

가

1. 가

가. EU

EU 가 ×
) (가 -
)

가 () -

+

() ()

$$= \frac{\text{가} (+) \times \sum \{ () \}}{\times () \times ()}$$

1 (

), 1
 (,),
 / ,
 (-
) / .
 가 , 2001 3
 0.18% .

< -1> EU

		EU	
			$\times 4\% \times R2/ R1(0.85)$)+ $\times 0.3\% \times R2/ R1(0.5)$)
	$\times 4\% \times$ $\times 0.3\% \times$	+	R2: () R1: ()
	.	.	5 : 0.3%
		.	3 5 : 0.15%
		.	3 : 0.1%

EU $\times (0.3\%) \times$
 $R2/ R1(0.5)$) . R2
 (), R1 ()
) .
 5 0.3%, 3 5
 0.15%, 3
 0.1% .

. RBC

가

6

가

< -2>

,

, , , ,
가 .

< -2>

RBC

가

		0.6/ 1000	= × 가
		0.06/ 1000	가 × 가
		10/ 1000	-
	×	3/ 1000	=10,000 × 가
	×	7.5/ 1000	=10,000 × 가
		1	-

0.6/ 1000

가 ,

0.06/ 1000

가

12).

12)

가

가
(ruin function)

1%

Solvency margin

13).

< -3> RBC 가

RBC			
-			
-			
(C3)			
	5	0.15 %	0.12 %
	5 ~50	0.10 %	0.08 %
	50 ~250	0.075 %	0.06 %
	250	0.060 %	0.05 %
		7~15 %	15~25 %
		25 %	-
	가	-	15~35 %
		15~25 %	15~25 %
		12 %	12 %
		8 %	8 %
		5 %	5 %

(net amount at risk)¹⁴⁾

RBC

3 5

13) 가

14) 가

5% 가

가,

2. 가 15)

가

RBC

EU

EU

가 16)

가. (Campagne) 17)

Campagne(1961) OECD

3가 ,

가

가

15) 가

EU
EU

가

가
EU

RBC

16) EU

4%

(Campagne)

(Buol)

17) W. M. Kastelijn and J.C.M. Remmerswaal, *Solvency, Surveys of Actuarial Studies*, No.3, 1986, pp.27~30.

, 가 ,
가 ,
,

, 가 , 가
가 , 가
.

, 가 , 가
가 가
V (U)
1

가

$$P \{ L / V \geq U / V \} \leq \varepsilon \text{ ----- (1)}$$

$$(1) \quad X \quad L / V \quad X \quad (L / V) \quad (2)$$

가 .18)

$$\frac{1}{f_X(x)} \frac{df_X(x)}{dx} = \frac{x + a}{b_0 + b_1x + x^2} \text{ ----- (2)}$$

, a, b_0, b_1 $\mu_2, \mu_3, \mu_4 (\mu_1 = 0)$

18) 가 . 10 1926 1948

$$\begin{pmatrix} a \\ b_0 \\ b_1 \\ b_2 \end{pmatrix} = \begin{pmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 3\mu_2 \\ \mu_2 & 0 & 3\mu_2 & 4\mu_3 \\ \mu_3 & 3\mu_2 & 4\mu_3 & \mu_4 \end{pmatrix} \begin{pmatrix} 0 \\ -\mu_2 \\ -\mu_3 \\ -\mu_4 \end{pmatrix}$$

$$f_X(x) = 31.73 \left(1 + \frac{x^2}{5.442^2}\right)^{-4.850} e^{2.226 \operatorname{arctg}\left(\frac{x}{5.442}\right)}$$

(x*)

$$\int_{x^*}^{\infty} f_X(x) dx = \epsilon$$

k (k=2, 3, 5, 10)

ε

가

()

< -4 >

ε	(%)				
	1	2	3	5	10
0.001	9	10	10	12	14
0.01	7	7	7.5	8	9
0.05	3.5	4	4	4	3
0.1	2.5	2.5	2	2	1

2가

,

1

4

(/)

가 35

) (fitting) , <
-4 > . Campagne € 5%
4%가 .

(Buol)

EC 19 가 1969
OECD 가 (Buol
Report¹⁹⁾) .

, 가

.
(20) 90%
(unstrengthened reserves)
80% (solvency magin)
. , unstrengthened
가 90% , strengthened
unstrengthened 80%²⁰⁾
(unstrengthened) < -5 > .

19) Buol Report(1971) (Buol) (A Working
Party) , OECD
1971 가
가 가

20) 85% 가 .

< -5> Unstrengthened

(a) First, the average effective rate of yield on the life company's assets over a sufficiently long period of time (20 years is recommended) is determined.

“ (20) ”

(b) Then, either this average yield, reduced by 10%, or, alternatively, a weighted average (two-thirds of the lowest annual rate of yield in the period plus one-third of the most recent rate) is chosen.

“ (1) 10%가 가
 (, 20 2/3 가
 1/3) ”

(c) Finally, in order to assure that, in spite of a possible downward trend in the rate of yield, the use of either formula suggested in (b) does not result in too high a valuation rate, the condition is added that Unstrengthened interest rate can never exceed 90% of the most recent rate of yield.

“ 가 가
 Unstrengthened 가 90%
 ”

(Working Party) strengthened reserve
 unstrengthened reserve 80%
 . strengthened reserve

< -6> Unstrengthened Reserves Strengthened Reserves

Unstrengthened Reserve		Strengthened Reserve	
20	8%	가	
(: 7.0%, 5.0%, 8.5%, 9.0%..., 9.5%, 6.0%, 10%)			
A:	90%	A' : A(7.2%)	80% = 5.76%
(8% × 90% = 7.2%)			
solvency margin(A-A') = 1.44%			
B:	20	B' : B(6.68%)	80% = 5.34%
(2/3)+	(1/3)		
(5.0% × 2/3 + 10.0% × 1/3 = 6.68%)			
solvency margin(B-B') = 1.34%			

unstrengthened reserves strengthened reserves
reserves < -6 > .

unstrengthened reserves
strengthened reserves solvency margin 가 .

Buol Report solvency margin(M_t)

$$\begin{aligned}
 M_t &= (A_{x+t:\overline{n-t}|} - \pi' \cdot \ddot{a}_{x+t:\overline{n-t}|}) - (A'_{x+t:\overline{n-t}|} - \pi' \cdot \ddot{a}''_{x+t:\overline{n-t}|}) \\
 &= (A_{x+t:\overline{n-t}|} - \pi \cdot \ddot{a}_{x+t:\overline{n-t}|}) - (A'_{x+t:\overline{n-t}|} - \pi' \cdot \ddot{a}_{x+t:\overline{n-t}|}) \\
 &\quad + (\pi - \pi') \cdot \ddot{a}_{x+t:\overline{n-t}|}
 \end{aligned}$$

21) Record of Society of Actuaries, "Life Insurance Assets and Liabilities and Their Difference", Vol.1.No.2, 1975, pp.382-389.

$$= ({}_t V_{x:n} - {}_t V'_{x:n}) + (\pi - \pi') \cdot \ddot{a}_{x+t:n-t}$$

$$= M_r + M_p$$

, strengthened unstrengthened
 unstrengthened
 , unstrengthened (9%)
 (6%)
 Boul Report , Mr unstrengthened
 reserves 9%, Mp (-unstrengthened reserves) 6%
 EC Directive 9% 6% 4% 0.3% ,
 , Buol Report
 1961 OECD Campagne 가 second campagne
 report , 4% solvency margin
 , 1968 EC Directive
 0.3%
 EC Directive EC
 solvency margin 22).
 가 ,

22) 1982 32 , 33 , (政令) R 334-11
 334-14 , 53C 1983 12 13 4

3. 가

가
 , 2001 3 0.18% 1
 2002 3 가 0.24%
 , 0.06% 가
 .

< -7 >

(: %)

2001. 3								2002. 3									
0.1	0.1	0.2	0.2	0.3	0.3	0.1	0.1	0.2	0.2	0.3	0.3	0.1	0.1	0.2	0.2	0.3	0.3
A	0.03	K	0.13	M	0.29	P	0.47	A	0.027	M	0.134	S	0.252	P	0.402		
B	0.0	L	0.13	N	0.21	Q	0.39	B	0.0	I	0.170			Q	0.390		
C	0.0			O	0.28	R	0.40	C	0.0	V	0.183			R	0.401		
D	0.07					S	0.31	D	0.008					H	1.612		
E	0.1					T	0.39	F	0.028					O	1.829		
F	0.04					U	0.35	T	0.038								
G	0.07							G	0.0								
H	0.09							U	0.066								
I	0.05							L	0.083								
J	0.04							J	0.020								
								K	0.062								
								N	0.062								
								E	0.054								
0.180%								0.242%									

: B, C, G 100% 가 0

< -7 > 0.1%
 가 2001 3 7 2002 3 10 가
 가 2001 3
 , 가 0.3%

0.3%

EU

가

가

NAIC

RBC < -8 >

가 1993

가 1996 20.2%

1998 18.2%

가

1/5

< -8 > RBC (: %)

	1993	1994	1995	1996	1997	1998
(C0)	18.1	17.4	17.5	17.8	18.4	18.4
(C1)	49.3	48.1	47.5	46.6	46.5	48.2
(C2)	18.0	19.0	19.7	20.2	20.1	18.2
(C3)	11.2	12.0	11.8	11.8	11.4	11.3
(C4)	3.4	3.6	3.6	3.6	3.6	3.9
	100.0	100.0	100.0	100.0	100.0	100.0

: NAIC, NAIC Research Quarterly, October 1999, Volume , Issue 4, p.15.

가 (C2)가

, 가

(C1)

RBC

, (admitted assets) 가 \$10 \$25
RBC 60% (C2)가 ,
(C1) 20% . 가 \$10
(C2) 10%
, (C1)가 60%
,23)

23) NAIC, NAIC Research Quarterly, October 1999, Volume , Issue 4, pp. 11-13.