

# RECORD OF SOCIETY OF ACTUARIES 1993 VOL. 19 NO. 3

## CAPITAL MANAGEMENT

Moderator: GLEN M. GAMMILL  
Panelists: MICHAEL J. COWELL  
ALASTAIR G. LONGLEY-COOK  
KLAUS O. SHIGLEY  
Recorder: GLEN M. GAMMILL

- Allocation issues
  - Is there a "right" level of capital? What considerations define that level? How does management balance a desire for growth and the related capital commitment with the need to satisfy rating and regulatory authorities?
- Rationing issues
  - Given scarce and costly capital resources, how does company management decide which products and business opportunities meet corporate financial objectives? How does today's product development manager consider various capital issues, such as asset management, risk-based capital (RBC) and the cost of capital?
- Financial management issues
  - How does management use its company's financial reports and information to monitor the progress of each business unit in meeting corporate financial objectives? Are the systems being developed to comply with the new cash-flow-testing requirements enhancing management's capacity to measure financial progress and make financial decisions?

MR. GLEN M. GAMMILL: Since capital management covers a fairly broad range of financial management issues, we're covering the topic in three main segments: First is capital allocation. Next is capital rationing. Finally is financial or product-line management or the monitoring phase, the capital management process.

Mike Cowell will cover capital allocation issues. Klaus Shigley will cover capital rationing. Finally, Alastair Longley-Cook will cover financial management issues. Mike is vice president and corporate affairs actuary at UNUM in Portland, Maine. Formerly, Mike was vice president and actuary at State Mutual. Mike graduated from the University of Michigan with a Bachelor of Arts in mathematics. He's an FSA, an FCIA, an MAAA, a member of the American Insurance Association (AIA), and a CLU. Mike has served the Society of Actuaries as Treasurer from 1986-90 and as a Vice President from 1990-92. Mike serves the ACLI as the Chairman of its AIDS Data Group and the NAIC on its Industry Advisory Group on RBC and as Chairman of the C-2 Risk Committee. His major contributions to actuarial literature include, "Mortality Differences Between Smokers and Nonsmokers," with Brian Hirst in 1980 and "AIDS-HIV Mortality in Life Insurance" with Walter Hoskins in 1987.

Klaus Shigley is a vice president in the retail life insurance product development area at John Hancock where he manages the actuarial department and is responsible for pricing, designing, and implementing new life products for the retail sector. Previously, Klaus was a vice president at John Hancock managing its nonparticipating group pension product line. Klaus has a Bachelor of Arts in mathematics from the University of California at Berkeley and has a Master of Arts in mathematics from the

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University of Massachusetts. Klaus is an FSA, MAAA, and a CLU. He is Chairperson of the Committee on Papers of the Society of Actuaries and a Council Member in the Society's Product Development Section.

Alastair Longley-Cook is a vice president and corporate life actuary for Aetna Life and Casualty. Prior to his current position, he served Aetna in many areas including group, life, corporate, auto, and homeowners. Alastair has also served Aetna as head of investors relations. Alastair has served as a General Officer of the Society's Education and Examination Committee and as the author of the 1983 paper, "REROSHE: the Concept of a Risk Free Equivalent Return on Shareholder's Equity" (TSA, XXXV, p. 321).

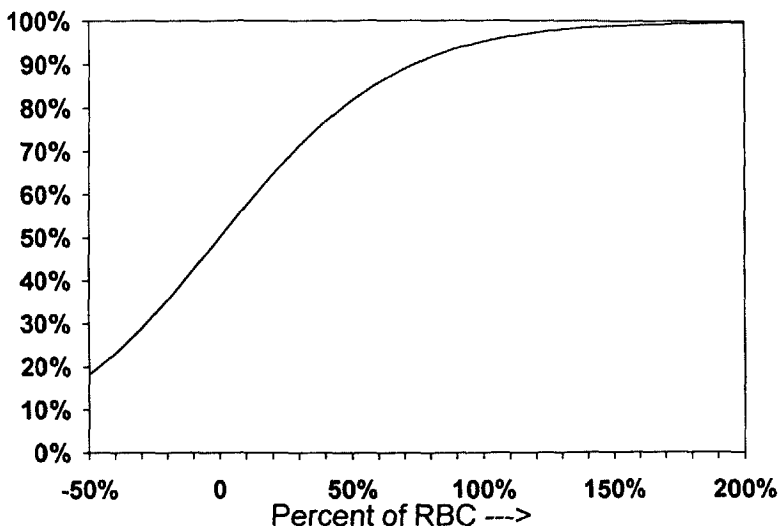
MR. MICHAEL J. COWELL: Is there a right level of capital? What are the purposes of capital? Are there minimum/maximum levels? How do you balance growth and financial soundness in your capital management? And what is an appropriate responsiveness to regulators, rating agencies, investors, policyholders, and particularly the news media? I will talk a little bit about financial management although this is principally Alastair's subject. I will also talk briefly about the importance of developing your own formula and not relying on standardized formulas. What's the linkage between your formula and your financial reporting system? How do you monitor the progress of your business units? What's the relationship between capital management, asset adequacy, and cash-flow testing?

Is there a right level of capital? Basically, no. The right level of capital is that level with which management feels comfortable. Basic purposes of capital are to absorb fluctuations in an organization's operation, to prevent insolvency, to fund growth, and to measure performance. I see those as the four basic purposes of capital in any organization, particularly in a life insurance organization.

What happens as you assign additional levels of capital to your business? As you add capital, the probability of your operation not becoming insolvent increases (Chart 1). This is particularly important in managing an insurance operation. More important than trying to ascertain a precise level of capital is determining how incremental amounts can reduce the probability of insolvency. When you are at the low end of the curve and have a very low percentage of your target capital, additional increments of capital do not significantly increase probability of not becoming insolvent. As you move toward the top end of the scale and you exceed your capital requirements by say 50% or 150%, additional increments of capital again don't significantly increase this probability of not becoming insolvent. Consequently, you have a very inefficient use of capital at the low end and at the top end of the scale. The most efficient application of incremental capital is where the capital solvency curve is the steepest, which is right around where you think your true capital requirement is. I have one additional comment. Recall that capital and surplus is equal to assets minus liabilities. The variance in your capital and surplus is closer to the sum of the variance in assets and the variance in liabilities. This is where the concept of adding C-1, C-2, and C-3, or at least doing some form of covariance combination of those comes from.

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CHART 1  
Capital and Solvency  
Probability of Not Becoming Insolvent



My suggestion is to approach the question of a right level of capital in your company from two directions. First is the level of confidence that management can accept for the probability of asset inadequacy. Does management want to have just exactly the right amount of assets equal to liabilities so that you're at a 0% of risk capital? In that case, you have a 50% probability of becoming insolvent or a 50% probability of not becoming insolvent. Or does management want sort of an "M-1 Tank" guarantee, i.e., short of worldwide economic cataclysm your company will survive?

As you assign additional levels of capital to any given operation, your return on equity (ROE) declines (Chart 2). While this is more of a stock than a mutual concept, it shouldn't matter what the nature of your structure is. The whole concept here is based on trying to find the right range in this scale at which your management is comfortable. For example, at 100% of capital you are earning a certain level of ROE. If you double the amount of capital, your ROE declines. It doesn't cut in half because you have earnings on that additional capital. The process that you're trying to find is a comfort zone, an area in which management is comfortable. Is management comfortable that you're getting a sufficient ROE for the amount of capital applied to the business? That's the basic concept, and it's really quite simple, at least in theory. In practice, it gets a bit more difficult.

Generally, you have two competing trends (Chart 3). You have investors trying to get higher ROEs, which means running more business with less capital. And you have rating agencies and regulators, wanting you to put in more capital, which makes the business more likely to survive, but drags down ROE and is, therefore, an inhibitor to raising additional capital.

CHART 2  
Risk Capital and ROE

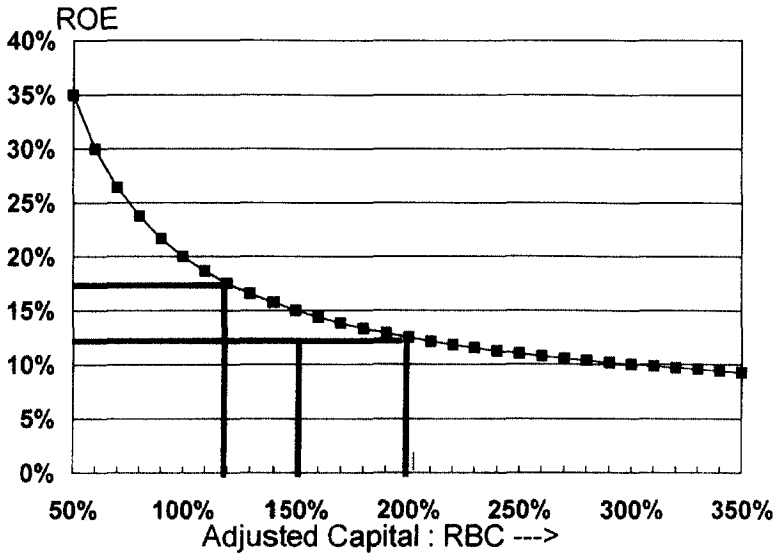
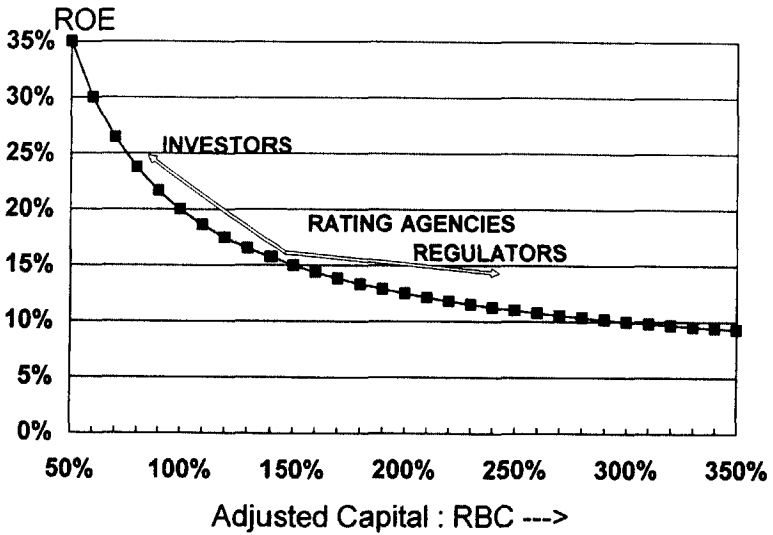


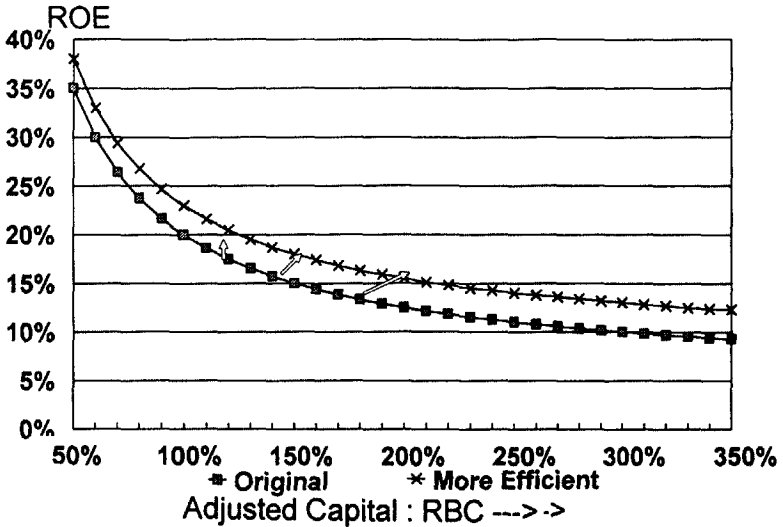
CHART 3  
Risk Capital and ROE  
Competing Pressures



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Again, conceptually more important than the absolute numbers is the process to get a sense of what management's level of comfort is where you can balance these competing objectives. If you balance them properly, then presumably you raise the whole ROE capital relationship to a more efficient level (Chart 4).

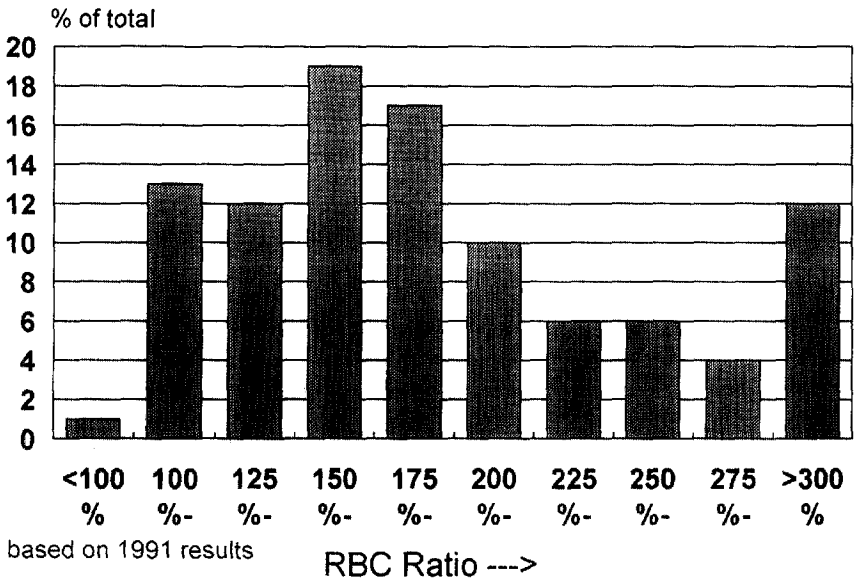
CHART 4  
Risk Capital and ROE



Inherent in determining the appropriate level of capital for a company is the perception by regulators, rating agencies, investors, policyholders, and the media that the company's a strong financial entity. While perceptions are subjective, subjective analysis is often important. Talking briefly with Alastair just before this panel discussion, we agreed that certain subjective facets of capital management are probably those areas that actuaries are the least well-trained to deal with. Our profession does an excellent job of measuring and managing the probability of the contingent event. But we often do a poor job of communicating to our industry's various publics.

The purpose of the NAIC RBC formula is to separate well-capitalized companies from poorly capitalized companies. It's not a ranking system. It's not a rating system. It is critical in capital analysis that you study your own formula. It's helpful to have your own formula that relates to the C-1, C-2, and C-3 risk to the extent possible. Based on 1991 financial results, there's a very heavy concentration up in the 150-200% range (Chart 5). That's where most companies stand, and as you know, having just 100% of RBC is not considered really adequate. Suffice it to say that it's a question of your ability to raise and retain capital that's really important.

CHART 5  
RBC Ratios  
Distribution of Tested Companies



What about cash-flow testing? Very briefly, you set your assets equal to your liabilities, initialize surplus at zero, and project assets and liabilities either deterministically or stochastically and then develop the present value of the capital after a fixed number of years. Then count the number of times that your surplus is less than zero and find an initial surplus such that your company's management is comfortable that the risk of company solvency is tolerable. Again, there's no right level of capital for every company.

I would close by saying that the whole focus in the allocation process is to develop a level of capital that management is comfortable with and to make sure that your company retains the ability to raise and retain capital. That's the ultimate test as to whether or not your have a sufficient level of capital.

MR. KLAUS O. SHIGLEY: I was asked to bring the perspective of the pricing and product development actuary to this subject. I want to review how the cost of capital translates into charges and loads to customers and how that cost can lead to changes in product design and asset allocation decisions. To get us started, I want to locate us on a map. Just about everyone begins the pricing process with a target surplus requirement and a hurdle rate. Table 1 is from a survey on pricing methodology conducted by Tillinghast in 1992. The table illustrates how prevalent target surplus and hurdle rates are. Between a similar 1988 survey and the 1992 survey, the number of companies using target surplus in pricing jumped from about 52% to about 78%. The survey also suggests that there's been a slight decrease in the required hurdle rates between 1988-92, but I don't have sufficient information to quantify the level of reduction.

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Since I'm the Chairperson of the Papers Committee, I will mention that there is some literature on the development of target surplus formulas that was published in the *Transactions*. One of the early papers on the subject was written by Rick Kischuck. There is also plenty of literature on hurdle rate determination in places like the chartered financial analyst (CFA) syllabus. The January 1989 edition of *The Actuary* also has a good article by Joe Tan on the relationship between surplus needs and hurdle rates.

What I want to do for this discussion is assume that the company has a satisfactory basis for developing hurdle rates and a satisfactory methodology for determining target surplus. My focus will be on developing a pricing tool, which translates the cost of capital into product loads and charges, and to use that tool to evaluate the impact of some of the RBC proposals on price, product design, and asset allocation decisions.

TABLE 1

Rate of Return	Number of Respondents			
	Stock		Mutual	
	With TS	Without TS	With TS	Without TS
1988 Survey				
<12%	0	0	5	2
12-13%	1	2	1	1
14-15%	10	7	1	3
>15%	6	5	0	0
Total	17	14	7	6
1992 Survey				
<12%	0	0	10	1
12-13%	6.5	2	1	1
14-15%	12.5	7	2	0
>15%	6	0	0	0
Total	25	9	13	2

Table 2 starts with a simple one-period investment of \$100, which returns \$125 at the end of the period. The profit margin is 25%. The ROI is 25%.

Line 1 of Table 3 expresses this simple transaction as an equation which states that ROI equals PM over I. In line 2, we modify this formula to reflect the situation where the investment is a target surplus investment. In this situation, the ROI or ROTS derives from two sources, from loads and charges to customers (EXP), and from investment income on capital (IER \*TS). In line 3, we adjust the equation for taxes. In line 4, we have an example. If the target surplus is \$4, we need to charge customers \$0.40 (EXP) if we want to meet a 12% ROTS. Return is derived from two sources. First, target surplus of \$4 is invested at 8% or \$0.32. That investment income of \$0.32 together with product charges of \$0.40 equals earnings of \$0.72.

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Divide that by \$4. That's 18% pretax. It comes out to be 12% after tax. So, if ROTS after tax is 12%, then you need to charge to customer \$0.40.

TABLE 2

$0 \text{ --- Time --- }  $ $I = 100 \qquad \qquad \qquad R = 125$ $ROI = 25/100 = PM/I$
--

Key: I = Investment                      R = Return  
 PM = Profit Margin                  ROI = Return on Investment

TABLE 3

$ROI = (PM) / I$ $ROTS = (EXP + IER \times TS) / TS$ $ROTS = (1 - T) \times (EXP + IER \times TS) / TS$ $.12 = (.66) \times (\$.40 + .08 \times \$4) / \$4$
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Key: ROI = Return on Investment      PM = Profit Margin  
 ROTs = Return on Target Surplus    EXP = Expense/Load/Charges  
 IER = Investment Earnings Rate    T = Tax Rate

Table 4 picks up where we left off. It reiterates that total return is derived from product charges, plus investment income from surplus. In line 2, we make some algebraic transpositions. We solve for the expense to target surplus ratio in terms of the ROTs (the hurdle rate), the invested earnings rate on surplus, and a tax rate, assuming the tax rate is constant. By doing this, we address the question: What are loads and charges to customers per unit of target surplus as a function of the tax rate, the hurdle rate, and the earnings rate on surplus? In line 3, we customize this expression to help us evaluate the special case where target surplus is set equal to RBC. Also, the ROTs term is replaced by ROE, which is a more familiar expression for the hurdle rate. What we want is an expression for the expense-to-RBC ratio as a function of this hurdle rate and of the rate at which we invest surplus. Line 4 says that for a 12% ROE objective and 8% surplus investment rate, the expense to RBC ratio will be 10%. That means we need to have loads and charges equal to 10% of the RBC requirement, whatever that happens to be. If you replace target surplus with RBC or multiples of RBC, loads and charges will be 10% of whatever that RBC requirement is. The equations in Table 4 show us where we want to be.

TABLE 4

$ROTS = (1 - T) \times (EXP + IER \times TS) / TS$ $EXP / TS = ROTs / (1 - T) - IER$ $EXP / RBC = ROE / (1 - T) - IER$ $.10 = .12 / (.66) - 0.8$
--

Key: ROI = Return on Investment      ROE = Return on Equity  
 RBC = Risk-Based Capital          ROTs = Return on Target Surplus  
 EXP = Expense/Load/Charges      IER = Investment Earnings Rate  
 T = Tax Rate



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Table 5 illustrates that this equation is used for evaluating the RBC in pricing. For any ROE and IER assumption, and assuming a constant tax rate of 34%, we derive the associated expense to cost of RBC ratios. Focusing your attention on the last column, if the ROE objective is 15%, then loads and charges need to be 16.5, 14.5, or 12.5 times the required RBC if the invested surplus is assumed to earn 6%, 8%, or 10%, respectively. Focus on the middle row, if the surplus is assumed to be invested at 8%, then loads and charges must be set at 7%, 10%, or 14.5% times the required RBC for an ROE objective of 10%, 12%, and 15%, respectively.

TABLE 5  
EXP/RBC  
ROE

		10%	12%	15%
IER	6%	.09	.12	.165
	8%	.07	.10	.145
	10%	.05	.08	.125

$$\text{EXP/RBC} = \text{ROE}(1-T) - \text{IER}$$

By fixing the ROE target at 12% and the IER assumption at 8%, the expense per unit of RBC comes out at an even 10%. The investment earnings rate for surplus at 8% is not too unrealistic at this time. Assuming that the expense to RBC ratio is fixed at 10% demonstrates how the RBC requirements or target surplus requirements translate into loads and charges.

In the first example (Table 6), for companies of a certain size, the RBC for mortality risk might be calculated at \$0.70 per \$1,000 net amount of risk. If this is used in lieu of the target surplus, then loads and charges to customers should be 10% for RBC or \$0.07 per \$1,000 net amount at risk. In the second example, if the required RBC is 4% of reserves, then loads and charges need to be 10% of RBC or 40 basis points. In the third example, if RBC is 2% of premium, then loads and charges to customers need to be 10% of 2% or 0.2% of premium.

TABLE 6

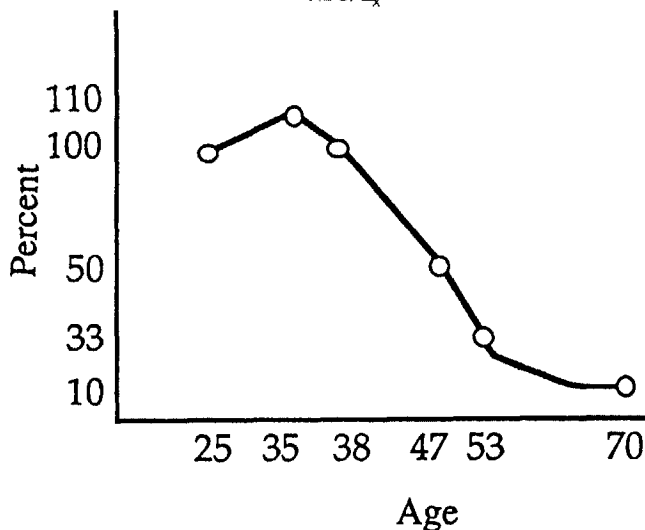
EXP/RBC = .10	EXP = .10 x RBC
RBC = \$.70/\$1,000 NAR	EXP = \$.07/\$1,000 NAR
RBC = 4% x Reserves	EXP = 40 Basis Points
RBC = 2% x Premium	EXP = .2% x Premium

(Assumes ROE = 12%, IER = 8% Tax Rate = 34%)

With this as background, let's look at the suitability of using RBC for pricing and product development decisions (Chart 6). I mapped the ratio of the C-2 RBC requirement to select mortality rates on the 1975-80 Male Basic Table at a few representative ages. At age 25, RBC per \$1,000 net amount at risk is assumed to be \$0.70 per \$1,000, roughly equal to the select mortality rate at age 25. There's a dip

in the mortality rates from about 25-38, so RBC is greater than mortality rates over this range. The mortality rate at age 38 is once again about a 100% of RBC. At age 47, RBC expressed as a percent of  $q$  is about 50%. At age 53, RBC is about 33% of expected mortality, and at age 70, RBC is about 10% of expected mortality. If we apply our pricing rule, which states that we need loads and charges equal to 10% of RBC to make to ROE objective, then we conclude that mortality loadings need to be about 10% of tabular mortality at younger ages and about 1% of tabular mortality at age 70. This points out some problems in using RBC to replace target surplus for pricing. Target surplus is usually selected to provide a cushion for events in the tail of the distribution, usually two to three standard deviations. To refresh your memory, a standard deviation for mortality risk is approximately the square root of  $npq$ . RBC does a very poor job of tracking that type of risk measure. RBC as a basis for capital allocation for customer pricing in this particular case would be inequitable. The relative charge at younger ages is higher than the charge at older ages. This becomes especially noticeable for products like term insurance.

CHART 6  
RBC/ $Q_x$



'75-'80 Male Basic Select  
RBC = \$.70/1,000 NAR

Here is another observation. For second to die contracts, at age 45, the RBC capital expense in the first year would be roughly 70 times the expected claim cost. So my first observation is don't use RBC for capital allocations in pricing. I want to point out that this is a critique on the use of RBC for pricing, not on its intended purpose.

Table 7 uses our rule that the expense is 10% of C-1 RBC factor. If RBC is going to be the basis for capital allocation of even some multiple of RBC, then interest spreads need to be variable by asset class. Let's take common stocks as an example. With a 30% RBC factor we need to be confident that we can earn a 290 basis point spread over BAAs (Category 2). If the target surplus objective was set at two times

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RBC, then the required spread would increase to 580 basis points. That would be two times 300 minus 20. So if the target surplus requirement were two times RBC, then an investment in common stock would require a 580 basis point premium over BAAs. That's if we require the same hurdle rate for those two types of investments. We could make an argument that the additional volatility for investing in common stock might demand a higher hurdle rate. That would increase the required spread even more. So these variable asset spreads illustrate how the cost of capital can affect the asset allocation decision. Even though we may not all agree on the precise amount of target surplus to hold for common stock, we all agree that we would recommend holding bigger target surplus allocations for common stocks than for investment grade bonds. Even though we may not agree with the guidance set out in the RBC proposals, the high required margins for volatile asset classes like common stock, which are a bad match for most of our liabilities, explain why product development actuaries are uncomfortable with risky asset classes unless they're properly priced. That's why many companies have all but eliminated common stock investments from their balance sheets.

TABLE 7  
RBC Expense Factors: C-1

Bonds	RBC Factor	Expense (BPs)
Category 1	.003	3
Category 2	.01	10
Category 3	.04	40
Category 4	.09	90
Category 5	.20	200
Category 6	.30	300
Mortgages	.03 x (.5,3)	30
C. Stocks	.30	300

(Assumes ROE = 12%, IER = 8% Tax Rate = .34)

Under the column labeled RBC expense factor for mortgages, the numbers in parentheses represent a range of multiples applied to all mortgages in a company's portfolio. For companies with high loss experience relative to the rest of the industry, their regular mortgage factor, which is three, could be multiplied by as much as three. So in situations such as this, if capital allocations are determined by RBC, then good mortgages could have a factor of nine. These mortgages could be sold to acquire below investment grade bonds (Category 3), with a factor of four. In that case, the RBC allocation would be reduced, but the asset risk would be increased. This is another reason why you really can't use RBC blindly for pricing purposes.

Here's another example why RBC should not be used for pricing. Assume we replace some nasty commercial mortgages with a collateralized mortgage obligation (CMO) and lose yield because CMOs are guaranteed. To get the yield back, we could execute a swap from governments to corporate, and then the CMO plus the swap combination is loaded with C-3 risk and retains C-1 risk from the swap provider but has no RBC requirement. My second observation is, don't use C-1 RBC in place of

existing C-1 target surplus requirements for pricing. Again, I want to emphasize I'm not criticizing RBC, I'm really saying don't necessarily use it for pricing.

In Chart 7, I attempt to show how a product development actuary could hypothetically influence the asset allocation decision. This is a simulation we did at John Hancock to show the distinction between asset credit quality and company credit quality. In other words, a company can be AAA without assets being AAA. We took all our assets at the John Hancock and set asset default rates equal to Depression-era levels. We ran 10,000 simulations, each of which assumed Depression-scenario default rates. In the worst case, surplus never falls to below 75% of initial surplus levels because the company is buffered by good earnings, has large amounts of capital, and very importantly, assets are highly diversified. However, when we threw in four assets with a B credit rating each, the size of one-half the company surplus, then the tail of the loss distribution extended to the right by about 4%. This was meant to be a "Mutual Benefit" simulation. Under that company's assumption, the tail of the distribution or target surplus requirement increased by 4%. At 10% exposure to RBC ratio, loads increase by 40 basis points on all products for the entire company. Question: Would those assets have sufficient yield to cover these additional charges for cost of capital? Answer: I don't know, but if someone had asked this question, some of those deals might not have been done.

Table 8 applies our rule to derive loads and charges for C-3 and C-4. If RBC is a scarce commodity, then this table gives us a decision rule for making product design changes to accommodate RBC allocations. For example, single premium deferred annuities (SPDAs) with market value provisions have lower RBC requirements than SPDAs payable at book value. Ten percent of the difference in the RBC or target surplus requirement is available as an extra interest credit to induce customers to accept less liquidity. In the same way, we can induce group pension customers with participating GICs to move into separate account GICs. Separate accounts with minimum interest guarantees have a C-1 RBC requirement with an offset for Regulation 128 "haircuts." The effect of the haircut is usually to eliminate the C-1 RBC requirement. If RBC is a scarce commodity item, we should design these GICs in the separate account to start with, or we can use 10% of the reduction to RBC as an inducement to get the customer to switch.

In conclusion:

1. We developed a tool that derives charges to customers for capital allocations.
2. If capital is scarce and redesign or renegotiation is a possibility, our tools give us a decision process for making tradeoffs between loads and charges, and design parameters under different capital allocation requirements.
3. We used this tool to evaluate the use of RBC as capital allocation mechanisms for pricing.
4. We determined that RBC is too crude to replace well-thought-out target surplus philosophies for pricing.
5. RBC may, nevertheless, become the dominant capital allocation constraint. For example, if corporate target surplus objectives are stated in terms of a multiple of RBC requirements, in that case, for pricing purposes, we should restate the corporate RBC multiple in terms of a common multiple of target surplus approximate to each business unit.

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CHART 7  
Loss Distribution

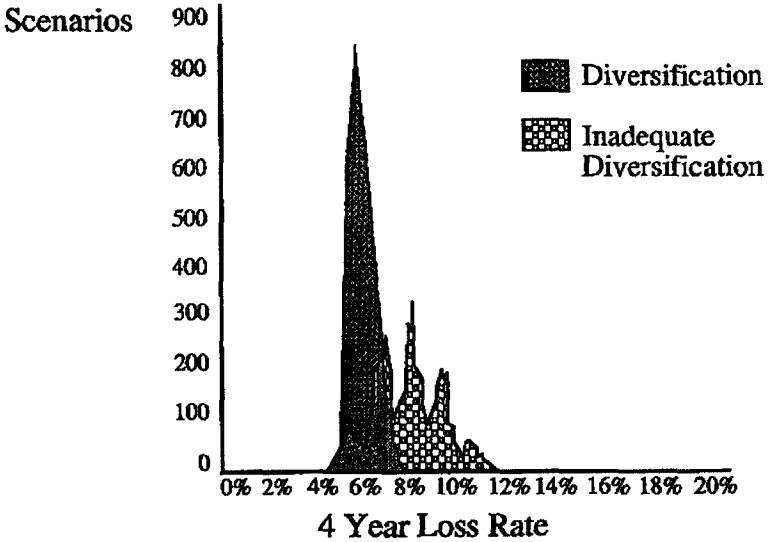


Table 8  
RBC for C-3 and C-4

	RBC Factor	RBC Expense
High C-3	2% x Reserves	20 BPs
Medium C-3	1% x Reserves	10 BPs
Low C-3	0.5% x Reserves	5 BPs
C-4	2% x Premiums	0.2% x Premiums

MR. ALASTAIR G. LONGLEY-COOK: I'm going to cover two financial management topics. First, I'm going to address the current capital standards, which both Mike and Klaus have mentioned, exploring the uses of such standards. Second, I'll discuss the increased use of cash-flow testing.

When we refer to capital standards, we're not just talking about total capital needs. In fact, some of the more important uses for those standards are allocation of surplus by business unit (or by product) and strategic planning. Many companies, including Aetna, are managing their businesses much more carefully to particular bogies influenced by capital allocation based on capital standards.

What capital standards are in place? There are at least three. The lowest standard is RBC, and as Mike and Klaus have both said, this is a threshold not a target. Your own internal standard might be your actuarial standard, your required surplus, whatever the actuaries in your company decide is the appropriate level. The third, and probably the largest, is what the rating agencies are saying you need. Your

company's actual total surplus may be influenced heavily by a rating agency's standard. If not, perhaps you compare with competitors and set your actuarial surplus somewhere close to where they are.

The rating agency standard is generally large right now. That's, I hope, a short-term phenomenon and another reason why the rating agency standard should not be necessarily the one used over a long period of time to manage a company. But right now it certainly has caused some companies to increase capital. The question is, what will happen after that short-term phenomenon ends? What will we use going forward?

In most cases, the internal standard is just about right. The actuaries within the company should be the primary determiners of that number. Aetna has a fairly extensive set of factors, calculations, and formulas determined by the corporate actuarial department after consultation with the business units. Historically, these factors, calculations, and formulas have been based on risk theory approaches. In the past, primary emphasis has been on the C-2 risk. As time evolved, we have spent more and more time on C-1 and C-3. As RBC indicates, that's where the bulk of the risk is. We calculate ROE by business unit and, therefore, measure performance based on ROE, which is not necessarily the best measure, but it tends to be the most popular. If a business unit wants to get into a new line of business, it might not if the new line were risky enough to drive a very high capital standard and, therefore, a low ROE.

If, after doing all those calculations, and adding them up, the total is less than the actual capital, what do you do with the breakage? Do you prorate or do you ignore? I have seen both approaches used. That breakage is, of course, greater because of the higher surplus standards.

The RBC standard, usually the smallest of the three, will be used by regulators to target the companies that may fail. RBC tends to be less precise. I hope it's less precise than your internal standard. I think of it as having less depth but more breadth. RBC may have certain items, and you don't take into consideration such as reinsurance recoverables, off-balance-sheet items with size adjustments; but, on the other hand, it does not get as deeply into the nature of your products, particularly with regard to withdrawal risk.

To repeat an earlier comment by Mike, RBC is not a target, it's a threshold.

I'm indebted to one of my colleagues, Lou Priog, who serves on the industry RBC task force for the following analogy: If we all went to get X-rays performed, the doctor would look at them to see if there's anything wrong. If there's something wrong, the doctor can follow up. But if the X-rays are fine, we don't stand around comparing our good X-rays. It's the same thing with RBC. It's only when a company fails the RBC test that it's particularly meaningful.

Let's move on to the second part of my talk, which is the use of cash-flow testing. Many of you probably have had the same experience I have had when reviewing modeling done in your company. You've found a real jigsaw puzzle. If you are the corporate actuary trying to pull together the different models for each line of business

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for the opinion, you've probably found that those models are all over the place. You might have some business units and products using commercially built models. Or they might be using something that an actuarial student designed and built (who has now gone on to another area of the company, or maybe another company, and you find that the documentation isn't quite what it ought to be). If you're going to model CMOs, it wouldn't be wise to have an actuarial student design such a model. I would take a look at the Wall Street models or those that are much more sophisticated and used every day. The problem is that we have a glut of models, and they are all used for different purposes: planning, pricing, and valuation. Are the same model assumptions and techniques being used for all three? Probably not. Also, when rolled up into the opinion, are the same assumptions being used across the different business units? Probably not.

In light of Regulation 126 and, more recently, the Standard Valuation Law revisions, many companies are revising homegrown models and spreadsheets and gearing them up, or purchasing commercial models, and performing cash-flow testing across the board for almost every line of business. This permits the kind of asset adequacy analysis that those regulations require, but it also allows us to enhance our capital management capacities. Modeling can be done not just line by line, but synergies can be recognized directly by modeling a whole company. For example, individual life business models can be combined to model an entire subsidiary that sells off all retail life and annuities.

This also permits the calculation of embedded value, which is nothing more than present value of future cash flow's statutory earnings of the in-force business. We are a little slow perhaps in the U.S. in using techniques like embedded value. In Europe, I believe, such value is required to be published in financial reports.

Adding new business to embedded value, we can calculate the economic value of a line of business and use "value-based accounting" techniques for strategic planning or performance measurement.

For a moment, let's look at performance measures using either ROE or value-based accounting. There are pros and cons to each one. ROE is short-term; value-based measures project out into the future, so they are more long-term. ROE is highly dependent upon allocated surplus and, therefore, subject to all the problems associated with such allocations. (I'm sure many of you have suffered through the endless discussion and arguments between different lines of business over who should have more or less surplus solely to improve performance ratings.)

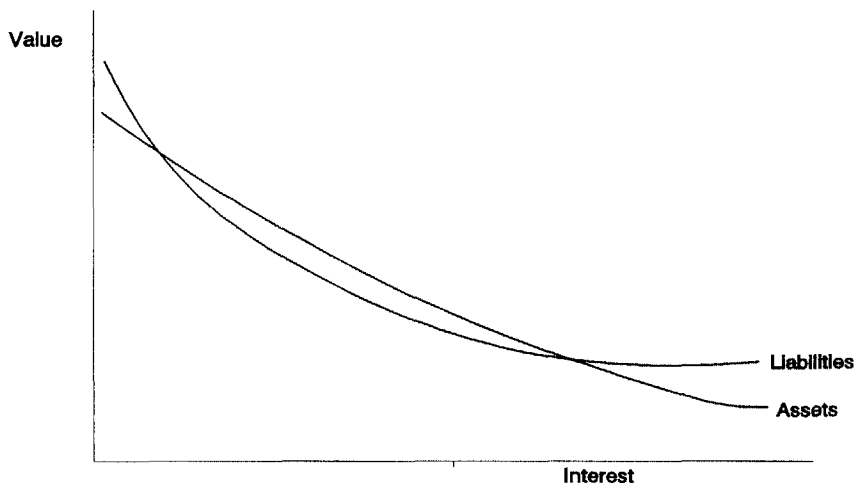
Value-based accounting isn't perfect. It is dependent upon what assumptions are being used for the long term, such as discount rate or withdrawal rate.

ROE tends to drive stock price; value-based accounting drives acquisition price, and therefore, if you are really trying to figure out whether a certain line of business is something you want to shrink or grow, such accounting gives a good measure of what embedded value is there. ROE is only partially risk adjusted, in the denominator.

Where cash-flow testing shines is in sensitivity testing, mostly around the C-3 risk. We've all seen graphs such as in Chart 8. Typically, surplus would be positive where

we are, but due to convexity, surplus can turn negative as interest rates either rise or fall. This is overly simplistic. Certain CMOs would have a liability curve that bends back down again at low enough interest rates. Minimum interest rates or interest rate guarantees in products in such circumstances will also do some interesting things to these curves.

CHART 8  
Present Value of Surplus



By running cash flows, we can look at what happens to the present value of surplus due to changes of interest rates as well as other sensitivities such as default rates. We can then determine not only what our present value of surplus is, but also how that value changes under different scenarios and, therefore, how much surplus to allocate. To the extent the scenarios span the universe of possibilities and are assigned representative probabilities, then reserves can be set at appropriate levels such that present values are positive, say, 75% of the time, and surplus such that present values are positive, say, 95% of the time. This allows for consistency of approach and should be easier to communicate to senior management and regulators.

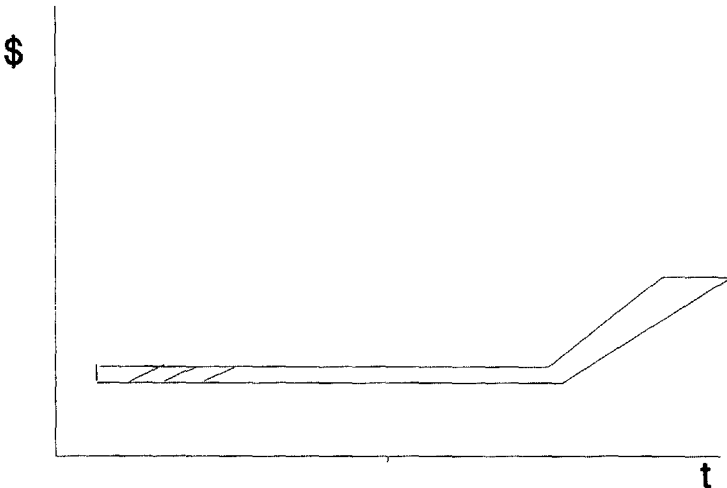
The weak point lies in the fact that management has been burned many times by long-term projections. Accordingly, management people are not firm believers in long-term projections. Management has seen too many hockey stick projections (Chart 9). We have all seen them. Things don't get together in the near term, but somewhere out there all the tulips start to come up. Except we never quite get there. It's up to the actuaries to ensure that the assumptions are reasonable through scenario testing.

Armed with these new tools, our new frontier becomes strategic management because, I believe, that's what capital management really is all about. We shouldn't decide to get into a line of business or out of a line of business just because that sounds like a good idea that was tried in the 1970-80s in the name of diversification and it didn't work. What is happening is much more bottom line and value oriented.



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### CHART 9 Hockey Stick Projection



If we are successful, we could then have the following actuarial processes all based on the same cash flow models: (1) reserve opinion, (2) pricing, (3) capital standards, (4) performance measurement, and (5) strategic planning.

Finally, a new area that we are moving toward is dynamic solvency testing (DST), which is the extension of reserve adequacy, or asset adequacy analysis, to include surplus and new business. Consequently, it asks the actuary to opine on the adequacy of current surplus to manage the company in the future based on the plans of that company. DST is required now in Canada. The American Academy of Actuaries is advocating DST in the U.S. I think most of us would support the concept, but we need to deal first with the question of whether this is a management report or a regulatory report. The more it is a regulatory report, the more we become quasi-regulators and the more difficult it is to be in the loop with senior management, because management may view us more as outsiders than insiders. Alas, as we add more and more responsibility to our shoulders that may be good for our employment, but not good for our liability exposure, we might find ourselves, in fact, painting a target on our chest.

MR. GAMMILL: In defense of GAAP, there's no perfect accounting model as we all know. If you have ever gone offshore where you might be involved in a situation where additional capital might be needed or be sought by an offshore company, there are a number of cases where those companies will convert to U.S. GAAP simply because it happens to be a safe harbor. No matter how many imperfections GAAP may have, it still provides a relatively stable measure against which an investor, anywhere in the world, can assess financial expectations. GAAP still provides a relatively consistent accounting model for a wide variety of constituencies to measure financial progress.

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MR. ROY GOLDMAN: I just wanted to make one comment. The comment is related to my role in the E&E Committee. You don't have to go to the CFA exams to learn about hurdle rates. The Society now has lots of information on the finance and investment track that I would recommend reading. The new courses coming out in the finance track really delve into the issues of the use of capital and hurdle rates, and I would recommend those texts to anybody who is interested.

MR. GAMMILL: I haven't seen that many explicit calculations of hurdle rates recently, and I would ask anyone how you go about determining a hurdle rate for a mutual company.

MR. SHIGLEY: We are actually going through a process at this time at the John Hancock to reinvent both capital or target surplus needs, as well as hurdle rates. When we finish that process, we will let you know.

MR. COWELL: Just one comment following up on what Klaus said and an after-thought of your earlier point, Glen. We at UNUM, for example, essentially use a pretax GAAP ROE measure. However, when it comes to looking at results in terms of how much is available to dividend up to the parent company, then we revert, properly I think, to statutory. I think what we are all searching for here is sort of like a grand unified theory of capital and surplus management in which the GAAP, the statutory, the pricing, and the regulatory issues can all be more or less brought together in a comprehensible whole.

MR. JAMES F. REISKYTL: I'll pick up on both of those comments. First, how do mutuals determine hurdle rates? I think the major focus may be different between the stock and mutual companies, and so I'll offer this for discussion. I would go back more along the lines Mike was talking about earlier, the real objective is to decide how much capital or surplus you need to be an effective, strong company. I would suggest the major objective is to pay the policyholders as much as we can. We only retain as much capital or surplus as we need, and therefore, this definition would be tied to the amount of capital or surplus we need to remain healthy and viable.

As a mutual person, I personally believe GAAP is very poorly designed to get at equity. And if, in fact, you are using it to measure capital and surplus, then I think the accountants are confused. If you're going to measure equity, I don't think GAAP does it at all or, at least, it may be a whole different paradigm. There are some people who think you ought to do market value of liabilities, and don't put me in that camp particularly because we will also have to solve the whole problem. You may yet need a different accounting system which may also tie to Mike's last comment that maybe neither one of these systems is adequate. But I don't want people to leave thinking that you can use this tool or that tool for stock and mutuals if stock companies are oriented to income and price per share to drive the stock prices. Clearly, that takes a different accounting structure, and I think GAAP probably does it well. But if you are moving to a world of capital allocation and deciding how to run your company or from a mutual company perspective that focuses on the policyholder, then you may need a different paradigm to do that. I also believe that GAAP's application is varied quite a bit.

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MR. GAMMILL: Under any accounting model, there's an amount of assets that can mature the future obligations of a particular line of business. Once you determine those assets for a particular line, then all the accounting model does is regulate how profits from that line are reported. Whenever you have a very assumption-dependent calculation, you're in deep trouble. GAAP provides a rule book. You might not like the rules or how the scoring is being kept, but rules create some stability and some boundaries.

MR. LONGLEY-COOK: I think we should all start pondering the end of the statutory accounting as we know it, which is a distinct possibility over the next few years. As you know, there is a movement towards federal regulation of insurance companies. In addition, a discussion around the guarantee fund laws and the movement towards market-value accounting all call into question the survivorability of statutory accounting as a separate fundamental accounting format. I think Glen probably feels more comfortable with GAAP because he has worked with it all his life and is an expert in it. Many of us are less expert, and maintaining two separate accounting systems is certainly expensive. We might want to ponder what the world would look like if in a few years statutory accounting is dissolved. Clearly, if GAAP is the central accounting model, we would want some adjustments to it to get us to an accounting model that is more solvency based.

MR. SHIGLEY: I would say that having been an actuary for both a mutual company and for a stock company, I come neither to bury GAAP nor to praise it, but each system does have its own use. Certainly from the standpoint of what works in dealing with stockholders in a stock company environment, GAAP is what's available.

