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Consideration of the structures and techniques of risk sharing in cash balance pension plans

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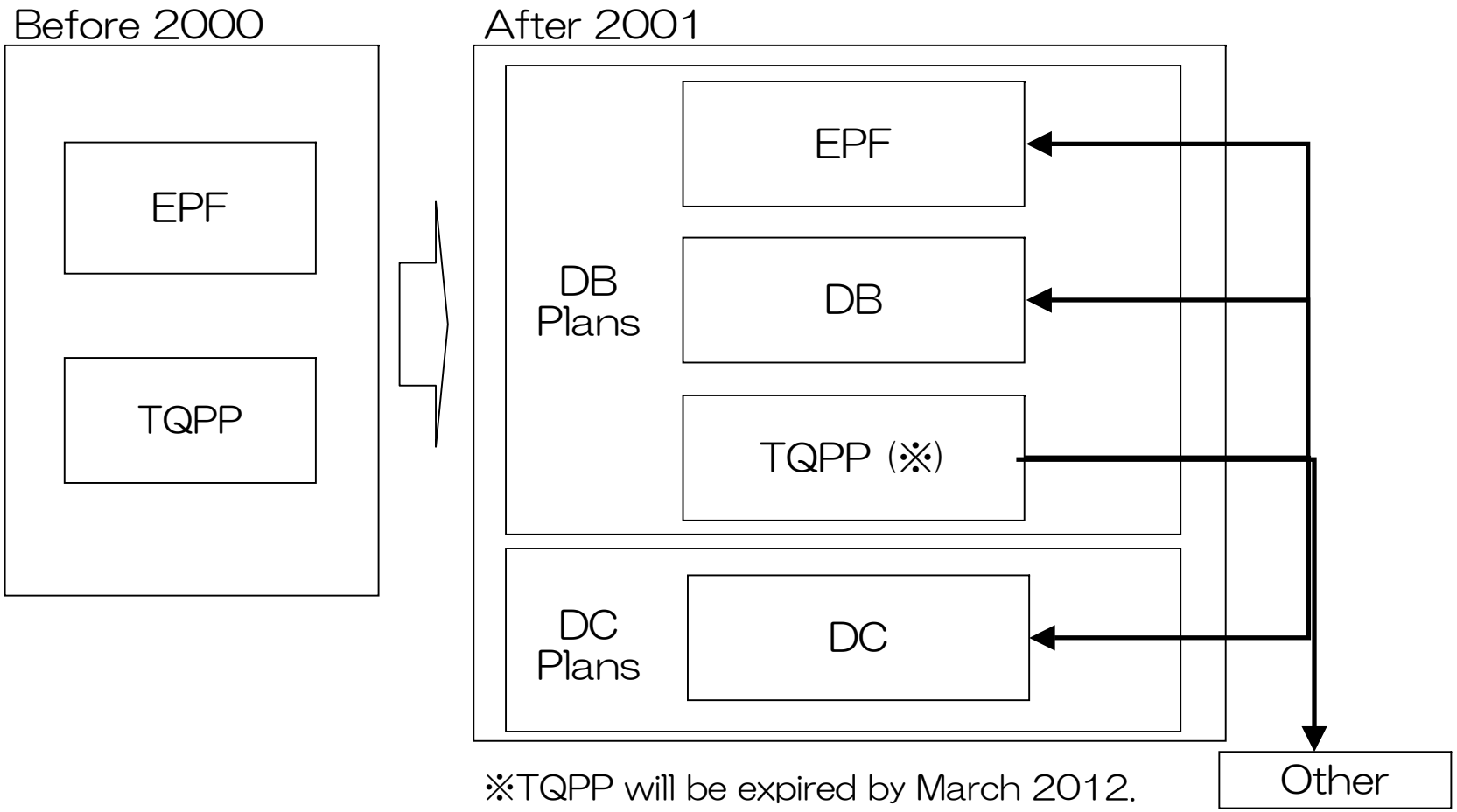
1. Introduction of CBP in Japan（1）

Japanese Corporate Pension Scheme

Date	Corporate Pension Scheme
1962-2012	Tax-Qualified Pension Plan（TQPP）
1966-	Employee's Pension Fund（EPF）
2001.10-	Defined Contribution Pension Plan（DB）
2002.4-	Defined Benefit Corporate Pension Plan（DC）

1. Introduction of CBP in Japan（2）

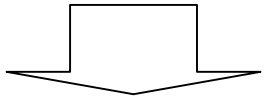
Japanese Corporate Pension Scheme Reform



1．Introduction of CBP in Japan（3）

Cash Balance Pension Plan(CBP)

Defined Benefits Corporate Pension Act(DB Act)



EPF・DB

⇒　Permitted to design benefits by CBP

TQPP

⇒　Not permitted to design benefits by CBP

1. Introduction of CBP in Japan（4）

In case of transfer of TQPP,
plan sponsors have chosen CBP in many cases.

Reason：

- This choise results in the mitigation of the volatility of the projected benefit obligation(PBO).
- When the economic environment turns bad , the benefits by CBPs will not grow as much in comparison with the conventional defined benefit pension plans.

1. Introduction of CBP in Japan（5）

●Review of risk sharing（Investment Risk）

Perfect Storm(2000-2002)

⇒ DB Act and DC Act were enacted.
(Permitted to design benefits by CBP)

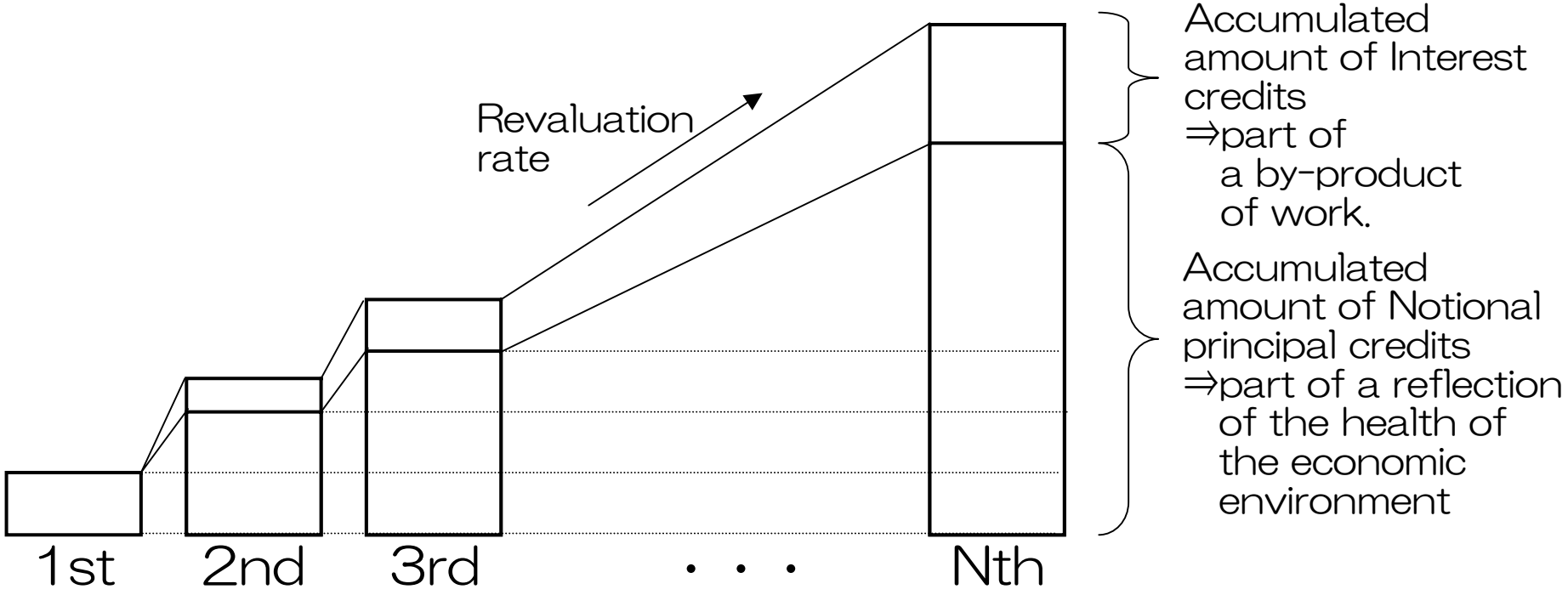
Subprime Crisis・Lehman Shock(2007-2008)

⇒ JSCPA began to examine expansion of the Hybrid-type Pension Plan, including Benchmark Related Pension Plans (BRPs).

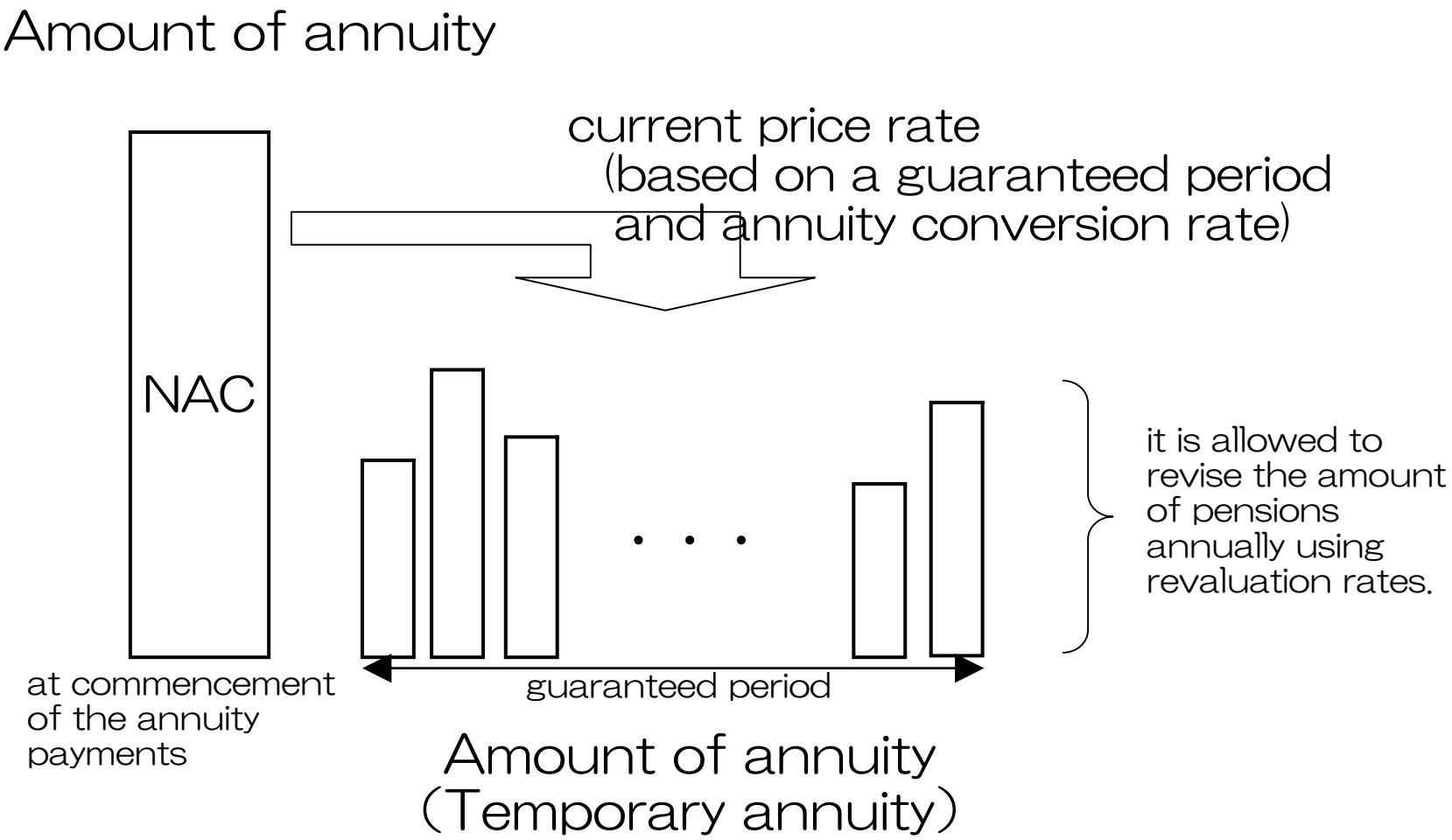
2. Japanese CBP and NAC（1）

NAC ＝ ΣNotional principal credits ＋ ΣInterest credits

ΣInterest credits : Don't decrease



2. Japanese CBP and NAC（2）



2. Japanese CBP and NAC（3）

Revaluation rate (in Japan)

＜legally-recognized options＞

① Fixed rate

② the interest rate of the government bond etc.
（Consumer Price Index , Wage rate Index）

③ Combination of ① and ②

④ ② or ③ provided that this choice dose not go beyond the upper or lower bounds

Don't fall below 0

⇒ In many cases,
the yield of the government bond is used.

2. Japanese CBP and NAC（4）

Other features

- In many cases, for coefficient according to retirement reason,
  lump sum benefits decreases more than NAC.

- In many cases, Temporary annuity
  （Not whole life annuity）

3. Structure of Risk Sharing（1）

Risks in Pension Plan（1）

Investment Risk

<DB>
this risk is that the plan sponsor might be required to pay an additional burden when RORs fall below the expected ROR assumed in contribution calculations

<DC>
this risk is that the employee's future benefit might become smaller than expected when the actual RORs fall below the expected RORs

ROR : rate of investment return

Reference : Shimizu Nobuhiro[2006],

"Reinventing the Risk Sharing Mechanism of Defined Benefit Pension Plans"

3. Structure of Risk Sharing（2）

Risks in Pension Plan（2）

Longevity Risk(Annuity Conversion Risk)

＜plan sponsor＞（whole life annuity）
this risk is that
the actual amount of annuities every year exceeds the amount of the expectation
when the results mortality rate to fall below the expected one because the annuitants live long.

＜employees and pension recipients＞（temporary annuity）
this risk is that
the original capital for old age is insufficient
when they live longer than one expects and that financial capital to maintain their livelihoods in old age might need to be increased.

3. Structure of Risk Sharing（3）

Risks in Pension Plan（3）

Mortality rate improvement Risk

This risk is that
the plan sponsor might be required to pay an additional burden
when mortality rates might improve beyond expectation and future benefits might be higher than expected.

3. Structure of Risk Sharing（4）

Risks in Pension Plan（4）

Earnings Increase Risk

<plan sponsor>
This risk is that
the plan sponsor might be required to pay an additional burden when earnings increase faster than expected and future benefits are higher than expected.
（This risk becomes larger in final earnings pension plans.）

<pension recipients>
this risk is that
the income substitution rate for the real wages might fall when the wage of active employees rises.

<employees>
this risk is that
the income substitution rate for the real wages might fall when the wage growth rate is less than the inflation rate.

3. Structure of Risk Sharing（5）

Risks in Pension Plan（5）

Inflation Risk

This risk is that
the real value of benefits might be reduced due to inflation.
(this risk becomes large in such cases where the amounts of benefits are proportionate to one’s career average earnings and past earnings are not revalued.)

Default Risk

This risk is that
the rights of participants to receive benefits might be partially or completely lost
when the plan sponsor becomes insolvent and the pension plan is forced to be terminated or to be dissolved.

3. Structure of Risk Sharing（6）

Risk Sharing in CBP

Investment Risk
Ernings Increase Risk

⇒ Those Risks are improved in comparison to the final earnings pension plan.

4. Structure of BRP（1）

Problem of CBP

Benefits ：

change according to the yield curve

Asset management：

ROR can’t completely synchronize
with the yield curve used.
⇒Investment Risk：plan sponsor

4. Structure of BRP（2）

Benchmark Related Plan(BRP)

[Under consideration in JSCPA]

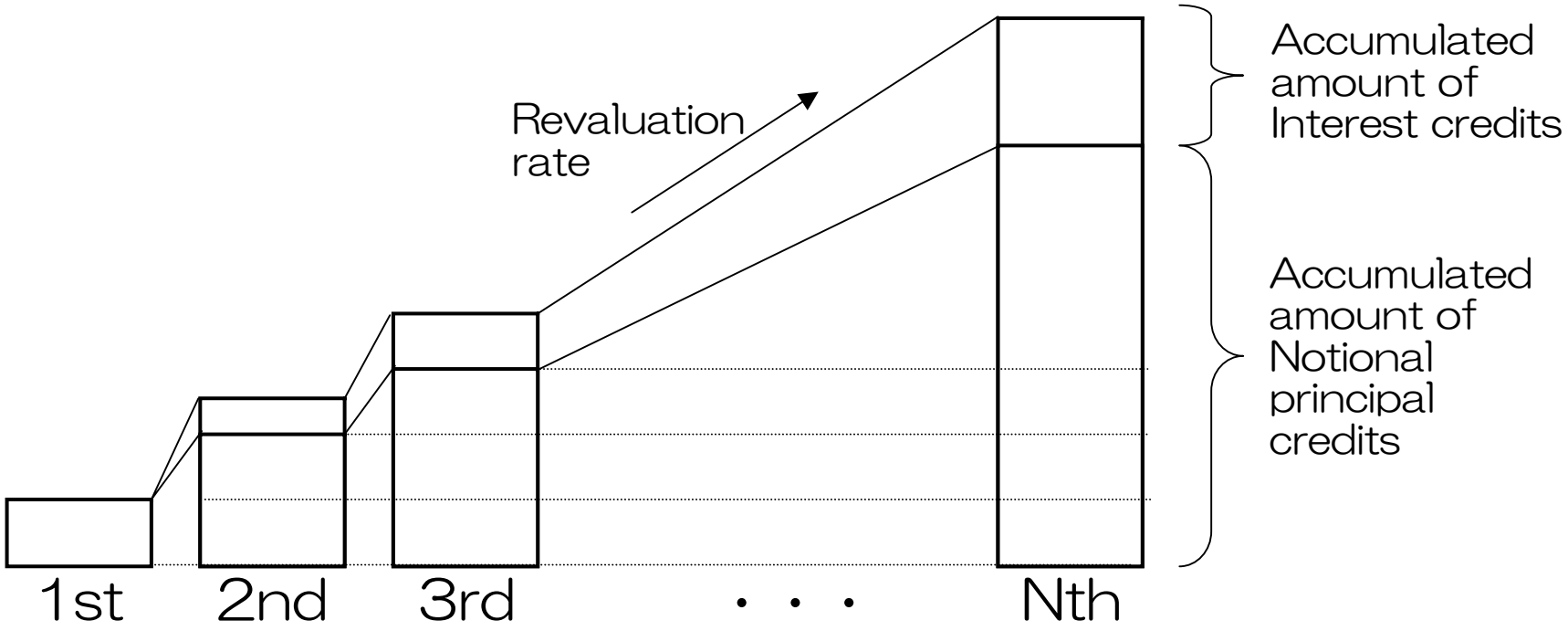
Difference point with CBP

- ●Revaluation rate
  - Combined benchmark index rate of return
    - ⇒Employees and plan sponsor mutual agreement
- ●Interest credits
  - It is possible to fall below 0.
  - Lower bound of ΣInterest credits ： 0
- ●Amount of annuity
  - a different of method for deciding the amount of the annuity

4. Structure of BRP（3）

NAC ＝ ΣNotional principal credits ＋ ΣInterest credits

Lower bound of ΣInterest credits ： 0

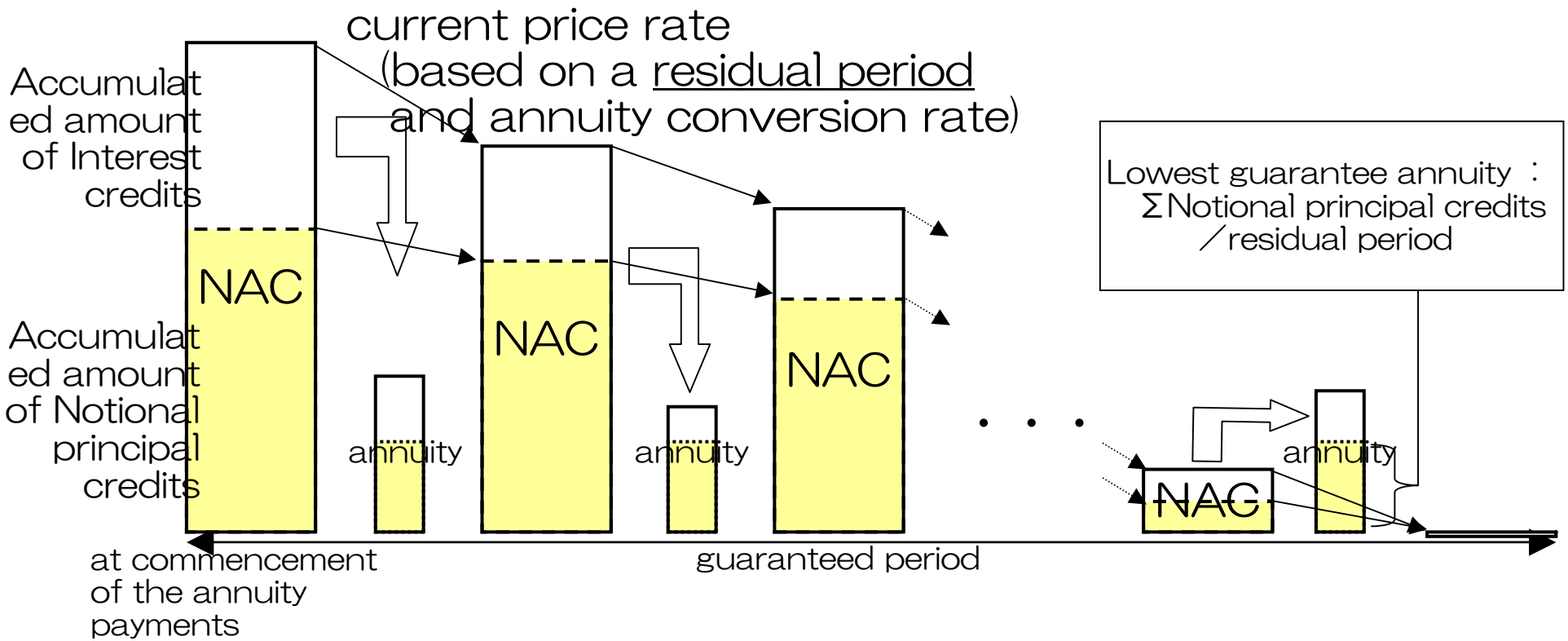


4. Structure of BRP（4）

Amount of annuity
（Temporary annuity）

This paper's Method
annuity amount
=NAC ／current price rate

JSCPA Report's Method
annuity amount
=NAC ／residual period



Appendix Example of Amount of Annuity Changing in BRP

Example1

Method for Deciding the Amount of the Annuity : This Paper's Method
(Temporary Annuity(guaranteed period : 15 years))

Year	Residual period (at end of previous year)	CBROR	NAC (at end of previous year)			Annity (per year)		
			Notional principal credit part	Interest credit part	Total	Notional principal credit part	Interest credit part	Total
1	15	3.0%	1,500,000	1,500,000	3,000,000	100,000	128,898	228,898
2	14	3.0%	1,400,000	1,461,102	2,861,102	100,000	131,699	231,699
3	13	3.0%	1,300,000	1,415,236	2,715,236	100,000	134,571	234,571
4	12	3.0%	1,200,000	1,362,122	2,562,122	100,000	137,523	237,523
5	11	3.0%	1,100,000	1,301,463	2,401,463	100,000	140,565	240,565
6	10	3.0%	1,000,000	1,232,942	2,232,942	100,000	143,711	243,711
7	9	3.0%	900,000	1,156,219	2,056,219	100,000	146,979	246,979
8	8	3.0%	800,000	1,070,927	1,870,927	100,000	150,392	250,392
9	7	3.0%	700,000	976,663	1,676,663	100,000	153,985	253,985
10	6	3.0%	600,000	872,978	1,472,978	100,000	157,808	257,808
11	5	3.0%	500,000	759,359	1,259,359	100,000	161,945	261,945
12	4	3.0%	400,000	635,195	1,035,195	100,000	166,536	266,536
13	3	3.0%	300,000	499,715	799,715	100,000	171,868	271,868
14	2	3.0%	200,000	351,838	551,838	100,000	178,651	278,651
15	1	3.0%	100,000	189,742	289,742	100,000	189,742	289,742

Annuity conversion rate : 2.0%

minmum:	128,898
maximum:	189,742
average:	152,992

Example2

Method for Deciding the Amount of the Annuity : JSCPA Report's Method
(Temporary Annuity(guaranteed period : 15 years))

Year	Residual period (at end of previous year)	CBROR	NAC (at end of previous year)			Annity (per year)		
			Notional principal credit part	Interest credit part	Total	Notional principal credit part	Interest credit part	Total
1	15	3.0%	1,500,000	1,500,000	3,000,000	100,000	100,000	200,000
2	14	3.0%	1,400,000	1,490,000	2,890,000	100,000	106,429	206,429
3	13	3.0%	1,300,000	1,470,271	2,770,271	100,000	113,098	213,098
4	12	3.0%	1,200,000	1,440,281	2,640,281	100,000	120,023	220,023
5	11	3.0%	1,100,000	1,399,466	2,499,466	100,000	127,224	227,224
6	10	3.0%	1,000,000	1,347,226	2,347,226	100,000	134,723	234,723
7	9	3.0%	900,000	1,282,920	2,182,920	100,000	142,547	242,547
8	8	3.0%	800,000	1,205,861	2,005,861	100,000	150,733	250,733
9	7	3.0%	700,000	1,115,304	1,815,304	100,000	159,329	259,329
10	6	3.0%	600,000	1,010,434	1,610,434	100,000	168,406	268,406
11	5	3.0%	500,000	890,341	1,390,341	100,000	178,068	278,068
12	4	3.0%	400,000	753,983	1,153,983	100,000	188,496	288,496
13	3	3.0%	300,000	600,106	900,106	100,000	200,035	300,035
14	2	3.0%	200,000	427,074	627,074	100,000	213,537	313,537
15	1	3.0%	100,000	232,349	332,349	100,000	232,349	332,349
						minmum:	100,000	
						maximum:	232,349	
						average:	155,666	

Example3

Method for Deciding the Amount of the Annuity : This Paper's Method
(Temporary Annuity(guaranteed period : 15 years))

Year	Residual period (at end of previous year)	CBROR	NAC (at end of previous year)			Annity (per year)		
			Notional principal credit part	Interest credit part	Total	Notional principal credit part	Interest credit part	Total
1	15	−10.0%	1,500,000	1,500,000	3,000,000	100,000	128,898	228,898
2	14	−10.0%	1,400,000	1,071,102	2,471,102	100,000	100,116	200,116
3	13	−10.0%	1,300,000	723,876	2,023,876	100,000	74,844	174,844
4	12	−10.0%	1,200,000	446,644	1,646,644	100,000	52,653	152,653
5	11	−10.0%	1,100,000	229,327	1,329,327	100,000	33,165	133,165
6	10	−10.0%	1,000,000	63,229	1,063,229	100,000	16,045	116,045
7	9	−10.0%	900,000	0	900,000	100,000	0	100,000
8	8	−10.0%	800,000	0	800,000	100,000	0	100,000
9	7	−10.0%	700,000	0	700,000	100,000	0	100,000
10	6	−10.0%	600,000	0	600,000	100,000	0	100,000
11	5	−10.0%	500,000	0	500,000	100,000	0	100,000
12	4	−10.0%	400,000	0	400,000	100,000	0	100,000
13	3	−10.0%	300,000	0	300,000	100,000	0	100,000
14	2	−10.0%	200,000	0	200,000	100,000	0	100,000
15	1	−10.0%	100,000	0	100,000	100,000	0	100,000

Annuity conversion rate : 2.0%

minmum:	0
maximum:	128,898
average:	27,048

Example4

Method for Deciding the Amount of the Annuity : JSCPA Report's Method
(Temporary Annuity(guaranteed period : 15 years))

Year	Residual period (at end of previous year)	CBROR	NAC (at end of previous year)			Annity (per year)		
			Notional principal credit part	Interest credit part	Total	Notional principal credit part	Interest credit part	Total
1	15	−10.0%	1,500,000	1,500,000	3,000,000	100,000	100,000	200,000
2	14	−10.0%	1,400,000	1,100,000	2,500,000	100,000	78,571	178,571
3	13	−10.0%	1,300,000	771,429	2,071,429	100,000	59,341	159,341
4	12	−10.0%	1,200,000	504,945	1,704,945	100,000	42,079	142,079
5	11	−10.0%	1,100,000	292,372	1,392,372	100,000	26,579	126,579
6	10	−10.0%	1,000,000	126,556	1,126,556	100,000	12,656	112,656
7	9	−10.0%	900,000	1,244	901,244	100,000	138	100,138
8	8	−10.0%	800,000	0	800,000	100,000	0	100,000
9	7	−10.0%	700,000	0	700,000	100,000	0	100,000
10	6	−10.0%	600,000	0	600,000	100,000	0	100,000
11	5	−10.0%	500,000	0	500,000	100,000	0	100,000
12	4	−10.0%	400,000	0	400,000	100,000	0	100,000
13	3	−10.0%	300,000	0	300,000	100,000	0	100,000
14	2	−10.0%	200,000	0	200,000	100,000	0	100,000
15	1	−10.0%	100,000	0	100,000	100,000	0	100,000

minmum:	0
maximum:	100,000
average:	21,291

5. Future tasks

- Countermeasure of the fluctuation of benefit by economic environment before the time of resignation
- Lower Bound of NAC (at The Time of Resignation) and Annuity
- Method for Calculating Liability in Pension Financing and Retirement Benefit Accounting
- Further review of risk sharing
  (Countermeasure of Longevity Risk)