ACTUARIAL ASPECTS OF FINANCIAL REPORTING

by

Lee M. Smith

Lee M. Smith has a Bachelor's degree in Finance from Northern Illinois University and a Master's degree in Economics from Trinity College. He is a Fellow of the Casualty Actuarial Society and a Member of the American Academy of Actuaries. He has served on CAS Examination Committees (Parts 3 and 8) and on the CAS Risk Classification Committee. He has been Chief Actuary for the State of Michigan, Director of Planning at Aetna Insurance Company, President of his own consulting firm, and is currently a consultant with Ernst & Whinney. He has taught actuarial science at the Universities of Connecticut and Michigan.

Abstract

Financial reports of property/casualty insurance companies are notoriously difficult to interpret. A major reason for this difficulty is that the actuarially generated elements of those statements are usually not understood. Often they are not even identifiable.

By the use of a fairly simple model, relationships between actuarial analysis and financial statement figures can be displayed. Once the sources of data in actuarial data bases and the flow of actuarial projections into financial statements are identified at the conceptual level, progress can be made toward financial reports with which non-actuaries can feel comfortable.

The first model illustrated is called deterministic because all growth, contingency, reporting, and payment patterns are uniform. The flow of information to and from actuarial models is easily followed. Predictions can be made with a high level of comfort.

The second model is labeled stochastic. This is to clarify that some of the uniformity from the first model is relaxed. Growth rates, reporting patterns, and payment patterns are allowed to fluctuate in this model.

These models are used to identify and study the interrelationships between various actuarial projections and financial statements. Clearly, the actuarial elements of an enterprise's financial statements should be understood by as wide an audience as possible. By the use of the simple models illustrated in the paper, the interrelationships between the rating, reserving, and financial reporting functions can be examined and more fully appreciated. While the development of these relationships can be a difficult task in practice, the increased level of understanding is well worth the effort.

ACTUARIAL ASPECTS OF FINANCIAL REPORTING

Overview

Deterministic Model

- Reconstructed Historical Financial Statement
- Loss Development Analysis
- Rate Analysis
- Projected Financial Statements
- Deterministic Model Summary

Stochastic Model

- Reconstructed Historical Financial Statement
- Loss Development Analysis
- Rate Analysis
- Projected Financial Statements
- Stochastic Model Summary

Conclusion

ACTUARIAL ASPECTS OF FINANCING REPORTING

OVERVIEW

Casualty actuaries are most often thought of as insurance professionals who perform ratemaking and reserve studies. While this may be a fairly accurate representation in general, it abstracts away much of the essence of actuarial science. It also leads to a sense of mystique about rate and reserve figures which is often unwarranted.

Three key elements of casualty actuarial work are mathematics, economics, and accounting. Because casualty actuaries are in the forefront of the struggle to evaluate the contingencies facing an insurer, they must be able to formulate algorithms and fit parameters by which to predict losses. Not only must they determine the likelihood of a loss and the amount of a loss from a given exposure, they must also determine when the loss is likely to become known by the insurer and when it will be paid.

The mathematics involved in the evaluation of casualty contingencies is formidable. The analysis includes fitting curves to frequency and severity distributions and combining them to produce an expected loss distribution for a coverage at a point in time. Predicting losses at a different point in time requires development of a growth function. These mathematical aspects of actuarial science are the least understood and most feared by non-actuaries.

A second key element of actuarial work is economics. Particularly in their pricing role, actuaries are performing an economic function. Producing an "actuarially correct" rate indication is an empty exercise if an inappropriate rate of return

results. The rate of return will be inappropriate if elasticity of demand is such that sales drop unacceptably. It will also be inappropriate if the rate algorithm used does not incorporate rate of return in an economically meaningful manner.

The accounting function of the actuary is in many ways the most important. An actuary's math can be precise, but be applied to bad data. An algorithm can be properly applied to good data, but the results can be misinterpreted or misutilized. Proper effort applied to the accounting aspect of actuarial science can assure actuarial calculations are properly applied and that the results are properly interpreted.

A DETERMINISTIC MODEL

It is the premise of this paper that a major reason financial statements of property/casualty insurers are difficult to interpret and utilize is that the actuarial elements impacting the figures are not well understood by the preparers and users of those statements. In addition, the financial statements into which the actuarial elements are flowing are not always understood by actuaries. As a result, a good conceptual grasp of the actuarial aspects of financial statements is hard to develop.

To illustrate the flow of actuarial elements into financial statements, a very simple model is needed. If too many complicating elements were introduced, the relationships would be difficult to trace. The idea is to see how basic reserve and ratemaking procedures impact and are impacted by financial statements.

Reconstructed Historical Financial Statement

Perhaps the report (not ordinarily produced) which would shed the most light on the issue is a historical financial report in which loss figures are identified

by accident year. Calendar year incurred losses are composed of payments and reserve changes on losses from a number of accident years. As such, they bury the key figures which casualty actuaries use in reserve and rate computations.

Exhibit 1A is an example of a historical financial report in which losses are broken into accident year components. The figures in this exhibit result from a "deterministic" insurance process. In other words, losses are reported and paid according to predetermined patterns, and premium and loss levels grow at predetermined rates.

A number of simplifying assumptions are made in order to illustrate the fundamental relationships in question. The model company writes in one line in one state. (Alternatively, all lines and states are aggregated for reporting, reserving, and ratemaking purposes.) No reinsurance is assumed or ceded. All transactions are on a cash basis. Investment and tax rates are aggregated.

A beginning level of written premium of $1 million is assumed. Unearned premium is assumed to be 50% of written premium. Expenses are set at 25% of earned premiums. A more realistic approach would have expenses as a function of written and earned premiums, but for illustrative purposes the relationships have been aggregated into a single percentage.

Incurred losses are set at 75% of earned premium. Paid losses, case reserves, and IBNR reserves for a calendar-accident year combination are a function of the assumed payout and reporting patterns. Because the process is assumed to be deterministic, IBNR reserves are always accurate.

Underwriting cash flow is defined to be written premiums less paid losses less expenses. Underwriting income is earned premiums less incurred losses less expenses.

Written premium growth is a function of exposure growth, average premium growth, and mix of business effect. Exposure growth reflects change in number of policies written. Average premium growth reflects change in premium per exposure resulting from rate changes. Mix of business effect is change in premium resulting from a change in demographic makeup of policyholders toward higher or lower rated classifications. The assumed rate of growth for each growth type is, respectively, 10%, 5%, 5%.

Incurred loss growth is a function of exposure growth, frequency growth, and severity growth. Frequency represents the average number of claims per exposure unit, and severity the average cost of a claim. The growth rates for these loss elements are chosen to correspond with the growth rates for the premium elements.

The relationships chosen for this model produce a zero underwriting gain for each year. Because of the predictability of events rates keep up with losses and expenses. A zero underwriting gain is assumed to produce the target rate of return for the model company.

Investment income is a function of beginning of year assets, underwriting cash flow, and pre-tax average investment return on assets. For simplicity, it is assumed that full investment rate is earned on beginning of year assets while half the rate is earned on underwriting cash flow.

Tax is defined to be 50% of underwriting profit plus 20% of investment income. The lower rate on investment income assumes 60% of the income from the portfolio is from non-taxable instruments.

End of year assets are defined as beginning of year assets plus underwriting cash flow plus investment income less taxes. End of year liabilities are the sum of unearned premium reserves, case reserves, and IBNR reserves. Surplus is the difference between assets and liabilities. Change in surplus is after-tax underwriting plus investment gain.

Discounted calendar year incurred losses represents the sum of past payments and present value of future payments on accident years not fully paid. The present vaues are computed from the payment schedules in Exhibit 1B. The discounted loss reserve at any point in time is the present value of future payments on claims from accident years with claims still outstanding.

Discounted liabilities are the sum of unearned premium reserve and discounted loss reserves. Discounted surplus is the difference between assets and discounted liabilities. GAAP adjustment is defined to be 20% of unearned premium reserve. GAAP surplus is statutory surplus plus the GAAP adjustment. GAAP income is underwriting gain plus investment income less taxes plus change in GAAP adjustment. It should be noted that the fact that expenses were earlier made a function of earned premium makes it unlikely that in a real company such an adjustment would be needed to assure proper matching of income and expense.

This reconstructed historical financial statement, then, is the primary document showing the relationship between actuarial analysis and financial reporting. By

decomposing calendar year losses into their accident year components we reveal data used by actuaries in their deliberations. We are thus in a position to analyze the flow from actuarial models to financial reports.

Loss Development Analysis

As was indicated above, reserve estimation is one of the areas most closely identified with actuaries and their work. While very sophisticated procedures have been developed by which to estimate ultimate liabilities as of a point in time, the basic idea is quite simple. One must review liability estimates on the books and formulate a model by which to adjust those liabilities to a "best estimate" basis, assuming the booked figures are not determined to be appropriate.

The most common model for producing ultimate loss estimates is one which examines groups of accidents for historical periods and evaluates patterns by which they were paid, reported, and reserved. All other things being equal, these historical patterns are assumed to continue into the relevant future.

Exhibit 1B builds a simple reserving data base from data in the reconstructed historical financial statement. Loss figures are arranged by accident year and calendar year in the traditional manner. Very simple reserve models often utilize such data.

Because this is a deterministic model, the development patterns are totally stable. Growth in paid and reported losses from one maturity point to the next is uniform for each accident year. This is a function of the assumed uniform reporting and payment patterns mentioned previously.

Reserve estimation in such an environment is fairly routine, assuming no changes can be anticipated. Because 1.4 times as many losses are always reported in two years as were reported at one year maturity, it can be projected that the most current year's reported losses will be 40% higher next year. Likewise, it can be assumed that paid loses on the most recent accident year will be three times as high by next year.

Because loss reserving is always accurate in such a world, there is a one to one relationship between the loss figures in financial statements and those in reserve models. If such were not the case, incurred estimates for an accident year would change from one calendar year to the next as new information leads to more refined estimates. There would be a reserve table corresponding to each calendar year's financial statement, rather than a single table resulting from and feeding into a five year financial statement.

The paid and reported development factors produced in this model can be used to produce projected incremental future payments and reports by calendar year. We can thus project how historical accident years will impact results of future calendar years. Also, the projected payment schedule can be used to determine the discounted value of an accident year's loss payments at various points in time. Some elements of the relationship between an actuarial reserve model and a company's final financial statements are now becoming more obvious.

Rate Analysis

Ultimate incurred loss estimates produced in the reserve model for a coverage would flow into the rate level analysis for that coverage. They are often the

most critical component of a rate filing in terms of sensitivity of the rate indication. A relationship is thus established between financial statements and rate analyses.

Two critical relationships between rate analysis and financial statements involve incurred losses and rate indications. The incurred losses should tie back to financial statement figures. The rate indication, if implemented, would impact future premium levels and thereby financial statement figures. Premium and expense figures should be consistent with financial statement figures.

The rate model presented in Exhibit 1C is a simple one. The rate algorithm is peripheral to illustrating relationships between actuarial analysis and financial statements. The basic idea of any rate model, including this one, is that premiums to be collected be sufficient to produce the proper rate of return for the insuring entity. The historical figures should be consistent with those in other company reports. Financial projections should account for expected impact of the rate change, including an evaluation of demand elasticity.

Projected Financial Statements

Financial projections can be used for a variety of purposes. Examples are company planning, merger and acquisition, and investment strategy. As a result, it is important that these projections be as realistic as possible. They must also be understandable to non-actuarial people using them.

Exhibit 1D provides key elements of projected financial statements of a property/casualty insurer. It reproduces the historical years 1980-84 and projects results for the next five years. The primary addition to the projection model

relative to the historical model is the assumed flow through of the rate indication in 1985. Since the rate change is zero and no elasticity is assumed, the projections follow the historical figures.

The column headings in Exhibit 1D are identical to those in Exhibit 1A. Growth assumptions after 1984 are the same as those prior to 1984 except that the rate increase flows through written premium in 1985. Surplus continues to grow as investment income flows through to surplus.

This company's planning process is fairly simple. Budgets can be met by holding expenses to 25% of earned premium. Evaluating the company for merger and acquisition is also routine since net income and cash flow can be projected with a high level of comfort. Similarly, investment strategy is simplified by the fact that maturity of liabilities and taxable gains are so predictable.

Deterministic Model Summary

We have seen that when insurance contingencies are predictable and when complicating elements are abstracted away, the relationships between actuarial models and financial statements are fairly straightforward. As predictability of losses decreases and complications increase, these relationships become more convoluted. Nonetheless, by definition the financial statement figures of an insuring entity must ultimately be tied back to their sources, which include actuarial data bases and analyses.

A "STOCHASTIC" MODEL

Developing a risk theoretic model of the insurance process is beyond the scope of this paper, and would add little to the understanding of the fundamental

relationships between actuarial analyses and financial statement figures. Notwithstanding this, however, there are some random and non-normal factors which affect actuarial work and which lead to terminology which confuses non-actuaries. This confusion can lead to misinterpretation of the results of actuarial studies and misuse of the figures.

Reconstructed Historical Financial Statement

Exhibit 2A shows financial statement figures resulting from an insurance process which does not have uniform growth rates, payment patterns, or reporting patterns. To allow key relationships between the actuarial models and the financial statements to be easily illustrated, distortions from a deterministic process have been minimized. This model merely adds a few complicating elements and some terminology.

Actuaries often speak in terms of frequency, severity, and pure premiums. This model allows growth in frequency and severity of claims to diverge from each other and from premium growth. This leads to fluctuation in underwriting results.

This model also allows payment and reporting patterns to fluctuate from one year to the next. This opens up the possibility of changes in ultimate incurred estimates for an accident year from one calendar year to the next. Such changes would lead to reconstructed reserve models for each calendar year's development.

Written premium growth from one year to the next in this model is a function of exposure growth, growth in average gross premium, and growth in mix of business. For 1981 the respective growth rates utilized are 5%, 10%, and 5%. For 1982 through 1984 the growth rates are (5%, 10%, 5%); (5%, 5%, 5%); and (5%, 10%, 5%). Unearned premium and expense ratios are as established in the deterministic model.

Growth in incurred losses is a function of exposure growth, frequency growth, and severity growth. The respective growth rates assumed in 1981 are 5%, 5%, and 10%. Growth rates for 1982 through 1984 are (5%, 5%, 10%); (5%, 5%, 10%), and (5%, 5%, 10%). In 1984 an additional 5% growth factor is added.

Paid loss patterns are assumed to be uniform except for accident year 1981. The payment pattern for 1981 by calendar year is .2, .2, .2, .2, .2. For other years it is .1, .2, .3, .2, .2.

Reporting patterns and resulting case reserves are also uniform except for 1981. The cumulative pattern for 1981 is .4, .6, .8, .9, 1.0. For other years it is .5, .7, .8, .9, 1.0.

Other financial statement items are defined as they were in the previous model.

Loss Development Analysis

As was the case with the first model, the data base for loss development is extracted from the reconstructed historical financial statements. In surveying the development factors in Exhibit 2B we can see the impact of the non-uniform reporting and payment patterns for accident year 1981. To simplify the analysis, however, we have assumed that the reserve actuary for the entity was clever enough to see that 1981 was distorted. As a result, incurred estimates for each accident year as of each calendar year are the same.

The other aspects of reserve analysis for this model are analogous to those of the first model. Payments and reports are projected out and payments are discounted as of each point in time to allow for the option of discounted liabilities.

Rate Analysis

Ratemaking also becomes more complicated when non-uniformity is introduced. We see in Exhibit 2C that loss ratios fluctuate somewhat from year to year. The interaction of the various growth assumptions has led to a slight upward trend in loss ratio and the need for a rate increase. This rate increase will flow into projected financial statements.

It is interesting to note that incurred losses for accident years 1983 and 1984 in the rate analysis are different than the corresponding figure in the financial statements. The explanation for this is that the rating actuary used average incurred development factors in projecting ultimate losses. The 1981 distortion is thereby projected forward in the rate model. As a result, the loss figures and rate indication are somewhat overstated.

Projected Financial Statements

Financial projections in this model are done under a greater degree of uncertainty. Because historical patterns have not been uniform, prediction even under the cet par assumption is more difficult. Even if future patterns can be assumed to follow those of the past, an assumption must be made as to which of the past patterns are likely to influence future figures. Exhibit 2D displays the financial projections for the stochastic model.

The years 1980-1983 are reconstructed to eliminate the premium growth anomaly in 1982. The rate of premium growth in 1985 is a function of exposure growth, average premium growth, mix of business growth, the rate increase, and zero elasticity effect. Growth rates for 1986-1989 are functions of exposure, average premium, and mix of business growth per the following: (5%, 10%, 5%); (5%, 10%, 5%); (5%, 10%, 5%); (5%, 10%, 5%).

Incurred loss growth is a function of exposure growth, frequency growth, and severity growth. The respective growth rates for 1985 are 5%, 5%, and 10%. For 1986-1989 the rates are: (5%, 5%, 10%); (5%, 5%, 10%); (5%, 5%, 10%); (5%, 5%, 10%).

Payment and reporting patterns are assumed to follow those of the historical accident years excluding 1981. Resulting payments, case reserves, and IBNR reserves therefore follow those patterns. Other elements of the projected financial statement are produced analogously to those in the historical statements.

Stochastic Model Summary

While the "stochastic" model added some complications, simplifying assumptions allow us to continue to trace relationships between actuarial analyses and financial reports. The more these assumptions are relaxed, and the more operating complexities added, the more abstruse these relationships become. Nonetheless, if complications are added incrementally, the relationships can continue to be observed.

CONCLUSION

This paper has attempted to build a bridge between actuarial models and financial statement figures. Financial statements aggregate components of actuarial models. As a result, many factors which could make use and interpretation of insurance financial statements easier are not available for review. By explicitly identifyng some of these factors reports can be produced which allow management to see and evaluate elements which have influenced past and may influence future results.

The models in this paper identify a few key actuarial elements and show how they interrelate with financial statement figures. The primary element allowing for the analysis is the identification of accident year components of calendar year figures. Actuaries use accident year data in producing many of the figures they provide to management.

The models here deal with two systems of relationships. The calendar year system is primarily composed of figures which show how much income was earned in a period and which show as of a point in time the volume of assets and liabilities which have arisen.

The key components of income are the premiums earned in a year, the losses which accrue, the expenses which accrue, and the investment earnings which arise. Assets and liabilities change based on the cash flow which arises and the future obligations which accrue. Much of the actuary's role involves a determination as to how loss obligations accrue over time.

The accident year system provides data which is organized in such a manner as to allow the actuary to estimate future losses based on patterns in which losses

on the books have arisen. There are two critical aspects to the loss estimation. The first aspect involves production of financial statement figures which reflect historical activity. Loss development analysis is used to estimate the extent to which losses the company is liable for at some point will differ from losses recognized by the company. Historical patterns of loss payment and loss reporting are used to determine how booked loss figures are likely to change.

The second type of loss estimation involves projection of losses likely to arise in future periods. This analysis is part of an actuary's ratemaking activity. Historical losses brought up to ultimate levels by development analysis are reviewed and compared to exposure measures to determine the rate at which losses are changing. This historical rate of change is used to predict future loss levels.

Because losses for property/casualty insurance coverages can vary in amount, it is often helpful to review trends in numbers of claims separately from trends in average claim size. These trends in frequency and severity, respectively, can be combined into a pure premium trend which measures change in loss cost per exposure unit.

The losses projected for future periods provide a basis for determining needed rate level. They can also be used to project future financial results. This process of developing losses to ultimate level and projecting them forward is one of the major functions a casualty actuary plays in the process of producing components of financial statements.

We have seen that actuarial methodology is conceptually related to financial reporting. Demonstrating this for a large multi-line, multi-state insurer would

involve enormous effort, and might be challenged on a cost/benefit basis. Working it through for a specialized entity like a one state malpractice carrier might prove both enlightening and fruitful.

Expansion of the model to encompass credibility considerations, loss distribution functions, changes in accident year incurred estimates by calendar year, reinsurance programs, and similar items, while adding complication, would increase understanding of the relationships. Only when actuaries can demonstrate how their data bases and projections relate to other aspects of company reporting can they expect non-actuaries to consistently and properly interpret financial statements of property/casualty insurance companies. Improper interpretation of those statements can lead to improper planning, improper marketing and underwriting decisions, and improper investment strategies. It can also lead to unnecessarily strained relationships with regulatory authorities.

Technical Appendix 1

Deterministic Model

Item	Comment
Direct Written Premium	The initial value is set at $1 million. Values for the years 1981-1984 are a function of the assumed growth rates in exposure, average premium, and mix of business. The growth rates are 10%, 5%, and 5%. Since the rate change is 0, these same growth rates persist in projected years 1985-1989.
Unearned Premium Reserve	This value is set at 50% of written premium.
Direct Earned Premium	This is defined to be written premium less change in unearned premium reserve.
Direct Expense	This is set at 25% of earned premium.
Paid Losses	Accident year paid losses in a calendar year are a function of ultimate incurred losses for the accident year and the assumed payment pattern. This model assumes 10% of ultimate losses are paid in the first year, 20% in the second, 30% in the third, and 20% in each of the fourth and fifth.
Case Reserves	Case reserves for an accident year in a given calendar year are a function of ultimate accident year incurred losses, and the assumed reporting and payment patterns. At any point in time case reserves are reported losses less paid losses. The rpeortring pattern assumed is 50%, 20%, 10%, 10%, 10%. As an example, after two years an accident year will have 70% of its losses reported and 30% paid. The difference, 40%, is case reserves.
IBNR	IBNR for an accident year in a given calendar year is the difference between ultimate amount for the year and the amount reported as of the calendar year. At the end of the second year, for example, 70% of ultimate losses are reported so 30% are incurred but not reported.
Incurred Losses	This model assumes the loss elements move in correspondence with the premium elements. As a result, a 75% loss ratio is maintained. Premiums and losses grow each year by $(1.05)^2(1.10)$.
U/W Cash Flow	Underwriting cash flow is defined as written premium less paid losses less expenses.

Deterministic Model--Continued

Item	Comment
U/W Gain	Underwriting gain is defined as earned premium minus incurred loss minus expense.
Investment Income	Investment income is the earnings rate (10%) times the sum of beginning of year assets and half the underwriting cash flow.
Tax	Tax is the tax rate (50%) times the sum of underwriting gain and 40% of investment income.
End of Year Assets	End of year assets are beginning of year assets plus underwriting cash flow plus investment income less taxes.
End of Year Liabilities	End of year liabilities are the sum of the case reserves, IBNR, and unearned premium reserves.
Surplus	Surplus is the difference between assets and liabilities. The change in surplus is the after-tax underwriting and investment gain.
Discounted Incurred Losses	Discounted incurred losses for an accident year in a particular calendar year represents the sum of past payments at that point in time plus the present value of future payments.
Discounted Loss Reserves	Discounted loss reserves in a calendar year are the sum of the present values of the payments remaining for each accident year.
Discounted Liabilities	Discounted liabilities are the sum of discounted loss reserves and unearned premium reserves.
Discounted Surplus	Discounted surplus is the difference between assets and discounted liabilities.
GAAP Adjustment	The GAAP adjustment is defined to be 20% of the unearned premium reserve.
GAAP Surplus	GAAP surplus is statutory surplus plus the GAAP adjustment.
GAAP Income	GAAP income is statutory income plus change in GAAP adjustment.
Beginning Exposure	Initial exposure is set at 1,000 units.
Exposure Trends	Annual change in exposure can be 5% or 10%.

Deterministic Model--Continued

Item	Comment
Average Premium	Initial average premium is set at $1,000.
Average Premium Trend	Average premium may change at the rate of 5% or 10%.
Mix of Business Trend	The impact of changing mix of business is set at at unity at the beginning. Mix of business effect can be 5% or 10% per year. Thereafter the change can be a function of additional coverage being provided or a shift toward higher rated policyholders.
Frequency Trend	Initial frequency is set at 10%. The change in frequency can be 5% or 10% per year.
Severity Trend	Initial average claim size is set at $7,500. This can increase at rates of 5% or 10% per year.

Technical Appendix 2

Stochastic Model

The income and balance sheet items in this model are defined in the same way as they are defined in the deterministic model. Where this model differs is in the specification of a a couple of growth factors, reporting patterns, and payment patterns. To illustrate the impact of non-uniformity in some elements of the insurance process on the relationship of actuarial calculations to financial statement figures, some variations were introduced.

The first change from the uniformity of the first model is that the average premium growth rate for 1982 is reduced to zero. In 1983 it is increased so as to produce the same premium that year as was produced in the deterministic model. The second change is an additional 5% growth in losses for the 1984 accident year. The impact of these changes is most readily apparent in reviewing underwriting gain which turns negative in 1982.

The other changes introduced in this model involve payment and reporting patterns. Accident year 1981 is given payment and reporting patterns which differ from those of the other years. The impact of this is best seen in the loss development tables which show loss development factors for 1981 which differ from those of other years at the first and second points.

This model best illustrates the type of situation faced by casualty actuaries performing their rating and reserving roles. When the various factors influencing loss amounts begin to vary the degree of mathematical and professional sophistication needed to project future losses increases. The casualty actuary must often look at inconclusive historical movements and attempt to build a model which best predicts the future therefrom.

PROPERTY-CASUALTY F1
DETERMINISTIC

1. FINANCIAL HISTORY

		TREND 1	TREND 2		
BEG EXPOSURE	1000	.05	.10		
AVERAGE PREMIUM	1000	.05	.10		
RIE OF BUSINESS	1	.05	.10		
FREQUENCY	.10	.05	.10		
SEVERITY	7500	.05	.10		
PAYMENT PATTERN	.1	.2	.3	.2	.2
CUM PAY PATTERN	.1	.3	.6	.8	1.0
REPORT PATTERN	.5	.2	.1	.1	.1
CUM REP PATTERN	.5	.7	.8	.9	1.0

CAL YEAR	DIRECT WRITTEN PREMIUM	UEPR	DIRECT EARNED PREMIUM	DIRECT EXPENSE	BOY ASSETS	ACC YEAR	PAID LOSSES	CASE RESERVES	IBNR	INCURRED LOSSES	U/W CASH FLOW	U/W DATA	INVEST INCOME	TAX	EOY ASSETS	EOY LIAB	EOY SURPLUS	DISC INCURRED LOSSES	DISC LOSS RESERVES	DISC LIAB	DISC SURPLUS	GAAP ADJUST	GAAP SURPLUS	GAAP INCOME
1980	1000000	500000	500000	125000	0	1980	37500	150000	187500	375000	837500	0	41875	8375	871000	837500	33500	319348	201848	701848	89152	100000	133500	133500
																		343877						
1981	1212750	606375	1106375	276594	971000	1980	75000	150000	112500	375000								706638	855032	1461407	288579	121275	255582	122082
						1981	82978	331913	414891	829781	778178	0	126009	25202	1749965	1615678	134307							
1982	1470763	735381	1341756	335439	1749985	1980	112500	75000	75000	375000								361519						
						1981	165956	331913	248934	829781								760903						
						1982	100632	402527	503139	1006317	756236	0	212810	42562	2676469	2371914	304555	854975	1404830	2140212	536257	147076	451632	196049
1983	1783647	891824	1627215	406804	2676469	1980	75000	37500	37500	375000								371510						
						1981	248934	165956	165956	829781								799950						
						1982	201263	402527	301895	1006317								922786						
						1983	122041	488164	610204	1220411	729625	0	304128	60826	3649396	3101538	547858	1039296	1911736	2803570	845826	178367	726225	274593
1984	2163143	1081571	1973405	493351	3649396	1980	75000	0	0	375000								375000						
						1981	165956	82978	82978	829781								822058						
						1982	301895	201263	201263	1006317								970139						
						1983	244082	488164	366123	1220411								1119104						
						1984	148005	592021	740027	1480054	734852	0	401682	80336	4705594	3836391	869204	1260406	2389968	3471539	1234055	216314	1085318	359293

Exhibit 1A

II. LOSS DEVELOPMENT TABLES

ACC YEAR	REPORTED LOSSES 1	2	3	4	5
1980	187500	262500	300000	337500	375000
1981	414891	580847	663825	746803	
1982	503159	704422	805054		
1983	610206	854288			
1984	740027				

ACC YEAR	PAID LOSSES 1	2	3	4	5
1980	37500	112500	225000	300000	375000
1981	82978	248934	497869	663825	
1982	100632	301895	603790		
1983	122041	366123			
1984	148005				

ACC YEAR	REPORTED DEVELOPMENT 2:1	3:2	4:3	5:4
1980	1.4000	1.1429	1.1250	1.1111
1981	1.4000	1.1429	1.1250	
1982	1.4000	1.1429		
1983	1.4000			
1984				
AVERAGE	1.4000	1.1429	1.1250	1.1111
CHOSEN	1.4000	1.1429	1.1250	1.1111
ULTIMATE	2.0000	1.4286	1.2500	1.1111

ACC YEAR	PAID DEVELOPMENT 2:1	3:2	4:3	5:4
1980	3.0000	2.0000	1.3333	1.2500
1981	3.0000	2.0000	1.3333	
1982	3.0000	2.0000		
1983	3.0000			
1984				
AVERAGE	3.0000	2.0000	1.3333	1.2500
CHOSEN	3.0000	2.0000	1.3333	1.2500
ULTIMATE	10.0000	3.3333	1.6667	1.2500

ACC YEAR	REPORTED LOSSES 1	2	3	4	5	ULTIMATE
1980	187500	262500	300000	337500	375000	375000
1981	414891	580847	663825	746803	829781	829781
1982	503159	704422	805054	905685	1006317	1006317
1983	610206	854288	976329	1098370	1220411	1220411
1984	740027	1036038	1184043	1332048	1480054	1480054
1985	897460	1256445	1435948	1615452	1794935	1794935
1986	1088404	1523765	1741446	1959127	2176808	2176808
1987	1319962	1847946	2111939	2375931	2639923	2639923
1988	1609784	2241097	2561254	2881410	3201567	3201567
1989	1941356	2717890	3106160	3494430	3882700	3882700

ACC YEAR	PAID LOSSES 1	2	3	4	5
1980	37500	112500	225000	300000	375000
1981	82978	248934	497869	663825	829781
1982	100632	301895	603790	805054	1006317
1983	122041	366123	732247	976329	1220411
1984	148005	444016	888032	1184043	1480054
1985	179494	538481	1076961	1435948	1794935
1986	217681	653042	1306085	1741446	2176808
1987	263992	791977	1583954	2111939	2639923
1988	320157	960470	1920940	2561254	3201567
1989	388270	1164810	2329620	3106160	3882700

INCREMENTAL PAID LOSSES 1	2	3	4	5
37500	75000	112500	75000	75000
82978	165956	248934	165956	165956
100632	201263	301895	201263	201263
122041	244082	366123	244082	244082
148005	296011	444016	296011	296011
179494	358987	538481	358987	358987
217681	435362	653042	435362	435362
263992	527985	791977	527985	527985
320157	640313	960470	640313	640313
388270	776540	1164810	776540	776540

DISCOUNTED PAID LOSSES 1	2	3	4	5
319348	343872	361519	371510	375000
706638	760903	799950	822058	829781
856975	922786	970159	996951	1006317
1039296	1119108	1176537	1209052	1220411
1264406	1357198	1426845	1466278	1480054
1528558	1645947	1730406	1778229	1794935
1853758	1996117	2098550	2156547	2176808
2248146	2420791	2545016	2615352	2639923
2726438	2935814	3086469	3171769	3201567
3306488	3560408	3743115	3846562	3882700

Exhibit 1B

III. RATE LEVEL ANALYSIS

ACC/CAL YEAR	WRITTEN PREMIUM	EARNED PREMIUM	RATE LEVEL INDEX	EARNED PREM AT CURR RT	REPORTED LOSSES	EXPECTED DEVEL FACTOR	ULTIMATE LOSSES	EXPENSES	LOSS RATIO AT CURR RT	ANNUAL TREND	EXPENSE RATIO AT CURR RT	ANNUAL TREND	PROJ OP RATIO
1980	1000000	500000	1.00	500000	375000	1.0000	375000	125000	75.00%		25.00%		100.00%
1981	1212750	1106375	1.00	1106375	746801	1.1111	829781	276594	75.00%	100.00%	25.00%	100.00%	100.00%
1982	1470763	1341756	1.00	1341756	805054	1.2500	1006317	335439	75.00%	100.00%	25.00%	100.00%	100.00%
1983	1783667	1627215	1.00	1627215	854708	1.4286	1220411	406804	75.00%	100.00%	25.00%	100.00%	100.00%
1984	2163143	1973405	1.00	1973405	740027	2.0000	1480054	493351	75.00%	100.00%	25.00%	100.00%	100.00%
										100.00%		100.00%	

PROJ YEAR	LOSS RATIO	DISCOUNT FACTOR	DISC LOSS RATIO	EXPENSE RATIO	RATE IND
1985	75.00%	.7786	58.40%	25.00%	1.0000

IV. FINANCIAL PROJECTIONS

		TREND 1	TREND 2		
WB EXPOSURE	1000	.05	.10		
AVERAGE PREMIUM	1000	.05	.10		
NBR OF BUSINESS	1	.05	.10		
FREQUENCY	.10	.05	.10		
SEVERITY	7500	.05	.10		
PAYMENT PATTERN	.1	.2	.3	.2	.2
CUM PAY PATTERN	.1	.3	.6	.8	1.0
REPORT PATTERN	.5	.2	.1	.1	.1
CUM REP PATTERN	.5	.7	.8	.9	1.0

CAL YEAR	DIRECT WRITTEN PREMIUM	UEPR	DIRECT EARNED PREMIUM	DIRECT EXPENSE	BOY ASSETS	ACC YEAR	PAID LOSSES	CASE RESERVES	IBNR	INCURRED LOSSES	U/W CASH FLOW	U/W GAIN	INVEST INCOME	TAX	EOY ASSETS	EOY LIAB	EOY SURPLUS	DISC INCURRED LOSSES	DISC LOSS RESERVES	DISC LIAB	DISC SURPLUS	GAAP ADJUST	GAAP SURPLUS	GAAP INCOME
1980	1000000	500000	500000	125000	0	1980	37500	150000	187500	375000	837500	0	41875	8375	871000	837500	33500	319348	281848	781848	89152	100000	133500	133500
1981	1212750	606375	1106375	276594	871000	1980	75000	150000	112500	375000								343872						
						1981	82978	331913	414891	829781	778178	0	126009	25202	1749985	1615678	134307	706638	855032	1461407	288579	121775	255582	122082
1982	1470763	735381	1341756	335439	1749985	1980	112500	75000	75000	375000								361519						
						1981	165956	331913	248934	829781								760903						
						1982	100632	402527	503159	1006317	754236	0	212810	42562	2674469	2371914	304555	856975	1404830	2640212	536257	147076	451632	196049
1983	1783447	891834	1627215	406804	2674469	1980	75000	37500	37500	375000								371510						
						1981	248934	165956	165956	829781								799950						
						1982	201263	402527	301895	1006317								922786						
						1983	122041	488164	610206	1220411	729625	0	304128	60826	3649396	3101538	547858	1039296	1911736	2803570	845826	178367	726725	274593
1984	2163143	1081571	1973405	493351	3649396	1980	75000	0	0	375000								375000						
						1981	165956	82978	82978	829781								822058						
						1982	301895	201263	201263	1006317								970139						
						1983	244082	488164	366123	1220411								1119108						
						1984	148005	592021	740027	1480054	734852	0	401682	80336	6705594	5836391	869204	1260404	2389968	3431539	1234055	216314	1085518	359293
1985	2623351	1311676	2393247	598312	6705594	1981	165956	0	0	829781								829781						
						1982	201263	100632	100632	1006317								996751						
						1983	366123	244082	244082	1220411								1176537						
						1984	296011	592021	444016	1480054								1357198						
						1985	179494	717974	897468	1794935	816192	0	511349	102274	5930882	4652583	1278299	1528550	2898434	4210109	1720772	262335	1540436	455116
1986	3181469	1590735	2902410	725603	5930882	1982	201263	0	0	1006317								1006317						
						1983	244082	122041	122041	1220411								1209052						
						1984	444016	296011	296011	1480054								1426845						
						1985	358987	717974	538481	1794935								1645942						
						1986	217681	870723	1088404	2176808	984837	0	442580	128516	7434782	5642420	1792363	1853758	3515075	5105810	2328972	318147	2110510	569876
1987	3850327	1929163	3519898	879974	7434782	1983	244082	0	0	1220411								1220411						
						1984	296011	148005	148005	1480054								1466278						
						1985	538481	358987	358987	1794935								1730406						
						1986	435362	870723	653042	2176808								1996117						
						1987	263992	1055969	1319962	2639923	1200425	0	803499	160700	9278007	6842844	2435162	2248146	4262908	6192071	3085936	385835	2820995	710483
1988	4679186	2339593	4268756	1067189	9278007	1984	296011	0	0	1480054								1480054						
						1985	358987	179494	179494	1794935								1778229						
						1986	653042	435362	435362	2176808								2098550						
						1987	527985	1055969	791977	2639923								2420791						
						1988	320157	1280627	1600784	3201567	1455815	0	1000591	200118	11534295	8298459	3235636	2726430	5169841	7509434	4024861	467919	3703554	882559
1989	5674682	2837341	5176934	1294233	11534295	1985	358987	0	0	1794935								1794935						
						1986	435362	217681	217681	2176808								2136547						
						1987	791977	527985	527985	2639923								2545016						
						1988	640313	1280627	960470	3201567								2935814						
						1989	388270	1553080	1941350	3882700	1765540	0	1241706	248341	14293200	10064199	4229001	3304480	6269725	9107066	5186134	567468	4796469	1092915

Exhibit 1D

PROPERTY-CASUALTY FINANCIAL MODEL
STOCHASTIC MODEL

I. FINANCIAL HISTORY

		TREND 1	TREND 2		
BEG EXPOSURE	1000	.05	.10		
AVERAGE PREMIUM	1000	.05	.10		
MIX OF BUSINESS	1	.05	.10		
FREQUENCY	.10	.05	.10		
SEVERITY	7500	.05	.10		
PAYMENT PATTERN	.1	.2	.3	.2	.2
CUM PAY PATTERN	.1	.3	.6	.8	1.0
REPORT PATTERN	.5	.2	.1	.1	.1
CUM REP PATTERN	.5	.7	.8	.9	1.0

CAL YEAR	DIRECT WRITTEN PREMIUM	UEPR	DIRECT EARNED PREMIUM	DIRECT EXPENSE	BOY ASSETS	ACC YEAR	PAID LOSSES	CASE RESERVES	IBNR	INCURRED LOSSES	U/W CASH FLOW	U/W GAIN	INVEST INCOME	TAX	EOY ASSETS	EOY LIAB	EOY SURPLUS	DISC INCURRED LOSSES	DISC LOSS RESERVES	DISC LIAB	DISC SURPLUS	GAAP ADJUST	GAAP SURPLUS	GAAP INCOME
1980	1000000	500000	500000	125000	0	1980	37500	150000	187500	375000	837500	0	41875	8375	871000	837500	33500	319348	261848	261848	89152	100000	133500	133500
1981	1212250	606375	1106375	276594	871000	1980	75000	150000	112500	375000								343872						
						1981	165956	165956	497669	829781	695200	0	121860	24372	1663688	1532700	130988	717692	783108	1389463	274205	121275	252263	118763
1982	1340096	670048	1276423	319106	1663688	1980	112500	75000	75000	375000								361519						
						1981	165956	165956	331913	829781								764765						
						1982	100632	402527	503159	1006317	641907	-49000	198464	15193	2468661	2223602	265259	856975	1325714	1995762	493099	134010	399269	147006
1983	1703667	851834	1561601	390470	2468661	1980	75000	37500	37500	375000								371510						
						1981	165956	165956	165956	829781								799950						
						1982	201263	402527	301895	1006317								922786						
						1983	122041	488164	610206	1220411	828936	-49000	290333	33567	3574564	3101536	473025	1039296	1911736	2803570	770994	178367	651392	252125
1984	2163143	1081571	1973405	493351	3574564	1980	75000	0	0	375000								375000						
						1981	165956	82976	82978	829781								822058						
						1982	301895	201263	201263	1006317								970139						
						1983	244082	488164	366123	1220411								1119108						
						1984	155406	621623	777029	1554056	727452	-74003	393829	41764	4654080	3903013	751067	1373427	2445560	3527159	1126921	216314	967401	316009

Exhibit 2A

ACC YEAR	REPORTED LOSSES 1	2	3	4	5
1980	187500	262500	300000	337500	375000
1981	331913	497869	663825	746803	
1982	503159	704422	805054		
1983	610206	854288			
1984	777028				

ACC YEAR	PAID LOSSES 1	2	3	4	5
1980	37500	112500	225000	300000	375000
1981	165956	331913	497869	663825	
1982	100632	301895	603790		
1983	122041	366123			
1984	155406				

ACC YEAR	REPORTED DEVELOPMENT 2:1	3:2	4:3	5:4
1980	1.4000	1.1429	1.1250	1.1111
1981	1.5000	1.3333	1.1250	
1982	1.4000	1.1429		
1983	1.4000			
1984				
AVERAGE	1.4750	1.2063	1.1250	1.1111
CHOSEN	1.4000	1.1429	1.1250	1.1111
ULTIMATE	2.0000	1.4286	1.2500	1.1111

ACC YEAR	PAID DEVELOPMENT 2:1	3:2	4:3	5:4
1980	3.0000	2.0000	1.3333	1.2500
1981	2.0000	1.5000	1.3333	
1982	3.0000	2.0000		
1983	3.0000			
1984				
AVERAGE	2.7500	1.8333	1.3333	1.2500
CHOSEN	3.0000	2.0000	1.3333	1.2500
ULTIMATE	10.0000	3.3333	1.6667	1.2500

ACC YEAR	REPORTED LOSSES 1	2	3	4	5	ULTIMATE
1980	187500	262500	300000	337500	375000	375000
1981	331913	497869	663825	746603	829781	629781
1982	503159	704422	805054	905685	1006317	1006317
1983	610206	854288	976329	1098370	1220411	1220411
1984	777028	1087839	1243245	1398651	1554056	1554056
1985	897468	1256455	1435948	1615442	1794935	1794935
1986	1088404	1523765	1741446	1959127	2176808	2176808
1987	1319962	1847946	2111939	2375931	2639923	2639923
1988	1600784	2241097	2561254	2881410	3201567	3201567
1989	1941350	2717890	3106160	3494430	3882700	3882700

ACC YEAR	PAID LOSSES 1	2	3	4	5
1980	37500	112500	225000	300000	375000
1981	165956	331913	497869	663825	829781
1982	100632	301895	603790	805054	1006317
1983	122041	366123	732247	976329	1220411
1984	155406	466217	932434	1243245	1554056
1985	179494	538481	1076961	1435948	1794935
1986	217681	653042	1306085	1741446	2176808
1987	263992	791977	1583954	2111939	2639923
1988	320157	960470	1920940	2561254	3201567
1989	388270	1164810	2329620	3106160	3882700

INCREMENTAL PAID LOSSES 1	2	3	4	5
37500	75000	112500	75000	75000
165956	165956	165956	165956	165956
100632	201263	301895	201263	201263
122041	244082	366123	244082	244082
155406	310811	466217	310811	310811
179494	358987	538481	358987	358987
217681	435362	653042	435362	435362
263992	527985	791977	527985	527985
320157	640313	960470	640313	640313
388270	776540	1164810	776540	776540

DISCOUNTED PAID LOSSES 1	2	3	4	5
319348	343872	361519	371516	375000
717692	764765	799950	822058	829781
856975	922766	970139	996951	1006317
1039296	1119108	1176537	1209052	1220411
1373427	1425058	1492197	1539592	1554056
1528558	1645547	1730406	1778229	1794935
1853758	1996117	2098550	2156547	2176808
2248146	2420791	2545016	2615352	2639923
2776438	2935614	3086469	3171769	3201567
3306488	3560408	3743115	3846562	3882700

Exhibit 2B

III. RATE LEVEL ANALYSIS

ACC/CAL YEAR	WRITTEN PREMIUM	EARNED PREMIUM	RATE LEVEL INDEX	EARNED PREM AT CURR RT	REPORTED LOSSES	EXPECTED DEVEL FACTOR	ULTIMATE LOSSES	EXPENSES	LOSS RATIO AT CURR RT	ANNUAL TREND	EXPENSE RATIO AT CURR RT	ANNUAL TREND	PROJ OF RATIO
1980	1000000	500000	1.00	500000	375000	1.0000	375000	125000	75.00%		25.00%		112.28%
1981	1212750	1106375	1.00	1106375	746603	1.1111	829781	276594	75.00%	100.00%	25.00%	100.00%	109.67%
1982	1340096	1276423	1.00	1276423	805654	1.2500	1006817	319106	78.84%	105.12%	25.00%	100.00%	111.35%
1983	1781667	1561881	1.00	1561881	854286	1.5479	1268212	390470	82.48%	104.62%	25.00%	100.00%	112.64%
1984	2163143	1973405	1.00	1973405	777028	2.1488	1669686	493351	84.61%	102.58%	25.00%	100.00%	112.22%
										103.06%		100.00%	

PROJ YEAR	LOSS RATIO	DISCOUNT FACTOR	DISC LOSS RATIO	EXPENSE RATIO	RATE IND
1985	87.22%	.7786	67.91%	25.00%	1.1222

IV. FINANCIAL PROJECTIONS

		TREND 1	TREND 2		
BEG EXPOSURE	1000	.05	.10		
AVERAGE PREMIUM	1000	.05	.10		
MIX OF BUSINESS	1	.05	.10		
FREQUENCY	.10	.05	.10		
SEVERITY	3500	.05	.10		
PAYMENT PATTERN	.1	.2	.3	.2	.2
CUM PAY PATTERN	.1	.3	.6	.8	1.0
REPORT PATTERN	.5	.2	.1	.1	.1
CUM REP PATTERN	.5	.7	.8	.9	1.0

CAL YEAR	DIREC WRITTEN PREMIUM	UEPR	Y EARNED PREMIUM	DIRECT EXPENSE	BOY ASSETS	ACC YEAR	PAID LOSSES	CASE RESERVES	IBNR	INCURRED LOSSES	W CASH FLOW	U/W GAIN	INVEST INCOME	TAX	EOY ASSETS	EOY LIAB	EOY SURPLUS	I INCURRED LOSSES	DISC LOSS RESERVES	DISC LIAB	DISC SURPLUS	GAAP ADJUST	GAAP SURPLUS	GAAP INCOME
1980	1000000	500000	500000	125000	0	1980	37500	150000	187500	375000	837500	0	41875	8375	871000	837500	33500	319348	281848	781648	89157	100000	133500	133500
1981	1212750	606375	1106375	276594	871000	1980	75000	150000	112500	375000								343872						
						1981	165956	165956	497869	829781	895200	0	121860	24372	1663688	1532700	130988	737692	783108	1389483	274205	121275	[illegible]	118763
1982	1470763	735381	1341756	335439	1663688	1980	112500	75000	75000	375000								361519						
						1981	165956	165956	331913	829781								764765						
						1982	100632	402527	503159	1006317	756236	0	204181	40836	2583268	2286936	[illegible]	856975	1325714	2061095	522173	143075	441405	18514
1983	1783667	891834	1627215	406804	2583268	1980	75000	37500	37500	375000								371519						
						1981	165956	165956	165956	829781								799950						
						1982	201263	402527	301895	1006317								922786						
						1983	122041	488164	610206	1220411	812603	0	298957	59791	3635036	3101538	533498	1039296	1911736	[illegible]	851466	[illegible]	[illegible]	[illegible]
1984	2163143	1081571	1973405	493351	3635036	1980	75000	0	0	375000								375000						
						1981	165956	82978	82978	829761								822055						
						1982	301695	201263	201263	1006317								976139						
						1983	244082	488164	366123	1220411								1115159						
						1984	155406	621623	777028	1554056	727452	-74003	399876	42974	4719391	3902955	816396	1525477	2445588	3527159	1192231	216314	1032712	326847
1985	2943795	1471897	2553469	638362	4719391	1981	165956	0	0	829781								829781						
						1982	201263	100632	100632	1006317								996951						
						1983	366123	244082	244082	1220411								1176537						
						1984	310611	621623	466217	1554056								1425058						
						1985	179494	717974	897468	1794935	1081780	120166	526028	165289	6161909	4864606	1297303	1528558	2944093	4415996	1745919	294375	1591663	556971
1986	3570087	1785043	3256941	814235	6161909	1982	201263	0	0	1006317								1006317						
						1983	244082	122041	122041	1220411								1209052						
						1984	466217	310611	310811	1554056								1496187						
						1985	358987	717974	538481	1794935								1645947						
						1986	217681	870723	1088404	2176608	1767671	265898	679572	268863	7840239	5866330	1973910	1853758	3542016	5327660	2513180	357009	2330919	719216
1987	4329623	2164811	3949655	987464	7840239	1983	244082	0	0	1220411								1220411						
						1984	310811	155406	155406	1554056								1539592						
						1985	538481	358987	358987	1794935								1730406						
						1986	435362	870723	653042	2176808								1998117						
						1987	263992	1055969	1319962	2639923	1549431	322468	861496	333533	9917633	7093293	2824340	2246146	4227020	6441831	3475802	432962	[illegible]	926384
1988	5250756	2625375	4790186	1197547	9917633	1984	310811	0	0	1554056								1554056						
						1985	358987	179494	179494	1794935								1778229						
						1986	653042	435362	435362	2176608								2058550						
						1987	527985	1055969	791977	2639923								2470791						
						1988	320157	1280627	1600784	3201567	1882222	391073	1085874	412711	12473018	8584442	3888576	2726438	5169841	7795216	4677801	535075	4412551	1156349

Exhibit 2D