Computing Capital Requirements

(Practice Problem from Study Aid on Butsic s Solvency Measurement Paper)

Be prepared for a problem asking you to compute capital requirements using Butsic's expected policyholder deficit. This is not the same as two other types of problems that are similar but which use entirely different procedures:

> Computing capital requirements using the NAIC risk-based capital formula, and
> Computing the covariance adjustment using the square root rule.

The capital requirements stemming from the NAIC risk-based capital formula are described in the "Risk-Based Capital Requirements" reading on the Exam 7 syllabus. Butsic was a major contributor to the American Academy of Actuaries risk-based capital task force, but his expected policyholder deficit concept is not used in the NAIC s formula.

The covariance adjustment and the square root rule are described both in the "Risk-Based Capital Requirements" study note and in Butsic's "Solvency Measurement" paper. Both procedures are Butsic s work, though some details of the procedure are different in the two readings. This study aid focuses on Butsic s procedures.

THE BASIC WORKSHEET

Butsic's method is illustrated in Tables 1, 2, and 10 of the "Solvency Measurement" paper. A simplified example is shown in the table below. The simplified example is based on a memo written by Butsic for the NAIC's risk-based capital efforts, which was published in the *NAIC Proceedings* and in the *CAS Forum*.

Study Recommendation for Candidates:

You should expect an EPD question on the examination, similar to the 1994, 1996, or 1997 exam problems. Most candidates are baffled by such questions.

Work through this practice problem in this study aid, then go back to Butsic's tables, which show the same procedure but are less well documented. Finally, work through the past exam problems shown below, along with the NEAS model solutions. The Spring 1994 exam problem is the most complex example, but after working through this study aid, you should feel comfortable with it.

In the simplest case, you will be given a table such as the one shown below, where

> X and Y are the two possible loss outcomes,
> p is the probability of the true loss being equal to X, and

Z is the expected policyholder deficit ratio.

	Asset Amount	*Loss Amount*	*Probability*	*Loss Payment*	*Deficit*
Scenario 1	A	X	p	E	G
Scenario 2	B	Y	(1 p)	F	H
Expected Value	C	D			
Capital			J		
EPD ratio			Z		

You are asked to calculate the risk-based capital amount, or C D, which equals the assets minus the expected loss amount. Note that C = B = A in this example. In Butsic's terms, the liability is uncertain in this problem, but the asset value is certain. [The following problem in this study aid illustrates the case of uncertain assets.]

To calculate the value of C D, we must determine the other values on this spreadsheet: A through J. To make the explanation clear, let us fill in sample values for X, Y, p, and Z. Suppose the examination problem asks:

> An insurance company faces a single uncertain loss. There is a 25% chance that the loss will be paid for $1,000 and a 75% chance that the loss will be paid for $5,000. The risk-based capital requirements use a 1% expected policyholder deficit ratio.
>
> Using the procedures developed by Robert Butsic, calculate the risk-based capital requirement for this risk.

The table below shows these input figures as well as the value for cell "D," the expected loss amount. We must "solve" this exhibit for the risk-based capital.

	Asset Amount	*Loss Amount*	*Probability*	*Loss Payment*	*Deficit*
Scenario 1	A	$1,000	25%	E	G
Scenario 2	B	$5,000	75%	F	H
Expected Value	C	$4,000			
Capital			J		

EPD ratio			1%		

The expected loss is

"D" = 25% * $1,000 + 75% * $5,000 = $4,000.

If the expected loss is $4,000, then the company must hold at least $4,000 in assets. If the actual loss amount is $1,000, the company will be able to pay the entire claim and the "deficit" will be zero. Thus, cell "E" is $1,000, and cell "G" is $0.

The EPD ratio is the expected policyholder deficit divided by the obligations to policyholders. The denominator is the expected loss amount, or $4,000. The numerator is the EPD. The EPD is the deficit in cell "H" times the probability of 75%. In other words

EPD ratio = 75% * H ÷ $4,000 = 1%.

This gives

H = $4,000 * 1% ÷ 75% = $53.33.

The deficit is the loss amount minus the claim payment. Thus

$5,000 - claim payment = $53.33, or

Cell "F" = claim payment = $4,946.67.

The company makes a claim payment less than the claim amount only if it exhausts all its assets in doing so. Thus, cell "B" equals $4,946.67. Since the initial asset amount does not depend on the eventual claim payment, cells "A" and "C" also equal $4,946.67.

The company's capital is the asset value minus the expected loss payment, or

Cell "J" = capital = $4,946.67 ÷ $4,000 = $946.67.

These figures are shown in the table below.

	Asset Amount	*Loss Amount*	*Probability*	*Loss Payment*	*Deficit*
Scenario 1	$4,946.67	$1,000	25%	$1,000	$0
Scenario 2	$4,946.67	$5,000	75%	$4,946.67	$53.33

Expected Value	$4,946.67	$4,000			
Capital			$946.67		
EPD ratio			1%		

This is the method used by Butsic for calculating capital requirements. Butsic, of course, dispenses with the documentation of the exhibit and simply says (page 678): "The values and their probabilities are given in Table 10. The desired expected policyholder deficit ratio is 1 percent. The risk-based capital needed for this degree of protection is easily calculated at $2,900."

The illustration above is the simplest form of this type of problem. On the examination, you can expect more complex problems.