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**PRODUCT DEVELOPMENT IN THE  
AGE OF RISK-BASED CAPITAL (RBC)**

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Recorder: JOHN DUANE DAWSON

- Impact of RBC on product design
- How is RBC reflected in pricing?
- Has the introduction of RBC changed pricing goals?

MR. JOHN DUANE DAWSON: I will begin the discussion with a brief overview of the regulatory aspects of RBC and offer some thoughts on how to incorporate RBC into the pricing of insurance products. My name is John Dawson, and I am a consultant with William M. Mercer, Inc. Next will be Grant Hemphill. Grant is going to offer the small company perspective, and he will also touch on the application of marginal RBC analysis. Bob Omdal will share some viewpoints from his company's perspective. Bob is from Aid Association of Lutherans, the largest fraternal benefit society in the country. Then Mark Walker will draw from his experiences of working with RBC as the pricing actuary of Surety Life Insurance Company. Finally, Mike Cowell will offer some perspectives on how UNUM Life Insurance Company takes RBC into account. He will also share insight from a preliminary analysis on RBC covariance between product lines.

My remarks are introductory in nature. First, I'll touch on the historical aspects of target surplus formulas because RBC is a type of target surplus formula. Then I'm going to provide a very brief overview of the regulatory activity that has taken place and briefly touch on the upcoming RBC reporting requirements. Third, I will address opportunities and concerns relating to using RBC as a management tool. Finally, I'll provide some introductory remarks and a formula that you might use in the product development and pricing process.

Large insurance companies began developing target surplus formulas many years ago. Many of you may remember studying about target surplus formulas when you were studying for Fellowship examinations. These formulas tended to be a function of premiums, reserves, and insurance in force. Most often the formulas used by insurance companies were driven by formulas used by rating agencies. Asset risks were generally not recognized in these formulas. How many of you do use target surplus in your pricing? Most people are raising their hands. You all know that the states don't always wait for the NAIC to draft model regulation. In fact, the NAIC's RBC formula was patterned after and tested against adjusted surplus formulas in place in Minnesota and New York. Historically, though, the target surplus formulas used by insurance companies were influenced more by rating agency formulas than by the state-required surplus formulas, but that may change under RBC.

Canadian regulators have also been very active in this area over the past several years. Although this session specifically addresses U.S. RBC and not the Canadian

perspective, I encourage any of you from Canada to offer some perspectives during the question-and-answer session.

The NAIC spent considerable time developing, testing, and exposing its RBC formula. The formula was adopted at the December 1992 meeting of the NAIC and all life insurance companies will be required to calculate and file their RBC measure beginning with the 1993 year-end. In addition, the NAIC adopted a model act which gives RBC its teeth. Four levels of concern are defined in the model act with specific company and regulator activities prescribed depending on the relationship between RBC and surplus resources.

How should RBC be used as a management tool? This seemingly simple question does not have a simple answer. I venture to say that all the members of our panel are going to agree that RBC should be monitored, but beyond that there is probably little agreement. Some might argue that it stops here or maybe that it is useful to compare the results of your target surplus calculations to RBC. At the other extreme, some will argue that a multiple of RBC might be an appropriate target surplus benchmark for your company. Where do I stand? I believe RBC has some applicability to the development of target surplus benchmarks, but RBC should not be used in a vacuum. RBC is intended to identify weakly capitalized insurers and was developed to be generally applicable in all situations. Its results may not be specifically valid to your company's particular circumstance.

But I do wonder if RBC will have some unintentional side effects if it is used as a management tool. For example, will RBC become an external marketing force? That is, insurers may find that certain product lines do not offer sufficient returns in light of the RBC requirements for those lines. That may cause insurers to get out of certain lines of business. On the flip side, low RBC requirements for other product lines may attract new players to those markets. I'm not as concerned about the possibility that might happen as I am concerned that companies may be leaving or entering markets for the wrong reasons.

We're all familiar with the four contingency risks: the C-1 asset default risk, C-2 pricing risk, C-3 interest rate risk, and the C-4 business risk. The RBC formula is defined in many, many pages of instructions provided by the NAIC enabling companies to calculate these components using primarily annual statement data. The NAIC decided, though, that merely adding these components together is not quite appropriate. It has given us this formula which has a covariance adjustment:

$$RBC = C_4 + \sqrt{(C_1 + C_3)^2 + C_2^2}$$

If you merely add the components together, you will be overstating RBC by a small amount unless you're pricing an annuity.

When you sell an insurance product, there is generally some cash received, some cash paid out, and some accrual items to take into account. A lot of products start out in a surplus deficit position; we call that surplus strain. On top of this, the RBC formula will dictate an amount of surplus that we need to have to keep the regulators happy. This additional amount adds to the surplus strain effect.

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I would like to conclude my remarks with a formula for calculating what I call "required capital infusion ( $C_1$ )," based on the NAIC's RBC formula. This formula will determine the amount of capital that must be added to cover the surplus strain, in addition, cover the RBC requirement. The formula is complex because of the NAIC's covariance adjustment.

The above formula may be rewritten as follows:

$$RBC = P \times C_4 + \sqrt{(A \times C_1 + V \times C_3)^2 + (R \times C_2)^2}$$

where

- $P$  = premium revenue for the year
- $C_4$  = the C-4 RBC component factor
- $A$  = invested assets
- $C_1$  = the C-1 RBC component factor
- $V$  = the policy reserve
- $C_3$  = the C-3 RBC component factor
- $R$  = the net amount at risk for life insurance, or earned premiums for health insurance
- $C_2$  = the C-2 RBC component factor.

I have assumed that invested assets are equal to the sum of cash flows from the insurance operation and  $C_1$  needed to meet capital funding requirements:

$$A = CF + C_1$$

Assuming we want to maintain total surplus equal to RBC capital at all times, we can determine the amount of  $C_1$  required as the difference between RBC and the surplus generated from the insurance operation:

$$C_1 = RBC - S$$

where  $S$  = surplus generated from the insurance operation.

Substituting  $CF + C_1$  for  $A$ , and  $S + C_1$  for  $RBC$ , we obtain the following equation:

$$S + C_1 = P \times C_4 + \sqrt{((CF + C_1) \times C_1 + V \times C_3)^2 + (R \times C_2)^2}$$

to solve for the  $C_1$ , subtract  $P \times C_4$  from both sides, square, and regroup to form a quadratic equation for the values of  $C_1$ . Then the  $C_1$  may be determined using the well-known quadratic formula:

$$C_1 = \frac{-b + \sqrt{b^2 - 4 \times a \times c}}{2 \times a}$$

where

$$a = 1 - C_1^2$$

$$b = 2 \times (S - P \times C_4 - CF \times C_1^2 - C_1 \times V \times C_3)$$

$$c = S^2 - 2 \times S \times P \times C_4 + P^2 \times C_4^2 - CF^2 \times C_1^2 - 2 \times CF \times C_1 \times V \times C_3 - V^2 \times C_3^2 - R^2 \times C_2^2$$

Should you use this complicated formula in your pricing routines? You could, but that's generally not done in my experience. I use this formula or one similar to it to conduct simple spreadsheet analysis to tell me how to adjust my target surplus formulas and how to determine how much initial surplus I need to cover the surplus strain and the RBC amount. I've also used a formula similar to this to study and determine production affordability and its implications. That's where this formula is really going to come in handy.

I'm now going to turn the podium over to Grant Hemphill. Grant has looked at marginal RBC by taking the derivatives of the RBC formula with respect to various components. I can see applications where taking the derivative of this formula with respect to say premiums might be useful. Grant, would you like to take the derivative of this?

MR. GRANT HEMPHILL: Marginal analysis would provide an excellent opportunity for students to apply their calculus knowledge.

Every company has unique circumstances. However, every company requires surplus. It must obtain surplus in order to grow; it must maintain surplus just to be viable. RBC standards have drawn our attention to the obvious. Our source of surplus may be the stock market, a parent company, a private investor, a reinsurer, or our policyholders. In any case, the source of surplus expects an adequate return on that surplus.

At the Quebec meeting, John suggested how old profit objectives could be modified to include RBC, for instance, a new break-even year when the asset share first exceeds the reserve plus RBC. In the December 1992 *Product Development News*, Klaus Shigley showed how the need for RBC may be equated to other, typical, expense and mortality loads. Our products must be priced to provide profits that will cover the expected return. The ROE, aftertax and target surplus, pricing objective, usually called the Anderson method, accomplishes this directly. Other pricing objectives must somehow accomplish it (profits to cover a return on surplus) indirectly.

Smaller companies have a stronger RBC requirement than larger companies because of size adjustments in the factors. Still, smaller companies tend to have higher RBC ratios than larger companies. Several authors, noting this, have stated that it is easier for the smaller company to have a high RBC ratio. This is most puzzling. Given the above, it means that small companies can more easily add profits into their pricing or that they have cheaper sources of surplus. I would have difficulty arguing for either of these alternatives.

How much surplus should a company require? Specifically, how should a small company develop a target surplus formula? The mathematical or theoretical approaches consider limiting the probability of insolvency to an acceptable level. This should be viewed as a practical problem, much like setting retention limits. Through regulators, the RBC formula clearly sets a minimum surplus standard. Does it set a maximum? Perceptions of proper RBC multiples will develop. Companies with too much capital may have difficulty with certain consumerism regulators.

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The rating agencies were the original source of many smaller company target surplus formulas. The RBC formula is a big improvement. However, there is activity at the rating agencies to improve their surplus standards and generally move towards the RBC formula. Some may adopt it.

Some major companies have published their target surplus formulas. Some smaller companies have copied them, perhaps with modification. Competition can set upper limits for target surplus. I personally experienced this in my company's early attempts at pricing based on a target surplus formula. We had based the formula on what we understood to be a rating agency's standard. We had successfully used it to price annuities and universal life (UL). Then we had a terrible struggle pricing a term policy. No matter how aggressive we made our assumptions – I am sure I am not the only one here who has searched for the assumptions to justify a price/commission level – we could not achieve a competitive and profitable result. It turned out that our target surplus factor for amount-at-risk was too large. Lowering it, while raising the factor for reserves, allowed reasonable results for all these products at the same overall surplus level.

Now let's consider using a multiple of the RBC formula as a target surplus formula. It is an improvement on formulas copied from rating agencies and larger companies. The RBC-based target surplus will not be too small. It will satisfy regulators and rating agencies. It will not cause competitive hardship. If the formula is "wrong," that is, it does not reflect actual risks, and current capital deployment is "right," then market dislocations will occur. I conclude from this that the NAIC and industry must get the formula corrected if it is not right. Furthermore, knowledgeable experts such as actuaries should lead in developing the perception of a correct multiple of RBC to use as target surplus.

If a small (or other) company has chosen to use RBC in establishing target surplus, how does it proceed? The 200 or so items entering the RBC calculation must be condensed into a few factors usable in a target surplus pricing formula. We use a common, commercial pricing package for life and annuity products. For unit pricing, target surplus must be specified in terms of six factors: reserves, amount at risk, death benefits in force, expected death claims, premiums, and cash values. No asset factor is provided for. We need one for C-1 risk, so we apply a factor to the reserves. We divide it, as well as all other target surplus factors, by its complement. For unit pricing, a percentage of assets reflecting average risk class and size factor might represent the C-1 component of RBC. A percentage of the amount at risk could represent the C-2 component, and a percentage of the reserve and a percentage of the premiums would provide for the C-3 and C-4 components, respectively.

These factors should be adjusted for covariance before being applied to calculate target surplus. Tony Zeppetella's paper in the June 1993 *Financial Reporter* and my paper in the June 1993 *small talk* discuss marginal RBC calculations. This provides an easy means to make the required adjustment.

Table 1 shows the formulas for marginal authorized control level (ACL) rates. They are first derivatives of ACL with respect to C-1 or C-3, C-2, and C-4. The point is that a transaction that increases the C-1 part of RBC by a dollar does not increase the overall RBC by a dollar (usually). These formulas give the actual effect. Other RBC

levels are just multiples. If 400% of the ACL is your target surplus, then 400% of these marginal effects is what you need to use in a target surplus formula.

TABLE 1  
Authorized Control Level Marginal Rates

$$ACL = 0.5 \times \left( \sqrt{(C-1+C-3)^2 + C-2^2} + C-4 \right)$$

Unit Change in	Resulting Change in Authorized Control Level
C-1 or C-3	$\frac{C-1+C-3}{2\sqrt{(C-1+C-3)^2 + C-2^2}}$
C-2	$\frac{C-2}{2\sqrt{(C-1+C-3)^2 + C-2^2}}$
C-4	.5

Table 2 shows some examples that may help develop your intuition about marginal RBC. Company A has equal levels of C-1, C-2, C-3, and C-4 risks. A \$1 change in its C-1 component will cause a \$0.44 change in its ACL. Company B is probably an annuity writer. Note that a dollar of additional C-2 risk only adds \$0.05 to its ACL. Company C must write mostly low-cost life insurance and invest in low-risk assets.

TABLE 2

Company	Sum of Risk Components (Many zeros omitted)			Marginal ACL Rates	
	C-1	C-2	C-3	C-1 or C-3	C-2
A	5	5	5	.44	.22
B	11	2	11	.50	.05
C	3	10	4	.29	.41

C-4 risk does not affect C-1, C-2, or C-3 marginal rates. The C-4 marginal rate is always .5.

For pricing, a rate that will apply over the life of the policy must be estimated. At least three things may change. You hope your company will grow, reducing its target surplus. You may change your business mix, changing your marginal factors. The NAIC may change the formula while your policy is in force. This is similar to the risk that tax laws will change while your policy is in force. You price with the knowledge you have available including some prognostications.

To summarize, use a multiple of RBC as target surplus. Develop some reasonable, simple factors that will cover your RBC (in the future). Adjust the factors for covariance. Price using an ROE, aftertax, and target surplus, profit objective.

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I'd like to introduce Bob Omdal. Bob is from a fraternal, and I would understand that he would have the privilege of ignoring all this, but it seems that his company is taking an active role and doing a good analysis.

MR. ROBERT W. OMDAL: What my predecessors up here have had to say is very interesting. I do have to admit, however, that it has been quite a long time since I even thought about calculus. When I studied Jordan, I tended to skip over that stuff as being too mathematical. However, I can see that we have a varied audience here, and many of you seem to really enjoy the talk of derivatives. Well, I guess I have to apologize to you – there are no high powered formulas in my presentation. But, for the rest of you, it's time to wake up – I don't think I have anything here that's beyond even the most senior actuary with rusty mathematical tools.

### AID ASSOCIATION FOR LUTHERANS

At Aid Association for Lutherans, we are not subject to the RBC requirements since we are a fraternal benefit society, but we do have all of the same risks the rest of you have. We are, however, subject to and have complied with the Minnesota requirements mentioned by John in his opening comments. My understanding is that we were left out of the model law by design for practical reasons, but I am not sure about the intent for the future. I have spoken with two individuals close to the development of the RBC formulas who have given me contradictory messages. One said that the intent was to only cover the "blue book" companies (ours is brown), and that it was unlikely we would be included until such time as a major fraternal had significant problems. The other said that we were excluded initially, but that in a short time we would be included. We are not opposed to being subject to the RBC requirements, and in fact, I expect we will routinely compute it for our company, whether we are required to or not.

For the balance of my time, I will talk about how we reflect target surplus in pricing. We have been doing this for some time. However, we are using target surplus, and not RBC. Since we are not using RBC, I will then compare our target surplus levels with the RBC levels by line of business, for our major lines. I will then conclude my remarks with some comments on possible future activity for us relative to RBC.

We use two general pricing models at Aid Association for Lutherans. An asset-share-based model, and a ROE model. Our older model, which we still use for repricing certain closed blocks of business is the asset-share model. The cost associated with maintaining target surplus is included in pricing as an expense item. The intent with this model is to include the difference between the earned rate on surplus assets and the target ROE as an additional product expense. For example, if the earned rate on surplus assets is 8% and the target ROE is 12%, an additional product expense item equivalent to 4% of the target surplus would be included in pricing. I think the concepts here are fairly straightforward, so I won't go into more detail.

Our other pricing model, the ROE-based model is used for all of our currently issued products. This pricing model has evolved from our GAAP type of reporting model. While we are not currently subject to GAAP, we have developed a GAAP type of reporting for our internal statements.

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Pricing assumptions form the base for this. For determination of deferred costs, we rely heavily on the ROE pricing model. The deferred costs reflect the company's total investment in the business, including target surplus, and are set to achieve a level ROE over the pricing period. This formula for the annual surplus investment is the underlying base for this.

$$\begin{aligned} \text{IRR} &= \text{Increase in Target Surplus} - \\ &\quad - \text{Statutory Book Profits} - \\ &\quad - \text{Investment Income on Target Surplus} \end{aligned}$$

Because it represents the investment in the business, the formula is increase in target surplus, less statutory book profits, less the investment income earned on target surplus.

The internal rate of return of this stream of annual surplus investment is the level ROE generated by the product. The deferred costs are based on the accumulated value of this stream at the ROE. Now, for you numbers people, here's a simple example of how this works.

In my example, we have a hypothetical product that we have named (Table 3). We have a five-year product with a flow of book profits equal to a loss of \$5 in the first year, followed by gains of \$2 in each of the subsequent four years. These book profits include expenses, benefits, reserve increases, interest earned on the reserve, and any other components of statutory book profits. For simplicity, these book profits are assumed to emerge at the end of the policy year.

The second and third columns are also measured at the end of the year and represent the target surplus for this product and the interest earned on the target surplus. This is at the assumed earned rate for surplus assets (7% in our example). This may or may not equal the assumed earned rate on reserves. In our company, these rates are different.

The fourth column is the annual surplus investment. As mentioned earlier, this is equal to the increase in target surplus less book profits, less the interest earned on target surplus. As with any well-behaved product, we can see an initial investment in the business, followed by a steady repayment of this investment. The internal rate of return on this column is 15.05%.

TABLE 3  
A Fabulous Financial Product

Policy Year	Book Profits	Target Surplus	7%i on TS	Annual Surplus Investment
1	-5.00	3.00	0.00	8.00
2	2.00	4.00	0.21	-1.21
3	2.00	3.00	0.28	-3.28
4	2.00	2.00	0.21	-3.21
5	2.00	0.00	0.14	-4.14
			IRR	15.05%



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As I have mentioned, we are not subject to GAAP. Thus we were able to define deferred costs at our company to be the accumulated value of the annual surplus investment at the ROE rate, less the target surplus at the end of the policy year. We also use statutory reserves for internal reporting purposes, thus internal and statutory book profits are identical. By doing this, we generate a level ROE by policy year, equal to the internal rate of return of the annual surplus investment – 15% in our example.

In the interest of time and simplicity, I will not develop the deferred costs here, but leave that as an exercise for the interested observer. Table 4 shows our internal basis results for this product. Our total return is equal to the book profits, plus interest earned on target surplus, plus the increase in deferred costs. Remember, this is an annual example, with all events taking place at the end of the year, thus the first year return is zero. In practice, we do make adjustment for the actual timing of events.

TABLE 4  
A Fabulous Financial Product

Policy Year	Book Profits	Deferred Costs	7% <i>i</i> on TS	Total Return
1	- 5.00	5.00	0.00	0.00
2	2.00	3.99	0.21	1.20
3	2.00	2.92	0.28	1.20
4	2.00	1.60	0.21	0.89
5	2.00	0.00	0.14	0.54

In this example (Table 5), the annual ROE is computed as the total return divided by the accumulated surplus investment at the end of the previous year. As shown here, it is a level 15%.

Thus we include target surplus in our process in much the same way as we do reserves. Through this, we are earning the target ROE on the full amount of surplus necessary to put and keep the business on the books. This is similar to our asset share model, but does it directly instead of indirectly.

TABLE 5  
A Fabulous Financial Product

Policy Year	Accumulated Surplus Investment	Total Return	Annual ROE
1	8.00	0.00	
2	7.99	1.20	0.15
3	5.92	1.20	0.15
4	3.60	0.89	0.15
5	0.00	0.54	0.15

Now that you know, at least in general how we include target surplus in our pricing, I'd like to spend a little time talking about how our target surplus levels compare to RBC levels by line of business. As I mentioned earlier, we have done a fairly

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comprehensive study of surplus and are comfortable with our target surplus formulas. They are based on the risk profile of both our liabilities and assets.

Earlier this fall 1993, in preparation for this panel, I reviewed our RBC computation, and attempted to allocate our total RBC to our various lines of business. I am comfortable with our total level of RBC, but my confidence in my allocation by line is significantly less. I found it fairly easy to do a rudimentary allocation that makes some sense, but I question the validity of such an exercise for other than some broad comparisons.

We do segregate our assets by line. Our three major lines of business are traditional life, UL, and deferred annuities. I made no attempt to apply the risk factors to each asset segment. Instead, I allocated the C-1 component of RBC to the lines based on the total assets in each segment. This made no allowance for the largest ten assets, or any other aggregate corporate adjustments.

The C-2 component was allocated based on a rough approximation of the split of net amounts at risk between traditional business and UL. The factors for size of company were not taken into consideration in this percentage split.

The C-3 component was allocated directly between life insurance and annuities, with the insurance component being allocated between traditional and UL on the basis of reserves.

Finally, the C-4 component was allocated based on the level of premium income for these three lines, including amounts retained.

It should be obvious from the discussion of my methodology, that I have not used any highly theoretical analysis in allocating the RBC by line of business. If that's not clear from the method, I'm trying to make it clear by my comments. This is an approximation!

The sole purpose of this exercise was to give an order of magnitude relationship between target surplus and RBC, by line of business. This approximate relationship can be seen in this table. I have expressed this relationship as a ratio of our target surplus to the Company Action Level of RBC, which is 200% of the authorized control level: Total company, 220%; traditional life, 240%; UL, 250%; annuities, 180%.

I found it interesting that the ratio for annuities is so much lower than the other ratios. However, as I said earlier, this is fairly new information to us, and we are not using it, nor have we done much in the way of analysis as to why the differences by line are occurring.

In light of this, what do these ratios tell us? I believe they tell us a couple of important things, but there are other things that they don't tell us:

1. They tell us that since RBC is a solvency testing tool, our target surplus formulas are adequate from a solvency and regulatory perspective.

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2. They tell us that using a single multiple of RBC to determine the target surplus for all lines of business is probably not appropriate.
3. They tell us that allocating total RBC by line is probably not linear, and care should be taken in interpreting the results.
4. The main thing they don't tell us is that our target surplus formulas are either less appropriate for annuities, or more appropriate for the life lines, just because the ratios are lower or higher.
5. Finally, the ratios tell us that we have a long way to go in interpreting, understanding, and using RBC.

This brings us to my final point. What changes will we make in the future due to the introduction of RBC? I don't anticipate that it will have a major impact on us. I expect we will continue to use target surplus in pricing, and base our target surplus on studies of the risk profile of our assets/liabilities, and not on RBC level. I doubt that we would shift to a percentage of RBC, even if or when RBC becomes a legal requirement for us.

I expect that we will monitor our RBC level and ratio, and may even set targets for this ratio. This may cause shifts in our asset base and risk profile, which could have an impact on target surplus formulas, but only indirectly.

In summary, RBC is here to stay, if not in the current form, in some form. Surplus management has become a fact of life, therefore, target surplus should be reflected in pricing, and it's not all that difficult to do. Care should be taken in using a multiple of RBC as a surrogate for target surplus. When possible, target surplus levels should be based on your own risk profiles.

Now Mark Walker will give some insight on how risk-based capital has impacted product development decisions and pricing at his company.

MR. MARK A. WALKER: I will try to add to Bob's comments and build on some of the ideas presented earlier. My experience is a slightly different twist, and I will focus on U.S. GAAP and its inter-relations with RBC.

To be sure, the introduction of RBC has made a significant impact in our pricing process and in our view of product design. I would like to hypothesize some cases where companies could possibly change their product design, not necessarily mix, as a result of RBC. As an introduction to my comments, I would like to offer my own summary of considerations presented earlier to create a foundation of why our view has been different.

As Grant mentioned, return on target surplus is becoming an important profit measurement. This is true not only in a company's financial performance, but also in the pricing process. My company, Surety Life, is a subsidiary of a large publicly traded company. As a free-standing company, Surety Life would be of medium size. Our company, like many in the investment public's eyes, focuses on ROE.

Reduced to this simple formula, ROE is profit divided by equity. It becomes increasingly important in a competitive environment to control the denominator of this equation as much as we focus on the sufficiency of the numerator. In our profit center in my company, this is becoming the challenge to the pricing actuary.

If I might digress for a moment, I once had a discussion about what gifts should be given to a friend that is not really a friend. The best suggestion was a horse. Though it is very impressive to the recipient, the time and other resources necessary to maintain the gift makes the thrill fade quickly. Stockholders, and policyholders in the case of a mutual company, demand something in return for their investment. Pricing methods and goals that exclude consideration of the company's target capital position may achieve appealing financial results, but produce nothing material to this important group. For example, impressive income may be reported, but that income may not be divisible due to the nonincome statement item, increase in target surplus.

Similar to the horse, an otherwise profitable portfolio of products may be the gift that keeps on taking. Again, reflecting on Grant's comments, how target surplus or equity in my case is determined and is used in pricing becomes an important factor. This will certainly vary from company to company and perhaps within the company from one profit center to another.

I have listed four determining and interrelating factors -- the first three being my own summary of prior comments. First, company tradition may be based on standards from various rating agencies, as Grant mentioned, or surplus contributions, as Bob alluded to, or some other measure. Now enter the age of RBC. If the prior practice of the company resulted in a higher target surplus position than its desired position relative to RBC, then it is likely that there will be no impact on the pricing process. However, it is my guess that RBC will at least cause companies to reevaluate their target surplus goals, if not replace them entirely due to the desired RBC levels. The ultimate impression we wish to make is on the insurance-buying public, whether judged by RBC, Standard & Poors, A.M. Best or others.

Second, from a planning standpoint, the company may be insufficiently or overly capitalized. If insufficient, the pricing process will have to consider making up the shortfall over the company's desired time frame. Likewise an overcapitalized position may affect marginal surplus requirements depending on what sources are used to fund new business.

As an example, the company may liquidate assets that are adding to the C-1 component to fund new business, which adds to the C-2 component. This may sound more corporate than pricing, but it is important to reconcile the pricing process with the long-term company position.

Assuming that RBC has an impact on the desired surplus level of the company, the third factor a company or profit center should consider is its current RBC position. As Grant touched on, relative or marginal RBC should be considered as well as aggregate. This may give a certain line of business relative advantages or disadvantages to competitors or other profit centers. An example would be a reinsurance company that handled only C-2 risk. For every dollar of C-2, the RBC would increase a dollar

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assuming very little C-1 or C-3 risk. This would put the company at a disadvantage to other reinsurers that had blocks of investment-related products.

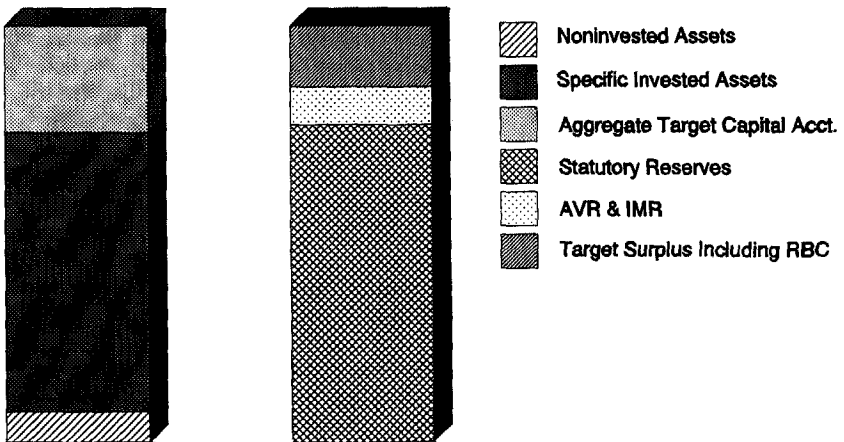
A new and final factor in developing equity is reserving and accounting methods. I am speaking both of statutory and GAAP bases. For companies with other internal and international accounting and reserving methods, these differences in their relations should be reviewed. For the purposes of this discussion, I will limit my remarks to U.S. statutory and GAAP accounting. With these four considerations, how is RBC reflected in pricing and how could it affect product design?

I will stay away from laborious formulas and equally frightening miracle examples and stick with pictures. Remember that our focus is increasingly centered on the denominator rather than the numerator. Chart 1 shows what the statutory balance sheet looks like with RBC. Let us assume that there is a defined set of assets to match your liabilities based on some investment and reinvestment strategies and a collective pool of assets equal to surplus or target capital funds.

With the pricing and asset/liability matching capabilities developed or purchased by most companies, this can be done in everincreasing detail. All components of RBC may be calculated as precisely as desired.

Using the exact NAIC formula is fraught with pitfalls. It may be appropriate for companies with homogeneous blocks of liabilities and assets. For an example, an exclusive writer of health business. As mentioned earlier, the marginal contribution to RBC should be considered for the majority of cases. In practice, some approximation formula will yield as sufficient an answer as the exact NAIC formula.

CHART 1  
Statutory Balance Sheet



On the rest of the liability side we have statutory reserves, interest maintenance reserve (IMR), and asset valuation reserve (AVR) and target surplus, of which the

desired RBC level will comprise the greater part. How can we design products, then, that will better our position relative to this picture? Assume we have a stock company that sells UL products that emphasize accumulation. This type of product will normally generate higher C-1 and C-3 risks in later durations and, thus, higher surplus levels. Continuing in this particular market would put them at a competitive disadvantage.

If the company were to take its expertise in the UL market to protection-oriented products, it could use a lower marginal target surplus requirement to its advantage. This would not only develop a more competitive product, but also it would balance the C-1 and C-3 risks from current blocks of business in force. Michael will be touching on this particular aspect, but here is a bizarre new twist of liability surplus matching.

Another example could be our C-2 reinsurer. It could increase its statutory reserves mildly and possibly lower its target capital. The latitude of this adjustment is much smaller. What else can be done to improve this picture? How about reinsuring unwanted elements of RBC? In Grant's case of the term product, he could pass the C-2 risk on to a more willing recipient. A decade ago this was a common occurrence with modified coinsurance for tax purposes. Another solution would be to pass some of the risk back to policyholders via market value adjustments or variable products.

Now we come to GAAP. The required assets will move over to the GAAP balance sheet perhaps with some minor modifications in the valuation of assets. To this we will add the item of deferred acquisition costs. The deferred acquisition cost should be met due to contra-deferred acquisition cost from reinsurance.

Chart 2 shows some obvious differences on the liability side. Reserving is on a different basis. GAAP reserves, on annuities for example, can be greater than statutory. I would like to interject that I found Bob's approach of interest. He chose to call the increase in target capital an expense similar to the increase in reserve and use it in a traditional pricing formula. Likewise, interest on target capital was used to offset the increase in target capital. I would prefer to put interest on target capital in income and concentrate on equity in the denominator. This is the way a company will ultimately be judged by the investment public. An important item on this list is other GAAP liabilities.

Let's assume that a stock company writing predominantly fixed premium whole life has an increase in statutory target surplus due to RBC. The company is sufficiently profitable when capitalized. With some changes in product design, it could increase its statutory liabilities by simply making the product limited pay and creating a deferred profit liability. Another favorite is redefining revenue.

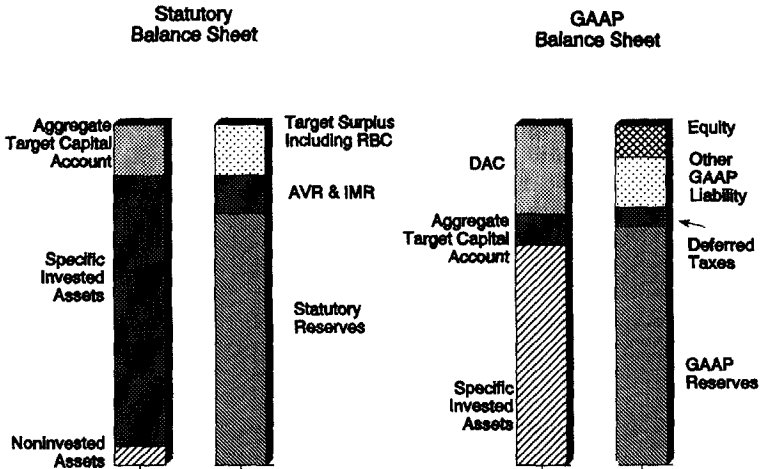
I read one investment firm's recommendation of a publicly traded company that boasted of developing products that did not require much capital. The company introduced the concept of deferred revenue by making some charges nonlevel without creating additional statutory liability.

At Surety Life, the product actuary has had to frame products that look the same to the field, perform better for the client and control capital better for the parent. This

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can no longer be done by the old-fashioned profit goal of present value of profits over the present value of premiums. Financial strength, benchmarked in part by RBC is priced into products at the front end as well as managed from the corporate level at the back end.

CHART 2



MR. MICHAEL J. COWELL: A very basic purpose of RBC is to absorb fluctuations, prevent insolvency, fund growth, and measure performance. I'll address questions that have been alluded to by some of the previous speakers about the right level of capital and touch on product management in an age of RBC.

I came across one interesting definition of what equity capital is. I thought this was a clever definition of equity capital: the least amount of money that owners can invest in the company and still get credit. Presumably that credit means not only the traditional sources of credit from the money markets but also credit from the standpoint of the policyholders who are in effect and in one sense lending us money.

Is there one right level of capital? The NAIC has established RBC as a target surplus formula. We have already had a couple of warnings, and I would certainly endorse those wholeheartedly, on the importance of companies understanding their own risk characteristics.

As Bob said, we have a long way to go to understand the implications of the RBC formula. Those of us who worked with the NAIC group on the industry advisory committee, recognize, and I'm sure any of you who worked with the formula and with your own company formulas know, that probably the worst thing you could do right now is blindly adhere to any of the canned formulas – be they the NAIC formula, the New York formula, the Minnesota formula, or whatever. There is no one formula that fits all companies, and I think there's a great danger in assuming that

you can take a canned formula and multiply it by some factor and assume that you're safe. Really, the formula should not be a bar. If it is a bar or gets in the way of understanding your own risk characteristics, then I would say it's probably doing more harm than good.

Why do we have risk capital formulas? We have a number of publics in the risk capital arena. For many of the regulators and legislators, we never can really answer the question of how much capital is really enough.

Rating agencies are very critical in this day and age, particularly for stock companies but also increasingly for mutual companies. There are many investors putting money into an insurance company. Often the right amount of capital, again going back to my earlier quote, is the least amount of money that you can get away with and still stay in business, so you can maximize your ROE. We have one or two examples, from the late 1980s, of what happens when some companies try to get away with the least amount of capital and then, with the first major hit, they go under. This is, in large measure why we have any NAIC RBC formula. Then, of course, we have a formula for customers, probably the most important reason for being in business. Unfortunately, I think our customers are often the last in the line to hear anything about RBC.

We cannot forget the media. Those of you who were around during the debacle of the *USA Today* article a couple of years ago recall that the paper reported some very bad formulas. It didn't even use its own bad formulas correctly, and it caused a lot of grief.

What is management's responsibility in all of this? It is clearly to get the right balance. Let me just take a quick show of hands. I realize we have a very mixed audience including regulators in the audience, but how many of you regularly deal with regulators on the issue of RBC? I certainly do. I'm sure others of you must. How many deal with rating agencies on RBC? A few more hands. How about your investors, do those of you in stock environments have any involvement? Mark obviously does and Grant. Your customers? One person. That illustrates the problem. It's all of these other publics and, of course, the media. How many have involvement with the media? How many have involvement with two or more of these publics? Only two? It's going to be more than the two of us. Maybe that's why we're up here talking about this because we've learned the hard way.

Having given you caution about the NAIC formula, having again, as I say, participated in it and I see a number of faces in the audience, people who worked on this, chart 3 shows the distribution of the 100 largest companies. This is the RBC formula of the NAIC as adopted, effective in 1993. This is the percentage of capital to the RBC requirement. Some of you may have studied this far enough to know that at the last minute, the NAIC in 1992 simply divided the RBC number that the committee had come up with by two so that, in effect, it doubles all of the percentages. It doesn't change anything substantially.

Chart 3 shows the RBC the way most of us think of it, where 100 is the standard. As you can see, for 100 of the largest companies, very few fall down at the lower end. The vast majority are at the 150 or 175 level. This should tell you something



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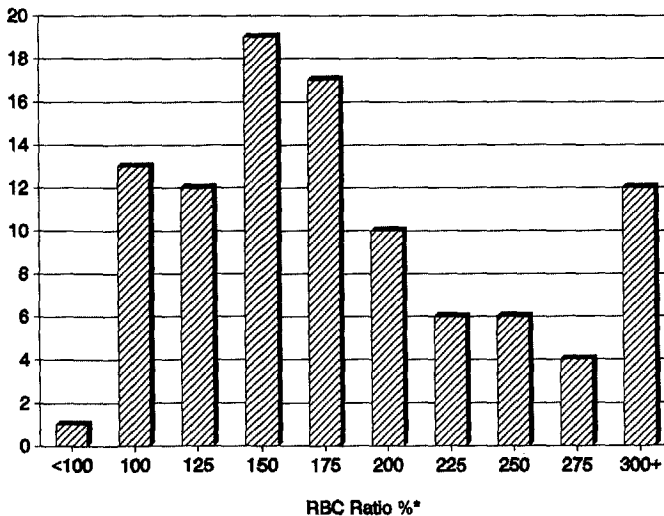
about the NAIC formula itself and that it is not intended to do anything other than separate well-capitalized and poorly capitalized companies. I think those of us who work closely with it realize more and more that it is a good formula; it does what it's supposed to do; but its use for any other purpose has to be taken very cautiously, like using any other tool for a purpose it wasn't intended.

The point that was made by Mark and alluded to, I'm sure, by the other speakers is that in the RBC formula, you do attain a lot of leverage from balancing your asset/liability risks. Chart 4 shows, on the left, what I call an ideal company in which the C-1 plus the C-3 risk, exactly equals the C-2 risk. Very few companies achieve that ideal, and as you can see on the right, the overwhelming pattern in the industry is for the C-1 and the C-3, the asset risks, to completely overwhelm the C-2 risk. The C-4 risk is a relatively small component.

The covariance shows how much you reduce the RBC requirement by matching your assets/liabilities, how much potential. This shows a 40% reduction, which is the most you can possibly get. If you think of it as we illustrate it in *The Actuary*, using Pythagoras, you get your best reduction on the diagonal relative to the two sides, if the two sides are equal. You're saying C-1 plus C-3 equals C-2.

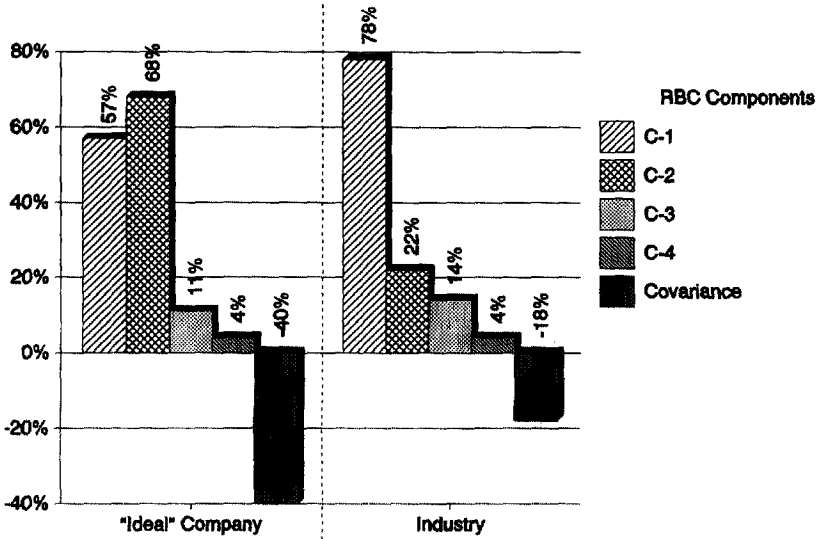
Again, what does this mean in a company's own risk capital formulas? Generally it says, look at your own mix of assets/liabilities. Make sure that you have assets that properly match your liabilities. Again, don't rely on some canned formula.

CHART 3  
Distribution of NAIC RBC Ratios  
100 Largest Companies



\*Multiply by 2 for Ratio to Authorized Control Level

CHART 4  
Leverage From Balancing Asset and Liability Risks



Finally, very briefly, let's wrap up evaluating capital requirements and profits expectations as previous speakers have mentioned, or balance of asset/liability risk. Again, I'm sure many of you are involved in the cash-flow-testing requirements of the valuation law changes. Again, this is another classic example of a snapshot RBC approach. That is what the NAIC formula does and what many of our formulas do, where you just simply take a single snapshot at a year-end, which does limited justice to the C-3 risk where you're trying to essentially look at a dynamic situation of balancing assets/liabilities out for the measurable future of both.

Finally, a number of other speakers have alluded to identifying and leveraging product covariance. Very few of us are fortunate enough to have the perfect covariance in which you have let's say group life insurance and you have a single premium or immediate annuities on all the same people who you have group life insurance on. You cannot lose in that situation. They'll either live or they'll die. Very few of us have that opportunity to get that perfect matching of mortality and morbidity risks. Having said that, there obviously are opportunities on both the assets and the liabilities side to manage or manage down the requirement of capital.

I think maybe somebody has also alluded to the fact that the risk capital formulation has implications on the investment side. There have been a number of articles out recently. I think the investment houses have done a good job in doing the kind of analysis on the asset side that Mark described on the liability side in measuring the indifference considerations between investing in particular assets as opposed to measuring in risk-free rates of return.

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I think with that I'll wrap up and say my own message is, don't rely slavishly on any single formula. Don't use RBC formulas as a bar to understanding the risk characteristics in your own company.

MR. DAVID L. CRESWELL: The emphasis here has certainly been on the NAIC RBC formula. We, like many other companies, have enough capital that we're not really going to be subject to unwanted regulator attention. However, we are very concerned about our ratings with the rating bureaus, and we have found through communication with A.M. Best that A.M. Best has its own RBC formula, which is similar in format to NAIC, but has very different factors. These are not just higher factors, in general, but specifically they are a bigger hit on the C-1 risk relative to C-2 and others. I am surprised that I haven't seen any indication of companies using that formula as maybe what they use in their pricing because keeping an A.M. Best rating is something that I think all companies have some nervousness about, whereas avoiding unwanted regulatory attention – there's a large tier of companies that needn't worry about that.

MR. DAWSON: That's a good comment. One of the reasons why we didn't address that is by design. We wanted to focus on the NAIC RBC formula. It is my understanding that A.M. Best is still working on its formula.

MR. CRESWELL: It's done. We have a copy of it.

MR. DAWSON: That is certainly something to take into account.

MR. COWELL: I would endorse that. Your point is extremely well taken, Dave. Again, getting back to any one single formula and recognize that A.M. Best has a different motivation than the NAIC and its greater emphasis right now on C-1 is probably tempered by the times. Why don't companies use Best as a pricing basis? Because I think most companies think in terms of the amount of capital that their analysis tells them is necessary to prevent insolvency at some very high degree of confidence. Most companies think of the Best requirement, which has typically been the most rigid of the formulas out there, as an additional requirement over and above which they have to make a decision as to what does it cost us to keep Best's A+ or A++ rating? Do we need A++ or A or A+ in certain markets? I think many companies think of it as going beyond the basic threshold which the NAIC and some of the other formulas tend to be more threshold, you're either in or you're out.

MR. PATRICK KELLEHER: I'm a relatively new student of U.S. investments, but I did do a lot of work earlier this year in developing an asset mix recommendation for our portfolio. In doing that I found that in looking at the performance of a diversified portfolio, when you look at change in total return on a bond portfolio and when you mix in different elements of equities and real estate, I noticed that the risk profile actually becomes a bit more favorable with a mix of equities. However, our RBC goes up. It didn't seem to make sense to me. Did any of you find that or have a problem with that?

MR. COWELL: Again, it's expecting maybe one formula to do too much. You can come up with situations in which a better mix of equities will actually lower your C-1 risk and in which additions to your C-2 risk for a given C-1 risk may actually lower

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your overall requirement. I'm sure you can find situations out in the margin, where what appears to you to be a more diversified mix is going to increase C-1. Did it also increase your overall risk requirement or just C-1?

MR. KELLEHER: What I was looking at was the marginal analysis, just looking at the effects of the portfolio mix decision on capital requirements.

MR. COWELL: And some of those decisions you're saying in your company do increase the total risk requirement even though you have a more balanced portfolio.

MR. KELLEHER: In effect what I found was in terms of correlations of return: the equity component was fairly significantly negatively correlated, and real estate was positive. There was also favorable diversification effect when I looked at the total variability and market value of the portfolio. The stock performance tended to increase the returns which to me, seemed to be the objective I was looking for in terms of increasing dividends for policyholders.

MR. COWELL: You're facing a formula, which as we said earlier, has a 30% factor for common stock on basis of market value.

MR. KELLEHER: That's the reason I asked the question. The Canadian requirement is conservatively lower and it seems to be more consistent with what I expected.

MR. COWELL: The formula, I think, for that particular situation probably would be lower. Again, Canada's minimum continuing capital surplus requirement (MCCSR) formula is structured somewhat differently from the NAIC's RBC. The only thing I can suggest is, I'm sure you've already done this, is put the two formulas side by side. Put your own company formula in the middle and understand what happens. What are you looking for? Are you looking for changes in the NAIC formula?

MR. KELLEHER: I was just interested in what you were saying.

MR. COWELL: There are threshold situations where one action at one level is going to increase and another one decrease the requirement.

MS. DEBORAH A. GERO: RBC was developed in a book value accounting environment. In light of FAS 115, has there been any discussion of reviewing the formula in context of the market value requirement as an impact on the specific components, especially the C-3 component?

MR. COWELL: This is another excellent question. The NAIC-based capital formula was essentially developed in the period 1991-92, largely to address some of the worst abuses of the 1980s, which were probably in order C-1, and we had examples of companies becoming insolvent because of C-1. We aren't aware of too many companies yet that have failed because of the C-2 risk, and of course, we had one case earlier in the 1980s involving Baldwin-United, which is probably a C-3 problem. The industry advisory committee as such completed its job at the end of 1992 and was wrapped up, but the same people, for the most part, on the industry advisory committee are continuing to work with the NAIC as a technical task force to look at changes such as this and other changes. I think I can assure you that changes are

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not going to be made to the NAIC formula in the near future. If it could be demonstrated that new standards of accounting on the asset side significantly changed the situation and the NAIC formula no longer did its original job of separating well from poorly capitalized companies, then I think a change would be forthcoming, but it would have to be a compelling reason to change.

MR. CRESWELL: Just to follow up, I wanted to ask quickly if I could maybe see a show of hands of anyone who has had the A.M. Best RBC formula shared with him or her? I get a lot of flack from my chief investment officer who says, this formula hits me harder, and it's not being used by other companies, and I suspect it is not being used because other companies don't have it.

MR. COWELL: I think that's right. I think A.M. Best was last in line to respond to the NAIC. I think that Moody's and Standard & Poors modified their formulas, and I think A.M. Best made a substantial revision, and it adopted, as you say, the form, although the factors are quite different from the NAIC. Best adopted the C-1, C-2, C-3, C-4, which the Society of Actuaries, of course, invented back in the 1970s. As more of us see the Best formula I think it will be just another one to get factored in there, and the plus of that is that it will get us away from overdue reliance on the one NAIC formula, and the minus is it will add a lot more confusion. I see somebody disagreeing with me.

MR. BRIAN R. LAU: I didn't really have a question so I wasn't going to say anything. But really what is going to happen is this formula is so visible and easy to understand, everyone will pick it up and it will be used to rate the industry across the board. Appropriate or inappropriate, I know you all said, well, you shouldn't blindly follow the formula, but the reality is in five years we won't ever talk about anything else because that's what the newspapers pick up and that's what everybody talks about. Agents already call in and ask – what's your ratio? The point is, it's an easy number to understand. But people believe they understand it when they don't, and so it's going to push the industry to follow that formula so everybody will figure out ways to maximize the ratio without changing the risk profile.

MR. COWELL: I'm hoping we can educate our publics. If we're expected to educate the Congress and the President, and we can't educate our agency forces, then I don't know what. Maybe we had better go back to the drawing board. You're absolutely right. There's no question, this formula before it was even out was being used by certain groups that were getting NAIC data banks and putting in their version. It's like any other tool. It is designed for one thing, use it for something else and it works. If it blows up in your face, don't blame us. We didn't design it for that. What can I say? What is your solution?

MR. LAU: Decisions should be based more on ratings and less on formulas.

MR. DAWSON: I share your concern, Brian, and I'll make a prediction that as soon as the NAIC data are generally available, some large national newspaper will publish all of the RBC ratios. Whether it is prohibited or not, the newspapers will do it. In response to your comment, Dave, now that you have told everyone here that Best has its formula and it is available, probably there are going to be several companies that will be actively pursuing it, at least the ones represented here will.

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MR. CRESWELL: You probably want to see how Best calculated it on your company. We got a computer printout from Best. We bothered the people there over the course of months, and when they had the printout, they gave it to us. I guess what I figured is it is being used for this purpose, not just for identifying which are the companies that are way undercapitalized. It is going to be used for, are you "A" or are you "A+." We figure it's the best.