# The Rate of Return on Investment

**By William R. Gillam, FCAS**
**VP/Actuary – National Council on Compensation Insurance**

## ABSTRACT

There is much discussion today on the topic of rate of return, without a clear definition of its parameters. This monograph carefully defines the return and the investment, numerator and denominator of the rate.

The author debunks certain common misuses of accounting terms. There can be no investment income on a loss reserve. Return on capital is not the same thing as return on surplus, which is close to meaningless.

An example relating the return on investment to the profit provision in the rates is provided.

# The Rate of Return on Investment in the Business of Insurance

**By William R. Gillam, FCAS**
**VP/Actuary – National Council on Compensation Insurance**

## Introduction

There is much discussion today on the topic of rate of return, without a clear definition of its parameters. This monograph carefully defines the return and the investment, the numerator and denominator of the rate of return.

It is hoped that the presentation elicits a higher understanding of the elements and considerations necessary to measure the return on investment in the insurance business. The point of view of the investor should be differentiated from those of the policyholder or the statutory surplus (if that has a point of view).

The source of the following material is the NCCI Internal Rate of Return model, which relates the profit loading in rates to the return on capital invested in the insurance company.

For ease of presentation, this article is written as though the author's opinions are unequivocal truths, and the reader should remain careful and critical. The writer's perspective is his own, not that of his employer, the reader, or any of the various parties to the insurance transaction.

## Outline

This paper provides a high level perspective on the following questions:

1) What is the capital invested in an insurance enterprise?

Exactly how much capital does the investor have committed? This invested capital is the denominator in the rate of return. From this point of view, the cost of capital can be thought of as the rate of return an investor expects, or targets, when he provides capital to an enterprise of a specific level of risk.

The investment in an insurance company must not be confused with policyholders' surplus. The latter is a balancing item, i.e., assets minus liabilities, and the value of each of these is quite volatile. The capital invested in a stock company may change over time, but in a way only loosely related to the size of the policyholders' surplus.

2) What is the return on capital invested in the insurance business?

For purposes of this monograph, the appropriate measure of the numerator is total return, including investment income and capital gains, as well as underwriting return. This is consistent with the point of view of the investor, whose expected total return is the cost of capital.

For simplicity, tax is not considered, nor is there any in-depth consideration of realized or unrealized capital gains.

This monograph does not discuss what the actual cost of capital is or should be in the insurance industry. In other words, we want to propose how it should be measured and related to the provision for profit in the rates, not how much it should be.

3) What is the correct provision in rates to achieve the targeted return on invested capital?

This is the ratemaker's non-trivial chore. The foremost impediment is that rates must generally be made before insurance is provided, generally using estimates of loss and expense and cash

flow models of the insurance transaction. The loss process is stochastic, but models will have to be deterministic.

A sample calculation using the internal rate of return model is provided below.

The future is uncertain, and even models which use statistical distributions recognizing process variance will be fraught with parameter risk. Some provision for this should be in the rate, and this should probably be related to the relative difficulty of pricing specific coverage. This paper does not discuss derivation of such a provision.

## Invested Capital

The capital invested in an insurance company is not the same as the surplus. It is better to think of surplus as a budgetary requirement of the business of insurance. It should become clearer in the example below that the necessary, or "par", surplus determines required capital investment. To the extent underwriting (including investment income on the cash flow of the process) does not provide adequate surplus, invested capital must fill the gap. It is no accident it is called the *policyholder's* surplus rather than "the investors'" or "owners'" surplus.

Surplus is necessary to support liabilities which are uncertain, particularly Unearned Premium and Loss Reserves (UPR and LR). Note that surplus supporting UPR is a slight variation on the traditional premium to surplus rule of thumb which says the ratio of written premium to par surplus ought not be significantly more than two. Unearned premium represents highly uncertain liability for losses that have not yet occurred. It tends to be of the same magnitude as written premiums, and the ratio of UPR to surplus should be about the same.

Loss reserves are a major estimated liability item which require a par surplus, but perhaps with a lower requirement than UPR since reserves are evaluated after the associated premium has been earned and, usually, most losses have been reported. Perhaps the ratio of loss reserves to surplus ought to be no more than five.

For purposes of this exposition, the author has selected a UPR to surplus ratio of two and a LR to surplus ratio of four. This par surplus could undoubtedly be more accurately estimated, perhaps using Risk Based Capital techniques. Such an estimate would be independent of the over-capitalization or under-capitalization of specific insurers. Alternatively, the values could be estimated empirically, perhaps using a regression on the sample ratios of the many companies writing the subject line of business. Both approaches are outside the scope of this paper.

**Return on Investment**

Interest rates and inflation are moderate and stable today, but will probably never go back to the low (and stable) rates of the first half of this century. Return to the insurance business has become as much a function of cash flow and the time value of money as the underwriting results. In recent years, investment income has made the difference between the failure and success of many major insurance companies. There may have been a time when it was nice but inconsequential; that time is past.

At the risk of hammering a point, this monograph considers both the insurance transaction and its potential for investment income from the point of view of the investor.

In order to measure investment income generated by the insurance transaction, it is necessary to analyze the cash flows of the transaction. It is very difficult to do such an analysis starting with statutory accounting, especially if there is any confusion between investible assets and liabilities.

There can be no investment income on loss reserves; as Charlie Hachemeister was fond of relating, investment income accrues to assets, not liabilities.

Given cash flow patterns for premium and loss, the higher the combined ratio, the greater the loss reserve but the lower the potential for investment income on funds provided by premium income alone. Writing to a high combined ratio reduces assets while generally increasing liabilities. Without additional investment, income and surplus will both be reduced. This could change return as a function of surplus in ways that are not intuitive. With a high combined ratio, more capital must be invested to return surplus to par, and the rate of return to the investor would decrease. This, in part, is why measuring return on surplus leads to distortions.

**Ratemaking**

The profit loading in rates does not bear a simple algebraic relationship to the expected underwriting profit, return on investment, or premium to surplus ratios. The loading must consider not only these three things, but also the estimated cash flows of premium, loss and expense, the uncertainty of those estimations, and (I've added) the par reserve to surplus ratios. Investment Income can accrue to the necessary invested capital as well as the cash flow from underwriting. In effect, we can back solve for the invested capital by an accounting analysis of what is necessary to satisfy surplus requirements.

Generally, cash flow models are necessary to relate the profit provision in the rates to the return on investment. The cash flow from underwriting is a stochastic process. Rates must be made before the cash flows are known. Modeling these lends a great potential for parameter risk. Consideration must be made for the relative difficulty of estimating adequate rates. The greater the difficulty, the greater the risk.

The following is a simple model of a hypothetical insurance transaction from the point of view of the investor, and calculates the internal rate of return. Other cash flow models are possible. (Dollar figures are rounded to whole dollar.)

The initial calculation using a 5% underwriting profit provision results in an 18.2% return on investment. Suppose this rate is unacceptably high, as it might be to a regulator, a politician or even a carrier bent on competition. Thus, as a second experiment, we try using the lower profit provision of 0%. This results in a +11.6% return.

We also calculate the rates of return on surplus as +31.1% and +20.5% for the respective scenarios. The reader should ask the question: exactly whose return is this?

## Internal Rate of Return Model

1. Initial Calculation.

Start up company will write $1,000 in premium 1/1/98.
Expenses are $250, paid immediately.
Losses are $700, paid at year-end.
The profit loading in the rates is $50 or 5% of the premium.
For simplicity, assume no taxes.
Par surplus to UPR is 0.50.
Par surplus to LR is 0.25.

Balance @ 1/1/98, after expenses have been paid.

| | | |
|---|---|---|
| Liabilities | | |
| UPR | $1,000 | |
| LR | | 0 |
| | | $1,000 |
| | | |
| Assets | | |
| Cash from premium transaction | | $ 750 |
| Necessary Capital Investment* | | 750 |
| | | $1,500 |
| | | |
| Par Surplus | | $ 500 |

*Necessary to support surplus of $500, half of the UPR.

Evaluating @ 7/1/98, let's assume the $700 loss has occurred, but has not been paid. Half the premium has been earned. Interest income has been 3% of $1,500 for six months, or $45.

| | | |
|---|---|---|
| Liabilities | | |
| UPR | $ 500 | |
| LR | 700 | |
| | $1,200 | |
| | | |
| Assets | | |
| (1500)(1.03) | | $1,545 |
| Necessary additional capital investment | | 80 |
| | | $ 1,625 |
| | | |
| Par Surplus | | |
| (0.5)(500) + (0.25)(700) | | $ 425 |

@ 12/31/98, the end of the year, all premium is earned, $700 losses are paid and investment income of $49 accrues to the assets supporting the transaction.

| | |
|---|---|
| Liabilities | |
| UPR | $ 0 |
| LR | 0 |
| | $ 0 |
| Assets | |
| (1,625)(1.03)-(700) | $ 974 |
| Surplus | $ 974 |

The ending surplus is returned to the investor. The Internal Rate of Return is the rate, which discounts the invested cash flows to ø. The cash flows are the initial $750, the addition of $80 at six months and the return of $974 surplus at year-end.

Using $v = ()$

$$750 + 80v^{.5} - 974v = 0$$

Solving $v^{.5} = .920$

$v = .846$

$i = 18.2\%$

the internal rate of return to the investor.

We can easily calculate the total return as a percent of average surplus.

| | |
|---|---|
| U/W Profit | $ 50 |
| Investment Income ($45+$49) | $ 94 |
| Total Income | $ 144 |
| Surplus (500 + 425) ÷ 2 | $ 463 |
| Rate of return | 31.1% |

2. After reducing the profit loading in the rates, write $950 in premium.

@ 1/1/98

| | |
|---|---|
| Liabilities | |
| UPR | $ 950 |
| LR | 0 |
| | $ 950 |

| | |
|---|---|
| Assets | |
| Cash from premium transaction | $ 700 |
| Necessary Capital Investment* | 725 |
| | $1,425 |

| | |
|---|---|
| Par Surplus | $ 475 |

*Necessary to support surplus of $475, half of the UPR.

@ 7/1/98 Assume $43 of investment income

| | |
|---|---|
| Liabilities | |
| UPR | $ 475 |
| LR | 700 |
| | $1,175 |

| | |
|---|---|
| Assets (add 43) | $1,468 |
| Additional Capital | 120 |
| | $1,588 |

| | |
|---|---|
| Par Surplus | |
| (.5)(475)+(.25)(700) | $ 413 |

@ 12/31/98 add $48 investment income, and pay the losses.

| | |
|---|---|
| Assets | |
| $48 + $1,588- $700 | $ 936 |

| | |
|---|---|
| Liabilities | 0 |

Liquidating this, the internal rate of return is i = 11.6%

The total return is $91 on average surplus of $444, or a rate of +20.5%