

SURPLUS—CONCEPTS, MEASURES OF RETURN, AND DETERMINATION

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Abstract

This paper discusses the role of surplus in an insurance company and alternative measurements of rate of return on surplus. The multi-year dimension of surplus and its linkage to liabilities over time is explained, and the concept of a calendar period balance sheet as the sum of underlying accident period balance sheets is introduced. Measures of rates of return on surplus inherent in internal rate of return and net present value discounted cash flow models are explained, and the conditions under which the returns are equivalent are demonstrated.

This paper also presents a methodology for determining a benchmark amount of surplus needed to support writings in a line of business in order to control the probability of insolvency. The methodology is based on a consideration of both the magnitude and the variability in underwriting, underwriting cash flows, and interest rates.

1. INTRODUCTION

This paper discusses several conceptual and financial aspects pertaining to surplus. It is intended to provide both a fundamental understanding of the role of surplus in an insurance company and measurements of rate of return on surplus (Section 3), as well as provide a methodology for the establishment of the proper amount of surplus (Section 4). A summary of key observations and findings is provided in Section 2 to assist the reader in assimilating the material in the paper.

Section 3 of the paper discusses the purpose of surplus, followed by the introduction of the concept of a calendar period balance sheet viewed as the sum of underlying accident period balance sheets. This discussion demonstrates the multi-year dimension of surplus and its linkage to liabilities (primarily loss reserves) over time and exposes the meaninglessness of premium to surplus relationships.

Section 3 also discusses measures of rates of return on surplus inherent in internal rate of return (IRR) and net present value (NPV) discounted cash flow models and demonstrates the conditions under which the returns are equivalent by utilizing the liability-to-surplus relationship. Section 3 also introduces the concepts of steady state and present-valued income statements, cash flow statements, and balance sheets. The effects of business growth and the commitment of surplus based on premium are demonstrated.

Finally, in Section 4, the annualized present-valued balance sheet is used as a basis for the volatility-adjusted funding approach to determine benchmark surplus requirements. Section 4 presents a methodology which determines the benchmark surplus requirement needed to control the probability of insolvency that can result from underwriting and investment volatility. This methodology is primarily based on a consideration of both the magnitude and variability in underwriting, underwriting cash flows, and interest rates. Leverage ratios are shown over an assumed range of these values.

Several pages of numerical exhibits are presented in the appendices for the reader interested in working through examples in detail. These are not required reading for this article as key figures are repeated in the text when necessary.

2. SUMMARY

The following are key observations and findings which are presented and discussed in this paper:

- 1) Calendar period accounting does not provide sufficient information to measure the true profitability of a given underwriting period.

- 2) An accident year development of income statements, cash flow statements, and balance sheets, much like a traditional loss triangle, is required to truly measure profitability.
- 3) Surplus is committed to support the writings of a given accident year and must run-off over a period of future years as policyholder liabilities run-off.
- 4) The premium-to-surplus ratio is a convenient but mostly irrelevant measure of leverage. The ratio of policyholder liabilities to surplus (or more simply, reserves to surplus) is the appropriate measure of leverage.
- 5) Internal rate of return and net present value cash flow models produce identical measurements of return on surplus as long as the same rules are followed for the initial contribution and subsequent withdrawal of surplus.
- 6) Single period financial statements (income, cash flow, balance sheet) can be created that are representative of the multi-year flows of an accident year and provide a transition to a simplified measurement of return. These are equivalent to financial statements that would exist under steady state business conditions.
- 7) Increasing rates of business growth will cause calendar returns on surplus to be increasingly lower than the true accident year rates of return when business is written at an underwriting loss.
- 8) Use of premium (via premium-to-surplus ratios) as a basis for controlling the flow of surplus for an accident year will, by itself, cause calendar rates of return to differ from the true rate of return.
- 9) It is possible to determine the benchmark surplus, necessary to provide a financial buffer for a line of business, that satisfies a specified probability level of insolvency.
- 10) The benchmark surplus needed for a line of business must recognize both the *amount* of financial exposure, which re-

sults from all cash flows, and the *volatility* expected in this financial exposure.

11) Benchmark surplus is neither SAP nor GAAP equity.

3. FUNDAMENTALS OF SURPLUS, CASH FLOW, AND RATE OF RETURN

Purpose of Surplus

Surplus exists in insurance for the same purpose as in other businesses: it serves as a financial buffer to guard against adverse business conditions during which operating losses occur. Surplus provides a cushion, at least temporarily, to cover losses and to permit business to continue to operate normally.

Insurance, however, is unique in that the major portion of its business costs (i.e., claim payments) are not known at the time the product is priced and sold. In fact, these costs may not be known for several years. Complicating the uncertainty, many factors, such as social inflation and changing tort law, limit the ability to forecast these costs with a high degree of certainty. As a result, it is difficult to determine the proper level of surplus that is required to support insurance writings.

Benchmark Surplus

Benchmark surplus is that level of surplus that will provide the proper financial buffer for a line of business or business segment. The magnitude of the benchmark surplus for a line of business must be based on a consideration of the factors unique to that line which introduce uncertainty (or volatility) in expected future results. It should also reflect the probable likelihood of the occurrence of those adverse conditions which would cause a drain on surplus.

The greater the amount of surplus, the less likely that the occurrence of adverse conditions will deplete the entire amount of a company's surplus. The concept of probability of occurrence of adverse conditions is integral to the establishment of a benchmark sur-

plus. An amount of benchmark surplus is viewed hand-in-hand with a specified probability of insolvency.

Benchmark surplus is neither statutory surplus nor GAAP equity. Rather, it is simply the amount of assets which should be available to financially support the operations of a line of business in order to control solvency and risk. Benchmark surplus is but a measure of a necessary financial cushion, and it may or may not match a particular company's reported surplus. It does, however, reflect the realities that should be considered by a company in its operating practices.

*Calendar Year Reported Surplus
as the Sum of Accident Period Surplus*

Policyholder Surplus, as reported on insurance company balance sheets, is often misunderstood and misused. This misuse results from a lack of understanding as to the composition of this calendar period item, which is determined by underlying current and previous accident year development activity. To understand this problem, which is somewhat unique to insurance, it helps to draw a parallel with manufacturing.

In manufacturing, a product or project is often evaluated as a unique entity with the product's revenues and expenses monitored throughout its life cycle. Management can thus make a final determination of the likely profit associated with this product. In this evaluation, capital investment in plant and equipment is linked to the product, and management can easily estimate a return on this investment.

The insurance equivalent to a product is an exposure year (or accident year) book of business. An insurance company prices policies based on an estimate of all costs, both present and future, which relate to the period for which the policy applies. Unfortunately, companies generally monitor only the cost of claim payments (i.e., losses) by accident year (and occasionally policy year).

It is important to recognize that the usual calendar period accounting does not maintain adequate detail to properly value accident year

profitability. Revenues subsequent to the accident year, primarily investment income, and subsequent costs other than claims are not monitored for each originating accident period.

An ideal scenario would involve the complete segmentation of accounting records for each accident year: That is to say, income, cash flow, and balance sheet statements for each year. Under this segmentation of the accounting structure, surplus would be maintained for each accident year and it would run off along with liabilities for that year. Under this structure, the calculation of each accident year's return on investment would be relatively simple.

Since most companies do not maintain this level of detail, we can only view a combined calendar balance sheet and recognize that it represents the sum of contributions from all current and previous accident years. Thus, when one looks at a company's surplus, one must realize that it is in fact a composite of surplus amounts which are "dedicated" to these same current and previous accident years. Since surplus in most lines of business is multi-year dimensioned, to view it as a single number associated with a calendar year is incorrect. The familiar premium-to-surplus ratio has no basis in theory, although it has come to provide a convenient reference point. Certainly, surplus is not established from calendar premium-to-surplus relationships.

Cash Flow Models

In order to understand the time dimension of surplus, it is helpful to review the so-called discounted cash flow models. As discussed later, it is possible to develop a present-value based balance sheet which provides a transition from the cash flows of multiple accident years to a calendar steady-state balance sheet. First, however, a very brief review of discounted cash flow models is in order.

Cummins [1] provides a good overview of the discounted cash flow models used in insurance ratemaking. Of importance to the discussion here, he contrasts the IRR model, as used by the National

Council on Compensation Insurance (NCCI), with the Myers-Cohn NPV model used in Massachusetts.

While there are differences in the two approaches as applied, both involve recognition of insurance cash flows and surplus over time. *One of the most significant attributes of both models is that surplus is a function of policyholder funds, with its release governed by reductions in policyholder liabilities over time.* (Policyholder funds represent the net liabilities of the company which have not been settled at any point in time. These are predominantly loss reserves. Some cash flow models form a linkage between loss reserves and surplus as a simplifying assumption.)

Cummins notes a difference between the models: the NCCI's IRR model assumes that surplus additions are required to cover an initial underwriting loss, whereas the NPV model does not require this. This difference, however, has to do only with the beginning surplus requirement, and not its subsequent release. These constraints governing the initial surplus in the models are unique to these two applications. Generally, they are not part of IRR and NPV models. In fact, either model could operate under the opposite constraint. Given consistent determination of the initial surplus, measured rates of return become equivalent, as discussed later.

Some proponents of IRR are not averse to defining arbitrary surplus withdrawal schedules whose sole apparent purpose is to maximize (or minimize) the IRR. This arbitrary withdrawal is improper. By ignoring the linkage of surplus release to policyholder funds, it thereby ignores the fundamental purpose of policyholder surplus: To act as a financial buffer against the adverse development of liabilities.

As described by this author in [2], the Hartford uses a NPV approach structured to provide a calculation of total return. As part of this approach, "annualized" balance sheets are developed on both nominal and discounted bases, which include surplus. It is the development of the balance sheet from cash flows that provides the means for measuring returns. This aspect is too often overlooked in cash flow models. This will be explained in the next subsection followed

by a demonstration of the equivalency of IRR and NPV measurements of return.

Controlling the Flow of Surplus

It is useful to begin by introducing an example which will demonstrate the concepts to be discussed. The appendices present 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; claims are paid in 25% installments at the end of the current and three following years.

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 schedule of appendices relating to this example is as follows:

- Appendix A—Basic assumptions and calculations of reserves and payments
- Appendix B—Nominal and discounted income statements and balance sheets for the single accident year over its four years of activity
- Appendix C—Appendix B accumulated across successive accident years, reaching steady state after four years
- Appendix D—Relationship of policyholder and shareholder funds
- Appendix E—Shareholder flows, nominal and discounted steady state income, IRR and NPV and rates of return

Appendix F—Accident year contribution to calendar year income and return on surplus (ROS)

Appendix G—Accident year contribution to calendar year shareholder flows and IRR

Appendix H—Annualized nominal and discounted balance sheet and income statement summary

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 in Appendix C.

In the example, writing the policy requires 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 are the sum of the underwriting income and the investment income on 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 which must be included in shareholder flows at some point, and are considered separate from 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 in Appendix D for both the single accident year and steady state.

Under this return of capital rule, the initial surplus 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 years one through four. At steady state, the reserve is \$20,000 and the surplus \$5,000. The calendar year premium-to-surplus ratio at steady state is 2:1.

The itemized shareholder flows are shown in Appendix E, page 1. Capital is withdrawn at the rate of 25% (\$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.

This pattern of surplus flow results in various equivalent measurements of rates of return on surplus, the subject of the next subsection.

Rates of Return on Surplus

In Appendix E, page 1, an IRR calculation is shown for operating earnings, contributed capital, and net shareholder flows. This is repeated in Table 1.

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.

TABLE 1

SINGLE ACCIDENT YEAR SHAREHOLDER FLOWS

	<u>Begin</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>	<u>IRR</u>
Operating Earnings	-231	102	77	51	26	5.3%
Contributed Surplus:						
Investment Income		106	79	53	26	
Capital Withdrawal	-2,000	500	500	500	500	
Contributed Capital	-2,000	606	579	553	526	5.3%
Net Shareholder Flows	-2,000	708	656	604	552	10.4%
Annual Return		10.4%	10.4%	10.4%	10.4%	

A parallel IRR workup at steady state is shown in Appendix E, page 2. Appendix E, page 3, displays nominal and discounted calculations of return on surplus derived from the steady state balance sheet and income statements. This is summarized in Table 2.

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 either the beginning or the end of the initial accident year. When valued at the end of the accident year, the total return of \$494 is 10.4% of the \$4,755 beginning surplus.

TABLE 2

STEADY STATE SHAREHOLDER RETURN

	<u>Nominal Basis</u>	<u>Discounted to Beginning of Accident Year</u>	<u>Discounted to End of Accident Year</u>
Beginning Surplus	5,000	4,517	4,755
Underwriting Income	-660	-660	-695
Investment Income (or Credit)	916	891	938
Investment Income on Surplus	264	238	251
Total Net Income	520	469	494
Return on Beginning Surplus	10.4%	10.4%	10.4%

This demonstrates 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.

Appendix F shows calendar and accident period net income, beginning contributed surplus, and ROS over an accumulation of eight successive accident years, including subsequent run-off after the last

year, in a format similar to a loss development triangle. The ROS section on page 3 of the Appendix shows the relationship between calendar and accident period returns over the period. Initially, calendar returns are lower due to the underwriting losses from the up-front payout of expenses. At steady state, both calendar and accident returns are equal. During run-off, the presence of investment income without underwriting losses causes the calendar year returns to exceed the accident year returns. Note, however, that the overall cumulative calendar period return is 10.4%, matching the accident period return.

Appendix G demonstrates this same equivalence from the shareholder perspective by using the same calendar and accident period format to set forth shareholder flows and returns.

Transition From Multi-Year To Single Period—Steady State and Present Value Implied Balance Sheets and Income Statements

The NPV measurement of return ratios the present value of all income streams—both underwriting and investment—to the present value of surplus committed. In effect, the process creates a balance sheet which represents the annualized present value sum of individual future calendar period balance sheets. The balance sheets for future years are discounted to the present and summed. This annualized equivalent balance sheet provides the vehicle through which a rate of return can be calculated.

Returning to the example in the appendices, Appendix H demonstrates the components of both an ongoing, steady state nominal balance sheet and a discounted income and balance sheet. The exhibit displays discounted values at both the beginning and the end of the accident year. This is summarized in Table 3. For example, the ongoing steady state loss reserves are \$20,000 on a nominal basis and \$19,022 discounted (valued at the end of the accident year). The nominal total balance sheet 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.

TABLE 3

ANNUALIZED NOMINAL AND DISCOUNTED
BALANCE SHEET AND INCOME STATEMENT SUMMARY:
FUNDING OF LIABILITIES THROUGH COMMITTED ASSETS AND SURPLUS

Committed Assets = Liabilities	Balance Sheet			Investment Income		
	Nominal	Discounted		Nominal	Discounted	
		Begin Year	End Year		Begin Year	End Year
Net Policyholder Funds	20,000	18,060	19,022	1,056	954	1,004
Net PH Liabilities (Including Tax Timing Items)	18,707	16,874	17,765	988	891	938
Net PH Liabilities (Including Retained Earnings)	17,342	15,627	16,452	916	825	869
Contributed Surplus	5,000	4,517	4,755	264	238	251
Calculation of Return:				Income		
Underwriting Income				-660	-660	-695
Operating Income				256	231	243
Total Net Income				520	469	494
Return on Surplus				10.4%	10.4%	10.4%

The corresponding discounted values are net liabilities of \$17,765 and surplus of \$4,755. This means that we need to set aside the equivalent of this amount today to fund future liabilities and provide the desired surplus support throughout the four year period.

The NPV investment income credit is \$938 on the \$17,765 policyholder related assets and \$251 on the \$4,755 in surplus assets. This means that the net funding requirement (i.e., assets committed) once this business is written is \$17,765.

The surplus commitment is \$4,755 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.

The steady state present-valued balance sheet viewpoint provides a means by which transactions over several years can be translated to a single calendar period measurement. In particular, the surplus commitment over multiple calendar years sums to a single period value against which returns are calculated.

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 measurement will equal the IRR under certain conditions, this 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) preferred by many in ratemaking. Appendix H shows the calculation. The ROP turns out to be 2.3% in this example.

In addition, the approach has the virtue and flexibility of separately dealing with individual cash flows, as opposed to only net shareholder flows as with the IRR. Risks associated with the component cash flows, for example, can be reflected by adjusting their respective discount rates (even though the example has used a single rate for convenience). This contrasts with the single fixed rate assumed in the typical IRR calculation.

When surplus relates to policyholder funds as in the example, it automatically responds to both the magnitude of the flows and the time frame over which flows occur. Equally important, however, is that the annualized present-valued balance sheet provides a frame-

work for incorporating assumptions on volatility. Benchmark surplus should not only reflect the magnitude of insurance liabilities, as measured by committed assets, but also the variability that can result from the deviations in underwriting and investment results from their expected values. Section 4 discusses this in more detail.

Two particular effects on measured rates of return hold special interest: business growth, and an alternative capital withdrawal policy which does *not* maintain the relationship between policyholder and shareholder funds.

The Effect of Business Growth on Rate of Return

Appendix F, pages 4 through 6, demonstrates the effect of a 10% annual accident/exposure year rate of growth in business. In this modification of the example, each successive accident year premium grows by 10%, while the underwriting and investment assumptions remain unchanged. The example maintains surplus at the same policyholder to shareholder (reserves to surplus) ratio of 4:1.

As in the earlier version of the example, each individual accident year has the identical 10.4% return on surplus. The calendar returns are lower than before, however. On an ongoing basis, calendar returns lag behind the accident returns since the newest accident year's higher initial underwriting loss has a larger impact on the calendar returns than before. This loss offsets more heavily the previous accident year's positive investment income contributions. The calendar return now reaches 9.1% in years four through eight, rather than the previous 10.4% realized without growth.

Since this example eventually allows the business to run off the books, the *total* return does reach 10.4% after all flows are completed. But if accident year business continued at the 10% growth rate, the calendar returns would show a permanent shortfall of 1.3%. This gap becomes greater with higher rates of growth, longer loss payouts, or higher interest rates.

Table 4 demonstrates the calendar return shortfall under alternative business growth scenarios (0%, 10%, 25%, and 40%), average

loss payouts ranging from one to four years, and interest rates of 8% and 10% before tax. The calendar returns which result under some of these scenarios fall significantly below the underlying 15% accident year ultimate return.

All cases in the table assume that the accident period ultimate return on surplus is 15%, the expense ratio is 30.0%, and the ratio of policyholder to shareholder funds is 4:1.

TABLE 4

CALENDAR ROS AND BUSINESS GROWTH

Interest Rate on Investment Before-Tax	Avg. Loss Payout (Years)	Loss Ratio	Combined Ratio	Calendar ROS			
				Rate of Business Growth			
				0%	10%	25%	40%
8%	1	72.6%	102.6%	15.0%	15.0%	15.0%	15.0%
8	2	75.4	105.4	15.0	14.5	13.8	13.3
8	3	78.1	108.1	15.0	14.0	12.7	11.5
8	4	80.6	110.6	15.0	13.6	11.6	9.8
10	1	74.2	104.2	15.0	15.0	15.0	15.0
10	2	78.8	108.8	15.0	14.2	13.2	12.3
10	3	83.4	113.4	15.0	13.5	11.4	9.6
10	4	88.0	118.0	15.0	12.8	9.7	6.9

The Effect of Independent Surplus Withdrawal

In order for the IRR, nominal steady state, and discounted return measures to be equal, it is necessary to maintain the linkage of shareholder and policyholder funds. To demonstrate what happens when the linkage is not maintained, Appendix E, pages 4-6, and Appendix F, pages 7-9, provide an example under which the entire surplus is withdrawn at the end of the accident year. That is, the full \$5,000 is provided at the beginning of each accident year and returned to the

shareholder at the end of the year. This is equivalent to setting surplus as a function of premium using a premium to surplus ratio of 2:1.

Operating earnings are distributed to the shareholder in the amount of calendar net income.

The calculated IRR is 9.5%, the nominal steady state return 11.1%, and the discounted return 10.1%. The degree to which the three return measures will differ is affected by many factors, including leverage, loss payout, and interest rates.

In the insurance industry, actual withdrawal of capital is often a function of income, or it may be designed to maintain a stable calendar year dividend payout. Certainly, historical withdrawals seldom have reflected any linkage to accident year policyholder funds and the run-off of surplus in parallel with these liabilities.

The examples in the appendices are intended to show the conditions under which the IRR, calendar period, and discounted accident period returns are equal and when they differ. If growth occurs, underwriting and investment conditions change, or capital is withdrawn without regard to a linkage with liabilities, then these measurements of return will differ.

It should be clear that rate of return measurements which are based on published calendar financial statements may not properly reflect current (i.e., accident year) profitability. Such calendar measures will likely be very poor proxies in lines of business which take many years to settle. The reported income statement, cash flow statement, and balance sheet are composites of current and prior accident years. While such calendar measures are unavoidable, the true performance picture can only be ascertained through a return measure which recognizes policyholder and shareholder flows for a given accident year over all subsequent periods during which cash flows occur.

4. DETERMINING BENCHMARK SURPLUS: THE VOLATILITY-ADJUSTED FUNDING APPROACH

Overview

Determining the “proper” surplus required to support an insurance line of business is a difficult task. Traditionally, premium/surplus leverage has been viewed from a judgmental perspective as to what constitutes a safe operating level for the financial protection of policyholders. The following discussion sets forth an analytical framework and method for determining a benchmark surplus. The method provides a structure within which judgment and knowledge are used to provide assumptions on the magnitude and volatility of underwriting and investment cash flows. The method then develops the appropriate benchmark surplus and translates this into policyholder funds/surplus and premium/surplus leverage statistics.

The following subsection discusses the purpose of surplus and presents the concepts of funding and volatility along with a methodology which utilizes funding and volatility as the foundation to determine surplus needs. The determination of the amount of assets required to fund the liabilities of a line of business and the volatility in this measure jointly produce the required level of surplus.

Table 5 presents suggested benchmark leverage ratios, for both policyholder funds-to-surplus and premium-to-surplus. Average loss payment lag and amount of loss, both their value and variability, are the key parameters in constructing this table. Variability in factors other than loss payment lag and amount also need to be evaluated but are not presented here for the sake of simplicity, since their effect is generally much less than the loss-related parameters.

The method can be utilized to determine benchmark leverage standards by line of business which reflect that line’s particular characteristics. These standards and an operating return figure can produce a return on surplus for measuring an insurance company’s profitability by line of business and across lines of business.

TABLE 5

BENCHMARK LEVERAGE RATIOS
(BASED ON 1% PROBABILITY OF INSOLVENCY)

Average Loss Payment Years	Loss Ratio	Variability of 5% & 10% in Avg Loss Payment Date	Variability of 5% & 10% in Loss Ratio	Suggested Leverage Ratios to Surplus	
				Policyholder Funds	Premium
1	75.0	0.05	3.75	5.8	8.2
			7.50	3.8	5.3
		0.10	3.75	3.6	5.2
			7.50	3.0	4.3
2	75.0	0.10	3.75	6.5	4.6
			7.50	3.9	2.8
		0.20	3.75	4.0	2.8
			7.50	3.2	2.3
3	80.0	0.15	4.00	6.3	2.8
			8.00	3.9	1.7
		0.30	4.00	4.1	1.8
			8.00	3.2	1.4
4	80.0	0.20	4.00	6.6	2.2
			8.00	3.7	1.3
		0.40	4.00	4.0	1.3
			8.00	3.2	1.1

The Hartford has integrated this approach into its total return methodology. This methodology also uses the concept of discounted operating return, the principles of asset/liability matching, and the assumption of "risk free" Treasury investment policies to further manage solvency risk and protect policyholder funds. An earlier paper [2] presented this methodology.

Risk and the Need for Surplus

Insolvency is the ultimate business risk. In an insurance company, the sources of this risk are the insurance operations and investment

activities. *Insurance risk* has two dimensions, since it arises from both the activities of underwriting and the investing of underwriting cash flows. However, insurance risk is principally a function of underwriting, provided underwriting cash flows are invested at a “risk free” rate and the maturities of the investments match the duration of the liabilities. This restriction essentially isolates total operating income from the effects of investment policy and market volatility.

Investment risk, on the other hand, is a function of company investment policy concerning types of investments and maturities, which gives rise to yield and default risks and related volatility.

Solvency risk is the exposure of surplus to both insurance (underwriting) and investment risk. The magnitude and volatility of underwriting losses along with fluctuating investment results with their associated probabilities are key determinants of this risk.

An important aspect of the management of solvency risk lies in determining the proper minimum level of surplus. Surplus should be a function of two factors:

- 1) *The degree and magnitude of financial exposure.* This essentially is the amount and length of time over which funds are committed to pay the liabilities of a respective line of business. It is the funding requirement.
- 2) *The volatility in the funding requirement.* The variability in underwriting and investment create the risk that increased surplus may be required to maintain a low probability of insolvency in the face of increased volatility.

In summary, *the surplus associated with a line of business is a buffer whose minimum size is determined by both the magnitude and volatility of financial exposure inherent in the line in order to insure an acceptably low probability of ruin.*

Determining Benchmark Surplus

The method developed begins with a determination of funding requirements by line of business. Funding is the amount of assets that are needed to pay the liabilities at a particular level of business vol-

ume. Specifically, it is the present value equivalent in assets required to meet the liabilities inherent in all expected future cash flows. It is based on the magnitude of the cash flows and the length of time that it takes to settle them, summed across all flows after discounting to present value.

The five basic insurance cash flow components considered are: Premium receipts, loss and expense payments, and prepayment of Federal taxes due to both loss discounting and the 20% unearned premium offset. These latter two components are creations of the 1986 Tax Reform Act.

Summing the required funding across all lines of business results in the total invested assets that must be committed by a company to support all writings.

This funding provides a beginning point to establish leverage, as it provides a measure of the liability-based asset commitment when writing a line of business. The exhibits provide formulae for approximating this funding level. Exact determination of funding requires the development of multi-period balance sheets for the full period during which cash flows occur.

The next step is to set surplus initially for each line of business in direct proportion to the line's funding requirements (i.e., money at risk). If the timing and magnitude of future operating flows were known with a high degree of certainty, a line would require only a small amount of surplus. However, most insurance flows are in the future and are uncertain as to timing and magnitude, and financial volatility can be expected. (In this regard, insurance differs substantially from banking and other financial services.) This means that a line will require a larger buffer to make provision for adverse future operating flows as uncertainty increases. The degree of this cushion clearly differs among lines of business.

Further adjustment, then, is necessary to recognize the financial volatility that exists in each line of business. Characteristics such as catastrophes which introduce much of this volatility, must be re-

flected in the methodology employed to determine a final benchmark leverage.

As can be seen, the formula for funding involves several parameters which are subject to variability. It is the handling of the variability associated with these parameters which is the key to determination of benchmark surplus. The parameters upon which funding is based are:

- premium amount and timing of collection;
- expense amount and timing of payment;
- loss amount and timing of payment;
- tax law loss discount factor and timing;
- proportion of premium unearned at year end;
- market interest rate; and
- tax rate.

Model Simulation

The dominant factors in terms of variability typically are the magnitude of loss amounts and the timing of loss payments. The variability in all other factors, for most lines of business, has a relatively minor effect by comparison. Paid loss retrospectively rated business is a notable exception, where the longer time period over which premium flows occur becomes a consideration. A simulation model was developed to measure the volatility in total funding in the absence of an analytical algorithm which could directly quantify it.

Table 5 presents a range of suggested benchmark leverage ratios (both policyholder funds and premium in ratio to surplus) as a function of loss payment date and amount of loss, taking into account both their value and variability, corresponding to a 1% probability of insolvency. This table was developed by the simulation model utilizing the funding formula with iterative options on loss payout (1, 2, 3, and 4 years), loss ratio (75% and 80%), variability of payout (5% and

10% of payment date), and variability of loss ratio (5% and 10% of loss ratio).

The figures in the table assume an expense ratio of 30%, interest rate before tax of 8%, tax law discount rate of 8%, and no delay in premium collection or expense payment.

The variability measures for the loss payment date and amount of loss are the respective standard deviations in those parameters. Since we are dealing with book of business averages, the normal distribution was assumed for simplicity of simulation. The total variability in funding was calculated from the simulated results. A Z value of 2.33 from the normal probability curve was used to determine the amount of surplus required to cover this probability-based maximum funding requirement. In other words, required surplus is calculated as Z times the standard deviation of funding, derived through simulation.

Table 5 as presented only demonstrates approximate possible leverage ratios. To more accurately determine the required benchmark, the simulation should be performed with all parameters specified more precisely: The expense ratio, interest rate, and timing of premium and expense flows for the line of business in question. In addition, the variability (i.e., standard deviation) of a line of business's average payout and loss ratio must be provided based on historical experience and judgment as to business expectations.

Policyholder funds in ratio to surplus is the more meaningful leverage statistic, although the premium-to-surplus ratio is the traditional leverage statistic. As the figures in this table demonstrate, the premium-to-surplus ratio covers a more extreme range, because surplus itself does not directly relate to premium. Premium, for example, does not capture the dynamics of a long tail line of business and its generally greater need for surplus.

The policyholder funds-to-surplus ratio provides a more meaningful measure of leverage, since surplus does relate to policyholder liabilities. The variability in this statistic in the table is a function of the variability levels simulated. If the variability were the same in all cases, the policyholder funds to surplus leverage statistic would re-

main constant, regardless of the magnitude of loss or the length of its payout.

Surplus Run-off

Expressing required surplus in relation to premium via a premium-to-surplus ratio is a convenience. Use of this ratio must not hide the fact that, while the premium flows generally span a single year, the requirements for surplus exist throughout the entire run-off period for the policy cash flows, however long that may be. In other words, the need for benchmark surplus remains beyond the year that the business is written.

It is suggested that surplus committed to support business be allowed to run off in proportion to the reduction in funding over time. In much the same way that funding is the present-valued assets corresponding to future cash flows, which declines over time, required surplus should be viewed as the related present-valued assets which run off in a parallel fashion. Since loss reserves are typically the primary component of this liability funding requirement, in simpler terms this says that surplus should run off as loss reserves decline to zero.

The convenience and simplicity of the premium-to-surplus ratio encourages its widespread use. Unfortunately, it also leads to its misuse as a means of surplus allocation. A reserve-to-surplus ratio would be a far more meaningful leverage statistic than premium-to-surplus, and it would provide a more intuitive means to allocate surplus.

The method demonstrated here using average payment dates is intended to provide an estimate of normal initial surplus requirements. Insurance programs having an atypical cash flow pattern may require a more detailed cash flow model to estimate the surplus requirements over time.

In addition, the independent determination of required surplus for each of a multi-line insurer's lines of business will produce a total across all lines greater than necessary, since any line may draw on the surplus of other lines in an emergency. A multi-line insurer could, in

effect, write at a higher overall leverage. The degree of truth in this depends on several factors, including the correlation in exposure to loss among lines being written.

Conclusion

This paper has discussed the role of surplus in an insurance company, measures of rate of return, and considerations which are important in the determination of a benchmark surplus requirement for a line of business.

Of particular importance is the multi-year dimension to surplus through its linkage to liabilities. Balance sheet development triangles were introduced to reinforce this concept, to demonstrate the conditions for equivalency of NPV and IRR measures of return, and to show the effects of growth and independent surplus withdrawal on calendar versus accident period rates of return.

REFERENCES

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EXHIBIT 1
ANNUALIZED NOMINAL (FUTURE VALUE) AND DISCOUNTED (PRESENT VALUE)
BALANCE SHEET AND INVESTMENT INCOME FORMULAE

APPROXIMATION FORMULAE

	Initial Reported Amount	Years Pay Lag	Balance Sheet		Investment Income	
			NOMINAL	DISCOUNTED Beginning of Period	NOMINAL	DISCOUNTED Beginning of Period
Committed Assets						
Premium	P	N_p	$-N_p P$	$-PD \{N_p\}/R$	$-RN_p P$	$-PD \{N_p\}$
Expense	E	N_e	$N_e E$	$ED \{N_e\}/R$	$RN_e E$	$ED \{N_e\}$
Loss	L	N_l	$N_l L$	$LD \{N_l\}/R$	$RN_l L$	$LD \{N_l\}$
Net Policyholder Funds			Sum 1	Sum 2		
Tax Law Timing Items:						
Loss Discounting			ZL/R	KL/R	ZL	KL
UPR Offset			$-0.2TPU$	$-0.2TPUD \{1\}/R$	$-0.2RTPU$	$-0.2TPUD \{1\}$
Net Timing Items			Sum 3	Sum 4		
Net Funding (including taxes)			Sum 5 = (Sum 1 + Sum 3)	Sum 6 = (Sum 2 + Sum 4)		
Contributed Surplus			(Sum 1)/ M	(Sum 2)/ M		

Where:

$$D \{N\} = 1 - 1/(1 + R)^N$$

= discount factor

R = interest rate, applicable to cash flows, after tax

T = corporate tax rate, presently 34%

$$Z = -RT \{ (N_l + 1)/2 \} [1 - 1/(1 + (R_l)^{N_l})]$$

= approximate loss discount nominal investment income factor

R_l = tax law discount rate

K = loss discount investment credit factor from Exhibit 3

M = policyholder liability/shareholder surplus leverage multiple

EXHIBIT 2
GENERAL DEFINITIONS AND FORMULAE

Underwriting Income = $(P - E - L)(1 - T)$, where

P = Premium

E = Expense

L = Loss

T = Tax Rate.

Nominal Basis

Operating Return = Underwriting Income +
Investment Income on Insurance Liabilities.

Total Return = Operating Return + Investment Income on Surplus.

Discounted Basis

Operating Return = Underwriting Income +
Investment Income Credit on Insurance Float.

Investment Income Credit (IIC) = Present value of investment
income on all cash flows related to the accident period.

Premium IIC = $-(1 - D_p)P$

Expense IIC = $(1 - D_e)E$

Loss IIC = $(1 - D_l)L$

UPR Tax IIC = $-(1 - D_u)(0.2T)PU$

Disc Tax IIC: See Exhibit 3 for formula

where:

$D = 1/(1 + R)^N$, i.e. discount factor

R = rate for calculating discount after tax

R_b = tax law discount rate before tax

N = average payment date for premium, expense, or loss;
for D_u , $N = 1$, UPR tax recovery payment date

U = Annual premium year-end unearned factor
(i.e., unearned premium/premium)

All dollar figures and discount factors are after tax except discount factor for loss discounting using R_b , the tax law discount rate.

EXHIBIT 3

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

APPROXIMATION FORMULA

1) Actual and Law Rates and Payouts Same

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

$D = 1/(1 + R)^N$, 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

$$- \left\{ (D_{r'b} - D_a) + T(1 - D_{r'b}) \right\} + (D_{r'b} - D_a) (R_a - R'_a)/(R_a - R'_b)$$

(Rate Adjustment)

where ' signifies using law rate.

3) Actual and Law Rates and Payouts Different

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

(Rate Adjustment)

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

(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

$$-T \left\{ (1 - D_{mra}) \times (1 - D_{n'r'b}) \right\}, \text{ where } m = (n + 1)/2$$

$$= -T \left\{ (1 - 1/(1 + R_a)^m) \times (1 - 1/(1 + R'_b)^n) \right\}$$

APPENDIX A

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 Before Tax (BT)	8.00%					
Investment Yield After Tax (AT)	5.28%					
Tax Law Discount Rate	8.00%					
		Year				
	<u>Total</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
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	2,000	2,000	2,000	0
<u>Discounted</u>		<u>1,852</u>	<u>1,715</u>	<u>1,588</u>	<u>1,470</u>	<u>0</u>
Beginning Reserve Before Discount		8,000	6,000	4,000	2,000	0
<u>Tax Law Timing Items BT</u>						
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				
<u>Reserves And Payments</u>						
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				
<u>Shareholder Cap. Flows</u>						
	<u>Begin</u>					
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

APPENDIX B

Part I

BALANCE SHEETS AND INCOME STATEMENTS
SINGLE ACCIDENT YEARBASELINE—FOUR YEAR PAYOUT (25% PER YEAR)
AT 4:1 RESERVE/SURPLUS RATIO

<u>Income Statement</u>	<u>Total</u>	<u>Year</u>				
		<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
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

APPENDIX B
Part 2

BALANCE SHEETS AND INCOME STATEMENTS
SINGLE ACCIDENT YEAR

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

Balance Sheet	Year				
	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

APPENDIX C

Part I

**BALANCE SHEETS AND INCOME STATEMENTS
STEADY STATE BASIS, FOUR YEARS**

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

Income Statement	Year				
	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

APPENDIX C
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

Balance Sheet	Year				
	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	20,144	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

APPENDIX D

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	5,000	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

APPENDIX E

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

<u>Shareholder Flows</u>	<u>Begin</u>	<u>Year</u>				<u>IRR</u>
		<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	
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%	

SURPLUS

¹ Operating earnings withdrawal: constant calendar ROS (AT)

² Contributed surplus withdrawal: proportional to reserves plus investment income

APPENDIX E
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

Shareholder Flows	Begin	Year											IRR
		1	2	3	4	5	6	7	8	9	10	11	
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

APPENDIX E

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

	<u>NOMINAL</u>	<u>% of Surplus</u>	<u>DISCOUNTED</u>			
			<u>Beginning of Year</u>	<u>End of Year</u>	<u>Valuation</u>	<u>% of Surplus</u>
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%

SURPLUS

APPENDIX E

Part 4

RATE OF RETURN TO SHAREHOLDER (INCOME DISTRIBUTED/BEGINNING SURPLUS)
 SINGLE ACCIDENT YEAR
 FOUR-YEAR PAYOUT, WITHDRAW CAPITAL AFTER ONE YEAR PLUS CALENDAR INVESTMENT INCOME

<u>Shareholder Flows</u>	<u>Begin</u>	<u>Year</u>				<u>IRR</u>
		<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	
Operating Earnings ¹	-231	-315	302	203	103	5.3%
Contributed Surplus Account						
Investment Income		264	0	0	0	
Capital Withdrawal	-5,000	5,000	0	0	0	
Contributed Capital ²	-5,000	5,264	0	0	0	5.3%
Net Shareholder Flows	-5,000	4,949	302	203	103	9.5%
Return						
(Operating and Investment Income)		-1.0%	0.0%	0.0%	0.0%	

¹ Operating earnings withdrawal: calendar income (U/W + investment income)

² Contributed surplus withdrawal: after one year

APPENDIX E

Part 5

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

STEADY STATE BASIS

FOUR-YEAR PAYOUT, WITHDRAW CAPITAL AFTER ONE YEAR PLUS CALENDAR INVESTMENT INCOME

Shareholder Flows	Begin	Year										IRR	
		1	2	3	4	5	6	7	8	9	10		11
Operating Earnings ¹	-315	-13	190	293	293	293	293	293	293	608	306	103	
Contributed Surplus Account													
Investment Income	264	264	264	264	264	264	264	264	264	0	0	0	
Capital Withdrawal	-5,000	0	0	0	0	0	0	0	5,000	0	0	0	
Contributed Capital ²	-5,000	264	264	264	264	264	264	264	5,264	0	0	0	5.3%
Net Shareholder Flows	-5,000	-51	251	454	557	557	557	557	5,557	608	306	103	9.5%
Return													
(Operating and Investment Income)	1.0%	5.0%	9.1%	11.1%	11.1%	11.1%	11.1%	11.1%	11.1%	0.0%	0.0%	0.0%	

SURPLUS

¹ Operating earnings withdrawal: calendar income (U/W + investment income)

² Contributed surplus withdrawal: after one year

APPENDIX E

Part 6

RATE OF RETURN TO SHAREHOLDER (INCOME DISTRIBUTED/BEGINNING SURPLUS)
 STEADY STATE BASIS
 FOUR-YEAR PAYOUT, WITHDRAW CAPITAL AFTER ONE YEAR PLUS CALENDAR INVESTMENT INCOME

	DISCOUNTED					
			<u>Beginning of Year</u>		<u>End of Year</u>	
	<u>NOMINAL</u>	<u>% of Surplus</u>	<u>Valuation</u>	<u>% of Surplus</u>	<u>Valuation</u>	<u>% of Surplus</u>
Beginning Surplus	\$ 5,000		\$4,749		\$5,000	
Underwriting Income	-660		-660		-695	
Investment Income	953		891		938	
Oper Inc Incl Ret Earns	293	5.9%	231	4.9%	243	4.9%
Investment Income on Surplus	264	5.3%	251	5.3%	264	5.3%
Total Net Income	557	11.1%	482	10.1%	507	10.1%

APPENDIX F

Part 1

ACCIDENT YEAR DEVELOPMENT AND CONTRIBUTION TO CALENDAR YEAR

NET INCOME

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

Accident Year	Pres Value @ Year End	Net Income in Year											Total	Acc Year Compound Growth
		1	2	3	4	5	6	7	8	9	10	11		
1	494	-209	359	245	125	0	0	0	0	0	0	0	520	0.0%
2	494		-209	359	245	125	0	0	0	0	0	0	520	0.0%
3	494			-209	359	245	125	0	0	0	0	0	520	0.0%
4	494				-209	359	245	125	0	0	0	0	520	0.0%
5	494					-209	359	245	125	0	0	0	520	0.0%
6	494						-209	359	245	125	0	0	520	0.0%
7	494							-209	359	245	125	0	520	0.0%
8	494								-209	359	245	125	520	0.0%
9	0									0	0	0	0	0.0%
10	0										0	0	0	0.0%
11	0											0	0	0.0%
Calendar Year		-209	150	395	520	520	520	520	520	729	370	125	4,160	

SURPLUS

APPENDIX F
Part 2

ACCIDENT YEAR DEVELOPMENT AND CONTRIBUTION TO CALENDAR YEAR
CONTRIBUTED SURPLUS
BASELINE—FOUR-YEAR PAYOUT (25% PER YEAR) AT 4:1 RESERVE/SURPLUS RATIO

Accident Year	Pres Value @ Year End	Beginning Contributed Surplus in Year											Total	Acc Year Compound Growth
		1	2	3	4	5	6	7	8	9	10	11		
1	4,755	2,000	1,500	1,000	500	0	0	0	0	0	0	0	5,000	0.0%
2	4,755		2,000	1,500	1,000	500	0	0	0	0	0	0	5,000	0.0%
3	4,755			2,000	1,500	1,000	500	0	0	0	0	0	5,000	0.0%
4	4,755				2,000	1,500	1,000	500	0	0	0	0	5,000	0.0%
5	4,755					2,000	1,500	1,000	500	0	0	0	5,000	0.0%
6	4,755						2,000	1,500	1,000	500	0	0	5,000	0.0%
7	4,755							2,000	1,500	1,000	500	0	5,000	0.0%
8	4,755								2,000	1,500	1,000	500	5,000	0.0%
9	0									0	0	0	0	0.0%
10	0										0	0	0	0.0%
11	0											0	0	0.0%
Calendar Year		2,000	3,500	4,500	5,000	5,000	5,000	5,000	5,000	3,000	1,500	500	40,000	

APPENDIX F

Part 3

ACCIDENT YEAR DEVELOPMENT AND CONTRIBUTION TO CALENDAR YEAR
RETURN ON SURPLUS

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

Accident Year	Pres Value @ Year End	ROS (Net Income/Beginning Period Contributed Surplus) in Year											Total	
		1	2	3	4	5	6	7	8	9	10	11		
1	10.4%	-10.5%	23.9%	24.5%	25.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.4%
2	10.4%		-10.5%	23.9%	24.5%	25.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.4%
3	10.4%			-10.5%	23.9%	24.5%	25.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.4%
4	10.4%				-10.5%	23.9%	24.5%	25.1%	0.0%	0.0%	0.0%	0.0%	0.0%	10.4%
5	10.4%					-10.5%	23.9%	24.5%	25.1%	0.0%	0.0%	0.0%	0.0%	10.4%
6	10.4%						-10.5%	23.9%	24.5%	25.1%	0.0%	0.0%	0.0%	10.4%
7	10.4%							-10.5%	23.9%	24.5%	25.1%	0.0%	0.0%	10.4%
8	10.4%								-10.5%	23.9%	24.5%	25.1%	0.0%	10.4%
9	0.0%									0.0%	0.0%	0.0%	0.0%	0.0%
10	0.0%										0.0%	0.0%	0.0%	0.0%
11	0.0%											0.0%	0.0%	0.0%
Calendar Year		-10.5%	4.3%	8.8%	10.4%	10.4%	10.4%	10.4%	10.4%	24.3%	24.7%	25.1%	10.4%	10.4%

SURPLUS

APPENDIX F
Part 4

ACCIDENT YEAR DEVELOPMENT AND CONTRIBUTION TO CALENDAR YEAR
NET INCOME

BASELINE—FOUR-YEAR PAYOUT (25% PER YEAR) AT 4:1 RESERVE/SURPLUS RATIO, 10% ANNUAL GROWTH

Accident Year	Pres Value @ Year End	Net Income in Year											Total	Acc Year Compound Growth
		1	2	3	4	5	6	7	8	9	10	11		
1	494	-209	359	245	125	0	0	0	0	0	0	0	520	0.0%
2	544		-230	395	269	138	0	0	0	0	0	0	572	10.0%
3	598			-253	434	296	152	0	0	0	0	0	629	21.0%
4	658				-279	478	326	167	0	0	0	0	692	33.1%
5	724					-307	525	359	184	0	0	0	761	46.3%
6	796						-337	578	394	202	0	0	837	61.0%
7	876							-371	636	434	222	0	921	77.1%
8	963								-408	699	477	244	1,012	94.6%
9	0									0	0	0	0	0.0%
10	0										0	0	0	0.0%
11	0											0	0	0.0%
Calendar Year		-209	129	387	549	605	666	733	806	1,335	699	244	5,944	

SURPLUS

APPENDIX F

Part 5

ACCIDENT YEAR DEVELOPMENT AND CONTRIBUTION TO CALENDAR YEAR
CONTRIBUTED SURPLUS

BASELINE—FOUR-YEAR PAYOUT (25% PER YEAR) AT 4:1 RESERVE/SURPLUS RATIO, 10% ANNUAL GROWTH

Accident Year	Pres Value @ Year End	Beginning Contributed Surplus in Year											Total	Acc Year Compound Growth	
		1	2	3	4	5	6	7	8	9	10	11			
1	4,755	2,000	1,500	1,000	500	-0	0	0	0	0	0	0	0	5,000	0.0%
2	5,231		2,200	1,650	1,100	550	-0	0	0	0	0	0	0	5,500	10.0%
3	5,754			2,420	1,815	1,210	605	-0	0	0	0	0	0	6,050	21.0%
4	6,330				2,662	1,997	1,331	666	-0	0	0	0	0	6,656	33.1%
5	6,962					2,928	2,196	1,464	732	-0	0	0	0	7,320	46.4%
6	7,659						3,221	2,416	1,611	805	-0	0	0	8,053	61.1%
7	8,425							3,543	2,657	1,772	886	-0	0	8,858	77.2%
8	9,267								3,897	2,923	1,949	974	0	9,743	94.9%
9	0									0	0	0	0	0	0.0%
10	0										0	0	0	0	0.0%
11	0											0	0	0	0.0%
Calendar Year		2,000	3,700	5,070	6,077	6,685	7,353	8,089	8,897	5,500	2,835	974	57,180		

SURPLUS

APPENDIX F

Part 6

ACCIDENT YEAR DEVELOPMENT AND CONTRIBUTION TO CALENDAR YEAR
RETURN ON SURPLUS

BASELINE—FOUR-YEAR PAYOUT (25% PER YEAR) AT 4:1 RESERVE/SURPLUS RATIO, 10% ANNUAL GROWTH

Accident Year	Pres Value @ Year End	ROS (Net Income/Beginning Period Contributed Surplus) in Year											Total	
		1	2	3	4	5	6	7	8	9	10	11		
1	10.4%	-10.5%	23.9%	24.5%	25.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.4%
2	10.4%		-10.5%	23.9%	24.5%	25.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.4%
3	10.4%			-10.5%	23.9%	24.5%	25.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.4%
4	10.4%				-10.5%	23.9%	24.5%	25.1%	0.0%	0.0%	0.0%	0.0%	0.0%	10.4%
5	10.4%					-10.5%	23.9%	24.5%	25.1%	0.0%	0.0%	0.0%	0.0%	10.4%
6	10.4%						-10.5%	23.9%	24.5%	25.1%	0.0%	0.0%	0.0%	10.4%
7	10.4%							-10.5%	23.9%	24.5%	25.1%	0.0%	0.0%	10.4%
8	10.4%								-10.5%	23.9%	24.5%	25.1%	0.0%	10.4%
9	0.0%									0.0%	0.0%	0.0%	0.0%	0.0%
10	0.0%										0.0%	0.0%	0.0%	0.0%
11	0.0%											0.0%	0.0%	0.0%
Calendar Year		-10.5%	3.5%	7.6%	9.1%	9.1%	9.1%	9.1%	9.1%	24.3%	24.7%	25.1%	10.4%	

APPENDIX F
Part 7

ACCIDENT YEAR DEVELOPMENT AND CONTRIBUTION TO CALENDAR YEAR

NET INCOME

FOUR-YEAR PAYOUT, WITHDRAW CAPITAL AFTER ONE YEAR PLUS CALENDAR INVESTMENT INCOME

Accident Year	Pres Value @ Year End	Net Income in Year											Total	Acc Year Compound Growth
		1	2	3	4	5	6	7	8	9	10	11		
1	507	-51	302	203	103	0	0	0	0	0	0	0	557	0.0%
2	507		-51	302	203	103	0	0	0	0	0	0	557	0.0%
3	507			-51	302	203	103	0	0	0	0	0	557	0.0%
4	507				-51	302	203	103	0	0	0	0	557	0.0%
5	507					-51	302	203	103	0	0	0	557	0.0%
6	507						-51	302	203	103	0	0	557	0.0%
7	507							-51	302	203	103	0	557	0.0%
8	507								-51	302	203	103	557	0.0%
9	0									0	0	0	0	0.0%
10	0										0	0	0	0.0%
11	0											0	0	0.0%
Calendar Year		-51	251	454	557	557	557	557	557	608	306	103	4,456	

SURPLUS

APPENDIX F

Part 8

ACCIDENT YEAR DEVELOPMENT AND CONTRIBUTION TO CALENDAR YEAR
CONTRIBUTED SURPLUS

FOUR-YEAR PAYOUT, WITHDRAW CAPITAL AFTER ONE YEAR PLUS CALENDAR INVESTMENT INCOME

Accident Year	Pres Value @ Year End	Beginning Contributed Surplus in Year											Total	Acc Year Compound Growth
		1	2	3	4	5	6	7	8	9	10	11		
1	5,000	5,000	0	0	0	0	0	0	0	0	0	0	5,000	0.0%
2	5,000		5,000	0	0	0	0	0	0	0	0	0	5,000	0.0%
3	5,000			5,000	0	0	0	0	0	0	0	0	5,000	0.0%
4	5,000				5,000	0	0	0	0	0	0	0	5,000	0.0%
5	5,000					5,000	0	0	0	0	0	0	5,000	0.0%
6	5,000						5,000	0	0	0	0	0	5,000	0.0%
7	5,000							5,000	0	0	0	0	5,000	0.0%
8	5,000								5,000	0	0	0	5,000	0.0%
9	0									0	0	0	0	0.0%
10	0										0	0	0	0.0%
11	0											0	0	0.0%
Calendar Year		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	0	0	0	40,000	

APPENDIX F

Part 9

ACCIDENT YEAR DEVELOPMENT AND CONTRIBUTION TO CALENDAR YEAR

RETURN ON SURPLUS

FOUR-YEAR PAYOUT, WITHDRAW CAPITAL AFTER ONE YEAR PLUS CALENDAR INVESTMENT INCOME

Accident Year	Pres Value @ Year End	ROS (Net Income/Beginning Period Contributed Surplus) in Year											Total	
		1	2	3	4	5	6	7	8	9	10	11		
1	10.1%	-1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.1%
2	10.1%		-1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.1%
3	10.1%			-1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.1%
4	10.1%				-1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.1%
5	10.1%					-1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.1%
6	10.1%						-1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.1%
7	10.1%							-1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.1%
8	10.1%								-1.0%	0.0%	0.0%	0.0%	0.0%	11.1%
9	0.0%									0.0%	0.0%	0.0%	0.0%	0.0%
10	0.0%										0.0%	0.0%	0.0%	0.0%
11	0.0%											0.0%	0.0%	0.0%
Calendar Year		-1.0%	5.0%	9.1%	11.1%	11.1%	11.1%	11.1%	11.1%	0.0%	0.0%	0.0%	0.0%	11.1%

SURPLUS

APPENDIX G

Part I

ACCIDENT YEAR DEVELOPMENT AND CONTRIBUTION TO CALENDAR YEAR
 SHAREHOLDER FLOWS FROM CAPITAL
 BASELINE—FOUR-YEAR PAYOUT (25% PER YEAR) AT 4:1 RESERVE/SURPLUS RATIO

Accident Year	Shareholder Flows From Capital (Contribution) Or Withdrawal in Year											Total	Acc Year Compound Growth	
	Begin	1	2	3	4	5	6	7	8	9	10			11
1	-2,000	500	500	500	500	0	0	0	0	0	0	0	0	0.0%
2		-2,000	500	500	500	500	0	0	0	0	0	0	0	0.0%
3			-2,000	500	500	500	500	0	0	0	0	0	0	0.0%
4				-2,000	500	500	500	500	0	0	0	0	0	0.0%
5					-2,000	500	500	500	500	0	0	0	0	0.0%
6						-2,000	500	500	500	500	0	0	0	0.0%
7							-2,000	500	500	500	500	0	0	0.0%
8								-2,000	500	500	500	500	0	0.0%
9									0	0	0	0	0	0.0%
10										0	0	0	0	0.0%
11											0	0	0	0.0%
Calendar Year	-2,000	-1,500	-1,000	-500	0	0	0	0	2,000	1,500	1,000	500	0	

SURPLUS

APPENDIX G

Part 2

ACCIDENT YEAR DEVELOPMENT AND CONTRIBUTION TO CALENDAR YEAR
NET SHAREHOLDER FLOWS

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

Accident Year	Net Shareholder Flows in Year												Total	Acc Year Compound Growth
	Begin	1	2	3	4	5	6	7	8	9	10	11		
1	-2,000	708	656	604	552	0	0	0	0	0	0	0	520	0.0%
2		-2,000	708	656	604	552	0	0	0	0	0	0	520	0.0%
3			-2,000	708	656	604	552	0	0	0	0	0	520	0.0%
4				-2,000	708	656	604	552	0	0	0	0	520	0.0%
5					-2,000	708	656	604	552	0	0	0	520	0.0%
6						-2,000	708	656	604	552	0	0	520	0.0%
7							-2,000	708	656	604	552	0	520	0.0%
8								-2,000	708	656	604	552	520	0.0%
9									0	0	0	0	0	0.0%
10										0	0	0	0	0.0%
11											0	0	0	0.0%
Calendar Year	-2,000	-1,292	-636	-32	520	520	520	520	2,520	1,812	1,156	552	4,160	

SURPLUS

APPENDIX G
Part 3

ACCIDENT YEAR DEVELOPMENT AND CONTRIBUTION TO CALENDAR YEAR
SHAREHOLDER RETURN
BASELINE—FOUR-YEAR PAYOUT (25% PER YEAR) AT 4:1 RESERVE/SURPLUS RATIO

Accident Year	Shareholder Return (Operating & Investment Income/Beginning Period Capital Contribution) in Year											IRR
	1	2	3	4	5	6	7	8	9	10	11	
1	10.4%	10.4%	10.4%	10.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.4%
2		10.4%	10.4%	10.4%	10.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.4%
3			10.4%	10.4%	10.4%	10.4%	0.0%	0.0%	0.0%	0.0%	0.0%	10.4%
4				10.4%	10.4%	10.4%	10.4%	0.0%	0.0%	0.0%	0.0%	10.4%
5					10.4%	10.4%	10.4%	10.4%	0.0%	0.0%	0.0%	10.4%
6						10.4%	10.4%	10.4%	10.4%	0.0%	0.0%	10.4%
7							10.4%	10.4%	10.4%	10.4%	0.0%	10.4%
8								10.4%	10.4%	10.4%	10.4%	10.4%
9									0.0%	0.0%	0.0%	0.0%
10										0.0%	0.0%	0.0%
11											0.0%	0.0%
Calendar Year	10.4%	10.4%	10.4%	10.4%	10.4%	10.4%	10.4%	10.4%	10.4%	10.4%	10.4%	10.4%

APPENDIX H

Part 1

ANNUALIZED NOMINAL AND DISCOUNTED BALANCE SHEET AND INVESTMENT INCOME

5.3% DISCOUNT RATE, 5.3% EARNINGS RATE, 8.0% TAX LAW DISCOUNT

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

Committed Assets = Liabilities	Initial Reported Amount	DISCOUNTED Beginning of Period	Average Timing of Cash Flow	Balance Sheet			Investment Income			Duration			
				DISCOUNTED			DISCOUNTED			Begin Period	End Period	Begin Period	End Period
				NOMINAL	Begin Period	End Period	NOMINAL	Begin Period	End Period				
Premium	\$10,000	\$10,000	0.00	0	0	0	0	0	0	0.00	0.00		
Loss & Loss Expense	8,000	7,046	2.50	20,000	18,068	19,022	1,056	954	1,004	1.97	0.97		
Underwriting Expense	3,000	3,000	0.00	0	0	0	0	0	0	0.00	0.00		
Net Policyholder Funds				20,000	18,068	19,022	1,056	954	1,004				
Tax Timing Items													
Tax Loss Discounting	-468	-422	2.04	-953	-871	-917	-50	-46	-48	1.75	0.75		
Tax Unearned Premium	-340	-323	1.00	-340	-323	-340	-18	-17	-18	1.00	0.00		
Net Liabilities (Including Timing Items)				18,707	16,874	17,765	988	891	938	2.00	1.00		
Retained Earnings				-1,365	-1,247	-1,313	-72	-66	-69				
Net Liabilities (Including Retained Earnings)				17,342	15,627	16,452	916	825	869				
Contributed Surplus	2,000	1,762	2.50	5,000	4,517	4,755	264	238	251	1.97	0.97		

SURPLUS

APPENDIX H

Part 2

ANNUALIZED NOMINAL AND DISCOUNTED RETURN
 5.3% DISCOUNT RATE, 5.3% EARNINGS RATE, 8.0% TAX LAW DISCOUNT
 BASELINE –FOUR-YEAR PAYOUT (25% PER YEAR) AT 4:1 RESERVE/SURPLUS RATIO

	<u>Balance Sheet</u>			<u>Investment Income</u>			<u>Duration</u>	
	<u>NOMINAL</u>	<u>DISCOUNTED</u>		<u>NOMINAL</u>	<u>DISCOUNTED</u>		<u>Begin Period</u>	<u>End Period</u>
		<u>Begin Period</u>	<u>End Period</u>		<u>Begin Period</u>	<u>End Period</u>		
Premium ¹	\$11,069	\$10,000	\$10,528				1.97	0.97
Underwriting Income				-660	-660	-695	0.00	-1.00
Operating Income				256	231	243	1.97	0.97
Operating Return on Premium (ROP)				2.3%	2.3%	2.3%		
Operating Return on Net Liabilities (ROL)				1.5%	1.5%	1.5%		
Total Net Income				520	469	494	1.97	0.97
Total Return on Surplus (ROS)				10.4%	10.4%	10.4%		

SURPLUS

¹ Nominal valued at date of average total timing

APPENDIX H

Part 3

ANNUALIZED NOMINAL AND DISCOUNTED LEVERAGE RATIOS
 5.3% DISCOUNT RATE, 5.3% EARNINGS RATE, 8.0% TAX LAW DISCOUNT
 BASELINE—FOUR-YEAR PAYOUT (25% PER YEAR) AT 4:1 RESERVE/SURPLUS RATIO

	<u>Balance Sheet</u>		
	<u>NOMINAL</u>	<u>DISCOUNTED</u>	
		<u>Begin</u>	<u>End</u>
		<u>Period</u>	<u>Period</u>
Net Policyholder Funds/Surplus	4.00	4.00	4.00
Net Liabilities (Incl Timing Items)/Surplus	3.74	3.74	3.74
Net Liabilities (Incl Retained Earnings)/Surplus	3.47	3.46	3.46
Premium/Surplus	2.21	2.21	2.21
Conventional Nominal Reported Premium/Surplus	2.00	N/A	N/A

SURPLUS