RATE OF RETURN—POLICYHOLDER, COMPANY, AND SHAREHOLDER PERSPECTIVES

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Abstract

This paper discusses rate of return from the policyholder, company, and shareholder perspectives. Both net present value (NPV) and internal rate of return (IRR) variations of discounted cash flow models are used to demonstrate two important considerations: The relationship between policyholder liabilities and surplus, and the release of income and return of surplus to the shareholder. A method for determining the "insurance risk charge" implicit in insurance transactions is also presented.

To render the concepts concrete and to provide a simple yet accurate method of calculating total return in most instances, the paper presents a spreadsheet model embodying all of the principles discussed. This simplified model provides an adequate basis for measuring total return for both profitability tracking and ratemaking purposes.

1. OVERVIEW

The insurance business can be viewed as a partnership among three parties—an insurance company, its policyholders, and its shareholders. In its management practices, an insurer can address the interests of its policyholders and shareholders by separately acknowledging the risks and returns that are appropriate to each of the parties within a total return framework. Total return means that income from all sources is included—from underwriting and the investment income on policyholder supplied funds and shareholder surplus.

An insurer can use a total return approach both retrospectively, to measure and analyze actual financial performance, and prospectively, in ratemaking and planning. A rate of return framework provides a consistent and most easily understood basis for reconciling these three viewpoints.

This paper discusses rate of return from the policyholder, company, and shareholder perspectives. In addition, it will present a framework utilizing discounted cash flow, both the net present value (NPV) and internal rate of return (IRR) variations, to demonstrate two important considerations: The relationship between liabilities and surplus, and the release of income and return of surplus to the shareholder.

The paper discusses rates of return applicable to the policyholder, company, and shareholder from both a balance sheet and a cash flow perspective and presents a means of determining the "insurance risk charge" implicit in insurance transactions. This charge will be explained, and the paper will demonstrate the charge's applicability to both short and long tail lines of business.

To render the concepts concrete and to provide a simple yet accurate method of calculating total return in most instances, the paper presents a spreadsheet model embodying all of the principles discussed. This simplified model provides an adequate basis for measuring total return for both profitability tracking and ratemaking purposes.

An earlier paper [1] by this author discussed several conceptual and financial aspects pertaining to surplus, including: The role of surplus in an insurance company, rates of return on surplus, and a volatility-adjusted funding approach to determining surplus requirements. Since the numerical example employed in that paper will be used here, the Appendix repeats the example in detail.

2. THE BALANCE SHEET PERSPECTIVE

The concept of "rate of return" defines the relationship between the income from an investment and the magnitude or value of the investment. An investment is a balance sheet concept, and this important fact will be explored in the following section by considering the balance sheet associated with insurance transactions.

Discounted cash flow (DCF) models often do not explicitly consider the balance sheet implied by a particular income and cash flow stream, yet this balance sheet perspective is important in order to understand the rate of return inherent in such flows. In addition, DCF models applied to insurance (other than a few IRR applications) often limit their scope of concern to insurance operations, that is to say, involving only transactions between the company and its policyholders. Total return implies by its name that the cash flows (and balance sheet implications) relating to surplus also must be included. This balance sheet perspective, inclusive of surplus, is provided in the example in the Appendix. The example follows regular accounting rules to create a nominally valued (i.e., not discounted) balance sheet along with income and cash flow statements.

Net present value (NPV) models restate the nominal income and cash flow values to present value by the process of discounting. A present-valued balance sheet is determined in the same manner—by discounting each future year's nominal balance sheet and summing to the present.

The NPV measurement of return presented here ratios the present value of all income streams—both underwriting and investment—to the present value of surplus committed. In effect, the process constructs a balance sheet that represents the annualized present value sum of individual future calendar period balance sheets for the accident period being evaluated. The process then discounts to the present the balance sheets for future years and sums them. This "annualized equivalent balance sheet" provides the vehicle through which a rate of return can be calculated.

An alternate way of presenting this concept is to consider the nominal (i.e., undiscounted) income and cash flow statements and balance sheet that would exist if business were written at a steady state (i.e., no growth). A financial steady state (i.e., static balance sheet, income, and cash flow statements) occurs after some amount of time when identical business is written in successive years without growth. This amount of time is determined by how long it takes for the last financial activity of an accident year to occur. In the case shown in the Appendix, for example, it takes four years to reach steady state, since the last activity (the final loss payment) occurs in year four. The annualized equivalent balance sheet is identical to the nominal steady state balance sheet produced in this manner, when discounted to the starting point in time. This steady state view is not an assumption of the total return approach, but is presented simply as an alternate means of explanation.

The annualized equivalent balance sheet provides a measure of the net annualized liability commitment that is made when business is written. A simple example may help explain this concept. If business were to be written at the beginning of a year with an expected loss payable in one year of $20,000, and all other cash flows were settled at inception of the policy, the balance sheet would reflect a loss reserve liability of $20,000 for the full year. On the other hand, if we expected a loss payable in two and one-half (2.5) years of $8,000, the balance sheet would reflect a loss reserve liability of $8,000 for 2.5 years. This is the annual financial equivalent of $20,000. Alternately, if this business were written for several years, the balance sheet would show a loss reserve liability of $20,000. In either case, the company is committed to a one year financial liability equivalent (not present valued) of $20,000.

Returning to the example, Table I demonstrates the annual components of both an ongoing, steady state nominal income and balance sheet and a discounted income and balance sheet. It displays income on an after-tax basis and all values discounted are valued at the beginning of the accident year. For example, the ongoing "Balance Sheet Liability" reflects steady state loss reserves of $20,000 on a nominal

TABLE 1

NOMINAL AND DISCOUNTED INCOME, BALANCE SHEET, AND RATE OF RETURN

	Income After Tax		Balance Sheet Liability		
Total Income Components	Nominal Future Value	Discounted Present Value	Nominal Future Value	Discounted Present Value	Rate of Return (After Tax)
INSURANCE OPERATIONS:					
Underwriting	-$660	-$660	$17,342	$17,342	-3.8% (Cost of PH Funds)
Policyholder Liabilities					
Loss & Loss Expense	1,056	954	20,000	18,068	5.3%
Tax Loss Discounting	-50	-46	-953	-871	5.3%
Tax Unearned Premium	-18	-17	-340	-323	5.3%
Net PH Liabilities	988	891	18,707	16,874	5.3%
Retained Earnings	-72	N/A	-1,365	-1,247	5.3%
TOTAL OPERATING INCOME	256	231	17,342	15,627	1.5% (Risk Charge)
SHAREHOLDER SURPLUS:					
Contributed Surplus	264	238	5,000	4,517	5.3%
TOTAL INCOME	$520	$469			10.4% (ROS)

basis and $18,068 on a discounted basis. The nominal total balance sheet liability consists of net liabilities of $18,707 and surplus of $5,000. The surplus commitment of $2,000, $1,500, $1,000, and $500 for years one through four, respectively, equates to an ongoing commitment at steady state of $5,000. The Appendix describes this example in more detail.

The corresponding discounted balance sheet values are liabilities of $16,874 and surplus of $4,517. This means that the annual equivalent of this amount must be set aside today to fund future liabilities and provide the desired surplus support throughout the four year period.

The NPV investment income credit is $891 on the $16,874 in invested assets corresponding to policyholder liabilities and $238 on the $4,517 in surplus assets.

The surplus commitment is $4,517 in present value terms. This can be thought of as the one-year, annualized asset commitment that equates to the actual commitment of assets over the four year period. The level of this asset commitment is a function of both the magnitude of the cash flow balances and the amount of time over which these cash flows and balances exist.

In short, *the funding commitment is the present valued balance sheet asset commitment dictated by cash flows.* This asset commitment also represents the asset earnings base upon which the credit for future investment income is based. The annualized investment income figure is the same as the present value of the investment income stream derived from the investment of assets over the period of years, each discounted to the accident period.

Table 1 shows three important rates of return from the company's perspective:

1) the underwriting rate of return on the assets corresponding to the liabilities assumed by the company when writing this

business (i.e., the cost to the company of policyholder supplied funds),

2) the operating return to the company on the assets corresponding to the same policyholder liabilities assumed (i.e., the insurance risk charge to the policyholder for the transfer of insurance risk to the company), and

3) the rate of return to the shareholder.

Each of these three rates of return is calculated by dividing a particular income item by its respective balance sheet liability (i.e., asset commitment). In the example, the company's underwriting return is -3.8% (-$660 divided by $17,342 in nominal dollars) and this is the cost of policyholder funds supplied to the company. The company's operating return is 1.5% ($256 divided by $17,342) and this is the insurance charge to the policyholder for the transfer of risk. The rate of return to the shareholder is 10.4%, the total net income of $520 divided by shareholder contributed surplus of $5,000. This is also the discounted net income of $469 divided by the discounted surplus of $4,517.

The steady state present-valued balance sheet viewpoint provides a mechanism to transform transactions over several years into a single annual period measurement. In particular, the surplus commitment over multiple calendar years sums to a single period value against which one can calculate shareholder returns.

The ability to employ a single period basis is a key to simplifying discounted cash flow models and providing a single return on surplus measurement. While this NPV measurement will equal the IRR under certain conditions, the NPV cash flow approach provides added flexibility not inherent in the IRR. For example, the approach supports the determination of the traditional Operating Return on Premium (ROP), a form of return preferred by many in ratemaking.

These results will be viewed from a cash flow perspective in a following section. First, the control of surplus will be discussed in

order to establish the conditions under which NPV and IRR rates of return are equivalent.

3. CONTROLLING THE FLOW OF SURPLUS

Surplus exists as a financial buffer in support of business writings. The amount of the initial surplus contribution and the timing of its subsequent withdrawal is an important component of total return. For any segment of business, the accident year total return is its income as a percentage of the surplus committed, wherein both income and surplus are sums across the many years of financial activity as the liabilities run off. (It is common to view the development of loss reserves in the form of a loss triangle, and surplus is viewed analagously here).

Selecting a financial leverage factor (i.e., the ratio of liabilities to surplus) is a critical starting point, since this factor determines the initial surplus contribution and the amounts of surplus subsequently released over time as liabilities are settled. The following principles guide the flow of surplus (i.e., both initial shareholder surplus contribution and subsequent withdrawal):

1. The benchmark surplus level should be controlled over time by a direct linkage of that level to the level of net policyholder liabilities.

2. Insurance operating earnings (underwriting and investment income on policyholder supplied funds) of each accident year should be released to the shareholder (e.g., as dividends) as liabilities are settled.

It should be noted that Principle 1 implies use of "net policyholder liabilities to surplus" as the real underlying leverage ratio. The traditional "premium to surplus" leverage definition is far less meaningful.

If surplus flows are controlled following these principles, all three of the following will be identical:

a) the net present value, discounted accident year return on surplus (ROS);

b) the internal rate of return (IRR) measured for the accident year shareholder flows; and,

c) the annual increments of accident year shareholder distribution, as a rate of each year's beginning surplus.

Attribute C means that the shareholder will receive a constant annual rate of return (equal to the ROS and IRR) on each year's beginning investment for the initial and each subsequent calendar period of development of the accident year, until all accident year flows are settled.

In the example in the Appendix, the net present value return, IRR, and annual rate of income returned to the shareholder are each 10.4%. The cash flow perspective and the resultant IRR will be explained in the next section.

Note that the calendar shareholder distribution is not equivalent to the calendar ROE based net income: the latter reflects the effect of contributions from several prior accident years. During a calendar period, a shareholder is actually receiving a return of income and previously contributed surplus relating to the settlement of the current *and* previous accident year liabilities.

4. THE CASH FLOW PERSPECTIVE

Cash flow transactions occur between the policyholder and company, and between the company and shareholder. Table 2 provides a cash flow perspective demonstrating all flows involved in the insurance transaction using the same example from the Appendix. Positive cash flows are *to* the company, negative flows are *from* the company. To make the ideas more meaningful, it is best to consider the "policyholder" as actually a group of policyholders, whereby the losses that occur represent an average for the group.

The first section of Table 2 summarizes the transactions between policyholder and company and shows the "Total Underwriting

TABLE 2

CASH FLOW ANALYSIS AND IRR COMPONENTS FROM COMPANY PERSPECTIVE

	Begin Year 1	End Year 1	End Year 2	End Year 3	End Year 4	Total	IRR
POLICYHOLDER UNDERWRITING FLOWS TO COMPANY							
Premium	$10,000	$0	$0	$0	$0	$10,000	
Expense Paid	-3,000	0	0	0	0	-3,000	
Loss Paid	0	-2,000	-2,000	-2,000	-2,000	-8,000	
Tax Paid (UW, Timing)	-468	520	140	97	50	340	
Total Underwriting	6,532	-1,480	-1,860	-1,903	-1,950	-660	3.8% (To PH)
POLICYHOLDER INVESTMENT INCOME FLOWS TO COMPANY AFTER TAX							
Loss Reserves		422	317	211	106	1,056	
Tax Timing Items		-43	-15	-8	-3	-68	
Retained Earnings		-35	-22	-11	-4	-72	
Total Investment Income		345	280	192	99	916	
TOTAL POLICYHOLDER OPERATING FLOWS TO COMPANY							
UW & Investment Income	6,532	-1,135	-1,580	-1,711	-1,851	256	-1.5% (To PH)
INVESTMENT INCOME FROM CONTRIBUTED SURPLUS TO COMPANY AFTER TAX		106	79	53	26	264	
SHAREHOLDER FLOWS TO COMPANY							
Operating Earning Withdrawal		-102	-77	-51	-26	-256	
Surplus Contribution	2,000	-500	-500	-500	-500	0	
Inv Income on Surplus		-106	-79	-53	-26	-264	5.3%
Net Contributed Surplus	2,000	-708	-656	-604	-552	-520	10.4% (To SH)
NET CASH FLOW TO COMPANY FROM ALL SOURCES							
	$8,532	-$1,737	-$2,157	-$2,262	-$2,376	0	

Flows" net of these transactions, including taxes payable on underwriting income. In the example, the company receives a net initial cash flow of $6,532, followed by payments of $1,480, $1,860, $1,903, and $1,950 at the end of years 1, 2, 3, and 4, respectively. The total of these flows is a net payment of $660, which is the after tax underwriting loss. The IRR *to the policyholder* for this stream of cash flows is 3.8%, or -3.8% *to the company.* This is the "cost of policyholder funds" supplied to the company.

The company invests the policyholder supplied funds prior to payment of losses, and the resultant cash flows are shown separately under "Policyholder Investment Income Flows to Company—Total Investment Income." These are $345, $280, $192, and $99 for years 1, 2, 3, and 4, respectively, and total $916.

The "Total Policyholder Operating Flows to Company" is the sum of "Underwriting" and "Investment Income" flows and is $6,532 at policy inception, and -$1,135, -$1,580, -$1,711, and -$1,851, at the end of years 1, 2, 3, and 4, respectively. The total of $256 is the operating income. The IRR is -1.5% *to the policyholder,* or +1.5% *to the company.* This is the "insurance risk charge," the rate of return implicit in the transfer of underwriting risk from the policyholder to the company. In essence, the company keeps the investment income in excess of that needed to cover underwriting costs in exchange for the transfer of risk. Viewed mathematically, the market rate of return on investments of 5.3% less the 3.8% cost of policyholder funds equals the 1.5% risk charge.

Switching to the transactions between the company and the shareholder, the level of surplus is controlled so that the ratio of liabilities to surplus is 4:1 and further so that the return to the shareholder will be 10.4% in every year. The "Shareholder Flow" consists of three components: The initial contribution of surplus and its subsequent withdrawal, investment income on this surplus, and operating earnings. In this example, the company received a shareholder contribution of $2,000 initially, followed by payments to the shareholder of $708, $656, $604, and $552, in years 1, 2, 3, and 4, respectively. This totals a net payment of $520 to the shareholder, which is the total net

income. The IRR *to the shareholder* is 10.4% and this is the shareholder total return in this example. The rate of return to the shareholder is also 10.4% of each year's beginning surplus.

5. NPV AND IRR RATES OF RETURN

The balance sheet and cash flow perspectives have been used to develop the NPV and IRR rates of return, respectively. In addition, rates of return have been determined at the policyholder, company, and shareholder levels. Table 3 provides a summary of the results and demonstrates the equivalency in returns.

TABLE 3

POLICYHOLDER, COMPANY, AND SHAREHOLDER RATES OF RETURN—NPV AND IRR

	Net Present Value (NPV)					Internal Rate of Return (IRR)	
	Balance Sheet Liability		Income After Tax				
	Nominal Future Value	Disc Present Value	Nominal Future Value	Disc Present Value	Rate of Return	Income After Tax Nominal Value	Rate of Return
Policyholder	$17,342	$17,342	-$660	-$660	-3.8%	-$660	-3.8%
Insurance Operations	17,342	15,627	256	231	1.5	256	1.5
Shareholder	5,000	4,517	520	469	10.4	520	10.4

As shown in Table 3, the policyholder, company, and shareholder rates of return produced by the NPV and IRR approaches are identical. This important result confirms their equivalency and demonstrates that, when surplus is controlled in the same manner, the results produced by the two approaches will be equal.

6. REFORMULATION OF THE TOTAL RETURN MODEL

The "cost of policyholder supplied funds" and "insurance risk charge" as rates of return are directly linked with the total return to the shareholder. The traditional model that describes total return is:

Total Return = Operating Return on Premium
× Premium to Surplus Ratio
+ Investment Yield on Surplus,

or notationally:

$$ROS = (ROP) \times (P/S) + R_S .$$

This model should be restated as follows:

Total Return = Operating Return on Liabilities
(i.e., Insurance Risk Charge)
× Liability to Surplus Ratio (i.e., Leverage)
+ Investment Yield on Surplus,

or notationally:

$$ROS = (ROL) \times (L/S) + R_S .$$

This new formulation reflects the direct relationship of income to the respective liabilities, but requires abandoning the old traditions of premium to surplus and return on premium. One difficulty with return on premium is that it does not provide a measure that is comparable among lines of business having different cash flow characteristics, such as long tail versus short tail lines of business. In addition and as a consequence, it is difficult to determine just what a "fair" return on premium (and profit margin) ought to be in a line of business. This difference is automatically reflected in the formulation using liabilities shown above.

As will be shown in the next section, a return on policyholder liabilities, or risk charge, can be determined that solves the short tail versus long tail problem. And perhaps more importantly, a return on liabilities provides a measurement of an insurance rate of return that can be a compromise for those who object to any "allocation" of surplus. One need simply to assume that the ratio of liabilities to surplus is the same for each line of business. This will also be discussed in the next section.

For each line of business, the linkage of surplus to liabilities controls the initial shareholder surplus contribution and its subsequent release. If there were no differences in volatility among lines of business, then the liability to surplus ratio would be constant. However, this is not the case. Therefore, the unique characteristics of each line must be reflected in the magnitude of this ratio.

While this paper and the examples used have focused on the clearly dominant loss reserves payable as the most significant liability (and thus the main factor affecting the level of surplus), *net* policyholder liabilities also include expenses payable, premiums receivable, the two tax law timing items (tax loss discount and UPR offset), and retained earnings. Some lines have unique and specialized cash flows that must be considered since this may have a significant effect on net liabilities, beyond that due to losses.

7. THE INSURANCE RISK CHARGE

The insurance charge calculation provides a means of determining what an insurance company retrospectively has charged for assuming insurance risk or prospectively should charge for assuming the risk. Furthermore, as shown in Table 4, when the principles regarding the control of surplus and the release of operating earnings discussed previously are followed, the insurance risk charge measurement "normalizes" away the differences in typical return measurements, such as ROP, that are caused by different cash flows among lines of business (i.e., the length of the tail). *Specifically, the insurance risk charge is fixed, at a given ROE level, regardless of line of business, if the liability to surplus leverage ratio does not vary.*

This insurance risk charge provides a much better way to measure operating rates of return than does the return on premium, and it is an acceptable measure to those who do not wish to allocate surplus to a line of business. Yet this is, in effect, a part of a specific total return approach that assumes a constant liability to surplus leverage ratio in all lines of business. Certainly this is more reasonable than a return on premium coupled with a constant premium to surplus ratio in all lines, a common practice by some in the industry.

As shown in the examples in Table 4, the risk charge corresponding to a 15% total rate of return is 2.43% regardless of the length of the loss payout (2.43% times 4.0 leverage plus 5.28% investment yield on surplus equals 15%). The policyholder is being paid 2.85% for the use of his or her funds. In the breakeven case, the risk charge is 0%, meaning the company is earning no return from its insurance operations.

TABLE 4

COMBINED RATIO, COST OF FUNDS, AND RISK CHARGE WITH VARYING PAYOUTS AND TARGET RETURNS

Loss Payout (Years)		Shareholder Total Return 25.0%	15.0%	Breakeven 5.28%
1	Combined Ratio (%)	100.3	102.8	105.3
	Cost of Funds (%)	0.35	2.85	5.28
	Risk Charge (%)	4.93	2.43	0.00
3	Combined Ratio (%)	101.0	109.1	117.8
	Cost of Funds (%)	0.35	2.85	5.28
	Risk Charge (%)	4.93	2.43	0.00
5	Combined Ratio (%)	101.7	115.7	132.5
	Cost of Funds (%)	0.35	2.85	5.28
	Risk Charge (%)	4.93	2.43	0.00

Each case in Table 4 assumes a liability to surplus leverage ratio of 4:1, that premium and expense are paid without delay, and that 100% of the loss is paid on the single date shown (i.e., after 1, 3, and 5 years, respectively). The expense ratio is 30%, the investment yield and tax discount rates are 8.0% before tax, and the tax rate is 34% in each case.

The supporting detail for the three year payout and 15% total return case is shown in Tables 5 and 6, which parallel Tables 1 and 2.

TABLE 5

NOMINAL AND DISCOUNTED INCOME, BALANCE SHEET, AND RATE OF RETURN
(THREE YEAR LOSS PAYOUT, 15% TARGET TOTAL RETURN)

	Income After Tax		Balance Sheet Liability		
Total Income Components	Nominal Future Value	Discounted Present Value	Nominal Future Value	Discounted Present Value	Rate of Return (After Tax)
INSURANCE OPERATIONS:					
Underwriting	-$599	-$599	$21,017	$21,017	-2.9% (Cost of PH Funds)
Policyholder Liabilities					
Loss & Loss Expense	1,253	1,131	23,723	21,422	5.3%
Tax Loss Discounting	-60	-55	-1,137	-1,043	5.3%
Tax Unearned Premium	-18	-17	-340	-323	5.3%
Net PH Liabilities	1,175	1,059	22,246	20,056	5.3%
Retained Earnings	-65	N/A	-1,229	-1,127	5.3%
TOTAL OPERATING INCOME	511	460	21,017	18,928	2.4% (Risk Charge)
SHAREHOLDER SURPLUS					
Contributed Surplus	277	250	5254	4732	5.3%
TOTAL INCOME	$788	$710			15.0% (ROS)

TABLE 6

CASH FLOW ANALYSIS AND IRR COMPONENTS FROM COMPANY PERSPECTIVE (THREE YEAR LOSS PAYOUT, 15% TARGET TOTAL RETURN)

	Begin Year 1	End Year 1	End Year 2	End Year 3	End Year 4	Total	IRR
POLICYHOLDER UNDERWRITING FLOWS TO COMPANY							
Premium	$10,000	$0	$0	$0	$0	$10,000	
Expense Paid	-3,000	0	0	0	0	-3,000	
Loss Paid	0	0	0	-7,908	0	-7,908	
Tax Paid (UW, Timing)	-585	511	184	199	0	309	
Total Underwriting	6,414	511	184	-7,708	0	-599	2.9% (To PH)
POLICYHOLDER INVESTMENT INCOME FLOWS TO COMPANY AFTER TAX							
Loss Reserves		418	418	418	0	1,253	
Tax Timing Items		-47	-20	-11	0	-78	
Retained Earnings		-32	-22	-11	0	-65	
Total Investment Income		339	375	396	0	1,110	
TOTAL POLICYHOLDER OPERATING FLOWS TO COMPANY							
UW & Investment Income	6,414	849	560	-7,313	0	511	-2.4% (To PH)
INVESTMENT INCOME FROM CONTRIBUTED SURPLUS TO COMPANY AFTER TAX		85	94	99	0	277	
SHAREHOLDER FLOWS TO COMPANY							
Operating Earning Withdrawal		-156	-173	-182	0	-511	
Surplus Contribution	1,604	173	97	-1,874	0	0	
Inv Income on Surplus		-85	-94	-99	0	-277	5.3%
Net Contributed Surplus	1,604	-67	-170	-2,155	0	-788	15.0% (To SH)
NET CASH FLOW TO COMPANY FROM ALL SOURCES	$8,018	$867	$484	-$9,368	$0	$0	

The insurance risk charge, or operating rate of return on policyholder liabilities, presented here, offers a definition of a rate of return that can be used in the establishment of a "fair" insurance return consistent (since it is mathematically part of total return) with total return as commonly accepted in the financial community.

8. THE SINGLE PAGE RATEMAKING SPREADSHEET

Cash flow models in insurance are made cumbersome due to the many periods of cash flows that must be considered for a given accident year. Fortunately, in many instances it is possible to model this process more simply through use of average settlement dates of cash flows rather than the many individual values that occur at different points in time. In the example in the Appendix, for example, this means using a single loss payment at the average payment date of 2.5 years to approximate the effects of actual flows of 25% equally at the end of years 1-4. A simplified model has been created to provide a much simplified calculation and presentation vehicle based on average settlement dates.

In Exhibit 1, "Calculation of Total Return" incorporates all of the principles discussed into a simple, concise calculation of a total rate of return. The upper portion presents the assumptions on underwriting, cash flow, investment, taxes, and leverage necessary as inputs to the determination of a total rate of return. The lower portion presents the results (at present value) for income from underwriting and investment and the rates of return that result. This exhibit is an extremely simplified, yet adequate, presentation of the rate of return that can be estimated prospectively as part of the ratemaking process. The formulas for this exhibit are presented in Exhibits 3 and 4.

It should be noted that the 10.7% total rate of return shown at the bottom of Exhibit 1 differs from the more precise 10.4% shown previously since average cash settlement dates have been used. This loss of precision is the trade-off for the gain in simplification in calculation and presentation achieved by this simplified method. The primary difference is in the loss discount provision of the tax law which does not lend itself well to the use of an average date.

A second spreadsheet page, Exhibit 2, "Nominal and Discounted Income, Balance Sheet, and Rate of Return" presented previously in format as Table 1, provides further technical backup and documents the components of the rate of return used in this simplified model in more detail. For example, the balance sheet that underlies the rate of return calculation is presented, as is the insurance risk charge. Formulas for this exhibit are presented in Exhibit 5.

9. CONCLUSION

This paper has presented a total return model of insurance that provides complementary rate of return measures that are applicable to the policyholder, company, and shareholder alike. The company operating rate of return is a direct measure of the charge for the transfer of insurance risk from the policyholder to the company. The paper offers this as a more meaningful and supportable measure than the more traditional return on premium, and it suggests a reformulation of the total return model in this regard.

Through utilization of both the balance sheet and cash flow perspectives, the paper has demonstrated equivalency of NPV and IRR rates of return *if* a company follows a set of suggested operating guidelines regarding the control of surplus: It must link surplus control to insurance liabilities and the release of operating earnings.

Finally, the paper has provided a simple rate of return calculation and presentation model as a means to approximate the more complex multi-period cash flows that exist for a given accident year. For those interested, Exhibits 3-5 provide the detailed formulas driving the model.

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EXHIBIT 1

CALCULATION OF TOTAL RETURN

INPUT ASSUMPTIONS	BEFORE TAX	PORTION OF PREMIUM
UNDERWRITING FINANCIALS		
Earned Premium	$10,000	
Loss & Loss Expense	$8,000	80.0%
Expense	$3,000	30.0%
Combined Loss and Expense	$11,000	110.0%
AVERAGE COLLECTION PAYMENT DELAYS (in years)		
Earned Premium	0.00	
Loss & Loss Expense	2.50	
Expense	0.00	
TAX AND INVESTMENT		
Underwriting Tax Rate	34%	
Operating Cash Flow Investment Rate—BT	8%	
Investment Income Tax Rate	34%	
Operating Cash Flow Investment Rate —AT	5.28%	
Tax Loss Discount—Average Date	2.50	
Tax Loss Discount—Discount Rate	8%	
Year End Portion Premium Unearned	50%	
SURPLUS		
Leverage Premium/Surplus	2.19	
Leverage Liability/Surplus	4.00	
Surplus Investment Rate—BT	8%	
Investment Income Tax Rate	34%	
Surplus Investment Rate —AT	5.28%	
GAAP Conversion Factor	1.00	

RESULTS AT PRESENT VALUE	BEFORE TAX	AFTER TAX
Underwriting Income	-$1,000	-$660
Investment Income Credit		
Premium	$0	$0
Loss	$1,463	$966
Expense	$0	$0
Tax Law Timing Items:		
Loss Discounting	-$63	-$42
UPR Offset	-$26	-$17
Net Investment Income Credit	$1,374	$907
Operating Income	$374	$247
Operating Return on Premium (ROP)	3.7%	2.5%
Surplus	$4,572	
Investment Income Credit on Surplus	$366	$241
Total Net Income	$740	$488
Total Return on Surplus	16.2%	10.7%
Total Return on Equity	16.2%	10.7%

EXHIBIT 2

NOMINAL AND DISCOUNTED INCOME, BALANCE SHEET, AND RATE OF RETURN

	Income After Tax		Balance Sheet Liability		
Total Income Components	Nominal Future Value	Discounted Present Value	Nominal Future Value	Discounted Present Value	Rate of Return (After Tax)
INSURANCE OPERATIONS:					
Underwriting	-$660	-$660	$17,618	$17,618	-3.7% (Cost of PH Funds)
Policyholder Liabilities					
Loss & Loss Expense	1,056	966	20,000	18,288	5.3%
Tax Loss Discounting	-45	-42	-849	-786	5.3%
Tax Unearned Premium	-18	-17	-340	-323	5.3%
Net PH Liabilities	993	907	18,881	17,180	5.3%
Retained Earnings	-63	N/A	-1,193	-1,090	5.3%
TOTAL OPERATING INCOME	270	247	17,618	16,090	1.5% (Risk Charge)
SHAREHOLDER SURPLUS					
Contributed Surplus	264	241	5,000	4,572	5.3%
TOTAL INCOME	$534	$488			10.7% (ROS)

EXHIBIT 3

FORMULAS FOR CALCULATION OF TOTAL RETURN EXHIBIT

INPUT ASSUMPTIONS	BEFORE TAX	PORTION OF PREMIUM
UNDERWRITING FINANCIALS		
Earned Premium	P	
Loss & Loss Expense	L	$100 \times L/P$
Expense	E	$100 \times E/P$
Combined Loss and Expense	$L + E$	$100 \times (L + E)/P$
AVERAGE COLLECTION PAYMENT DELAYS (in years)		
Earned Premium	N_p	
Loss & Loss Expense	N_l	
Expense	N_e	
TAX AND INVESTMENT		
Underwriting Tax Rate	T	
Operating Cash Flow Investment Rate—BT	R_b	
Investment Income Tax Rate	T_i	
Operating Cash Flow Investment Rate —AT	$R = R_b \times (1 - T_i)$	
Tax Loss Discount—Average Date	N_t	
Tax Loss Discount—Discount Rate	R_t	
Year End Portion Premium Unearned	U	
SURPLUS		
Premium/Surplus Leverage Factor	F	
Surplus Investment Rate—BT	R_{sb}	
Investment Income Tax Rate	T_i	
Surplus Investment Rate —AT	$R_s = R_{sb} \times (1 - T_i)$	
GAAP Conversion Factor	G	

RESULTS AT PRESENT VALUE	BEFORE TAX	AFTER TAX
Underwriting Income	$P - L - E$	$W = (P - L - E) \times (1 - T)$
Investment Income Credit		
Premium		$-P \times (1 - 1/(1 + R)^{N_p})$
Loss		$L \times (1 - 1/(1 + R)^{N_l})$
Expense		$E \times (1 - 1/(1 + R)^{N_e})$
Tax Law Timing Items:		
Loss Discounting		KL
UPR Offset		$-0.2TPU \times (1 - 1/(1 + R))$
Net Investment Income Credit	$C/(1 - T)$	C = sum of 5 items above
Operating Income	$(W + C)/(1 - T)$	$W + C$
Operating Return on Premium (ROP)		$(W + C)/P$
Surplus	$S = P/F$	
Investment Income Credit on Surplus	$R_{sb} \times S$	$C_s = R_s \times S$
Total Net Income	$(W + C + C_s)/(1 - T)$	$W + C + C_s$
Total Return on Surplus	$ROS/(1 - T)$	$ROS = 100 \times (W + C + C_s)/S$
Total Return on Equity	$ROE/(1 - T)$	$ROE = ROS/G$

K = Loss discount investment credit factor from Exhibit 4.

EXHIBIT 4

LOSS DISCOUNTING INVESTMENT INCOME CREDIT FACTOR (FACTOR TIMES LOSS FOR DOLLAR IMPACT)

APPROXIMATION FORMULA

1) Actual and Law Rates and Payouts Same

$$-\{(D_b - D_a) + T(1 - D_b)\}, \text{ where}$$

$D = 1/(1+R)^N$, i.e., discount factor
R = rate for calculating discount
N = payment date
b = before tax
a = after tax
T = tax rate
$D_a = 1/(1+R_a)^N$
$R_a = (1-T)R_b$

2) Actual and Law Rates Different, Payouts Same

$$-\{(D'_{rb} - D_a) + T(1 - D'_{rb})\} + (D'_{rb} - D_a)(R_a - R'_a)/(R_a - R'_b)$$

(Rate Adjustment)

where $'$ signifies using law rate.

3) Actual and Law Rates and Payouts Different

$$-\{(D_{n'r'b} - D_{n'a}) + T(1 - D_{n'r'b})\} + (D_{n'r'b} - D_{n'a})(R_a - R'_a)/(R_a - R'_b)$$

(Rate Adjustment)

$$+TD_a[(1 - D_{n''r'b}) - (D_{n''r'b} - D_{n''a})R'_b/(R_a - R'_b)]$$

(Date Adjustment)

where $'$ signifies using law rate or payment date and
$n'' = n' - n$, i.e., difference in payment date

The effect of different rates is greater than that of payout differences, and Formula 2 is sufficiently accurate for most applications.

An approximate formula for the above is

$$-T\{(1 - D_{mra}) \times (1 - D_{n'r'b})\}, \text{ where } m = (n+1)/2$$
$$= -T\{(1 - 1/(1+R_a)^m) \times (1 - 1/(1+R'_b)^{n'})\}.$$

EXHIBIT 5
Part 1

NOMINAL AND DISCOUNTED INCOME, BALANCE SHEET, AND RATE OF RETURN
MATHEMATICAL FORMULAS

Components of Total Income		Income After Tax: Nominal Future Value	Income After Tax: Discounted Present Value	Balance Sheet Liability: Nominal Future Value	Balance Sheet Liability: Discounted Present Value	Rate of Return (After Tax)	
INSURANCE OPERATIONS:		(3)	(4)	(5)	(6)		
Underwriting		$W' = W$	$W = (P - L - E) \times (1 - T)$	Nominal Sum 3	Nominal Sum 3	Column (3)/(5) or (4)/(6)	Cost of PH Funds
Policyholder Liabilities							
Premium	(a)	$-R \times Np \times P$	$-P \times (1 - 1/(1+R)^{Np})$	$-Np \times P$	$-P \times (1 - 1/(1+R)^{Np})/R$	"	
Loss & Loss Expense	(b)	$R \times Nl \times L$	$L \times (1 - 1/(1+R)^{Nl})$	$Nl \times L$	$L \times (1 - 1/(1+R)^{Nl})/R$	"	
Underwriting Expense	(c)	$R \times Ne \times E$	$E \times (1 - 1/(1+R)^{Ne})$	$Ne \times E$	$E \times (1 - 1/(1+R)^{Ne})/R$	"	
Net Policyholder Liabilities (excluding Tax Timing Items)	Sum 1	< Sum of (a) through (c) >				"	
Tax Timing Items							
Tax Loss Discounting	(d)	ZL (Note 4)	KL (Note 4)	ZL/R	KL/R	"	
Tax Unearned Premium	(e)	$-R \times 0.2TPU$	$-0.2TPU \times (1 - 1/(1+R))$	$-0.2TPU$	$-0.2TPU \times (1 - 1/(1+R))/R$	"	
Net Liabilities	Sum 2	< Sum of (a) through (e) >				"	

EXHIBIT 5
Part 2

NOMINAL AND DISCOUNTED INCOME, BALANCE SHEET, AND RATE OF RETURN
MATHEMATICAL FORMULAS

Components of Total Income		Income After Tax: Nominal Future Value	Income After Tax: Discounted Present Value	Balance Sheet Liability: Nominal Future Value	Balance Sheet Liability: Discounted Present Value	Rate of Return (After Tax)	
Retained Earnings	(f)	$R \times E'$ (Note 2)	N/A	E'	E (Note 3)	Column (3)/(5) or (4)/(6)	
Net Liabilities (including Retained Earnings)	c: Sum 3	<——— Sum of (a) through (f) ———>				"	Market Inv Rate on PH Funds
TOTAL OPERATING INCOME		$W' + C'$	$W + C$	Nominal Sum 3	Discounted Sum 3	"	Insurance Charge Risk
SHAREHOLDER SURPLUS:							
Contributed Surplus		$C_S' = R_S \times S'$	$C_S = R_S \times S$	S' (Note 1)	S	"	Market Inv Rate on SH Funds
TOTAL INCOME		$W' + C' + C_S' + R \times E'$	$W + C + C_S$			Column (3)/(5) Column(4)/(6)	ROS' ROS

" ' " Denotes nominal

Note 1: Nominal Surplus $S' = S \times$ (Nominal Sum 2/Discounted Sum 2)

Note 2: $R \times E' = \text{ROS} \times S' - (W' + C' + C_S')$

Note 3 : $E = E' \times$ (Discounted Sum 2/Nominal Sum 2)

Note 4: $Z = -R \times T \times (Nl - (1 - 1/(1 + Rt)^{N\,l})/Rt$

Note 5: K = Loss discount investment income credit factor determined by detail formula that reflects differing discount rates and/or payment dates of the tax law from actual

Before Tax amounts are determined by dividing After Tax amounts by $(1 - T)$.

APPENDIX

Numerical Example

This appendix presents an example involving a single accident year (which can be viewed as a single policy written on the first of the year) with a premium of $10,000, expense of $3,000, and ultimate loss of $8,000. The premium is received and the expenses are paid without delay, whereas claims are paid in 25% increments at the end of each of the current and three following years.

In addition, the example assumes the yield rate on investments to be 8%, before tax, and the tax rate on underwriting and investment income to be 34%. For simplicity, the rate used for loss discounting under the 1986 Tax Reform Act is also 8%. The example assumes one-half of premium to be unearned at the end of the first year for purposes of the premium offset provision of the tax law. In this example all cash flows are discounted to the beginning of each respective year. Traditional accounting rules are followed to construct income statements and balance sheets.

The exhibits in this appendix for this example are as follows:

Exhibit A.1—Basic assumptions and calculations of reserves and payments.

Exhibit A.2—Nominal and discounted income statements and balance sheets for the single accident year over its four years of activity.

Exhibit A.3—Exhibit A.2 accumulated across successive accident years, reaching steady state after four years.

Exhibit A.4—Relationship of policyholder and shareholder funds.

Exhibit A.5—Shareholder flows, nominal and discounted steady state income with IRR and NPV, and respective rates of return.

Underwriting and investment are assumed to remain constant over time. With no growth in the level of business, it takes four years to

reach a steady state condition, after which all items remain the same as shown on Exhibit A.3.

In the example, the writing of the policy required an initial capital contribution by the shareholder. Subsequently the shareholder receives payments (i.e., return of capital) consisting of three components: 1) The return of invested capital; 2) the investment income on the invested capital while held by the company; and 3) the insurance operating earnings, which is the sum of the underwriting income and the investment income on the policyholder funds.

The release of funds to the shareholder is governed by maintaining a constant 4:1 ratio of policyholder funds to shareholder funds over time. For simplification in this example, policyholder funds are assumed to consist of loss reserves only, and do not include either the tax law timing items or retained earnings. (Retained earnings are, in effect, undistributed operating earnings that must be included in shareholder flows at some point, and are considered separate from contributed surplus).

The release of funds to the shareholder is thus a payout policy of 1) withdrawing investment income on capital as it is earned (i.e., annually) and 2) withdrawing the initial capital contribution and operating income as a function of loss payout. This is demonstrated on Exhibit A.4 for both the single accident year and steady state.

Under this return of capital rule, the initial surplus contributed for the accident year is $2,000, based on the 4:1 reserve-to-surplus ratio, followed by declines to $1,500, $1,000, and $500 in years two through four since the loss reserve is $8,000, $6,000, $4,000, and $2,000, respectively, for these years. At steady state, the reserve is $20,000 and the surplus $5,000. The calendar premium-to-surplus ratio at steady state is 2:1.

The itemized shareholder flows are shown on the upper section of Exhibit A.5. Capital is withdrawn at the rate of 25%, or $500, per year matching the loss payout pattern. The shareholder receives the investment income on the contributed capital and the operating earnings in a manner that maintains the relationship to reserves.

Rates of Return on Surplus

On Exhibit A.5, an internal rate of return (IRR) calculation is shown for "Operating Earnings", "Contributed Capital", and "Net Shareholder Return". The IRR for operating earnings and contributed capital are both 5.3%, since these flows earn 8% before tax, or 5.3%, after tax. The shareholder receives a net IRR of 10.4%, based on the initial capital contribution of $2,000 followed by withdrawals of $708, $656, $604, and $552 in years one through four. The IRR measures the return to the shareholder from both operating earnings and investment income on surplus. It should be noted that the annual return on invested capital is also 10.4% in every year.

Part 2 of Exhibit A.5 displays a nominal steady state calculation of return on surplus derived from the steady state balance sheet and income statements.

Note that the "Total Net Income" of $520 is 10.4% of the $5,000 "Beginning Surplus". The calculation of discounted return is shown to the right and reflects the steady state figures on a basis discounted to both the beginning and the end of the initial accident year. When valued at the beginning of the accident year, the "Total Return" of $469 is 10.4% of the $4,517 "Beginning Surplus."

What this demonstrates is that all three measures of return—the IRR, the steady state nominal calendar period, and the discounted return—are equivalent. This equivalence holds under the assumption that underwriting and investment are fixed, there is no growth in business level, *and* policyholder and shareholder flows are linked over time.

EXHIBIT A.1

BASIC ASSUMPTIONS AND CALCULATIONS BASELINE — FOUR YEAR PAYOUT (25% PER YEAR) AT 4:1 RESERVE/SURPLUS RATIO

Earned Premium	10,000.00
Expense Ratio	0.30
Loss Ratio	0.80
Underwriting Tax Rate	34.00%
Investment Yield BT	8.00%
Investment Yield AT	5.28%
Tax Law Discount Rate	8.00%

		Year				
	Total	1	2	3	4	5
Loss Payment Sched Actual	100%	25%	25%	25%	25%	0%
Loss Payment Sched Law	100%	25%	25%	25%	25%	0%
Loss Payout by Law	8,000	2,000	2000	2,000	2,000	0
Discounted		1,852	1,715	1,588	1,470	0
Beginning Reserve Before Discount		8,000	6,000	4,000	2,000	0
Tax Law Timing Items BT						
Beginning Loss Discount	1,375	1,375				
Scheduled Recovery	-1,375	-530	-412	-285	-148	0
Begin UPR Subject to Tax	1,000	1,000				
Scheduled Recovery	-1,000	-1,000				
Reserves And Payments						
Beginning Nominal Loss Reserve		8,000	6,000	4,000	2,000	0
Loss Payments		2,000	2,000	2,000	2,000	0
Begin Loss Discount Tax Reserve		-468	-288	-147	-50	0
Loss Discount Tax Recovery		180	140	97	50	0
Begin UPR Tax Reserve		-340				
UPR Tax Recovery		340				
Shareholder Cap. Flows	Begin					
From Operating Earnings[1]		102	77	51	26	0
From Investment Income on Contributed Capital		106	79	53	26	0
Capital Withdrawal	-2,000	500	500	500	500	0
Contributed Capital[2]	-2,000	606	579	553	526	0
Net Capital Flows	-2,000	708	656	604	552	0

[1] Operating earnings withdrawal: Constant calendar ROS (AT)

[2] Contributed surplus withdrawal: Proportional to reserves plus investment income

EXHIBIT A.2
Part 1

BALANCE SHEETS AND INCOME STATEMENTS
SINGLE ACCIDENT YEAR

BASELINE—FOUR YEAR PAYOUT (25% PER YEAR)
AT 4:1 RESERVE/SURPLUS RATIO

		Year				
Income Statement	Total	1	2	3	4	5
NOMINAL						
Income BT						
Underwriting Income	-1,000	-1,000	0	0	0	0
Investment Income						
Loss Reserve	1,600	640	480	320	160	0
Loss Disc Tax Reserve	-76	-37	-23	-12	-4	0
UPR Tax Reserve	-27	-27	0	0	0	0
Retained Earnings	-109	-53	-33	-17	-6	0
Surplus	400	160	120	80	40	0
Total Income BT	787	-317	544	371	190	0
NOMINAL						
Income AT						
Underwriting Income	-660	-660	0	0	0	0
Investment Income						
Loss Reserve	1,056	422	317	211	106	0
Loss Disc Tax Reserve	-50	-25	-15	-8	-3	0
UPR Tax Reserve	-18	-18	0	0	0	0
Retained Earnings	-72	-35	-22	-11	-4	0
Surplus	264	106	79	53	26	0
Total Income AT	520	-209	359	245	125	0
DISCOUNTED						
Income AT						
Underwriting Income	-660	-660	0	0	0	0
Investment Income						
Loss Reserve	954	401	286	181	86	0
Loss Disc Tax Reserve	-46	-23	-14	-7	-2	0
UPR Tax Reserve	-17	-17	0	0	0	0
Retained Earnings	-66	-33	-20	-10	-3	0
Surplus	238	100	71	45	21	0
Total Income AT	404	-232	324	210	102	0
Total Income (Excluding Retained Earnings)	469	-199	344	220	105	0

EXHIBIT A.2
Part 2

BALANCE SHEETS AND INCOME STATEMENTS
SINGLE ACCIDENT YEAR

BASELINE—FOUR YEAR PAYOUT (25% PER YEAR)
AT 4:1 RESERVE/SURPLUS RATIO

	Year				
Balance Sheet	1	2	3	4	5
NOMINAL					
Beginning Assets	8,532	6,795	4,638	2,376	0
Liabilities					
Loss Reserve	8,000	6,000	4,000	2,000	0
Disc Tax Reserve	-468	-288	-147	-50	0
UPR Tax Reserve	-340	0	0	0	0
Surplus					
Retained Earnings	-660	-417	-214	-73	0
Contributed	2000	1,500	1,000	500	0
Liabilities + Surplus	8,532	6,795	4,638	2,376	0
DISCOUNTED					
Beginning Assets	8,104	6,131	3,975	1,934	0
Liabilities					
Loss Reserve	7,599	5,413	3,428	1,628	0
Disc Tax Reserve	-444	-259	-126	-41	0
UPR Tax Reserve	-323	0	0	0	0
Surplus					
Retained Earnings	-627	-377	-184	-60	0
Contributed	1,900	1,353	857	407	0
Liabilities + Surplus	8,104	6,131	3,975	1,934	0

EXHIBIT A.3
Part 1

BALANCE SHEETS AND INCOME STATEMENTS
STEADY STATE BASIS, FOUR YEARS

BASELINE—FOUR YEAR PAYOUT (25% PER YEAR)
AT 4:1 RESERVE/SURPLUS RATIO

	Year				
Income Statement	1	2	3	4	5
NOMINAL					
Income AT					
Underwriting	-660	-660	-660	-660	-660
Investment Income					
Reserves	422	739	950	1,056	1,056
Loss Disc Tax Reserve	-25	-40	-48	-50	-50
UPR Tax Reserve	-18	-18	-18	-18	-18
Retained Earnings	-35	-57	-68	-72	-72
Surplus	106	185	238	264	264
Total Income AT	-209	149	394	520	520
DISCOUNTED					
Income AT					
Nominal Underwriting	-660	-660	-660	-660	-660
Investment Income					
Loss Reserve	401	687	868	954	954
Loss Disc Tax Reserve	-23	-37	-44	-46	-46
UPR Tax Reserve	-17	-17	-17	-17	-17
Retained Earnings	-33	-53	-63	-66	-66
Surplus	100	172	217	238	238
Total Income AT	-232	92	301	404	404
Total Income (Excluding Retained Earnings)	-199	145	364	469	469

EXHIBIT A.3
Part 2

BALANCE SHEETS AND INCOME STATEMENTS STEADY STATE BASIS, FOUR YEARS

BASELINE—FOUR YEAR PAYOUT (25% PER YEAR) AT 4:1 RESERVE/SURPLUS RATIO

	Year				
Balance Sheet	1	2	3	4	5
NOMINAL					
Beginning Assets	8,532	15,327	19,965	22,342	22,342
Liabilities					
Loss Reserve	8,000	14,000	18,000	20,000	20,000
Disc Tax Reserve	-468	-755	-903	-953	-953
UPR Tax Reserve	-340	-340	-340	-340	-340
Surplus					
Retained Earnings	-660	-1,077	-1,292	-1,365	-1,365
Contributed	2,000	3,500	4,500	5,000	5,000
Liabilities + Surplus	8,532	15,327	19,965	22,342	22,342
DISCOUNTED					
Beginning Assets	8,104	14,235	18,210	20144	20,144
Liabilities					
Loss Reserve	7,599	13,012	16,440	18,068	18,068
Disc Tax Reserve	-444	-704	-830	-871	-871
UPR Tax Reserve	-323	-323	-323	-323	-323
Surplus					
Retained Earnings	-627	-1,003	-1,187	-1,247	-1,247
Contributed	1,900	3,253	4,110	4,517	4,517
Liabilities + Surplus	8,104	14,235	18,210	20,144	20,144
DISCOUNTED END OF YEAR VALUATION					
Beginning Assets—	8,532	14,987	19,171	21,207	21,207
Liabilities					
Loss Reserve	8,000	13,699	17,308	19,022	19,022
Disc Tax Reserve	-468	-741	-874	-917	-917
UPR Tax Reserve	-340	-340	-340	-340	-340
Surplus					
Retained Earnings	-660	-1,056	-1,250	-1,313	-1,313
Contributed	2,000	3,425	4,327	4,755	4,755
Liabilities + Surplus	8,532	14,987	19,171	21,207	21,207

EXHIBIT A.4

POLICYHOLDER/SHAREHOLDER FUNDS

BASELINE—FOUR YEAR PAYOUT (25% PER YEAR) AT 4:1 RESERVE/SURPLUS RATIO

	Beginning of Year				
	1	2	3	4	5
Single Accident Year					
NOMINAL					
Policyholder Funds	8,000	6,000	4,000	2,000	0
Shareholder Funds	2,000	1,500	1,000	500	0
Ratio PH/SH Funds	4.00	4.00	4.00	4.00	
DISCOUNTED					
Policyholder Funds	7,599	5,413	3,428	1,628	0
Shareholder Funds	1,900	1,353	857	407	0
Ratio PH/SH Funds	4.00	4.00	4.00	4.00	
DISCOUNTED END OF YEAR VALUATION					
Policyholder Funds	8,000	5,699	3,609	1,714	0
Shareholder Funds	2,000	1,425	902	428	0
Ratio PH/SH Funds	4.00	4.00	4.00	4.00	
Steady State Basis, Four Years					
NOMINAL					
Policyholder Funds	8,000	14,000	18,000	20,000	20,000
Shareholder Funds	2,000	3,500	4,500	5000	5,000
Ratio PH/SH Funds	4.00	4.00	4.00	4.00	4.00
DISCOUNTED					
Policyholder Funds	7,599	13,012	16,440	18,068	18,068
Shareholder Funds	1,900	3,253	4,110	4,517	4,517
Ratio PH/SH Funds	4.00	4.00	4.00	4.00	4.00
DISCOUNTED END OF YEAR VALUATION					
Policyholder Funds	8,000	13,699	17,308	19,022	19,022
Shareholder Funds	2,000	3,425	4,327	4,755	4,755
Ratio PH/SH Funds	4.00	4.00	4.00	4.00	4.00

EXHIBIT A.5
Part 1
RATE OF RETURN TO SHAREHOLDER (INCOME DISTRIBUTED/BEGINNING SURPLUS) SINGLE ACCIDENT YEAR

BASELINE—FOUR-YEAR PAYOUT (25% PER YEAR) AT 4:1 RESERVE/SURPLUS RATIO

		Year				
Shareholder Flows	Begin	1	2	3	4	IRR
Operating Earnings [1]	-231	102	77	51	26	5.3%
Contributed Surplus Account						
Investment Income		106	79	53	26	
Capital Withdrawal	-2,000	500	500	500	500	
Contributed Capital [2]	-2,000	606	579	553	526	5.3%
Net Shareholder Flows	-2,000	708	656	604	552	10.4%
Return						
(Operating and Investment Income)		10.4%	10.4%	10.4%	10.4%	

[1]Operating earnings withdrawal: constant calendar ROS (AT)

[2] Contributed surplus withdrawal: proportional to reserves plus investment income

EXHIBIT A.5
Part 2

RATE OF RETURN TO SHAREHOLDER (INCOME DISTRIBUTED/BEGINNING SURPLUS)
STEADY STATE BASIS

BASELINE—FOUR-YEAR PAYOUT (25% PER YEAR) AT 4:1 RESERVE/SURPLUS RATIO

		Year											
Shareholder Flows	Begin	1	2	3	4	5	6	7	8	9	10	11	IRR
Operating Earnings[1]		102	179	230	256	256	256	256	256	153	77	26	
Contributed Surplus Account													
Investment Income		106	185	238	264	264	264	264	264	158	79	26	
Capital Withdrawal	-2,000	-1,500	-1,000	-500	0	0	0	0	2,000	1,500	1,000	500	
Contributed Capital[2]	-2,000	-1,394	-815	-262	264	264	264	264	2,264	1,658	1,079	526	5.3%
Net Shareholder Flows	-2,000	-1,292	-636	-32	520	520	520	520	2,520	1,812	1,156	552	10.4%
Return (Operating and Investment Income)		10.4%	10.4%	10.4%	10.4%	10.4%	10.4%	10.4%	10.4%	10.4%	10.4%	10.4%	

[1]Operating earnings withdrawal: constant calendar ROS (AT)

[2]Contributed surplus withdrawal: proportional to reserves plus investment income

EXHIBIT A.5
Part 3

RATE OF RETURN TO SHAREHOLDER (INCOME DISTRIBUTED/BEGINNING SURPLUS)
STEADY STATE BASIS

BASELINE—FOUR-YEAR PAYOUT (25% PER YEAR) AT 4:1 RESERVE/SURPLUS RATIO

			DISCOUNTED			
			Beginning of Year		End of Year	
	NOMINAL	% of Surplus	Valuation	% of Surplus	Valuation	% of Surplus
Beginning Surplus	$5,000		$4,517		$4,755	
Underwriting Income	-660		-660		-695	
Investment Income	916		891		938	
Oper Inc Incl Ret Earns	256	5.3%	231	5.1%	243	5.1%
Investment Income on Surplus	264	5.3%	238	5.3%	251	5.3%
Total Net Income	520	10.4%	469	10.4%	494	10.4%