THE GUARANTEED INVESTMENT CONTRACT (GIC)

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ABSTRACT

This paper is designed to be a single reference source for an actuary who wants to increase his or her understanding of a GIC, its risks, and how to control them. It was first published in March 1983 as a study note for the Part 10E exam syllabus. The paper emphasizes the practical difficulties of matching asset and liability cash flows and discusses in detail how the sponsor and/or participants of the plan being funded by the GIC can antiselect against the insurance company. It also discusses how the actuary should go about pricing and reserving for GICs.

I. INTRODUCTION

The purpose of this paper is to increase the reader's understanding of the following:

1. Exactly what a GIC is;
2. How GICs evolved from "guaranteed cost" and "investment participation" (IPG) contracts;
3. What advantages/disadvantages a GIC offers a buyer relative to IPG contracts and other investments such as stocks and bonds;
4. What problems a GIC poses for an insurance company; and
5. What an insurance company actuary can do to solve these problems and thus enable the GIC to be sold and administered on a sound basis.

II. DEFINITION OF A GIC

Simply stated, a GIC is an insurance company contract which provides that (1) the contract holder places funds on deposit with the insurance company; and (2) the insurance company repays the contract holder's deposits plus interest at a guaranteed rate according to a schedule specified in the contract.

To expand somewhat on this definition, we can say that there are generally eight features common to all GICs (even though not all insurance companies have the same form of GIC).

1. *The contract holder*: The GIC contract holder is normally the sponsor

of an employee benefit plan, for example, a regular defined benefit pension or a defined contribution plan such as a Taft-Hartley pension plan, a profit-sharing plan, or an employee savings plan. It is almost always qualified under Section 401(a) of the Internal Revenue Code. The sponsor is usually the employer but might be a union, an association, or a Taft-Hartley group.

2. *Deposit account*: This is a precise definition of the funds the contract holder agrees to place on deposit with the insurance company. The deposit account can be a single sum of money deposited on a single day (e.g., $10 million on October 1). It can also be several deposits (plus guaranteed interest thereon) over a longer period of time (e.g., all plan deposits in calendar year Z or 50 percent of plan deposits over the next five years).

3. *Repayment schedule*: This defines when the contract holder gets his original deposit(s) (plus guaranteed interest thereon) back at book value. The repayment schedule can be in a single sum (called a "bullet") or in installments.

4. *Guaranteed interest rate*: The guaranteed interest rate on new GICs is always closely related to current, or "spot," long-term interest rates. Sometimes the guaranteed interest rate is net of the insurance company's administrative expense charges. Alternatively, these charges can be billed annually to the contract holder, thereby enabling him to credit a correspondingly higher interest rate to plan participants.

5. *Guaranteed expenses*: GIC contracts usually provide that the insurance company's administrative expense charge schedule is guaranteed for the duration of the contract. Otherwise, the contract holder would not, in actual practice, have a guaranteed rate of return on his funds.

6. *Unscheduled withdrawals severely restricted*: All GICs limit the contract holder's right to withdraw his funds other than as scheduled under the contract. Some allow no unscheduled withdrawals at all. Others allow them under limited circumstances such as plan termination or bankruptcy of the employer. Most GICs written to fund defined contribution plans, however, permit book-value withdrawals requested by individual plan participants according to the terms of the plan.

7. *Generally no participation*: Traditional GICs generally have little or no provision for dividends or any kind of sharing of good (or bad) experience with the contract holder. Most, in fact, are exclusively nonparticipating. A minority, however, provide for participation based on some index rate (such as Moody's Bond Index or the consumer price index).

8. *Penalty for failure to deposit*: This is necessary because the insurance company normally buys an investment (or investments) to support the new contract when the client accepts the offer. If interest rates increase after-

wards, the market value of those investments will decrease. The resulting loss, of course, will be borne by the insurance company if the client reneges on his deposit commitment in favor of a current (higher) rate. Penalties under GICs vary from a flat percentage to a formula approximating the decrease in market value. A few older GICs have no penalty provisions, but new ones without them are becoming rarer and rarer.

III. THE EVOLUTION OF GICs

To understand how GICs evolved, one needs to trace the evolution of the group pension product line offered by insurance companies during the last twenty-five years. That evolution was in part a response to two major disadvantages insurance companies had in competing with the banks for pension deposits.

1. *Interest crediting method*: Insurance companies were generally required by law to credit the same rate of interest to all pension funds regardless of the year of deposit. Thus, during a period of the rising interest rates, the "average portfolio rate" credited by insurance companies would invariably be less than current interest rates that banks were able to offer.
2. *Common stocks*: During the 1950s common stocks began to become a very popular investment for pension plans. Unfortunately, insurance companies were severely limited by law as to what percentage of their assets could be common stocks. Banks, however, had no such limit.

To counter these disadvantages, the insurance industry continually pressed the New York State Insurance Department for legislative relief. Success was finally achieved when New York authorized two major changes in its investment law during the period 1960–62.

1. *Investment-year interest crediting method*: This new method permitted insurance companies to credit interest to funds depending on the year of deposit. Thus, new pension deposits could be credited "new-money" interest rates competitive with rates offered by banks.
2. *Separate accounts*: A "separate account" is simply an insurance company fund which is accounted for separately from the company's general asset account. Separate accounts are not subject to limitations on common stock investments.

Shortly after New York authorized these changes, other states followed suit. Thus, new-money interest and separate accounts became a standard part of every major insurance company's competitive arsenal by the mid-sixties.

The development of new-money interest and separate accounts allowed the insurance industry to add IPG contracts to its product line to supplement its guaranteed cost contracts (e.g., deferred annuity, deposit administration).

Briefly, a guaranteed cost contract emphasizes the assumption of the mortality risk by the insurance company. Thus, its primary feature is a table of annuity premium rates. The modern investment participation or IPG contract, on the other hand, primarily emphasizes the insurance company's investment function. It allows the contract holder to participate in the pooled investment experience of the insurance company's general asset account (via the new-money interest crediting method) and/or the experience of one of its common stock (or other) separate accounts. Guaranteed cost and IPG contracts are designed for different market segments. The former is more appropriate for smaller employers who prefer to have the insurance company bear the mortality risk and handle the administration and investing for the plan. The latter is more appropriate for employers large enough (e.g., at least $50,000 in annual deposits) to assume the mortality risk and handle some of the plan administration themselves.

IPG contracts quickly became very popular in the marketplace. The bond market performed well in the mid-sixties; thus, an insurance company general asset account offering new-money rates was an attractive new investment. Common stocks performed even better. (The S&P 500 Stock Index increased from 55 in mid 1962 to 104 in early 1969). Therefore, an insurance company separate account was also attractive. In short, insurance companies (through IPG contracts) had everything the large-case marketplace needed during the sixties.

The marketplace's complete satisfaction with IPG contracts, however, proved to be short-lived for three reasons.

1. *Record levels of interest rates*: In the late sixties and early seventies long-term interest rates increased to then record levels. (For instance, long-term interest rates increased from 5½ percent in 1967 to over 8 percent in 1970). The result was a decrease in market values of bond portfolios and of IPG contracts funded through insurance company general asset accounts.
2. *Poor common stock performance*: The natural place for the marketplace to turn when the bond market performed poorly was the stock market. Unfortunately, stock prices also took a nose dive. In particular, the S&P fell from 104 in early 1969 to 72 in the mid-seventies.
3. *ERISA (Employee Retirement Income Security Act of 1974)*: For two reasons, ERISA increased the pressure on the typical plan sponsor to achieve a more predictable rate of return on plan funds than an IPG could provide. First, ERISA deemed him to be a "fiduciary" who was accountable for using the judgment of a "prudent man" in making investment decisions. Second, ERISA imposed much greater administrative burdens on defined benefit pension plans than on defined contribution plans (i.e., a profit-sharing plan, an employee savings plan, or any plan which involves individual employee accounts). The result was a great increase in the popularity of defined

contribution plans, which have a much greater need for a predictable rate of return (to communicate to individual employees) than defined benefit plans.

As the marketplace started to become dissatisfied with IPG contracts, the insurance industry sought an alternative. Fortunately, the two main regulatory hurdles to developing one had already been overcome in the early 1960s.

1. *Ability to credit "spot rates"*: The concept of relating interest rates credited to time of deposit had already been accepted by New York when the new-money system was approved. It proved to be relatively easy to extend this concept from an annual basis to a spot rate basis as long as the insurance company was willing to segregate its GIC experience from that of IPGs and other contracts utilizing the general asset account. (See item 2 below.)
2. *Segregated accounting*: New York had already accepted this concept for purposes of investment income allocation when separate accounts were approved. Indeed, some insurance companies set up a new separate account for GIC deposits. Others used their general asset account but segregated the GIC experience from regular general asset account contracts' experience.

Thus, once the need for GICs was established, it did not take long for the insurance industry to develop them.

The first GIC appeared around 1970, but it was not until 1973 that a major insurance company marketed a GIC aggressively and successfully. That GIC was the Equitable "future deposits lockup" contract, which had a single guaranteed rate applicable to all deposits in a five-year period followed by a bullet maturity. The other major insurance companies were not factors in the GIC market until the mid-seventies. When they did enter the market, however, they enjoyed phenomenal marketing success. For instance, new pension deposits to the seven largest insurance companies increased from $1.8 billion (1974) to $7.7 billion (1980) and the insurance industry's market share increased from 28 percent (1975) to 34 percent (1980) largely because of GICs.

As GICs started to flourish in the mid-seventies, each insurance company emerged with its own unique contract form. Even though no two insurance companies have exactly the same form of GIC today, there have been at least three major developments worth noting in the evolution of GICs since 1975.

1. *More flexible repayment schedules*: At first, insurance companies were not very flexible with regard to repayment schedules offered. One com-

pany, for instance, offered only five-year bullets, and another offered only a ten-year installment schedule with the initial installment occurring on the sixth contract anniversary. Today, however, almost every company offers a wide variety of both bullet and installment repayment schedules. Indeed, this increased flexibility is a major reason why GIC sales have continued to grow at an impressive rate.

2. *Shorter deposit periods*: Nowadays insurance companies are generally reluctant to offer a single guaranteed rate to deposits made during a period that lasts more than one year. Thus, the most common deposit accounts offered called for a single sum or for plan deposits in a single calendar year.

3. *Tighter underwriting*: This as well as item 2 above is attributable to the increased understanding of the risks of GICs. Examples of the trend toward tighter underwriting are the following:

   a) *Proposal expiry*: At first, GIC offers were good for several weeks. Now, it is rare to find a GIC offer that is good for more than a few days. Some offers, in fact, expire in one hour!

   b) *Sales capacity*: It is becoming increasingly common for the insurance company to limit how much GIC business it will accept in a given period of time (e.g., one week). In other words, the GIC proposal "self-destructs" if the prospect does not accept before the sales capacity (stated in the proposal) is reached.

   c) *Deposit agreement*: Almost all companies now insist that all acceptances of GIC proposals be evidenced by a signed deposit agreement. Typically, the deposit agreement contains a penalty clause for failure to make the deposit(s) as promised.

   d) *"Competing" fixed-income funds*: Most GICs funding employee savings plans permit individual plan participants to transfer their account balances to certain other plan investment options. Insurance companies, however, are becoming more and more restrictive in defining which other plan investment options GIC funds may be transferred to. In particular, most insurance companies will not permit GIC funds to be transferred to a "competing" fixed-income fund M that is, a fund under the plan (other than the GIC) that is primarily invested in fixed-income securities.

VI. ADVANTAGES/DISADVANTAGES OF A GIC

The criteria for assessing whether or not to buy a GIC are different for defined benefit and defined contribution plans. A defined benefit plan sponsor should view a GIC as one alternative investment for his plan and compare

it with other available alternatives. A defined contribution plan sponsor, however, should give primary consideration to the needs of his plan. In particular, if the plan has a "guaranteed interest rate" option (as most do), many consulting actuaries are recommending a GIC.

The *defined benefit plan* sponsor should compare the GIC with other investments from three points of view. Almost by definition, every investment is relatively strong in one or two of these areas at the expense of the other(s).

1. *Safety of principal:* How likely is the investment to default or to experience frequent fluctuations in market value?
2. *Liquidity:* How easily can the investment be converted to cash for plan benefit payments or for another investment opportunity?
3. *Yield:* How much return (including interest and capital gains/losses) will the investment realize during the period it is held?

For example, common stocks and public bonds are strong in liquidity and expected yield (including appreciation) at the expense of safety of principal. Buying real estate instead of stocks or bonds can be viewed as sacrificing liquidity in hopes of achieving a higher yield. Short-term paper, on the other hand, is strong in safety and liquidity but (normally) relatively weak in yield.

The two major fixed-income investments offered by insurance companies (i.e., the general asset account through an IPG contract and the GIC) can (and should) also be analyzed in the manner described above. The former is strong in yield as a result of the edge insurance companies have in fixed-income investing through direct-placement bonds. It is also strong in liquidity, as IPG contracts typically permit cashout subject to a "market-value adjustment." It is weak, however, in safety of principal because of the market-value adjustment formula. The latter, the GIC, is very strong in safety of principal because it is backed by the insurance company and all its payments are at book value. It is also fairly strong in yield but not as strong under normal circumstances (i.e., other than those of the last three years) as an IPG contract, because of the cost of the guarantee. Its weakness is lack of liquidity.

A recently developed investment alternative that is similar to a GIC is the immunized bond portfolio. This vehicle, which is offered by both insurance companies and banks, does not have a guaranteed rate of return. Its goal, however, is to "immunize" its "target investment return" against erosion due to future changes in interest rates. It is managed like a GIC investment portfolio except that the risk that the target return will not be achieved is borne by the plan sponsor instead of by the insurance company.

Thus, an immunized bond portfolio is weaker in safety of principal than

a GIC. That is because its book value and target return are not guaranteed. On the other hand, it is much stronger in liquidity, because the bonds can be sold (at market value) at any time. Finally, it is slightly stronger in yield because of the cost of the GIC guarantees. The choice between an immunized bond portfolio and a GIC is often a very close one that depends on how badly an individual plan sponsor needs the GIC guarantees and how much confidence he has that the target return will actually be achieved.

All this might be summed up by describing a GIC as ''an investment offering a guaranteed interest rate and guaranteed maturity in return for reduced liquidity and yield.'' Thus, a GIC is a good investment for a defined benefit plan sponsor when and only when he has a particular need for its guarantees that warrants the price paid in yield and liquidity. The following are examples of where this might be the case.

1. *Investment diversification:* Sometimes the plan's investment policy calls for a portion of the plan's assets to be invested in very safe (i.e., having low volatility of return) investments and the remainder to be invested more agressively, for instance, in common stocks or real estate. In that event, the GIC should be considered for the safe investment.
2. *Cash-flow planning:* Sometimes a plan has an unusual need for X dollars Y years from now. A Y-year bullet with a maturity value of X can be a good way to meet this need.
3. *Actuarial valuation assumption:* Purchasing a GIC with a repayment schedule equal to expected benefit payments under the plan for, say, existing retirees may induce the plan actuary to liberalize the plan's assumed interest rate for liability valuation purposes.

Before buying a GIC, however, the defined benefit plan sponsor should consider potential problems such as the following:

1. *Benefit payment obligations:* Will the plan have enough liquidity to pay benefits even though some of its assets are tied up in the GIC? What if future benefit payments prove to be more than the plan actuary projects?
2. *Deposit commitment:* Do the sponsor and the insurance company have exactly the same understanding as to how the deposit account is defined? If they do not, and interest rates increase later, the insurance company may claim that the sponsor is still bound to put money into the GIC at the old ''stale'' guaranteed rate. If interest rates fall, the insurance company may claim that the initial deposit account is closed, and any more deposits get current (lower) guarantees. A written deposit agreement signed by both parties is a good way to minimize these kinds of misunderstandings.

3. *Emergencies:* Suppose the plan sponsor goes bankrupt or terminates the plan? What if he sells his business to another company or closes down a plant or a subsidiary? What if benefit payments are heavy enough to exhaust all the plan's other investments? What if the sponsor later finds an unusually good investment opportunity? For each of these events, the sponsor should find out whether GIC funds are available at all, and if so, on what basis—book or market (and if market, what is the formula and is it guaranteed?).

4. *Contract review:* A GIC contract is complicated enough that the plan sponsor should have his attorney review it thoroughly before it is finalized. On the other hand a GIC proposal is often good for only a few days—not enough time for an attorney to review and understand the contract. There are two solutions to this dilemma. One is to ask the insurance company for a sample contract several weeks before an actual proposal is required. The other is to condition proposal acceptance upon the attorney's subsequent review and acceptance of the contract.

Many consulting actuaries recommend a GIC for a *defined contribution plan* with a guaranteed interest rate option for the following reasons.

1. *Guarantee of principal:* As mentioned previously, each plan participant has his own individual account under a defined contribution plan. Most participants' investment experience is limited to savings bank deposits; they take integrity of principal for granted. Thus, the GIC's guarantee of principal makes it more acceptable to most plan participants than an IPG or an immunized bond fund (both of which lack such a guarantee).

2. *Maturity:* This GIC feature allows a plan sponsor to keep his plan's aggregate interest rate reasonably current, even in periods of rapidly rising interest rates, by investing each year's plan deposits in a GIC of relatively short duration (i.e., five years or less). In that way, GIC funds become available for reinvestment before their guaranteed interest rate becomes too stale.

   In contrast, IPGs generally performed poorly when interest rates took off in the early eighties. IPG contract holders almost always found themselves locked in to an interest rate reflective of the seventies and unable to liquidate their contract except at a very steep discount.

3. *Ability to credit spot rates:* The fact that a new GIC can offer a current spot rate is a big advantage of a GIC over an IPG. The latter's new-money rate reflects the insurance company's average yield on funds it receives during an extended period of time (usually one year). Thus, it will lag the spot rate whenever interest rates are increasing and the in-

surance company follows its, up to now, normal practice of advance-committing investments.

4. *Unconditional interest rate guarantee:* The fact that a GIC's guarantee applies regardless of the experience under the contract gives it a big edge over an IPG or an immunized bond fund. The former's "guarantee" is experience rated while the latter has no guarantee at all.

5. *Simplicity:* A GIC is a lot easier for the plan sponsor to explain to plan participants or company management than an IPG (which has experience rating, market-value adjustments, nonguaranteed expenses, etc.) or an immunized bond fund (which has no guarantee).

Before buying a GIC, however, a defined contribution plan sponsor should also consider the four potential problem areas discussed previously for defined benefit plans. In addition, he should make sure the GIC is compatible with the provisions of his plan. For instance, will it in fact make payments at book value (not market value) when the plan allows employees to withdraw or reinvest their money? Many GICs, for instance, prohibit employee transfers from the GIC to funds deemed "competing funds." In that case, a plan amendment may be required. Also, many GICs limit the plan sponsor's right to amend his plan in the future. In that case, the plan sponsor should make sure he understands and can live with the limitations.

V. PROBLEMS GICs POSE FOR THE INSURANCE COMPANY

Compared to most insurance arrangements, a GIC is very simple for the buyer to understand, that is, there is just the initial deposit(s), a repayment schedule, and a guaranteed interest rate. This simplicity, however, belies all the problems GICs pose for the insurance company. The problems can be divided into five kinds as follows: (1) financial risks, (2) cash-flow antiselection, (3) expense recovery, (4) customer relations, and (5) product management.

A. *Financial Risks*

There are six financial risks — associated with initial investment, reinvestment, short-term investment, market value, default, and prepayment.

1. The *initial investment risk* is the risk of not being able to acquire any investment(s) at the interest rate assumed in pricing the GIC as a result of interest rates declining after the client receives the proposal. Nowadays, interest rate movements of 1.00 percent or more a week are not uncommon, so an offer appropriate (from the insurance company's viewpoint) for Monday may be overly liberal (and eagerly accepted) by Fri-

day. This risk is also present when the deposit account includes future deposits.

2. The *short-term risk* is the risk that a sizable amount of GIC funds will have to be invested for a short term at rates less than the long-term rates anticipated in the GIC pricing. Short-term investing results mainly from the lag (which often can be several months or more) between the date the GIC deposit is made and the date the new GIC funds are actually dispersed for the long-term investment. During the lag period, the insurance company has no other choice but to invest the new funds short.

3. The *reinvestment risk* is the risk that the investment income from the assets where the GIC deposits were originally invested cannot be reinvested at the interest rate assumed in the GIC pricing. In that event, the overall yield assumed in the pricing will not be realized unless the initial yield achieved was greater than assumed.

4. The *market-value risk* is the risk that the market value of the asset(s) supporting the GIC will be less than book value at the time the client receives payments (at book value) from the GIC. In that case, the insurance company loses money—either through selling assets at a capital loss or raising the needed cash by borrowing (or selling new GICs) at an interest rate higher than that assumed in the original pricing. (*Note:* Whenever the original assets are selling at a discount, borrowing costs are likely to exceed the original pricing interest rate because both phenomena are caused by interest rates increasing.)

5. The *asset default risk* is the risk that the borrower of the GIC funds from the insurance company will make some or all of the promised interest and/or principal payments late or not at all.

6. The *prepayment (call) risk* is the risk that the borrower will elect to repay his loan ahead of schedule when interest rates are less than the original interest rate on the loan. The risk is present in both bonds (for which the term "call" is more commonly used) and mortgages. When it materializes, the lender is invariably forced to reinvest at lower interest rates.

B. *Cash-Flow Antiselection*

Cash-flow antiselection is the process whereby cash flow into the GIC is increased when prevailing interest rates are less than the GIC rate and decreased (or eliminated) in the opposite situation. Whenever the exact amount of deposit(s) to the GIC is not absolutely fixed by a written agreement, there are several ways the plan sponsor can exercise cash-flow antiselection. In addition, under GICs funding a defined contribution plan (which therefore permit withdrawals requested by individual participants according to the

terms of the plan), plan participants also have the opportunity to antiselect. The most common kinds of cash flow antiselection are described below.

1. *Deposits:* Either the plan sponsor or plan participants will tend to direct relatively more funds to the GIC when its rate exceeds prevailing interest rates and less (or none) in the opposite situation. For example, under a defined benefit plan funded through a GIC, the plan sponsor might make the maximum IRS-deductible contribution if the GIC rate exceeds prevailing interest rates.
2. *Withdrawals:* The sponsor or participants might withdraw GIC funds when prevailing interest rates exceed the GIC rate. For example, if a defined contribution plan participant needs money for medical expenses, he might withdraw it from the GIC if the GIC rate is less than prevailing interest rates; otherwise, he might get the money from somewhere else (if possible).
3. *Transfers:* Plan participants might transfer GIC funds to another GIC option under a defined contribution plan when the GIC interest rate is less than prevailing interest rates.
4. *Benefit payments:* If the GIC permits withdrawals for benefit payments, the plan sponsor might make benefit payments from the GIC and invest new-plan cash flow elsewhere when prevailing interest rates exceed the GIC rate. In the opposite situation, he could leave funds in the GIC and pay benefits out of new cash flow.
5. *Plan termination:* If the GIC pays at book value upon plan termination and the plan sponsor has decided to cease contributing to the plan for reasons not related to the GIC (perhaps because he cannot afford to fund the plan any more), he can terminate the plan (via official notice to IRS) if prevailing interest rates exceed the GIC rate. Otherwise, he can suspend the plan (i.e., cease contributions without officially terminating it) and thereby keep the GIC (and its attractive interest rate) in force.
6. *Sale or merger:* In the event of a merger or sale of the business to another employer where the employees end up with the same jobs but a new employer, the plan sponsor might declare that the employees are "terminated" (and hence eligible to receive their accounts at book value from the GIC) if the GIC rate is less than prevailing rates. Otherwise, he can have the new employer take over the GIC (and its attractive interest rate) as one of the terms of the merger or sale.
7. *Market value cashout:* If the GIC can be cashed out at "market," the sponsor is likely to look for opportunities to invest the market value in another GIC (at prevailing interest rates) and end up with more than the original GIC would have produced.

C. *Expense Recovery*

As indicated in section III, most GIC contracts guarantee the insurance company's expense charges for the duration of the contract. As a result, it is necessary for the company to estimate expenses such as the following for several years into the future.

1. Administrative and marketing expenses,
2. Investment expenses,
3. Overhead,
4. Federal income taxes,
5. Other taxes and fees, and
6. Inflation.

The estimate could prove to be low; therefore, there is a risk of not being able to recover expenses during the lifetime of the contract. This risk, of course, is much greater under a GIC than under the typical participating insurance company contract whose expense charges are updated (increased) annually. A complicating factor in GIC expense recovery is that GIC expense charges are typically expressed as a percentage of GIC funds. Thus, if the GIC repays in installments (as many do), revenue from expense charges will decrease with duration (as the fund decreases) just as incurred expenses are increasing due to inflation.

D. *Customer Relations*

There are two reasons why GIC contracts can cause serious customer relations problems for insurance companies.

1. *Short proposal period but tight restrictions*: Section III mentions that most GIC offers are only good for a short time but involve tight restrictions (e.g., sales capacity, deposit agreement). Section III also mentions certain GIC restrictions (e.g., liquidity, "competing" funds) that the plan sponsor needs to consider. This combination of short proposal period and tight restrictions often leads to misunderstandings with customers. Typically, neither side is free of blame. The insurance company salesman, operating under severe time constraints, may give a less than completely understandable explanation of the restrictions. On the other hand, the customer, anxious to lock in a high interest rate, may not listen or read as carefully as he should.
2. *Potentially opposing interests of insurance company and customer*: When a customer buys a GIC, he is in fact trying to lock in what he hopes will turn out to be a relatively high guaranteed interest rate. In other words, he "wins" (and the insurance company "loses") if interest rates fall

soon after he buys the GIC. In the opposite situation, he loses and the insurance company wins. In that case, he may press to renegotiate for a different GIC rate or for other concessions and feel less than fairly treated if the insurance company refuses.

The potentially opposing interests of the customer and the insurance company also come into play when the insurance company tries to prevent cash-flow antiselection (see subsection V.B, above). In that event, the customer is apt to respond with something like this: "I'm not out to get you. I'm just trying to administer my plan and do the best I can for the participants, as ERISA requires me to do. You, however, are preventing me from doing that by using the 'fine print' in the contract as an excuse to refuse to pay these withdrawals (or accept these deposits). Even if you lose money doing this, such a loss is part of the risks of the GIC business for which you've already extracted plenty of profit from me."

Note that this aspect of GICs (i.e., opposing interests) does not apply to IPG contracts (or other participating insurance contracts). Under participating contracts, the insurance company's ability to recover deficits enables it to be quite flexible in accommodating unusual requests. In short, it can say: "You have an unusual need this year for us to credit more interest (or charge less for expenses, pay more withdrawals, etc.) than we anticipated when we wrote the contract. We're happy to accommodate you, however, as long as you let us recover any additional deficits that might result."

E. *Product Management*

There are seven product management problems that need to be solved by every insurance company in the GIC business.

1. *Discrimination against other policyholders*: State laws generally prohibit the insurance company from discriminating in favor of one line of business at the expense of another. Thus, the insurance company should be able to show that it does not use choice higher-yielding investments to support GICs or charge GIC losses against the experience of other policyholders.

2. *Marketing-investment coordination*: For most participating insurance products (including IPG contracts), the marketing and investment functions can operate largely independently. That is, the investment people can invest whatever funds the sales people bring them in whatever they want (subject to applicable law). In turn, marketing people can sell to customers by saying, "You'll get whatever yield our investment people get less a small margin."

GICs are different, because they require very close coordination between the marketing and investment functions; that is, proposal terms at any time have to be geared to the terms of whatever investments are currently available. In turn, the investment people have to consider the needs of the GIC marketplace in their investment planning.

3. *Asset-liability matching*: Section VI will mention that matching cash flow from the assets supporting the GICs to the cash flow required by the GICs is a good risk-management technique. This is easier said than done, however. In particular, the GIC marketplace tends to prefer contracts with relatively short (i.e., five years or less) duration and bullet maturities. Fixed-income investments traditionally acquired by insurance companies, however, have generally been of long (i.e., fifteen to thirty years) duration and had repayment in installments of interest and principal over several years.

4. *GAAP reserving*: What level of GAAP reserve to hold is an important actuarial judgment for any insurance company product, including the GIC. If too little GAAP reserve is held, a company could experience significant losses at a later date and find itself unprepared to cope with them. If too much is held, the product's profitability outlook will appear worse than it actually is and overly conservative decisions will be made about its pricing and surplus requirements. This judgment is perhaps an especially difficult one for the GIC actuary to make, because traditional actuarial reserving methods do not deal with the cash-flow mismatch risk, the most serious GIC risk. (This risk is discussed in section VI.)

5. *Statutory reserve requirements*: Up to January 1, 1982, only New York had a specific requirement for GICs, which was commonly known as the "excess interest reserve." Generally speaking, this requirement forced companies to discount the cash-flow stream under GICs at the valuation rate set by New York. The valuation rate depended on when the GIC deposits were received and was normally conservative, because it was the rate the New York Insurance Department believed any company could earn on its invested assets after taking into consideration expenses and taxes.

As of January 1, 1984, forty-eight states have passed a new minimum statutory valuation law following the 1980 NAIC model for a dynamic valuation law (only Virginia, Alaska, and the District of Columbia have not passed the new law). This new law prescribes maximum valuation interest rates for determining minimum reserve requirements, which are pegged to an outside indicator and, therefore, can vary from year to year. More importantly, though, this new law addresses GICs for the first time.

As a result, nearly all states now have a statutory reserve requirement for GICs that follows somewhat the same principles as the old New York "excess interest reserve" requirement.

The detailed procedures for determining the appropriate valuation rate and calculating the reserve requirement is outside the scope of this paper. However, this requirement has the effect of limiting GIC growth, because every company has only a limited amount of funds to use to set up these additional reserves.

6. *Contingency surplus*: A reasonable amount of contingency surplus is needed to protect an insurance company against plausible but unlikely variations in experience. On the other hand, many companies are severely limited in how much surplus they have to support a GIC (or any other) product line. Furthermore, the surplus requirements of a product affect its pricing because of the need to achieve a return on surplus. Thus, what level of contingency surplus should be held to support GICs is a very important judgment for the GIC actuary. It is also a very difficult judgment, however, because of the cash-flow mismatch risk—the same reason the GAAP reserving judgment is so difficult.

7. *Pricing*: The issue here is to find the right balance between competitiveness and soundness. This issue seems especially sensitive nowadays when more and more insurance companies are entering the GIC business.

VI. WHAT AN INSURANCE COMPANY ACTUARY CAN DO TO SOLVE THE PROBLEMS

Perhaps no other insurance company product requires to the same degree that the actuary have both a strong theoretical foundation (immunization, etc.) and good practical business sense. In other words, GIC product management is as much an art as it is a science.

This section deals with the same topics as section V, that is,

A. Financial risks,
B. Cash-flow antiselection,
C. Expense recovery,
D. Customer relations, and
E. Product management.

A. *Financial Risks*

As stated in section V, there are six financial risks—associated with initial

investment, short-term investment, reinvestment, market value, default, and prepayment.

1. There are two ways to protect against the *initial investment risk*—a short proposal period and a risk margin to cover its expected cost. The risk margin would be assessed by offering a lower guaranteed interest rate. The shorter the proposal period, the less time there is for interest rates to decline; thus, less risk margin is necessary. More risk margin is needed if the deposit account includes future deposits.

   Even a proposal period of a few days is not adequate to reduce the expected cost of the initial investment risk to a negligible number. Interest rates can still move 0.50 percent or more during that time, and when they do, the risk becomes more and more one-sided against the insurance company.

   It might seem that the initial investment risk can be controlled by buying investments before quoting GICs. In that way, the insurance company would be assured of having supporting investments at the appropriate rate whenever a sale is made. The problem with this occurs when interest rates increase after the investments are bought. In that event, the GIC marketplace will not accept the "stale" rate associated with the precommitted investments and the insurance company will be stuck with the market-value loss (due to increased interest rates) on the investments. Thus, precommitting investments to support GICs does not control the initial investment risk. It just reverses the situation when the risk results in loss to the insurance company (i.e., increasing rather than decreasing interest rates).

2. There are also two ways to protect against the *short-term risk*: minimize the amount of short-term investing and factor any losses from investing short-term (instead of long-term) into the GIC pricing. The amount of short-term investing can be minimized by making the date for the initial deposit of the new GIC coincide as closely as possible with the date the borrower(s) of the new GIC funds is (are) ready to receive the money. Losses from short-term (instead of long-term) investing can be factored into the GIC pricing by reducing the guaranteed yield offered in the marketplace. The amount of yield reduction, of course, depends on the duration of the GIC contract. The longer the duration over which to spread the cost, the less reduction is required.

3. The best way to protect against the *reinvestment risk* is to minimize the amount of reinvesting that is necessary through cash-flow matching. In other words, for any single GIC or closed group of GICs, if all the

revenue from the supporting investments becomes available at exactly the same time that payments to GIC contract holders are due, no reinvesting is necessary and there is no reinvestment risk. In practice, however, perfect cash-flow matching is rarely possible. (This is because investments repay in installments of principal and interest, which may or may not be level, while most GICs are bullets and/or allow unscheduled withdrawals for plan benefit payments. Also, the cash-flow from investments and from contracts can be uncertain because of call, asset default, withdrawals from the contracts for benefit payments, etc.) Therefore, some cash-flow from the investments will invariably become available to the insurance company before GIC contractual payments are due. To the extent this happens, the insurance company is exposed to reinvestment risk, "winning" if interest rates have increased since the original sale date and "losing" in the opposite situation.

4. The *market-value risk* is best thought of as the inverse of the reinvestment risk. Thus, it too can be completely controlled by perfect cash-flow matching. In practice, however, some GIC contractual payments will become due that will not be covered by current investment cash-flow (from interest and principal repayments). To the extent this happens, the insurance company is exposed to market-value risk, "winning" if interest rates have decreased since the original sale date(s) and "losing" in the opposite situation.

Note that the reinvestment and market-value risks offset each other and thus can be considered as combined into a single *cash-flow mismatch risk*. This risk occurs whenever a dollar of investment income or principal repayment is received at a different time from that when a dollar of contractual payment is due. It results in a gain when there is positive cash-flow and interest rates are high (relative to where they were at the point of sale). It also results in a gain when there is negative cash-flow and interest rates are low. It results in loss in the opposite situations.

The term "immunization" is often used to describe the condition of an asset/liability portfolio which is protected from the cash-flow mismatch risk. To the extent the cash-flow mismatch risk of an asset/liability portfolio is controlled, that portfolio's investment return is "immunized" against reinvestment or market value losses. Perfect immunization can only be achieved via perfect cash-flow matching, which rarely happens in the real world. A considerable amount of immunization, however, can be achieved even when the cash flows of the assets and liabilities are poorly matched. How this is accomplished is outside the scope of this paper; however, there are many good articles on immunization in actu-

arial and other literature.

   To the extent perfect cash-flow matching or immunization cannot be achieved, the GIC actuary should insist on higher reserves and higher contingency surplus (see subsections E.4-6, below). In turn, higher reserve and surplus requirements result in higher pricing margins (see subsection E.7, below).

5. The *asset default* risk is addressed in three ways—by means of investment selection, risk margin, and contingency surplus. The higher the quality of investments selected, of course, the less is the risk margin needed to cover the expected cost. (But higher-quality investments generally have lower yields to start with; therefore, there is no simple rule of thumb for determining what quality of investments to buy.) Thus, the GIC actuary should study his company's and the insurance industry's asset default statistics for the investment quality used for the GIC asset portfolio. The asset default risk margin and contingency surplus provision, then, should reflect the default experience determined from his study.

6. The *prepayment (call) risk* is also addressed in three ways—through careful attention to the call provisions in the loans negotiated with borrowers of the GIC funds, a risk margin, and a contingency surplus provision. Again, the more call protection achieved in the loans, the less margin and contingency surplus is needed. Keep in mind that most loans negotiated by insurance companies allow the borrower to prepay any time if he uses internally generated funds (as opposed to borrowed funds). Furthermore, there is very little available in the way of reliable data on calls because the last quarter century has seen few periods of declining interest rates; and, therefore, relatively few calls have occurred. Thus, the actuary's decision on how much margin and contingency surplus to use for call requires a great deal of judgment.

   Before leaving the subjects of asset default and calls, some comment about mortgage-backed pass-through securities (e.g., GNMAs) is appropriate. A GNMA is a group of individual residential mortgages packaged together by the Government National Mortgage Association and offered to financial institutions with a guarantee against default of each individual mortgage. Many large GIC writers have recently been buying GNMAs and other mortgage-backed pass-through securities at a discount to offset losses from prepayments and to eliminate the asset default risk. (*Note:* When a prepayment occurs, the insurance company's realized yield increases as the result of a faster-than-scheduled accrual of the discount.) GNMAs and other mortgage-backed securities, however, have one serious disadvantage, and that results from each individual homeowner

tending to act in his own best interests; that is, he will tend to keep his mortgage when interests rates are high and prepay it when they are low. In aggregate, this results in a form of cash-flow antiselection against the insurance company. Thus, the GIC actuary should consider a higher risk margin and contingency surplus provision if his company uses significant quantities of GNMAs in its GIC investment portfolio.

In summary, we can say that all the financial risks can be addressed in three ways:

1. *Good product/investment management.* This can decrease the insurance company's exposure to any given financial risk, but it can never completely eliminate it.
2. *A risk margin to cover the expected cost.* The better the product/investment management is, of course, the less risk margin is needed.
3. *Contingency surplus* (see subsection E.6, below). Again, the better the product/investment management is, the less contingency surplus is needed.

B.   *Cash-Flow Antiselection*

A major challenge for the GIC actuary of the 1980s is to devise a set of GIC underwriting and contractual rules which satisfy two conflicting objectives:

1. Adequately protect the insurance company against cash-flow antiselection by the plan sponsor or plan participants (i.e., limit it through contractual restrictions and/or assess a risk charge to cover the expected cost of any contractually-permitted cash-flow antiselection), and
2. Still leave the plan sponsor enough flexibility to operate his plan.

If he errs too much on the side of objective 1, of course, his company will have little success in the marketplace. On the other hand, if he errs too much on the side of objective 2, he will be exposing his company to huge losses down the road. In the end, there is no way for the GIC actuary to avoid making some tough decisions on how tight the underwriting rules and contractual restrictions must be. The following guidelines, however, can aid him in making his decisions.

1. *Insist that the plan sponsor sign a deposit agreement in order to accept the GIC proposal.* The deposit agreement should obligate the plan sponsor to make deposit(s) to the GIC in return for the insurance company's agreeing to credit those funds the rate(s) specified in the accepted proposal. What funds the sponsor is promising to deposit (i.e., the deposit account) should be clearly spelled out in the deposit agreement. In addition, the actuary should seriously consider putting into the deposit

agreement a lump-sum penalty if interest rates increase and the plan sponsor fails to make the promised deposits. The penalty should be based on (1) how much interest rates increased between the date the deposit agreement was signed and the date the promised deposits were due and (2) how long the promised deposits were to remain in the GIC.

The deposit agreement should be a standard form drafted by the insurance company's lawyers. It should also have a "legal review" clause; that is, the plan sponsor may cancel the deposit agreement within *x* days after signing it if his attorney reviews it and finds an unresolvable problem *not related to the interest rate*. Such a clause generally makes the sponsor comfortable in signing an insurance-company-drafted deposit agreement but in practice rarely has to be invoked by the sponsor.

2. *Make sure the client understands the contract at the outset, particularly as to when withdrawals are permitted and when they are not.* Often, plan sponsors feel compelled to exercise cash-flow antiselection when they discover later that the GIC contract conflicts with the plan's provisions. If this occurs, the insurance company is in a "no-win" situation; that is, it can correct the antiselection and get the customer angry or do nothing and suffer potentially large losses. (The desirability of the client's understanding the contract was also pointed out in section IV.)

3. *Make clear at the outset that the insurance company will not later renegotiate the interest rate or withdrawal provisions of the contract later for any reason.* Note that this makes guideline 2 above all the more critical. Often the plan sponsor will express a concern about being "locked in," "looking foolish if interest rates rise later," "meeting unanticipated cash-flow needs of the plan," or the like. The best response is something like the following: "If liquidity's a problem or you're concerned about being locked into today's interest rate, don't buy a GIC now. We cannot afford to increase the interest rate later if experience is favorable for us, because you surely won't let us reduce it if experience goes the other way. Nor can we afford to allow more withdrawals than we anticipated at the point of sale, because that will invariably result in cash-flow antiselection. However, if you can demonstrate a true cash-flow emergency, and liquidity is not a problem for us at the time, we will make GIC funds available to you early on a fair market-value basis as determined by us."

This response should be sufficient to satisfy the only legitimate need of the plan sponsor for renegotiation, that is, fair liquidation in case of emergency if the insurance company has the cash. The "fair liquidation value" might be determined as the discounted value at the point of liquidation of

the remaining payments scheduled under the contract. The interest rate used for the discounting might be whatever rate the insurance company could then achieve on newly invested funds. Note that the market value of the contract calculated as a result of this process will not normally be the same as the market value of the assets the insurance company bought to support the GIC.

Items 4–10 below apply only if the GIC contract is funding a defined contribution plan, that is, an employee savings or thrift plan. (Recall from section II that GICs written to fund such plans generally permit withdrawals requested by individual plan participants according to the terms of the plan.)

4. *Savings plan participants have three kinds of needs for access at book value to GIC funds. Competitive pressures are likely to dictate that the GIC must satisfy these needs.*
   (a) *Termination of employment*: Death, retirement (normal, late, or early), disability, or separation from service (voluntary or involuntary).
   (b) *Transfer to equity fund*: Employer stock and/or a pooled fund.
   (c) *In-service withdrawal*: A withdrawal while still employed for either an emergency (e.g., new house, college education for children, unusual medical expense) or nonemergency (e.g., reinvestment outside the plan, purchase of a luxury item such as a new rug). (*Note*: Most but not all plans provide for a substantial penalty for nonemergency withdrawals. A typical penalty is forfeiture for six months of the right to contribute new money to the plan and receive matching employer contributions. Those plans which allow nonemergency withdrawals without penalty are riskier for the insurance company to underwrite.)

Legitimate as these needs are, they will nonetheless result in cash-flow antiselection against the insurance company. Thus, the GIC actuary should assess a risk charge to cover the resulting expected cost. The level of the risk charge depends on three factors: the provisions of the plan being underwritten, data (from company or industry sources) showing how sensitive GIC withdrawals are to prevailing interest rates, and the GIC actuary's judgment concerning how much interest rate volatility to price for.

5. *The GIC actuary should be very reluctant to allow withdrawals from the GIC for any reason other than one of the three described above.* The most common reason insurance companies refuse to allow withdrawals from GICs is the "competing fixed-income funds" rule. (Different companies have different definitions of "competing fixed-income funds." Most consider other GIC-type funds and short-term funds "competing." Some extend the definition to include "balanced" funds, market-value

bond funds, or any fund containing fixed-income investments.) A common form of this rule is as follows:

1. No new deposits may be directed to a "competing fixed-income fund."
2. No direct transfers may be made from the GIC to a "competing fixed-income fund."
3. If an employee transfers his funds from the GIC to an equity fund, he must wait at least six months before retransferring to a "competing fixed-income fund" (the purpose of this is to discourage circumventing item 2).

Most plan sponsors nowadays recognize that insurance companies need to protect themselves against "competing" funds. A few, however—particularly the larger ones with more bargaining power—are reluctant to amend their plan or to give up any flexibility for their participants and thus will not accept "competing fund" restrictions. It is generally best not to issue GICs to these clients, but it is occasionally possible, with very careful underwriting, to work out an acceptable compromise.

In addition to being aware of competing funds, the GIC actuary should be cautious about allowing book-value withdrawals from the GIC upon "plan termination" and/or "sale of the business." (See section V for a description of how these events can result in antiselection.) In the case of plan termination, there is generally no need for participants to get their money back before the GIC matures. The same is true if the employer's business is sold to, or absorbed by, another company that continues to employ the participants. In either case, the employees need their money back only when they end up out of a job (i.e., not hired or rehired by the successor employer). In other words, the GIC should say something like "in the event of plan termination, merger, sale, acquisition, etc., contract funds are payable at book value prior to maturity only to those employees who completely lose their jobs." (This wording may present problems to a plan sponsor whose plan already indicates that employee accounts are payable in full at book value after either or both of these events. In that situation, careful judgment and/or an extra risk charge is necessary.)

6. *When the GIC contains some but not all of the funds under the plan's "guaranteed interest rate" option, it should pay its appropriate share of participant withdrawals—no more, no less.* The GIC actuary should establish an "appropriate share" formula as part of the contract even if the GIC contains 100 percent of the "guaranteed interest rate" option's assets at the point of sale (e.g., the plan is brand new), because the plan sponsor may select another funding vehicle for new contributions some

time before the GIC matures. The two kinds of formulas most commonly used are the following:

1. *"Last in, first out" (LIFO)*: A LIFO formula makes the newest deposit account responsible for all withdrawals. In practice, a LIFO formula is usually administered by having the plan sponsor deduct withdrawals from current deposits.

2. *"Pro Rata"*: Under a pro rata approach, if a GIC contains X percent of the fixed investment option's assets and W of participant withdrawals are requested, the GIC pays $WX/100$.

When the initial GIC deposit account is established, the GIC actuary can allow the plan sponsor to choose any reasonable formula, as long as he sticks to the formula selected and follows it exactly; otherwise the plan sponsor could exercise cash-flow antiselection.

7. *Review and understand the plan before issuing the GIC.* Before issuing a GIC which allows participant withdrawals according to the terms of the plan, the insurance company underwriter should first review and understand the plan—particularly its withdrawal provisions. The purpose of the plan review is to determine to what extent the plan's provisions comply with the insurance company's underwriting rules. If the plan review uncovers any underwriting problems, the GIC actuary has four choices:

1. Underwrite the plan, anyway, without an extra risk charge.
2. Impose an extra risk charge (i.e., yield deduction).
3. Insist that the plan be amended as a condition of the sale. (This is apt to meet with strong resistance from the plan sponsor.)
4. Impose contractual restrictions. (It is a good idea, even when the plan review uncovers no problems at all, to include a clause in the contract that the "contract takes precedence if it ever conflicts with a plan provision.")

8. *Protect against plan changes after the GIC is issued.* The GIC should contain a provision along the following lines: "The insurance company is agreeing to underwrite the plan only as it exists at the point of sale. If the plan is subsequently amended to affect the cash flow to the GIC's deposit account or the benefit obligations during the lifetime of the GIC, the insurance company reserves the right to reject the effect of the change."

Experience shows that plan sponsors often resent this contractual provision. Sound GIC underwriting, however, may preclude any compromise. The GIC actuary should reinforce in the plan sponsor's mind the reasons that such a provision is necessary.

9. *Insist on the right of audit.* Another essential GIC provision is that "the insurance company has the right to request reasonable proof that book value withdrawals requested to comply with plan provisions are indeed

for that purpose and are in amounts consistent with the terms of this contract.'' In other words, the insurance company has the right to verify that its ''competing funds,'' ''appropriate share,'' and other underwriting rules are indeed being complied with. In practice, the mere existence of this provision makes it unnecessary to invoke it in most cases. The GIC actuary should use this provision to check carefully, however, if unusually large withdrawals (e.g., more than 10 percent of the fund in any year) are requested.

The main reason this provision is necessary is to protect against misunderstandings rather than against outright dishonesty. GIC contracts are so complicated that not all plan administrators will understand all the withdrawal provisions—especially the restrictive ones. Thus, a defined contribution plan sponsor (or his successor who was not around when the GIC was purchased) could unknowingly request more than the GIC permits. Alternatively, he could find himself caught in a bind between his plan (which allows participant withdrawals at book value in a certain situation) and the GIC (which does not). If such a situation occurs (despite the GIC actuary's best efforts) the plan sponsor, reinforced by ERISA, may request the withdrawals anyway and indicate that the contract permits them. (ERISA requires that the plan sponsor act for the exclusive benefit of plan participants. Some sponsors see this obligation as more important than their contractual obligation to the insurance company.)

10. *Watch out for IRAs (Individual Retirement Accounts)*. With the flood of interest in IRAs since the passage of the Economic Recovery Tax Act of 1981, it is probably worth advising the reader to be careful about selling GICs for IRAs. The main problem IRAs present for GICs is the ''rollover'' feature. This feature allows participants in an employer-sponsored IRA plan to withdraw their funds and reinvest them outside the plan at any time *without paying any tax*. (In contrast, in-service withdrawals under qualified defined contribution plans are fully taxable if the funds withdrawn have not previously been taxed.) As a result, IRA participants have no discouragement from withdrawing money from GICs for reinvestment elsewhere whenever prevailing interest rates exceed the GIC rate. Alternatively, if interest rates fall after the GIC is issued, participants can increase deposits to the GIC by transferring funds (tax free) from other investment vehicles.

If the GIC actuary elects to underwrite IRAs, he should consider measures such as the following to protect his company:

1. Allowing deposits or transfers to the GIC only during a very limited period (e.g., one month),

2. Requiring a "market-value adjustment" on withdrawals,
3. Writing only short-duration GICs so the rate never gets too stale,
4. Insisting on strong employer interest and involvement (to encourage high employee participation), and
5. Imposing a risk charge for the extra risk.

Even with careful underwriting, GICs for IRAs may not be cost justified. Careful underwriting and the necessary follow-up administration entail high fixed costs. The asset base over which to spread these costs, however, will be very small for most employee groups, because participation is apt to be low (perhaps 10 percent or less) and the average contribution per participating employee will also be small (because of the $2,000 tax-deductible limit).

C. *Expense Recovery*

The actuary's goal for GIC expense recovery is to establish an expense formula that will be adequate to recover GIC expenses for the duration of the contract. In other words,

$$\left(\begin{array}{c} \text{Present value} \\ \text{of expense charges} \end{array} \right) \geq \left(\begin{array}{c} \text{Present value} \\ \text{of expenses} \end{array} \right)$$

In pursuing this goal there are several things he should consider.
1. Many GIC expenses are independent of contract size (e.g., marketing, initial setup, ongoing administration). Therefore, at least part of the GIC expense formula should be independent of size (i.e., a single or annual flat charge), otherwise, the expense formula will encourage the sale of cases too small to permit adequate expense recovery through asset charges. Of course, the flat portion of the expense formula can always be converted to a reduction from the guaranteed interest rate if the client prefers.
2. In projecting how much revenue will be realized from asset charges, it is necessary to consider the actual repayment schedule under the contract. For instance, to produce a given amount of revenue, a contract that repays in installments will require a larger asset charge than a bullet contract with the same initial deposit.
3. When the GIC is funding an employee savings plan, special care must be taken in projecting how much revenue will be realized from asset charges. Any projections must consider contractually permitted withdrawals, which reduce assets and thereby reduce asset charges. Also, deposit levels are uncertain—especially if the plan is brand new.
4. Projecting the level of federal income taxes that will be allocated to the

GIC line of business requires great care. First, the GIC actuary must project the level of future federal income taxes that his company will pay in the future. This can be tricky for the following reasons:

a) The applicable tax law can easily change in the future in ways difficult to predict. For instance, if the Stark-Moore tax bill passes in 1984 retroactive to January 1, 1984, the life insurance industry will have three different tax laws (the 1959 act, Stopgap, and Stark-Moore) for the three-year period 1982–84.

b) A given tax law can affect different companies (e.g., stock as opposed to mutual) in different ways.

Second, he must understand how his company allocates federal income taxes among its lines of business and thus what share of the total tax will be charged to the GIC line. (The "one phase" approach of the Stark-Moore bill would seem to make tax allocation easier, but the fact remains that companies allocate taxes in different ways.)

Because of the innate inexactness of federal income tax projections, the GIC actuary should be cautious about building into his GIC pricing assumptions tax advantages that may turn out to be temporary. One example is the assumed rate of return on deep discount public bonds. Actuaries who built an 18 percent tax advantage (i.e., 28 percent capital gains rate versus 46 percent corporate rate) for these bonds into their GIC pricing may find that the advantage is only 6½ percent (i.e., 28 percent versus 34½ percent) if Stark-Moore passes.

5. The GIC line of business should bear its fair share of overhead (e.g., corporate officers' salaries, personnel department, auditors, mail room, cafeteria). The insurance laws of most states (including New York) prohibit expense allocation on a "marginal cost" basis if the result is increased expenses allocated to other lines.

6. All in all, it makes sense to be conservative in projecting future ex, enses. No one can predict future levels of inflation; thus, future operating costs are unpredictable. Also, the insurance company should expect to make a profit from its GIC expense formula commensurate with the risk of guaranteeing expense charges.

D. *Customer Relations*

The best way to avoid future customer relations problems is to make sure that the customer fully understands what he is buying before the contract is consummated. In other words, many of the points covered in earlier sections of this paper also apply to this section.

1. *Written deposit agreement*: This document also protects the customer by defining what funds of his will get what rate.
2. *Advantages/disadvantages of a GIC*: The company's GIC salespeople should explain the relative advantages of GICs versus IPGs to any potential GIC customer.
3. *Contract review*: Obviously, misunderstandings do not foster good customer relations.
4. *Plan review*: Issuing a GIC that conflicts with one or more plan provisions is only asking for customer relations problems.
5. *Making clear at the start that there will be no renegotiations later*: Otherwise, there may be customer relations problems later.

Another point to consider is the "commonality of interest" principle. This principle, which is adhered to by consulting actuaries, holds that it is in the common interest of the plan sponsor and the insurance company that the plan present few underwriting problems. In that way, the plan sponsor can attract several competing insurance company GIC bids and thereby increase the likelihood of obtaining an attractive interest rate guarantee. Said another way, insurance companies might improve their relationships with their GIC customers in general if they view the two parties as having common rather than opposing interests.

E.   *Product Management*

As indicated in section V, the problems of GIC product management can be divided into seven parts—discrimination against other policyholders, marketing–investment coordination, asset-liability matching, GAAP reserving, statutory reserve requirements, contingency surplus, and pricing. Thus, this section will be divided into these same seven parts.

1. *Discrimination against other policyholders*: To solve this problem, the GIC actuary must separate GIC experience (i.e., assets, liabilities, and gains or losses) from that of other product lines. This involves a statement of investment policy, an investment allocation process, and segregated GIC accounting.

    The statement of investment policy describes the types of investments (e.g., private placements, public bonds, GNMAs) that will be purchased with GIC assets and the characteristics (e.g., quality, duration, repayment schedule, call protection) of each type. The description should be in sufficient detail to tell whether any single investment is suitable or not suitable for the GIC account. For instance, the private placements purchased might be restricted to A or better credits (as rated by Moody's), five to ten years duration, repayment in level annual installments over at least six years, and at least five years call protection. Other investment types would be described in the same degree of detail.

The investment allocation process describes how any single investment type deemed suitable for more than one account (e.g., the GIC account and the general asset account) is to be allocated among the eligible accounts on a nondiscriminatory basis. The description should be in sufficient detail to allow a given investment to be allocated pro rata among the accounts that had previously forecasted a need for investments of that type. Suppose, for instance, that two accounts, the GIC account and the general asset account, each forecast the need in any given time period for the type of private placement described above in amounts of $20 million and $10 million respectively. Suppose further that ten investments of that type totaling $27 million are purchased during that period. Then two-thirds (i.e., 20/30) of each individual investment (regardless of yield) is allocated to the GIC account, totaling $18 million, and one-third to the general asset account, totaling $9 million. Thus, of the $27 million of investments purchased, the GIC account gets $2 million less and the general asset account $1 million less than requested, and neither account benefits at the expense of the other.

Both the statement of investment policy and the investment allocation process require the approval of the New York State Insurance Department if the company wants to market GICs in New York.

Segregated GIC accounting is the process of (1) establishing and maintaining a special account just for GIC assets (i.e., assets, or pro rata portions of assets, allocated to GICs) and GIC liabilities (i.e., cash-flow due under GIC contracts); and (2) determining the gains or losses of the GIC account without regard to the experience of other accounts (e.g., the general asset account), and vice versa.

In establishing the special GIC account, the GIC actuary has two choices—to use part of the general asset account or to use a separate account. Whichever he chooses, he should satisfy himself and his company's law department that the actual operation of the GIC account will be in accord with state insurance laws prohibiting unfair discrimination. He should also ask the law department if any special regulatory approvals are needed. For instance, if the separate account option is selected, it may be necessary to obtain special approval from the company's state of domicile to issue guarantees through a separate account.

In summary, solving the "discrimination" problem requires a lot of careful thought (including legal research) followed by extensive documentation. In addition, some special regulatory approvals may be needed.

2. *Marketing-investment coordination*: As indicated in previous sections, close marketing-investment coordination is necessary to successfully

manage a GIC product line. Three individuals (or areas of responsibility) must be involved in this coordination—the investment manager, the GIC actuary, and the marketing manager. Thus it is essential that they work effectively together. All three should understand each other's responsibilities, which might be as follows:

1. Investment manager
   a) Quotes target investment rates and capacities based on the universe of investments meeting the investment policy;
   b) Buys securities to cover contract sales at, or as close as possible to, the target rate quoted;
   c) Keeps informed about investment market conditions to be able to readily establish new capacity when needed; and
   d) Establishes and executes strategies for carrying out the investment policy.
2. GIC actuary
   a) Formulates profit objectives;
   b) Sets profit margins to achieve profit objectives;
   c) Determines underwriting rules and contractual restrictions; and
   d) Establishes the investment policy for the GIC account.
3. Marketing manager
   a) Sets sales objectives (ideally these are tied to investment market conditions and changes in margins required by the GIC actuary); and
   b) Promotes sales.

Company management should continually monitor the effectiveness of the marketing-investment coordination. However crucial good marketing-investment coordination is to a typical insurance company product, it is much more crucial to the GIC product line!

3. *Asset-liability matching*: In previous sections of this paper, we concluded that perfect cash-flow matching of GIC assets and liabilities is the ideal (risk-free) but unachievable situation. Thus, this section describes some methods the GIC actuary can employ to keep down the amount of mismatch (and, as a result, keep down the amount of reserves, surplus, and pricing margins needed for mismatch).

  Immunization technique: There are several different ways to measure how well a portfolio is immunized, and this paper will not go into them. The point to be made here, however, is that the GIC actuary should select *some* immunization technique so he can quantify in simple terms the matching results he expects and deviations therefrom. Without a yardstick (e.g., Macauley duration, average life differential), it is impossible to measure results.

  Staying on top of developments: Being able to quantify matching results

in simple terms accomplishes little unless the GIC actuary stays on top of the most recent GIC developments (such as new business sold, new investments purchased, and current interest rate levels). This is another argument for good marketing-investment coordination.

Matching new sales with new assets: The simplest way of controlling mismatch is to make sure that new contracts being sold are close in duration to that of the new assets being bought, and vice versa. This is not possible, of course, without good marketing-investment coordination.

Rebalancing: "Rebalancing" means lengthening or shortening existing assets and/or liabilities to improve the overall match. For example, marketable long-duration assets such as GNMAs can be sold and replaced by shorter-duration assets such as seasoned public bonds. Another example of rebalancing is renegotiating the repayment schedules of existing contracts. (This, of course, requires contract holder consent.) *Caution*: The best time for rebalancing is when the then prevailing interest rates are the same or close to the same as they were when the mismatch being corrected occurred. In that event, the financial impact will be minimal— similar to selling bonds at par. Otherwise, the financial impact will be substantial (how substantial depends on the interest rate disparity).

Steering: "Steering" means managing the relationship between the duration of new assets and contracts to improve the overall match. For example, if the current asset/liability book has assets too long, the GIC actuary might elect to encourage the sale of new business with durations longer than those of new assets being bought. Steering can also be accomplished via the pricing of new business; that is, a new contract which helps/hurts the overall match would be priced at less/more than the margins normally appropriate.

4. *GAAP reserves*: As indicated earlier in this paper, the major GAAP reserving issue for the GIC actuary is the cash-flow mismatch risk. Other aspects of reserving for GICs (e.g., asset default) can be handled by traditional reserving methods, so they are outside the scope of this paper.

   The most straightforward way of determining how much GAAP reserve is needed to protect against possible GIC losses due to fluctuations in future interest rates is discussed in J. A. Tilley's article (*RSA* VII, No. 4 [1982] *discussion note, 1368–77*) entitled "Preliminary C-3 Risk Calculation." This paper, which is part of the Report of the Society of Actuaries Task Force on C-3 Risk, can be thought of as required reading for the GIC actuary.

   The above-mentioned paper recommends determining how much GIC reserves are needed by projecting future experience along several plau-

sible interest rate paths. The level of GAAP reserve needed, then, is the minimum level needed to mature the liabilities along the "worst" path. (The "worst" path is that which produces the most unfavorable results for the insurance company.) The paper also shows how the C-3 Task Force went about setting up three "sample companies," selecting assumptions, and performing the calculations. Finally, it presents the results of the calculations and offers some conclusions based on the results.

The following are some of the conclusions of the task force discussed in the paper:

1. If GIC assets are longer than GIC liabilities, "up" interest rate paths are "bad" and "down" paths are "good." The reverse is true if assets are shorter than liabilities.
2. Higher pricing margins mean lower reserve requirements (and vice versa), but margins of 1.00 percent or more may not mitigate the need to hold reserves considerably in excess of 100 percent of GIC funds. For example, the "sample company" offering GICs allowing voluntary withdrawals at book value and backing them with fifteen-year private placements needs reserves of about 110 percent of GIC funds.
3. Interest rate paths "good" for one product may be "bad" for another. Thus, it may be possible to reduce GAAP reserve requirements via "risk offset" with two different GIC products or a GIC and another product.
4. For a single GIC product whose assets and liabilities are not particularly well matched, minimum GIC statutory reserve requirements (per the 1980 dynamic valuation law) may not be adequate. For a multiple GIC product company that matches assets and liabilities, however, minimum GIC statutory reserve requirements are adequate.

Other thoughts about GAAP reserving for the GIC actuary to consider are the following:

1. Whenever the mismatch risk results in a gain to the insurance company, the GIC actuary should consider reserving some or all of the gain for potential future mismatch losses.
2. In general, the reserve needed for mismatch depends on the level of current interest rates and the amount of mismatch that the current portfolio can be expected to experience in the future.
3. Sound management of a GIC line of business requires adequate reserves, surplus, and pricing. In other words, reserves and surplus provisions are not designed to protect against pricing known to be inadequate.
4. The GIC actuary should test whatever mismatch reserve formula he comes up with to assure that it produces as smooth a progression of GAAP earnings as possible. Wide fluctuations in year-to-year earnings results are not desirable.
5. Once he selects his reserve formula, the GIC actuary should monitor it closely and consider changing it in light of emerging experience.

5. *Statutory reserves*: Section V.E.5 indicates that the level of statutory

reserves required by the dynamic valuation law has the effect of limiting GIC growth. This makes sense, of course, because unrestricted growth of a risky business like the GIC business is inappropriate. Nonetheless, the GIC actuary does not want to have his company's GIC growth constrained more than necessary. To this end, he has two options—application of the aggregate principle and development of an actuarial opinion. (*Note*: New York State is singled out in this section because it has the strictest reserving requirements, and most of the leading GIC writers are subject to New York's requirements.)

a) The Aggregate Principle

This principle is that the reserve held for each line of business of a life insurance company should be "good and sufficient" to discharge its expected future obligations according to the company's chief actuary. The reserves held for one line of business, however, can be less than state minimum valuation standards for that line as long as total reserves for all lines meet the minimum valuation standards in aggregate. New York permits this principle to be applied to the GIC line of business; that is,

$$\begin{pmatrix} \text{Good and} \\ \text{sufficient} \\ \text{GIC} \\ \text{reserve} \end{pmatrix} + \begin{pmatrix} \text{Good and} \\ \text{sufficient} \\ \text{reserves} \\ \text{for other} \\ \text{lines} \end{pmatrix} \geq \begin{pmatrix} \text{Minimum} \\ \text{statutory} \\ \text{requirement} \\ \text{for GICs} \end{pmatrix} + \begin{pmatrix} \text{Minimum} \\ \text{statutory} \\ \text{requirement} \\ \text{for other} \\ \text{lines} \end{pmatrix}$$

or

$$\begin{pmatrix} \text{Good and} \\ \text{sufficient} \\ \text{GIC reserve} \end{pmatrix} + \begin{pmatrix} \text{Reserve} \\ \text{redundancies} \\ \text{in other} \\ \text{lines} \end{pmatrix} \geq \begin{pmatrix} \text{Minimum} \\ \text{statutory} \\ \text{requirement} \\ \text{for GICs} \end{pmatrix}$$

In other words, redundancies in reserves for other lines of business can be used to fund the minimum statutory reserve requirement for GICs as long as actual reserves held for GICs are adequate on a "good and sufficient" basis. (If redundancies in other lines are not available, however, there is no choice but to use surplus funds to set up the statutory reserves. In that event, the GIC actuary should provide for an appropriate return on those funds in the GIC pricing, subsection 7, below.)

b) Actuarial opinion

As a result of discussions with the Society of Actuaries and the ad hoc industry committee (consisting of actuaries representing the largest GIC writers), New York now prescribes a lower set of valuation factors (which

results in lower minimum reserves) for GIC companies providing an actuarial opinion. The opinion, to be signed by the company's chief actuary, should certify that (1) the company matches assets and liabilities and has adequate contingency reserves for its GIC business; and (2) GIC reserves resulting from the lower set of valuation factors are adequate on a "good and sufficient" basis.

Accompanying the opinion should be a supporting memorandum demonstrating item 2 above on the basis of several different interest rate paths. The methodology for the demonstration should be similar to that used by the Society of Actuaries Task Force on C-3 Risk. What assumptions to use and other details of the calculations (such as what and how many interest rate paths to use) are not specified by New York; however, on June 24, 1983, New York released a letter to all New York licensed companies asking for input on this matter. Thus, the details of the actuarial opinion are still being firmed up as of this writing (January 1984). More details will undoubtedly emerge in connection with the submissions of actuarial opinions for year-end 1983 and future years.

Note that the work required to develop this actuarial opinion is closely related to that required to determine how much GAAP reserve is required for GICs. Thus, even if the GIC actuary's company is not required to develop the actuarial opinion, it still makes sense to do the necessary work.

6. *Contingency surplus*: As mentioned in V. E.6, contingency surplus is needed to provide protection (in addition to that provided by reserves) against losses that are very unlikely but still plausible. A good article on the subject of contingency reserving for GICs is D. D. Cody's "Contingency Surplus for C-3 Risk of Change in Interest Environment" (*RSA* VII, No. 4 [1981], discussion note, 1378–91). This article is also a part of the Report of the Society of Actuaries Task Force on C-3 Risk.

Contingency surplus requirements for mismatch can be determined using the same methodology previously discussed for determining GAAP reserve requirements for mismatch, except that an "unlikely" rather than a "likely" set of interest rate paths would be selected. Then the contingency surplus needed for mismatch would be the excess of assets needed (to mature the liabilities along the "worst unlikely" path) over the reserve (The above-mentioned Cody article recommends this methodology.)

An alternative approach is to select a "confidence level" and a probability distribution for future interest rate changes. The confidence level

represents the degree of assurance (e.g., 0.999, 0.9999) the GIC actuary wants to have that all losses will be covered. The probability distribution would form the basis of a stochastic projection of future earnings. The contingency surplus needed, then, would be $k\sigma$, where

σ = standard deviation of earnings developed from the stochastic projection, and

k = number of standard deviations associated with the confidence level selected.

Whatever method the GIC actuary selects, he should also keep the following points in mind.

1. Any method still requires a great deal of judgment. For instance, what constitutes an "unlikely" path? Or what probability distribution will future interest rates follow?

2. Mismatch is not the only risk requiring a contingency surplus allocation. Other risks that need to be considered include asset default and call (especially if the GIC asset portfolio includes GNMAs). Contingency reserving for these risks, however, will not be discussed in this paper, as they can be handled by traditional reserving methods.

3. In calculating contingency surplus requirements, it is appropriate to include an offset for earnings expected during the projection period.

4. Product design affects contingency surplus requirements. In particular, contingency surplus requirements are very high for GICs allowing participant withdrawals at book value, especially if such contracts are backed by long assets.

5. Because of risk offset and/or risks correlated with each other, the total contingency surplus for GICs may be less than the sum of its parts. In like manner, the total contingency surplus needed for the company may be less than the sum of what is needed for each product line.

6. GICs are only a recent product phenomenon and, accordingly, the actuarial community (or the GIC actuary's company alone) may still have a few things to learn about the financial and underwriting risks of GICs. Accordingly, it might make sense to be a little conservative in setting contingency surplus requirements for GICs.

7. *Pricing*: This section appears last in this paper because GIC pricing requires an understanding of financial risks, cash-flow antiselection risks, expense recovery (including taxes), reserving, and surplus requirements.

The following can be thought of as a GIC pricing formula for new business:

$$M = E(r,e) + S(R - I),$$

where

M = GIC profit margin = excess of the interest rate available on newly invested assets over the interest rate (net of all expenses) offered to GIC buyer;

$E(r,e)$ = expected cost of GIC risks and expenses (including taxes);

S = surplus needed to support the GIC product line (this includes contingency surplus as well as the amount of surplus funds, if any, required to meet statutory reserve requirements; see subsection 5, above);

R = after-tax return on surplus objective set by management for product lines in the GIC actuary's company; and

I = after-tax return available on surplus funds invested in the company's surplus account (thus, the GIC product line should earn a total return of R consisting of I from surplus invested in the surplus account and $(R - I)$ from product pricing).

For example, suppose the company has a 15 percent (after tax) return-on-surplus objective, a 6 percent (after tax) return is available from the surplus account, and the GIC product line has surplus requirements equal to 5 percent of liabilities. Then, the $S(R - I)$ term of the above formula is 0.45 percent. Note that this term, $S(R - I)$, provides for the risk that the actual cost of GIC risks and expenses (including taxes) will exceed the expected cost, as well as for a return to shareholders (or policy-holders).

In terms of this formula, the GIC actuary should ask two questions.

1. Is $E(r,e)$ adequate? In other words, have all the risks (both financial risks and those to do with cash-flow antiselection) and expenses (including taxes) been thought of, and has adequate provision been made for their expected cost? As mentioned above, GIC is a recent enough product development that the GIC actuary may want to be conservative in assuming that he has thought of everything. Thus, he may want to assess a few extra basis points for "other."

2. Is $S(R - I)$ adequate? In other words, are shareholders (policyholders) being given an appropriate return on the surplus funds needed to support the GIC product line (including surplus, if any, needed to set up statutory reserves)? Presumably, the GIC product line competes for company surplus with other product lines that can produce a return of R. In that event, allowing GICs to use surplus for a return of less than R may not be appropriate.

Given how competitive the GIC market is nowadays, the GIC actuary may experience pressure in his company to use margins less than the M produced by the above formula. The best response to such pressure is to educate company management concerning the following:

1. The risks of GIC—both financial and pertaining to cash-flow antiselection;
2. How much margin is needed to cover the expected costs of GIC risks and expenses (including taxes);
3. How much surplus is needed to support the GIC product line; and
4. What return on surplus is provided by each of the pricing alternatives being contemplated by management.

(This education process is apt to take time, because each of the above subjects is fairly complicated by itself.)

Note that while offering GICs at a return less than R may not be appropriate, it may not necessarily be inappropriate. GICs may offer advantages to the company other than profits. For instance, GICs can be a "door opener" to other (possibly more profitable) business. Also, they can on occasion be a convenient means of developing liquidity for the company. Thus, the point here is that the GIC actuary should make sure that management fully understands and is comfortable with whatever returns are being derived from GIC pricing.

DISCUSSION OF PRECEDING PAPER

KENT L. MEYERS:

In addition to the points made by Mr. Stiefel, a plan sponsor should bear in mind that a GIC guarantee is only as good as the financial strength of the carrier providing it.

Events over the past year have begun to focus attention on how good a GIC guarantee really is. Major plan sponsors are now beginning dialogues with GIC carriers to understand the financial strength of the companies as a whole and their GIC business in particular. They are recognizing that in the final analysis that is where they must look for the security of their funds. Sound financial management should accept nothing less.

As plan sponsors begin their research, I would offer a few areas of suggested dialogue:

1. What is the carrier's understanding of GIC risks, including asset/liability mismatch, plan design (antiselection options granted at little or no cost), asset calls and defaults?
2. What is the nature of communication and cooperation between the investment and the pension areas? Close daily coordination is imperative to the immunization process.
3. What is the quality of the assets backing the GIC portfolio? What kind of default experience has the company had, and what level of diversification exists? Are GIC assets segregated from assets of other lines of business to facilitate asset/liability matching?
4. What is the level of understanding of immunization concepts and techniques? What is the level of immunization of the GIC portfolio?
5. What are the company's reserving policies for GICs? Do they take into account the actual degree of asset/liability mismatch?

I do not believe there are single, correct answers to these questions. However, the dialogue that comes from asking them should give a plan sponsor a good feel for the risks the GIC carrier is undertaking, its understanding of those risks, and its means for managing the risks. This should help greatly in assessing the security of the guarantee the sponsor is obtaining.

MICHAEL J. WELSH:

This paper was very informative and should act to increase awareness of the risks on GIC products. I'd like to add some comments.

In Section VI. A.6., the author states that "most loans negotiated by insurance companies allow the borrower to prepay any time if he uses internally generated funds." Because of the recent volatility in interest rates, lenders have been demanding more prepayment protection than the author

has implied. From the lenders' point of view, call means that the bond or loan cannot be repaid for any reason prior to the call date. Refund means that the bond or loan cannot be repaid prior to the refund date unless the borrower uses internally generated funds. Not all loans contain refund protection beyond the call date. The refund date (if it exists) is later than the call date. Hence, before the call date, the borrower may not prepay the loan at all. During the period between the call and refund dates, the borrower can only prepay with internally generated funds. After the refund date, the borrower can prepay by any means. Since repaying a loan from internally generated funds will be difficult for most companies, the refund date probably defines the earliest date a loan could be prepaid.

Throughout the paper there was no mention of the impact of the yield curve. Possibly this topic is beyond the scope of the paper. Since most GIC activity (contract sales and asset purchases) involves maturities in a steep segment of the yield curve, the yield curve plays an important role in pricing, mismatching and rebalancing. If not adequately accounted for, the yield curve could become an overlooked risk with a potentially significant impact on financial results.

DENNIS LAUZON:

Mr. Stiefel's paper is an excellent introduction to the guaranteed investment contract (GIC) product. I offer some additional thoughts on the management and pricing of the product.

Add data management and management reporting to Mr. Stiefel's list on the problems of GIC product management. The GIC product is a highly leveraged investment of company surplus. This leveraging increases the need for accurate and timely management information. Mismatch and cash-flow variance are complex risks, and one must be prepared to act quickly as circumstances change. Reports should identify changes in the value of cash-flow by the source of the change. Ultimately, explainable growth in product surplus is the best evidence that adequate provisions have been made for risks.

The paper suggests that "the best time for rebalancing is when the then prevailing interest rates are the same or close to the same as they were when the mismatch being corrected occurred." The reason given for this timing is minimal financial impact. However, not rebalancing could make bad results worse or good results disappear. The wisdom of risk exposure depends on the distribution of possible outcomes and one's utility. The actuary should quantify the risk of mismatch given an interest rate forecast. The actuary should provide, as is pointed out in the paper, larger surplus and pricing margins for larger mismatch.

Keep in mind that many GIC risks are borne and not spread. Because such risks have a large variance, results are often far from expected. Just one example is the risk of cash-flow variance from a large defined contribution GIC, where large is relative to the company's capacity to write business. When subject to the law of small numbers (Murphy's Law), more effort studying worse case scenarios is required.

The most important features of a transaction, whether an investment or a contract, are the amounts and timings of the cash-flows. As cash-flows, investments and contracts should be treated consistently. For example, a system which sets rates for contracts should, with minor modifications, be capable of setting rates for investments.

DALE A. RAYMAN:

I thank Mr. Stiefel for his well-written and thorough examination of the GIC contract. Our company has used his paper both in the pension product pricing area and the investment area for explaining the risks involved in writing these contracts.

As the author points out, the job of the GIC actuary is that of a coordinator or liaison between the marketing area and the investment area. He or she must design a product that is flexible enough to handle the plan provisions of the plan sponsor and make sure that when sold, the product is soundly backed by supporting assets.

The author wisely stresses the importance of the mismatch risk. In addition, the paper repeatedly stresses that the insurance company can be protected from each risk in two ways. It can charge for the risk with a risk margin or underwrite the risk carefully.

Risk margins are usually applied in the form of a reduction in the GIC guaranteed rate. The GIC marketplace is very competitive, however, and trying to apply risk margins for each of the various risks mentioned in the paper could easily price the company out of the market. Each company should seek to achieve a proper balance of underwriting certain risks and charging for others so that its rates are competitive in its primary markets.

From our experience it appears that a company will rarely get a chance at a sale unless its rates are in the first quartile of, say, the top thirty-five companies quoting, regardless of how attractive its contract provisions are. In cases sold directly or through general agents, though, the competition is much less intense.

Perhaps a third method of pricing the risk to protect the company is to ignore it. This is really a subset of the underwriting method. The actuary may decide, perhaps based on past experience, that certain risks are small enough or offsetting in various interest rate environments so that they can

be ignored. Careful judgement and extreme caution should be used in these cases even though competitive pressures may dictate a certain degree of bullishness. From our company's limited exposure in this market, however, it appears that some companies are adopting this approach too frequently.

On several occasions, I have talked to actuaries at other companies to find out why their rates are 20 basis points above the rest of the market. In many cases, it turns out that they have ignored certain risks that we consider substantial. An article in the *Wall Street Journal* on March 2, 1984, mentioned that one large insurance company had to add $300 million to reserves backing certain GIC contracts.

Any company that is new in the market can learn some very important lessons from actuaries at these larger companies who have been involved with GICs since the mid-1970s and through volatile interest rate periods. Several of these companies now forbid plan amendments without approval by the insurance company as is mentioned in the paper. Initial underwriting is not enough; it is necessary to protect against the risks involved for the duration of the contract.

Window contracts for new 401(k) plans also involve some special considerations. Plan sponsors will sign a deposit agreement but want a minimum of zero since the employees select the investment options and the sponsor is not sure if or how often the GIC option will be used. I have talked to several actuaries who have handled this in a variety of ways. Some companies retain a restrictive lower limit and require the sponsor to poll employees on use of the various options. This restriction makes it difficult to compete in many cases. Many companies (including ourselves) allow a minimum of zero but allow no competing options for the duration of the contract.

A few companies allow a minimum of zero and do not restrict other options or price for the risk. Some of these actuaries feel that their clients are honorable and will not enter into another contract during the window period. I question the strength of this trust when interest rates rise, say, 2 percent in the first few months of the window period. The motivation to forego deposits and enter into a higher yielding GIC is apparent.

With the recent growth in the 401(k) plan market, the realm of qualified plans has increased. It is important that the pricing actuary have a good idea of the provisions commonly found in the variety of plans (that is, pension, profit-sharing, savings, 401(k), stock ownership) and be able to notice uniqueness in an individual company's plan. Loan provisions (restricted by TEFRA), rollovers from other qualified plans, transfer provisions, benefit provisions and withdrawal provisions all play an important part in evaluating the cash-flow mismatch risk.

M.U. PROKOPETZ* AND ELIAS S.W. SHIU:

Mr. Stiefel has presented a clear and comprehensive discussion of the GIC and given valuable insight into the special risks inherent in marketing such a competitive product. He points out that for effective management of these risks a well-defined investment policy is essential and close coordination of the investment, actuarial and marketing departments is paramount. Of particular concern to the GIC actuary is the cash-flow mismatch risk. Perfect cash-flow matching is difficult if not impossible to achieve. Mr. Stiefel indicates several management techniques which are useful in mitigating the problem. Here we wish to discuss some mathematical aspects of cash-flow matching.

Let $\{C_t\}$ be a stream of cash flows; each C_t may be positive or negative. Given a force-of-interest function $\delta(\cdot)$, the value of $\{C_t\}$ evaluated at time τ is

$$\sum_t C_t \, e^{-\int_\tau^t \delta(s)ds}. \tag{1}$$

If the force-of-interest function changes from $\delta(\cdot)$ to $\delta(\cdot) + \Delta(\cdot)$, the value of the cash-flows $\{C_t\}$ becomes

$$\sum_t C_t \, e^{-\int_\tau^t (\delta(s) + \Delta(s))ds}. \tag{2}$$

A question one might ask is how (1) compares with (2). To simplify writing, put

$$V_t = C_t \, e^{-\int_\tau^t \delta(s)ds}$$

and

$$f(t) = e^{-\int_\tau^t \Delta(s)ds} - 1.$$

Then the question becomes how

$$\sum_t V_t f(t)$$

compares with 0.

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By the Taylor expansion formula,

$$f(t) = f(\tau) + (t - \tau)f'(\tau) + \frac{1}{2}(t - \tau)^2 f''(\tau) + \ldots$$

Since

$$f(\tau) = 0,$$
$$f'(\tau) = -\Delta(\tau)$$

and

$$f''(\tau) = (\Delta(\tau))^2 - \Delta'(\tau),$$

we have

$$\sum_t V_t f(t) = \Delta(\tau) \sum_t (\tau - t) V_t$$

$$+ \frac{1}{2}[(\Delta(\tau))^2 - \Delta'(\tau)] \sum_t (t - \tau)^2 V_t + \ldots$$

If it turns out that

$$\tau \left(\sum_t V_t \right) = \sum_t t V_t, \tag{3}$$

then

$$\sum_t V_t f(t) = \frac{1}{2}[(\Delta(\tau))^2 - \Delta'(\tau)] \sum_t (t - \tau)^2 V_t + \ldots \tag{4}$$

The implications of formula (4) are discussed in [1] and [2].

We remark that if $\Delta(\cdot)$ is a constant function, that is, for each t,

$$\Delta(t) = \Delta,$$

then (4) reduces to

$$\sum_t V_t f(t) = \frac{1}{2}\Delta^2 \sum_t (t - \tau)^2 V_t + \ldots$$

Moreover, if $|\Delta|$ is small,

$$\sum_t V_t f(t) \doteq \frac{1}{2}\Delta^2 \sum_t (t - \tau)^2 V_t. \tag{5}$$

Formulas (3) and (5) can be viewed as the basis of F. M. Redington's theory

of immunization ([4], section 3). In fact, Redington used the restrictive assumption that the force of interest, as a function of time, is constant. This means that the yield curves are always flat.

Now, consider a GIC with a repayment schedule consisting of a single sum V payable at time τ. Consider $\{C_t\}$ as the asset cash flows backing up this GIC. If

$$V = \sum_t V_t,$$

then the expression

$$\sum_t V_t f(t) \tag{6}$$

represents the amount of profit or loss of the GIC contract evaluated at time τ as the interest rates change from $\delta(\cdot)$ to $\delta(\cdot) + \Delta(\cdot)$. Assume that equation (3) holds. Thus, the *duration* of the asset cash flows $\{C_t\}$, $\dfrac{\Sigma t V_t}{\Sigma V_t}$, equals τ, which is the time when the repayment of the GIC occurs. Then it can be shown that

$$\sum_t V_t f(t) \geq 0 \tag{7}$$

if

$$(\Delta(s))^2 \geq \Delta'(s), \text{ for all } s,$$

and

$$\sum_t V_t f(t) \leq 0 \tag{8}$$

if

$$(\Delta(s))^2 \leq \Delta'(s), \text{ for all } s.$$

The proof of (7) and (8) follows from the Taylor expansion formula with remainder. A twice-differentiable function $h(t)$ can be expanded as

$$h(\tau) + (t - \tau)h'(\tau) + \frac{1}{2}(t - \tau)^2 h''(\zeta), \tag{9}$$

where ζ is some point between t and τ.

Formula (9) can also be applied to obtain an elegant lower bound for (6). Since $e^x \geq 1 + x$ for each real number x, we have

$$f(t) \geq - \int_\tau^t \Delta(s) \, ds.$$

Put $h(t) = - \int_\tau^t \Delta(s) \, ds$. It is obvious that

$$h(\tau) = 0,$$
$$h'(\tau) = -\Delta(\tau),$$

and

$$h''(\zeta) = -\Delta'(\zeta).$$

Hence,

$$f(t) \geq h(t)$$
$$= (\tau - t)\Delta(\tau) - \frac{1}{2}(t - \tau)^2 \, \Delta'(\zeta).$$

Since $\{C_t\}$ are asset cash flows, they are positive numbers. As equation (3) is assumed to hold, we have

$$\sum_t V_t f(t) \geq -\frac{1}{2}(\sup_x \Delta'(x)) \sum_t (t - \tau)^2 \, V_t. \tag{10}$$

Inequality (10) was recently derived by H. G. Fong and O. Vasicek in [3]. From (10) we see that the *variance* term

$$\sum_t (t - \tau)^2 \, V_t$$

can be used as a measure of the cash-flow mismatch risk.

We now conclude this discussion with a few words on J. A. Tilley's approach to asset-liability matching ([5], [6]). Tilley's model abandons the concept of matched durations for assets and liabilities. Consider a GIC with a repayment schedule consisting of a single sum payable at time τ. Assume that at time 0 there are n investment instruments available and the GIC actuary has concluded that there are m possible future economic scenarios. For each unit amount originally invested in instrument j, let M_{ij} denote the

market value at time τ under scenario i. Using the method of linear programming, solve the problem:

$$\text{Minimize } \sum_{j=1}^{n} x_j$$

subject to the constraints

$$x_j \geq 0, \qquad\qquad j = 1, \ldots, n,$$

$$\sum_{j=1}^{n} x_j M_{ij} \geq 1, \qquad\qquad i = 1, \ldots, m.$$

Let $x_1, \ldots, x_n$ be a solution to the problem above; then the proportion of funds to be invested in instrument j is

$$x_j \left/ \sum_{k=1}^{n} x_k,\right.$$

and the maximal interest rate that can be guaranteed for the GIC contract (with the assumption that one of the m economic scenarios will occur) is

$$\left(\sum_{k=1}^{n} x_k \right)^{-1/\tau} - 1.$$

REFERENCES

1. FONG, H.G., AND VASICEK, O. "The Tradeoff Between Return and Risk in Immunized Portfolios," *Financial Analysts Journal*, September/October 1983, 73–78.
2. _____ . "Return Maximization for Immunized Portfolios," *Innovations in Bond Portfolio Management: Duration Analysis and Immunization* edited by G.O. Bierwag, G.G. Kaufman and A. Toevs, Greenwich, Connecticut: JAI Press Inc., 1983, 227–38.
3. _____ . "A Risk Minimizing Strategy for Portfolio Immunization," *Journal of Finance*, XXXIX (1984), 1541–46.
4. REDINGTON, F.M. "Review of the Principles of Life-Office Valuations," *JIA* LXXVIII (1952), 286–315; Discussion, 316–40.
5. TILLEY, J.A. "The Matching of Assets and Liabilities," *TSA* XXXII (1980), 263–300; Discussion, 301–304.
6. _____ . "Preliminary C-3 Risk Calculation," *RSA* VII (1981), 1368–77.

(AUTHOR'S REVIEW OF DISCUSSION)

JOHN D. STIEFEL:

I would like to thank Mr. Meyers, Mr. Welsh, Mr. Lauzon, Mr. Rayman, Professor Shiu and Ms. Prokopetz for their comments.

I was happy to see Mr. Meyers address the issue of how good a GIC "guarantee" really is. Many corporate treasurers, when considering investments for their company's pension plan or other assets, are quite willing to pay .25 percent or .50 percent or even more to obtain a slightly higher quality fixed-income investment. Some of these same treasurers, however, have been choosing between two GIC bids on the basis of a .02 percent or .05 percent higher rate without any thought as to the relative financial strength of the two competing carriers. In doing this, of course, they are making the implicit assumption that all insurance companies are equally strong. What happened to Baldwin-United, however, clearly indicates that this assumption is not valid.

Researching the questions Mr. Meyers poses (or hiring a consultant to do the research) is a must for larger plans and certainly desirable for smaller ones. I also suggest that this is an area where brokers and consultants can be of more service to their clients than they have been to date. In other words, a plan sponsor of any size should expect any broker or consultant he or she retains to have some understanding of how to answer Mr. Meyers' questions with respect to all the companies offering GICs for the plan.

Mr. Welsh correctly observes that most new insurance company loans today do not allow borrowers to prepay at any time with internally generated funds. Therefore, the reference to prepayment in section VI.A.6. of the paper is no longer true. This is one of the good examples of how insurance companies have recently improved their management of the financial risks inherent in GIC and other investment products.

I agree with Mr. Welsh's expressed concern about the yield curve. It is tempting for an insurance company to back, for instance, 4-year GICs with 5-year investments. The resulting extra yield (which can be .30 percent or more) can then be used to make GIC quotes more competitive.

The problem with this approach is that 4-year GICs backed by 5-year investments are much riskier than 4-year GICs backed by 4-year investments. The company could find itself four years later faced with a lot of book value maturities supported by assets worth less than book value and not scheduled to mature for another year. Thus, I recommend that the GIC actuary assess an appropriate extra margin for the resulting mismatch if his or her company uses this approach. In other words, not all of the resulting gain in yield should be used to make the GIC quotes more competitive.

I agree with Mr. Lauzon that data management and management information should be added to the list of GIC product management issues. My experience has been that companies go through at least the first few years of their GIC product line's lifetime without adequate data or management information. I attribute this to:

(a) not fully understanding GIC risks and, hence, not fully understanding what data is needed to properly monitor GIC experience;
(b) lack of pressure from policyholders or regulators, and
(c) rapid growth.

In the text, I mention the need for the GIC actuary to stay on top of developments. This is impossible, of course, without good management information available frequently and in an easy to use format.

Mr. Lauzon is correct in observing that there may be times that a GIC actuary will want to rebalance even though the financial impact is not minimal. For instance, if assets are longer than liabilities and interest rates are high but expected to go higher, rebalancing will lock in a small loss while guarding against an even bigger one.

I share Mr. Lauzon's concern about concentration of GIC risk exposure in one or two large contracts or investments. Both the underwriting and financial risks of GIC are subject to what Mr. Lauzon refers to as the law of small numbers.

Mr. Lauzon observes that investment and contract cash flows can and should be treated consistently. In other words, if we know the expected positive and/or negative cash flow and the expected variation therefrom for a given year, it does not matter (from a risk analysis point of view) what part if any of the cash flow is from investments and what part if any is from contracts.

Mr. Rayman observes that there is a practical limit, especially for a highly competitive product like GIC, as to how much risk management can be achieved through pricing. Both in the case of financial and underwriting risks, the GIC actuary is better off thinking along the lines of "what investment, plan, or contract provisions will mitigate the risk?" instead of "how much risk charge do I need?"

In my mind, no GIC risk should be ignored, although some extreme ones such as nuclear catastrophe, major depression, and so on should be provided for by contingency surplus. Both the sales and investment side of the GIC produce line involve financial options exercisable by someone else (e.g. call option in a bond or option to transfer to another fund in a savings plan), and all options have value. As indicated in the text, I think that any actuary who ignores a risk on the grounds that other companies do not seem concerned about it is being derelict in his or her duty. Company management may be unwilling to use enough pricing margin to achieve as high an expected return on investment as the actuary feels appropriate. The actuary still is responsible for determining what return is expected and sharing that knowledge with company management.

My experience is that company management does want to know what pricing the GIC actuary thinks is appropriate and often is willing to beef up pricing margins if the GIC actuary can do a good job making the case. In other words, those companies who are still pricing their GIC business very aggressively are doing so either because they think they are going to get higher returns than is likely (i.e. the GIC actuary has not done his or her job), or they have other reasons like opening doors to other business and liquidity.

401(k) plans are a major development (from a GIC actuary's point of view) that have occurred since my paper was first submitted for publication. In particular, loans under 401(k) plans present an underwriting risk very similar to that presented by loans under life insurance policies.

Most 401(k) plans treat the proceeds of a loan like a withdrawal from the employee's account and loan repayments like deposits. The problem with this, from the insurance company's viewpoint, is that the employee can gain financially whenever current interest rates exceed the rate being credited by the plan by borrowing from the plan, reinvesting outside the plan, and taking a tax deduction on the loan repayments to the plan. It does not take a very high percentage of the employees to figure this out before the insurance company can get hurt badly. Good news tends to spread fast and furthermore, it is the higher paid employees with the largest account balances who are the quickest to take advantage of arbitrage opportunities.

As mentioned by Mr. Rayman, there are other 401(k) provisions besides loans that present underwriting problems for the insurance company. Some, but not all of these provisions, are also found in 401(a) plans. There is not enough space to cover all the risky 401(k) provisions, but it is safe to say that underwriting 401(k) plans requires great care.

Mr. Rayman is wisely skeptical of assuming that a client who has not signed an enforceable deposit agreement will always feel honor bound not to divert deposits elsewhere if rates rise, say 2 percent during the window period. As pointed out in the text, the client (plan sponsor) is a fiduciary under ERISA and that might make him or her feel honor bound (as well as legally bound) to divert deposits elsewhere if doing so would benefit plan participants.

Professor Shiu and Ms. Prokopetz assert (and provide supporting formulas) that the variance of the difference between expected asset and liability cash flow is a measure of the cash-flow mismatch risk. By implication, and by omission from their formulas, they are also implying that the mean or average difference between expected asset and liability cash flow is not a suitable measure of cash-flow mismatch. In other words, matching average lives of assets and liabilities does not necessarily mean you are immunizing yourself against the cash-flow mismatch risk. This seems counterintuitive

but is actually quite easy to verify in a simple example. Assume the contract (liabilities) in a GIC portfolio has an average life of five years and that half of the supporting assets has an average life of one year and the other half nine years. Then the mean (average) difference between assets and liabilities is zero. The insurance company can get hurt badly, however, if interest rates are low next year (when half of the assets must be reinvested) and high four years later (when cash must be raised to pay GIC maturities at book value).

Professor Shiu's and Ms. Prokopetz's discussion reminds me and other GIC actuaries that the mathematical formulas underlying cash-flow matching are far from trivial. Nonetheless, they should be fully understood by at least one person in every GIC writing company. Of course, understanding the math is necessary but not sufficient for good cash-flow matching. The GIC writing company must also be able to determine accurately the two key ingredients of any cash-flow matching formula, that is, mean and variance of expected cash flow. This requires good data (as mentioned in Mr. Lauzon's discussion) and the ability to keep it current. It also requires very good judgment and understanding of both investments and the provisions of pension and savings plans. (Anyone who has ever tried to estimate future cash flow from a GNMA investment or a savings plan with an employer stock option will have a particularly good understanding of this point.)

In short, the GIC actuary should be doubly wary when told that "things look OK from a matching point of view." First, the person making that statement may not have the mathematical sophistication that Professor Shiu and Ms. Prokopetz demonstrate is necessary. Second, even if the math is just fine, the data and/or assumptions upon which all the nice calculations are based may be incorrect.

Since my paper was written, there have been some changes in federal income tax and actuarial opinion. The Stark-Moore tax bill did indeed pass in 1984, and I can think of at least three GIC-related tax issues that have surfaced as a result.

1. The tax deduction for "insurance business" is 20 percent, not the 25 percent some thought it would be. Thus, the tax advantage of capital gains (instead of ordinary insurance income) treatment is 8.8 percent (80% × 46% − 28%) instead of the 6.5 percent (75% × 46% − 28%) mentioned in the text.
2. It is not totally clear the GICs are automatically considered "insurance business" under Stark-Moore. Inserting annuity purchase rate guarantees into a GIC contract, however, (if it does not already have them) would seem to increase the likelihood of it being considered "insurance business" for tax purposes.
3. As a result of TEFRA (1982) and the Tax Reform Act of 1984 (which

encompasses Stark-Moore), the previously significant tax advantages to life insurance companies of buying deep discount bonds for GIC (or other) portfolios have just about been eliminated.

The situation regarding the actuarial opinion required for lower reserve factors under New York's version of the dynamic valuation law was in a state of flux during 1982-83 but has not changed much since January 1984. My paper mentions that New York, on June 24, 1983, asked companies licensed there for input on the matter. Considerable input was received and coordinated through ACLI. The result was much more extensive instructions for the year-end-1983 actuarial opinion than was the case for 1982. These instructions, however, have not changed very much since 1983.

Finally, it is probably worth recommending New York Circular Letter 33 (dated 12-31-82) as required reading for the GIC actuary. This is particularly so if his or her company is licensed in New York. This letter defines "qualified actuary" and provides guidelines concerning the submission of an actuarial opinion.