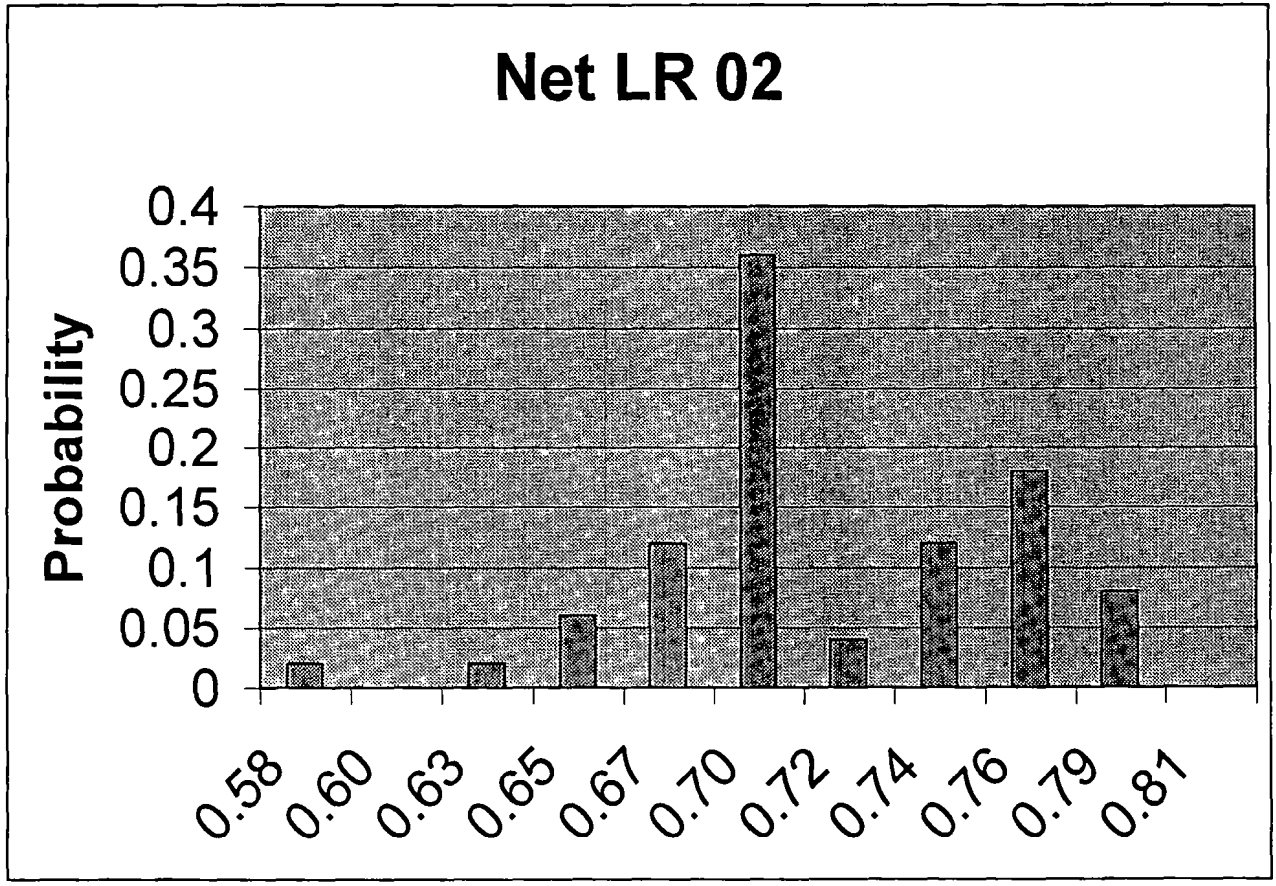
	Output p27	Output q27	Output r27	Output W8	Output x8	Output y8	Output z8	Output aa8
	No	No	Yes	No	No	No	No	Yes
	0.977	0.968	0.970	0.727	0.728	0.727	0.720	0.723
Trial #	OR 00	OR 01	OR 02	Net LR 98	Net LR 99	Net LR 00	Net LR 01	Net LR 02
1	0.993	0.988	0.933	0.724	0.769	0.747	0.757	0.705
2	1.013	0.974	1.030	0.720	0.726	0.770	0.736	0.768
3	1.006	0.969	1.075	0.720	0.774	0.755	0.705	0.786
4	0.965	0.959	0.897	0.701	0.668	0.732	0.714	0.690
5	0.956	1.025	0.994	0.741	0.792	0.707	0.781	0.715
6	1.028	1.002	0.868	0.758	0.687	0.766	0.753	0.635
7	1.017	0.945	0.959	0.730	0.756	0.767	0.688	0.725
8	1.006	0.986	0.982	0.735	0.729	0.745	0.721	0.743
9	0.908	0.964	0.956	0.758	0.652	0.672	0.699	0.703
10	0.975	0.981	1.024	0.757	0.714	0.722	0.716	0.750
11	0.951	0.934	0.909	0.704	0.772	0.714	0.685	0.684
12	1.005	0.927	0.963	0.737	0.737	0.731	0.693	0.711
13	0.962	0.983	1.040	0.711	0.691	0.725	0.747	0.787
14	0.995	1.011	0.936	0.735	0.714	0.736	0.742	0.704
15	1.009	0.977	1.029	0.772	0.759	0.738	0.738	0.769
16	0.983	0.927	1.037	0.750	0.774	0.734	0.691	0.796
17	0.958	1.016	0.969	0.698	0.698	0.706	0.748	0.714
18	0.981	0.973	0.959	0.716	0.763	0.729	0.727	0.717
19	0.903	0.901	1.041	0.683	0.671	0.669	0.681	0.792
20	0.952	0.983	1.006	0.767	0.697	0.721	0.736	0.758
21	1.070	1.038	1.063	0.771	0.829	0.800	0.775	0.773
22	0.951	0.980	0.954	0.716	0.687	0.711	0.724	0.706
23	0.954	0.924	0.927	0.759	0.832	0.707	0.679	0.685
24	1.003	0.964	0.954	0.717	0.683	0.761	0.724	0.715
25	0.932	1.022	0.965	0.757	0.738	0.679	0.777	0.712
26	0.955	1.045	0.941	0.772	0.736	0.695	0.760	0.702
27	0.964	0.994	0.950	0.640	0.678	0.723	0.736	0.692
28	0.992	0.957	0.984	0.741	0.737	0.731	0.711	0.698
29	0.952	0.874	0.799	0.689	0.704	0.711	0.632	0.580
30	1.004	0.938	0.961	0.719	0.769	0.746	0.696	0.721
31	0.969	0.969	0.922	0.780	0.706	0.716	0.731	0.699
32	0.954	0.997	0.975	0.776	0.757	0.696	0.755	0.715
33	0.861	0.965	1.013	0.671	0.627	0.663	0.735	0.783
34	0.895	0.980	0.951	0.727	0.719	0.665	0.742	0.709
35	1.011	1.023	1.076	0.693	0.734	0.756	0.794	0.810
36	0.974	1.019	0.956	0.780	0.783	0.711	0.747	0.707
37	0.936	0.922	0.951	0.675	0.665	0.702	0.690	0.691
38	0.991	0.955	1.006	0.734	0.726	0.737	0.699	0.770
39	0.993	0.876	0.963	0.721	0.625	0.742	0.626	0.705
40	1.006	0.988	0.983	0.663	0.798	0.747	0.731	0.754
41	0.979	1.041	0.937	0.775	0.707	0.712	0.780	0.676
42	0.895	1.014	0.902	0.713	0.765	0.662	0.756	0.661
43	0.980	0.904	0.952	0.714	0.742	0.726	0.653	0.702
44	0.975	0.872	0.886	0.752	0.709	0.737	0.638	0.669
45	1.012	0.971	1.041	0.655	0.788	0.746	0.720	0.790
46	1.033	1.033	1.038	0.765	0.770	0.776	0.777	0.772
47	0.943	0.948	0.996	0.732	0.758	0.699	0.715	0.755
48	1.096	0.966	1.009	0.696	0.729	0.832	0.735	0.770
49	1.066	0.892	0.982	0.774	0.742	0.768	0.656	0.742
50	0.947	0.896	0.852	0.669	0.617	0.711	0.676	0.655

Exhibit C-2


Surplus 02
Probability
0.3
0.25
0.2
0.15
0.1
0.05
0
55,478,452.78
92,314,495.60
129,150,538.42
165,986,581.24
202,822,624.06
239,658,666.88
276,494,709.69
313,330,752.51
350,166,795.33
387,002,838.15
423,838,880.97


P/S 02
Probability
0.6
0.5
0.4
0.3
0.2
0.1
0
1.30
2.16
3.02
3.88
4.74
5.60
6.46
7.32
8.18
9.04
9.90


OR 02
Probability
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0.80
0.83
0.85
0.88
0.91
0.94
0.97
0.99
1.02
1.05
1.08


Net LR 02
Probability
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0.58
0.60
0.63
0.65
0.67
0.70
0.72
0.74
0.76
0.79
0.81

Constrained Growth Case
50 Iterations Using Excel

Exhibit C-6-a

ABC Insurance Company
Statutory Balance Sheet

		1998	1999	2000	2001	2002
ASSETS						
1.	Bonds	396,499,803	446,898,745	497,829,153	589,700,288	718,720,887
2.	Stocks:					
	2.1 Preferred stocks	14,023,733	17,061,531	20,785,554	26,423,310	34,323,460
	2.2 Common stocks	97,994,321	105,550,614	112,460,582	126,104,943	147,248,793
3.	Mortgage loans on real estate	196,144	196,144	196,144	196,144	196,144
4.	Real estate	16,880,795	16,880,795	16,880,795	16,880,795	16,880,795
5.	Collateral loans	-	-	-	-	-
6.	Cash	34,512,971	40,507,351	46,442,206	55,121,920	65,046,227
7.	Other Invested assets	446,683	446,683	446,683	446,683	446,683
8.	Aggregate write-ins					
9.	Subtotals, cash & invested assets	560,554,450	627,541,863	695,041,118	814,874,083	982,862,990
10.	Agents' balances or uncollected pr	48,628,153	52,552,186	57,615,575	64,149,153	71,373,787
11.	Funds held by reinsurer	210	210	210	210	210
12.	Bills receivable	-	-	-	-	-
13.	Reinsurance recoverables	5,497,330	5,921,323	6,645,300	7,603,519	8,196,091
14.	Federal income tax collectable		-	-	-	-
15.	Electronic data processing	2,992,030	2,992,030	2,992,030	2,992,030	2,992,030
16.	Interest, dividends & real estate	6,344,827	6,344,827	6,344,827	6,344,827	6,344,827
17.	Receivable from parent	1,107,674	1,107,674	1,107,674	1,107,674	1,107,674
18.	Equities and deposits in pools	-	-	-	-	-
19.	Amounts receivable relating to A&	-	-	-	-	-
20.	Other assets nonadmitted	-	-	-	-	-
21.	Aggregate write-ins	4,956,493	4,956,493	4,956,493	4,956,493	4,956,493
22.	Total assets	630,081,167	701,416,606	774,703,227	902,027,989	1,077,834,103

Output

Constrained Growth Case **Exhibit C-6-b**

50 Iterations Using Excel

			1998	1999	2000	2001	2002
LIABILITIES							
1.	Losses & LAE:	###	274,866,487	296,066,154	332,264,999	380,175,936	409,804,567
2.	Unearned premiums:		152,246,049	164,553,572	180,545,169	200,946,307	222,552,191
3.	Other expenses		6,017,656	6,359,261	6,925,775	7,660,788	8,533,674
4.	Taxes, licenses and fees		6,233,649	6,738,378	7,387,003	8,224,718	9,145,463
5.	Federal income taxes		804,323	2,655,053	1,695,285	2,936,039	3,959,327
6.	Other liabilities						
7.	Total liabilities		440,168,163	476,372,419	528,818,231	599,943,787	653,995,222
SURPLUS							
8.	Additions to surplus		-	-	-	-	-
9.	Surplus as regards to policyholders		189,913,004	225,044,188	245,884,995	302,084,201	423,838,881
	Net Income (Before taxes)		27,769,271	78,821,663	51,800,669	87,013,290	131,537,893
	Underwriting Gain/(Loss)		(21,458,877)	20,982,474	(21,902,348)	(7,733,303)	(2,955,578)
	Combined Ratio		1.055	0.938	1.041	1.004	0.994
	Operating Ratios		0.976	0.855	0.947	0.896	0.852
	Investment Income / Surplus		0.155	0.143	0.163	0.170	0.177
	Investment Income / Earned Premium		0.079	0.082	0.094	0.108	0.142
IRIS Ratios							
1.	**Premium to Surplus**		**1.97**	**1.80**	**1.80**	**1.63**	**1.30**
2.	Change in Writings		0.9%	8.1%	9.6%	11.3%	11.3%
3.	Surplus Aid to Surplus		3.6%	3.4%	3.4%	3.0%	2.3%
4.	Two Year Overall Operating Ratio			93%	93%	95%	90%
5.	Investment Yield		5.4%	5.1%	5.8%	6.3%	7.6%
6.	Change in Surplus		17.5%	16.0%	8.1%	20.0%	35.8%
7.	Liabilities to Liquid Assets		64%	63%	63%	62%	56%
8.	Agents Balances to Surplus		26%	23%	23%	21%	17%
9.	One Year Development		5.1%	0.8%	1.3%	1.2%	2.9%
10.	Two Year Development			6.6%	1.9%	2.0%	3.1%
11.	Estimated Current Reserve Deficiency to Surplus			#N/A	-3.7%	-4.4%	4.0%

Output

Constrained Growth Case
50 Iterations Using Excel

Exhibit C-7

		Apriori Loss & ALAE Ratios				
		Accident Years				
Coverage	Subdivision	1998	1999	2000	2001	2002
All	Direct	0.61	0.55	0.64	0.61	0.59
	Ceded	0.16	0.05	0.11	0.06	0.06
	Net	0.67	0.62	0.71	0.68	0.66
HMP	New	0.67	0.83	1.03	0.68	0.91
	Renewal	0.49	0.58	0.82	0.72	0.67
	Renewal (2)	0.81	0.49	0.71	0.67	0.64
	Direct	0.79	0.57	0.78	0.68	0.68
	Ceded	0.10	0.02	0.04	0.00	0.00
	Net	0.86	0.63	0.86	0.75	0.75
PPAL	New	0.99	1.07	1.07	0.92	1.00
	Renewal	0.68	0.90	0.94	0.79	0.84
	Renewal (2)	0.73	0.70	0.88	0.80	0.85
	Direct	0.76	0.77	0.92	0.82	0.88
	Ceded	0.00	0.00	0.00	0.00	0.00
	Net	0.79	0.81	0.96	0.86	0.92
APD-P	New	0.75	0.69	0.74	0.66	0.57
	Renewal	0.59	0.60	0.74	0.63	0.62
	Renewal (2)	0.57	0.51	0.60	0.62	0.49
	Direct	0.62	0.57	0.69	0.63	0.52
	Ceded	0.07	0.02	0.10	0.00	0.00
	Net	0.65	0.61	0.73	0.68	0.56
APD-C	New	0.76	0.82	0.82	0.76	0.78
	Renewal	0.34	0.39	0.63	0.70	0.45
	Renewal (2)	0.49	0.38	0.62	0.56	0.42
	Direct	0.52	0.44	0.68	0.60	0.46
	Ceded	0.10	0.02	0.08	0.00	0.00
	Net	0.55	0.47	0.72	0.64	0.49
CAL	New	1.08	1.63	0.85	1.56	1.25
	Renewal	0.67	0.79	0.87	0.67	0.88
	Renewal (2)	0.86	0.93	0.36	0.47	0.72
	Direct	0.86	0.97	0.45	0.60	0.79
	Ceded	0.02	0.02	0.01	0.02	0.03
	Net	0.89	1.02	0.48	0.63	0.83
CMP-L	New	0.84	0.87	0.76	0.64	0.65
	Renewal	0.55	0.59	0.67	0.57	0.48
	Renewal (2)	0.48	0.53	0.46	0.51	0.40
	Direct	0.52	0.57	0.52	0.53	0.44
	Ceded	0.00	0.00	0.00	0.00	0.00
	Net	0.54	0.59	0.54	0.56	0.46
CMP-P	New	0.83	0.94	0.79	0.66	0.37
	Renewal	0.55	0.51	0.69	0.65	0.58
	Renewal (2)	0.39	0.16	0.36	0.45	0.51
	Direct	0.54	0.35	0.58	0.52	0.52
	Ceded	0.33	0.13	0.26	0.14	0.14
	Net	0.57	0.39	0.63	0.58	0.59
OL	New	0.66	0.03	0.48	0.25	0.19
	Renewal	0.27	0.62	0.45	0.24	0.12
	Renewal (2)	0.47	0.24	0.12	0.69	0.08
	Direct	0.47	0.25	0.20	0.59	0.10
	Ceded	0.00	0.00	0.00	0.02	0.00
	Net	0.49	0.26	0.21	0.61	0.10
OL-U	New	0.20	0.02	0.37	0.07	0.18
	Renewal	0.18	0.03	0.20	0.04	0.12
	Renewal (2)	0.14	0.02	0.01	0.03	0.03
	Direct	0.15	0.02	0.08	0.04	0.06
	Ceded	0.15	0.02	0.07	0.04	0.06
	Net	0.16	0.02	0.08	0.04	0.06
WC	New	0.52	0.81	0.71	0.98	0.65
	Renewal	0.45	0.51	1.04	0.77	0.63
	Renewal (2)	0.55	0.47	0.51	0.49	0.37
	Direct	0.53	0.50	0.57	0.58	0.43
	Ceded	0.00	0.00	0.00	0.00	0.00
	Net	0.55	0.51	0.58	0.60	0.45

Output

New Business
Homeowners Multiple Peril
Direct Underwriting Module

Exhibit C-8

Description	2nd Prior Year 1996	1st Prior Year 1997	Accident Years 1st Year 1998	2nd Year 1999	3rd Year 2000	4th Year 2001	5th Year 2002
1. Premiums:							
a. Exposure Growth Rate			-1%	2%	2%	2%	2%
b. Number of Exposures	10,740	9,569	6,282	6,736	6,881	7,031	7,177
c. Average Rate Growth Rate			3%	4%	4%	10%	13%
d. Average Rate per Exposure	387.61	377.37	389.81	403.87	421.91	463.85	521.94
e. Written Premiums	4,162,984	3,610,877	2,448,776	2,720,447	2,903,131	3,261,302	3,745,942
f. Earning Ratio	0.50	0.50	0.50	0.50	0.50	0.50	0.50
g. Earned Premiums	4,162,984	3,886,930	3,029,826	2,584,612	2,811,789	3,082,216	3,503,622
h. Unearned Premium Reserves	2,081,492	1,805,438	1,224,388	1,360,224	1,451,565	1,630,651	1,872,971
i. Renewal Ratio	60%	60%	60%	60%	60%	60%	60%
2. Expenses:							
a. Commissions	585,760	486,894	342,829	380,863	406,438	456,582	524,432
b. General Expense	272,033	243,112	196,939	168,000	182,766	200,344	227,735
c. Other Acquisition	523,786	458,017	357,519	304,984	331,791	383,702	413,427
d. Premium Taxes	133,330	117,821	83,258	92,495	98,706	110,884	127,362
e. Policyholder Dividends	-	-	-	-	-	-	-
f. Other Nonrecurring Expenses	-	-	931,848	-	-	-	-
g. Subtotal (Expenses)	1,514,908	1,305,843	1,912,393	946,342	1,019,702	1,131,512	1,292,957
3. Losses:							
a. Initial Severity Mean	2,000	2,000	2,000	2,000	2,000	2,000	2,000
b. Initial Severity Std.	192	192	192	192	192	192	192
c. Severity Trend	0.959	1.000	1.056	1.082	1.165	1.278	1.403
d. U/W & Rate Adjustments							
e. Modeled Severity	2,228	2,021	2,098	2,120	2,227	1,946	3,050
f. Initial Frequency Mean	0.157	0.157	0.157	0.157	0.157	0.157	0.157
g. Initial Frequency Std.	0.014	0.014	0.014	0.014	0.014	0.014	0.014
h. Frequency Trend	1.000	1.000	1.000	1.000	1.000	1.000	1.000
i. U/W & Rate Adjustments	1.000	1.000	1.000	1.000	1.000	1.012	1.022
j. Modeled Frequency	0.16	0.15	0.15	0.15	0.19	0.15	0.15
k. a Priori Ultimate Losses & ALAE	3,744,409	2,934,173	2,038,890	2,136,907	2,882,135	2,081,766	3,195,043
l. a Priori Loss & ALAE Ratio	0.90	0.75	0.67	0.83	1.03	0.68	0.91
m. New Business Penalty	0.09	(0.23)	(0.12)	0.25	0.24	(0.01)	0.23

Exhibit D-1

@RISK Simulation of DYNAMO2E.XLS

Run on 3/19/98
Simulations = 1
Iterations = 1,000

	1998 Surplus	1999 Surplus	2000 Surplus	2001 Surplus	2002 Surplus
Minimum =	(461,984,300)	(464,044,400)	(658,655,200)	(3,981,046,000)	(4,109,432,000)
Maximum =	219,620,400	232,325,600	247,397,700	279,958,500	349,451,900
Mean =	175,183,300	172,729,100	162,437,000	140,325,500	119,960,000
Std Deviation =	25,367,610	35,172,020	58,886,520	158,989,100	170,083,700
Skewness =	(16)	(8)	(8)	(19)	(17)
Kurtosis =	399	135	96	464	393
Errors Calculated =	0	0	0	0	0
Mode =	183,323,400	189,186,500	157,942,800	146,236,600	144,654,100
5% Perc =	150,111,300	133,530,300	110,952,500	69,588,900	17,046,880
10% Perc =	156,466,800	143,562,100	126,444,200	93,083,060	47,894,900
15% Perc =	160,428,200	150,650,900	134,350,400	109,960,300	69,858,660
20% Perc =	163,369,400	156,111,900	141,608,300	118,977,200	83,737,990
25% Perc =	166,067,800	160,462,300	147,622,400	125,549,900	92,905,990
30% Perc =	168,222,300	164,026,900	153,066,700	133,642,000	102,295,100
35% Perc =	170,358,300	167,002,500	157,766,700	140,360,400	110,937,800
40% Perc =	172,559,400	170,754,200	161,036,400	144,735,900	120,214,500
45% Perc =	174,956,500	172,904,100	165,105,400	148,773,700	126,096,300
50% Perc =	177,070,800	175,912,900	168,157,400	154,535,400	132,922,300
55% Perc =	178,402,200	178,036,100	171,592,500	160,116,100	141,605,100
60% Perc =	180,724,700	180,663,500	175,279,600	164,656,600	147,768,700
65% Perc =	182,738,400	183,921,300	179,008,700	168,188,100	155,598,400
70% Perc =	184,302,400	187,031,800	183,095,600	172,875,500	162,953,700
75% Perc =	186,266,200	189,848,800	186,883,400	179,016,000	171,141,000
80% Perc =	188,621,500	193,273,200	190,873,800	185,600,500	181,757,900
85% Perc =	190,977,800	197,860,700	197,096,300	193,082,800	192,261,800
90% Perc =	194,243,200	202,111,600	204,055,200	205,672,300	209,546,100
95% Perc =	199,679,300	208,505,600	213,341,300	219,849,100	233,545,300

Exhibit D-2

@RISK Simulation of DYNAMO2E.XLS

Run on 3/19/98
Simulations = 1
Iterations = 1,000

	1998 NWP/Surplus Ratio	1999 NWP/Surplus Ratio	2000 NWP/Surplus Ratio	2001 NWP/Surplus Ratio	2002 NWP/Surplus Ratio
Minimum =	(0.808)	(5.412)	(94.557)	(189.958)	(634.106)
Maximum =	3.736	104.599	3808.938	78.941	346.398
Mean =	2.132	2.458	6.631	3.471	4.851
Std Deviation =	0.231	3.285	120.382	7.519	30.270
Skewness =	(0.918)	30.076	31.510	(15.803)	(10.783)
Kurtosis =	32.101	935.062	995.272	455.744	255.953
Errors Calculated =	0.000	0 000	0.000	0.000	0.000
Mode =	2.091	2.379	2.803	2.950	3.645
5% Perc =	1.852	1.881	2.067	2.261	2.212
10% Perc =	1.901	1 966	2.187	2.445	2.609
15% Perc =	1.937	2.011	2.272	2.604	2.895
20% Perc =	1.967	2.062	2.351	2.708	3.085
25% Perc =	1.990	2.108	2.415	2.816	3.288
30% Perc =	2.011	2.149	2.461	2.929	3.442
35% Perc =	2.034	2.187	2.518	3.008	3.629
40% Perc =	2.061	2.220	2 573	3.105	3.786
45% Perc =	2.082	2.260	2.647	3.192	3.988
50% Perc =	2.103	2.282	2.705	3.286	4.180
55% Perc =	2.131	2.320	2.766	3.386	4.396
60% Perc =	2.155	2.354	2.813	3.503	4.666
65% Perc =	2.183	2.402	2.875	3.608	4.996
70% Perc =	2.214	2.464	2.952	3.787	5.359
75% Perc =	2.244	2.529	3.069	3.996	5.793
80% Perc =	2.281	2.606	3.207	4.269	6.435
85% Perc =	2.327	2.689	3.366	4.552	7.259
90% Perc =	2.390	2.817	3.588	5.183	9.074
95% Perc =	2.488	3.021	3.989	6.361	14.287

Exhibit D-3

@RISK Simulation of DYNAMO2E.XLS

Run on 3/19/98
Simulations = 1
Iterations = 1,000

	1998 Net Loss Ratio	1999 Net Loss Ratio	2000 Net Loss Ratio	2001 Net Loss Ratio	2002 Net Loss Ratio
Minimum =	0.587	0.569	0.601	0.629	0.624
Maximum =	2.567	1.904	2.612	9.949	1.368
Mean =	0.730	0.742	0.759	0.781	0.772
Std Deviation =	0.072	0.064	0.107	0.318	0.056
Skewness =	16.268	7.583	12.696	24.984	2.537
Kurtosis =	413.071	122.695	199.693	696.739	27.796
Errors Calculated =	0.000	0.000	0.000	0.000	0.000
Mode =	0.750	0.773	0.777	0.766	0.773
5% Perc =	0.654	0.666	0.683	0.690	0.693
10% Perc =	0.670	0.684	0.699	0.706	0.708
15% Perc =	0.682	0.695	0.712	0.718	0.720
20% Perc =	0.692	0.703	0.719	0.726	0.733
25% Perc =	0.700	0.712	0.725	0.736	0.743
30% Perc =	0.706	0.719	0.733	0.742	0.750
35% Perc =	0.712	0.725	0.739	0.750	0.756
40% Perc =	0.719	0.731	0.745	0.757	0.762
45% Perc =	0.724	0.736	0.752	0.762	0.766
50% Perc =	0.729	0.741	0.756	0.766	0.771
55% Perc =	0.736	0.746	0.761	0.769	0.774
60% Perc =	0.741	0.751	0.765	0.772	0.777
65% Perc =	0.748	0.757	0.769	0.775	0.783
70% Perc =	0.754	0.762	0.773	0.779	0.791
75% Perc =	0.759	0.766	0.776	0.786	0.799
80% Perc =	0.765	0.771	0.779	0.798	0.809
85% Perc =	0.771	0.775	0.790	0.808	0.822
90% Perc =	0.776	0.782	0.801	0.821	0.833
95% Perc =	0.790	0.807	0.825	0.841	0.853

Exhibit D-4

@RISK Simulation of DYNAMO2E.XLS

Run on 3/19/98
Simulations = 1
Iterations = 1,000

	1998 Combined Ratio	1999 Combined Ratio	2000 Combined Ratio	2001 Combined Ratio	2002 Combined Ratio
Minimum =	0.954	0.889	0.905	0.928	0.942
Maximum =	2.978	2.260	2.958	10.278	1.705
Mean =	1.118	1.080	1.092	1.112	1.102
Std Deviation =	0.077	0.070	0.111	0.320	0.063
Skewness =	13.829	6.105	11.660	24.671	1.882
Kurtosis =	333.794	92.078	178.080	684.653	18.775
Errors Calculated =	0.000	0.000	0.000	0.000	0.000
Mode =	1.143	1.100	1.123	1.091	1.082
5% Perc =	1.030	0.994	1.007	1.009	1.011
10% Perc =	1.049	1.016	1.023	1.029	1.029
15% Perc =	1.062	1.025	1.035	1.041	1.043
20% Perc =	1.075	1.033	1.047	1.052	1.055
25% Perc =	1.083	1.044	1.055	1.062	1.064
30% Perc =	1.092	1.053	1.061	1.070	1.075
35% Perc =	1.098	1.060	1.068	1.077	1.082
40% Perc =	1.106	1.067	1.075	1.084	1.089
45% Perc =	1.111	1.072	1.081	1.089	1.094
50% Perc =	1.118	1.078	1.086	1.093	1.099
55% Perc =	1.124	1.083	1.091	1.099	1.105
60% Perc =	1.132	1.090	1.098	1.105	1.111
65% Perc =	1.139	1.096	1.103	1.111	1.117
70% Perc =	1.145	1.102	1.109	1.117	1.125
75% Perc =	1.150	1.108	1.116	1.124	1.134
80% Perc =	1.158	1.116	1.122	1.133	1.145
85% Perc =	1.166	1.123	1.133	1.146	1.158
90% Perc =	1.176	1.133	1.147	1.161	1.175
95% Perc =	1.191	1.165	1.171	1.189	1.197

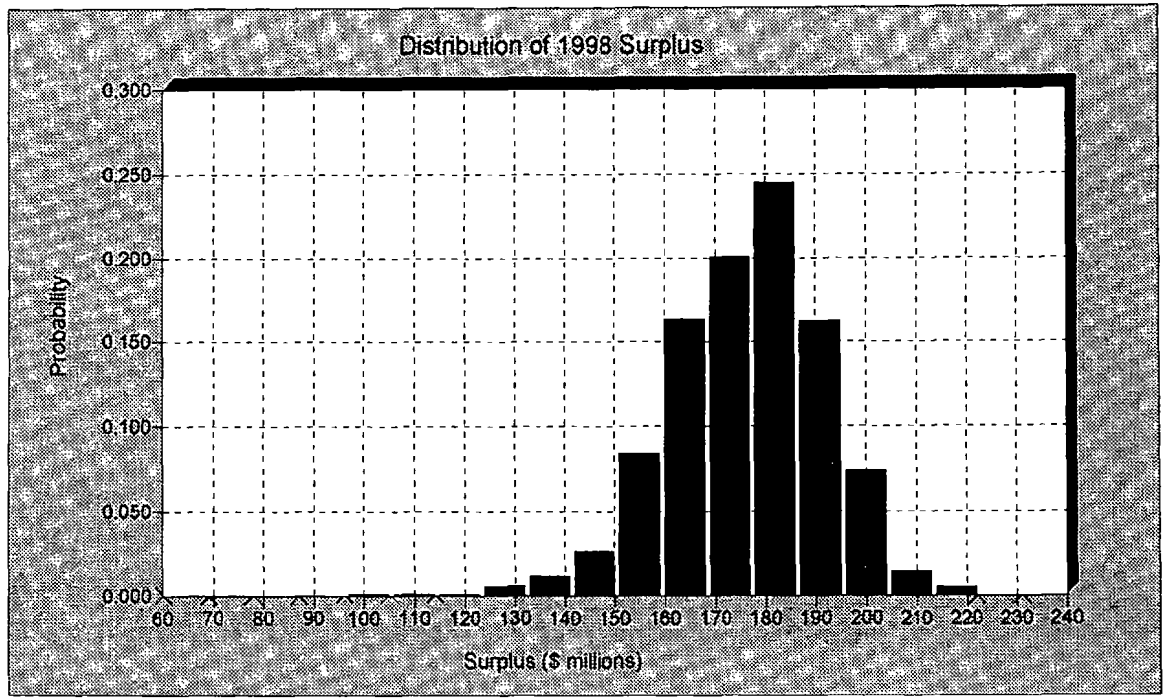
Exhibit D-5

@RISK Simulation of DYNAMO2E.XLS

Run on 3/19/98
Simulations = 1
Iterations = 1,000

	1998 Operating Ratio	1999 Operating Ratio	2000 Operating Ratio	2001 Operating Ratio	2002 Operating Ratio
Minimum =	0.874	0.806	0.838	0.871	0.874
Maximum =	2.899	2.177	2.879	10.206	1.657
Mean =	1.039	1.000	1.016	1.040	1.034
Std Deviation =	0.078	0.070	0.111	0.320	0.063
Skewness =	13.774	6.108	11.774	24.704	1.909
Kurtosis =	332.041	91.546	180.029	685.955	19.120
Errors Calculated =	0.000	0.000	0.000	0.000	0.000
Mode =	1.066	1.025	1.029	1.039	1.040
5% Perc =	0.950	0.916	0.931	0.936	0.942
10% Perc =	0.969	0.936	0.947	0.956	0.961
15% Perc =	0.983	0.946	0.959	0.972	0.973
20% Perc =	0.995	0.954	0.972	0.981	0.987
25% Perc =	1.003	0.965	0.979	0.990	0.995
30% Perc =	1.012	0.975	0.985	0.999	1.004
35% Perc =	1.018	0.981	0.992	1.005	1.011
40% Perc =	1.026	0.987	0.999	1.012	1.020
45% Perc =	1.032	0.993	1.005	1.019	1.026
50% Perc =	1.038	0.999	1.010	1.024	1.031
55% Perc =	1.044	1.004	1.016	1.029	1.038
60% Perc =	1.053	1.010	1.022	1.033	1.044
65% Perc =	1.059	1.016	1.027	1.039	1.051
70% Perc =	1.065	1.023	1.033	1.044	1.059
75% Perc =	1.071	1.028	1.040	1.051	1.068
80% Perc =	1.078	1.036	1.047	1.061	1.077
85% Perc =	1.087	1.044	1.055	1.073	1.089
90% Perc =	1.097	1.056	1.069	1.088	1.106
95% Perc =	1.112	1.084	1.093	1.116	1.128

Exhibit D-6


Distribution of 1998 Surplus
Probability
0.300
0.250
0.200
0.150
0.100
0.050
0.000
60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240
Surplus ($ millions)