

Redesign of Retirement Benefit, Underlying Issues in Japan

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Abstract. The major question mostly asked when employers redesign retirement benefits is whether annuity or lump sum an employer should provide as retirement benefit for their employees under budget restrictions.

When retirement plans are redesigned, actuaries should help employers redesign retirement benefit to deal with not only financial stability of pension arrangements, but also enough preparation for retirement, where we should consider economical issues for each worker's old age.

For an example of the consideration, it is shown by the numerical illustration that a lump sum only benefit is an optimum allocation of benefit for employees in case of funding shortage, although large share of annuity is the best option when enough money is prepared. The continuous employment program may increase utility in light of measuring utility with a form of loss functions defined in this paper.

According to the backgrounds issues and the numerical illustration, we may speculate that there is inadequacy of retirement resources that refrain from putting a large part of their wealth into the sort of annuity. Therefore our alternative challenge turns out to be developing measures to help people enlarge their retirement resources.

Key-words: employment extension, retirement benefit, loss function, annuity, lump sum

1. Introduction

1.1. Annuity or lump sum; one of the major questions on redesigning corporate retirement benefit

A mainstream of retirement benefit program in the private sector in Japan is a traditional lump sum benefit paid at withdrawal or retirement. Due to changing of social security system and economical and statutory environment, we have to think of redesign of retirement benefit. There are two important themes, which choice is better, annuity or lump sum for future retirees, and how to deal with delayed retirement, i.e. delaying eligible age of public pension.

1.2. Annuity is better than lump sum?

It is generally recognized that annuity benefit is better than lump sum in terms of retirement benefit. The reasons on the employees' perspective are that an annuity benefit provides a stable income stream during retirement till the time of death, and that annuitants can shift their longevity risk to the pension funds and plan sponsors.

In some countries, it is (was) common sense that pension funds provide life annuity benefit. Corporate pensions are often regarded as a major part of social security system. For example in Japan, the Employees' Pension Funds (EPFs) substitute a part of public pension and therefore the EPFs are mandated to grant life annuities for participants.

Many employers, however, freeze their traditional defined benefit (DB) pension plans and adopt hybrid type plan or defined contribution (DC) plan instead of the DB plans, which plans don't necessarily provide annuity as a primary benefit (i.e. the benefit formula primarily determinates lump sum value and then it is converted to annuity amount, if applicable). We also know that some employees tend to welcome the introduction of DC plan.

In addition, it is well known (for example, in the UK) that people may prefer to hold their pension wealth in non-annuity form. The fact that annuity demand is typically low in spite of 'mortality drag' raising utility constitutes the 'annuity puzzle'.¹

We will discuss whether annuity benefit is better than lump sum benefit for corporate retirement benefit from both employers' and employees' standpoints in the context of Japanese society as below.

2. Background

2.1. Shrinking of public pension benefit

The public pension has indexation on its benefit according to prices and wage level. In 2004, Pension Reform Act introduced "Adjustment scheme of indexation". This is called with "Macro-economy indexation", which based on the growth of entire social premium bearing capacities. The indexation turns out to be CPI less the adjustment rate. In addition, the complicated indexation system included in the public pension also curb on the real value of benefit in future, in which benefit increase rate is just the average compensation increase even when CPI climb higher. It just rises no more than the average compensation rate in the benefit formula while the average compensation rate will not go up because the baby boomers those earn more salary than younger generations are getting retired. Over all, it results in a

¹ Cannon, Edmund and Ian Tonks (2005),

decline of income replacement ratio of public pension, though it is estimated to be around 50 % for the standard household at the present day.

2.2. Downsizing of corporate retirement benefit

Lump-sum benefit at retirement is rather popular in light of history. One of the labor statistics² says that 85.5% of employers introducing retirement benefit provide lump-sum benefit. It is not necessarily common for private employers to grant (life) annuity to their employees. Additionally, the annuity, even if companies supply it, is a single life rather than joint life. It might turn out to leave spouse lack of money when he/she could outlive over a householder's life.

Corporate benefit is further downsizing. There are some reasons. The economical and demographic environment does not allow employers to provide their employees with annuity. Firstly the historical lowest interest rate (See Table 2-1) makes the present value of pension liability be larger considerably, especially when benefit payment series has such longer duration as (life) annuity.

Secondly, longevity improvement is proceeding. It means that pension cost for annuity is commensurately increasing.

Thirdly, that pension funds provide annuity means that the funds has and holds the significant amount of financial assets in case of funded plans, which increase volatility of price change of fair value of the asset. It can be shown by simple simulation that amount of projected benefit obligation (PBO), when lump sum only benefit is provided, is a little more than 50% of the case of life annuity in the stationary state, even if the service costs are even.

Most of employers don't seem to prefer the financial uncertainty on the economical and demographic environment described above. The statistics as Table 2-1 seem to support this implication. The average of PBO per employee of corporate retirement benefit at the fiscal year was 7.47 million yen on March 31, 2001, and 6.05 million yen on March 31, 2006. It means around 20% decrease of liability that companies bear in spite of 1.04 per cent point descent of average discount rate for PBO calculation purpose which declines from 3.17% per annum on March 31, 2001 to 2.13% on March 31, 2006.

² National Personnel Authority (2006), "Comparative investigation of retirement benefit between public and private" (in Japanese), (<http://www.mhlw.go.jp/english/database/db-l/surveys.html>)

Table 2-1 Trend of per-capita liability of corporate retirement benefit

End of Fiscal Year	Average PBO per employee	Average Service Cost Per employee	Average Discount rate per annum
March 31, 2001	7.47 million yen	0.33 million yen	3.17%
March 31, 2006	6.05 million yen	0.26 million yen	2.13%

Source: Calculated from financial data of 1157 public companies extracted from entities listed on the Tokyo Securities Exchange (TOPIX)

The pension accounting standard was introduced in 2000, which lead many employers to decide to reverse the substitutional portion of their Employees' pension fund (EPF) to the government, called "Daiko Henjo". It follows that amount of pension liability materially decreased after the reversion. Numerous employers also made the benefit formula change and even make accrued benefits of their employees cut to curb on the pension liability. Additionally, lump sum only benefit plan is allowed to be book-reserved and isn't mandated to funding outside companies.

Some major surveys said that 25 million yen of the typical (average) amount of lump sum provided by Japanese private companies. The National Personnel Authority (2006) showed that average amount of present value of retirement benefit granted by the private companies is around 30 million yen. These statistics might show average level of retirement benefit provided by employees.

2.3. Household savings

The household savings is one of the most important measures to prepare retirement. Japanese people have been outstanding for their eager of savings past day. The reality might prove somewhat different. The national livelihood survey³ says that the average amount of savings held by householders of age 50-59 was 13 million yen in 2004. We can guess the median of savings is less than half of it. It seems difficult to say that it is much enough for many people to purvey cost of living in their old age.

2.4. Statutory change for pension arrangement

The tax-qualified pension system have prevailed many employers for several decades to fund outside for retirement benefit. Now we should transfer them to the new defined pension plan as the new pension law enacted in 2001, which direct to 'annuity for elderly' rather than 'lump sum at retirement'. It might reflect on the growing awareness of their rights by each individual. Some employers seem to feel

³ Ministry of Health, Labor and Welfare (2004), "National Livelihood Survey" (in Japanese), (<http://www.mhlw.go.jp/toukei/saikin/hw/k-tyosa/k-tyosa04/2-5.html>)

embarrassment in redesigning retirement benefit for their employees because they should retain obligation of annuity longer than before (i.e. 'from entry till death', instead of 'from entry till withdrawal'). Although the law don't mandate life annuity as retirement benefit, it is not easy for the employers to fit their benefit program to the new law's concept in order to retain tax preferential. Many employers believe that they are responsible for just while employees are active but after withdrawal.

2.5. Mandatory employment extension

In recent years, employment extension policy is also expected to play a roll on a source of retirement income. Most companies have a mandatory retirement age. It was typically 60 years old. The amendment of Law Concerning Stabilization of Employment of Older Persons enacted in 2006. This law made employment extension policy compulsory for employers. They have to rise a mandatory retirement age to 65 years old, or to introduce a continuous employment program (CEP) (refers to the system of continuing to employ an older person wishing to be employed following employee's retirement), or to abolish the mandatory retirement age completely. The statistics show that this policy prevail a lot of companies.

Table 2-2 Statistic of Compulsory Retirement Age and Introduction of a continuous employment program

Compulsory Retirement Age	Ratio
60	90.5%
60-64	3.1%
65	6.2%
65-	0.2%

Continuous Employment Program	Ratio
Employment extension, only	13.6%
Re-employment, only	53.1%
Both	9.6%
N/A	23.7%

Source: Ministry of Labour, Health and Welfare, General Survey on Working Conditions, 2006,

(<http://www.mhlw.go.jp/toukei/itiran/roudou/jikan/syurou/06/kekka5.html>)

Table 2-3 Statistic of life planning after age 60

Do you wish to work after 60?	Ratio
Yes	70.9%
No	24.4%
N/A	4.6%

How long will you keep working?	Ratio
Till 60	2.3%
61-64	5.3%
65	20.8%
66-69	0.8%
70	5.6%
Over 70	0.8%
As long as possible	64.4%

Source: Ministry of Labour, Health and Welfare, The 1st Continuous Research regarding life style of middle-aged or elderly, 2006, (<http://www.mhlw.go.jp/toukei/saikin/hw/judan/chukou06/kekka4-2.html>)

Many employees also prefer to continue to work after 60. The statistics show that 64.4% of mid-aged or elderly people wants to work as long as they can. Just because Japanese workers would be diligent does not mean it. Uncertainty of retirement income may fill them with anxiety.

The CEP may have some feature differentiating from an annuity and lump sum as following, in that it might not cost employers almost any additional money. They just pay compensations for their employees' work. The labor practices allow employers materially reducing pay by material amount when they continue employment or re-employ elderly after the traditional retirement age to the level much less than that of before the retirement age. Some employers might get economical merit rather than giving subsidy to elderly workers because experienced labors are expected to make contributions to improving business performance. This may be one reason why the unit labor cost of Japan economy tends to get lower recently.

Another feature for employees' perspective is that salary after retirement age may be uncertain income for retirement people because their illness or lack of skill restrains them getting jobs. This demerit is deference to annuity benefit. The feature is also just one of the reasons why the social safety net should be needed.

2.6. Preliminary conclusion

For a life planning during retirement, no one will dispute that providing employees with life annuity enough to meet their consumption is one of the most complete answers. But neither of the government and employers could have capability to grant them such amount of annuity. When we redesign a employees' benefit, we face on strict budget constraint. It follows that most employers must have their employees plan their retirement by assuming inadequate amount of annuity and they count on their savings as well as other type of corporate retirement benefit such as lump-sum benefit and/or the continuous employment program now on the road to dissemination. Actuaries should help employers redesign retirement benefit to deal with not only financial stability of pension arrangements, but also enough preparation for retirement, where we should consider economical issues for each worker's old age.

Now, for an example of the consideration, we will try to analysis bellow on an optimal allocation between annuity and lump sum with/without CEP. We may communicate to principal to show illustration for the issue by such a measure described below.

3. Optimal allocation between annuity and lump sum, with budget constraint

3.1. Numerical illustrations for benefit design

We want to show that which is better, annuity or lump sum, as well as how the continuous employment program helps employees make their retirement money last to some extent until they pass away.

Now, the years of adversity is defined as a random variable denoted by "y" which represents a number of years that his/her money account is less than zero while he/she survives. The variable y is bounded and can be actuarially simulated by assuming mortality rates of each age, an expected return of his/her money account, amount of an annual consumption, annuity of public pension, and other retirement income such as annuity and lump sum provided by employers.

Assume the loss function is defined as a real-valued function of y:

$$(1) \quad L(y) = Ky^2 \quad \text{for } y \geq 0$$

where K is a constant coefficient that may interpreted as how employees (and again eventually their employers) prefer to avoid from economical adversity during their retirement age. Supposing how they feel when every year of retirement is in adversity could identify a value of K. The quantity of monetary shortage does not turn out to be taken into account on the loss function L, because lack of money for cost of living during old ages means that they must borrow money without any reasonable prospect of repayment or decide to get public assistant and despond of their future.

We shall attempt to characterize optimal allocation of funding between annuity and lump sum by minimizing the Loss Function (1).

Our aim is to minimize the loss function over the set of the reasonable allotment plan. In other words, we wish to minimize the expected value of $L(y)$:

(2) Minimizing $\phi(r) = E[L]$ over the set of parameter r

Subject to:

(3) (Cost of annuity and lump sum) = C (constant)

where the parameter r is a vector of each amount of retirement incomes, and the cost of annuity is actuarially measured at age 60. The C is a constant amount depending on employer's budget constraint. The function $\phi(r)$ can be approximately calculated by Monte Carlo simulation. The results of the simulation are illustrated in some graphs coming up, which are contour plots of $\phi(r)$ for three examples described below:

Example A: Annuities of public pension and corporate pension plan are payable at age 60 (Graph 2-1)

Example B: Annuities of public pension and corporate pension plan are payable at age 65 (Graph 2-2)

Example C: Annuities of public pension and corporate pension plan are payable at age 65 and the continuous employment program allows employees to work through age 65 after the traditional retirement age 60 (Graph 2-3)

The common assumptions are as follows:

- (a) Times of iteration in the Monte Carlo simulation for expected value of random variable $L(y)$: 1000 times per a parameter r
- (b) Annual consumption of the elderly households: 3.2 million yen per annum
- (c) Annually payment of a life annuity granted by social security: 2.1 million yen per annum
- (d) Annual compensation that the employees earn from 60 till 65 in the example C: 2.0 million yen per annum
- (e) The interest rate is applied in calculating actuarial factor of life annuity: 2.0% annum
- (f) The expected return of the saving account: 2.0% annum

(g) The mortality rate: the statutory standard rate of Defined Benefit Corporate Pensions, 2005, female

(h) The coefficient K of the Loss Function: 0.1

(i) Initial account balance: 0 yen.

The assumption (b) and (c) stem from the average consumption and income of age 60 and older of the Household Survey⁴. The assumption (c) is taken into account into decrease of real value of annuity compared to salary of active workers. The assumption (d) doesn't seem to be too big number, since the statistics⁵ say that average salary of workers of age 60-65 was more than 3 million yen. The risk of return associated with assumption (f) is not considered here because we are dealing with expected value of random variable. The coefficient K of the assumption (h) is was experimentally assumed in order to derive moral answer (i.e. no retirement preparation lead to a bad result.) The assumption (i) means that household savings is not considered in this simulation not only because of simplicity on calculation but also because it significantly depends on each employee.

The result of the numerical simulations is as follows:

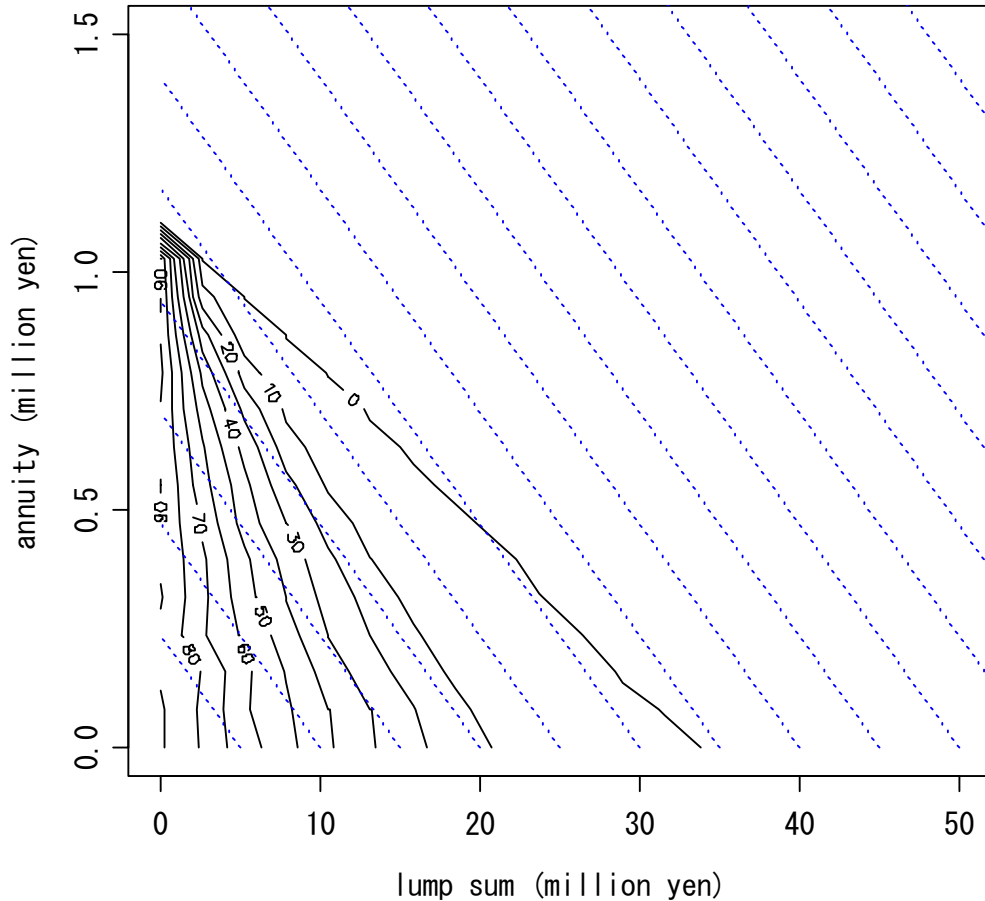
⁴ Statistics Bureau (2006), "Annual Report on the Family Income and Expenditure Survey" (in Japanese), (<http://www.stat.go.jp/data/kakei/2006np/gaikyo/index.htm>)

⁵ Ministry of Health, Labor and Welfare (2006), "Basic Survey on Wage Structure", (<http://www.mhlw.go.jp/english/database/db-1/index.html>)

Graph 3-1 Expected Loss in the Example A for each of benefit allocation

*Dotted lines express the equation (3) of each C (equal cost lines)

* Numbers in the contour map express values of Expected Loss (million yen)



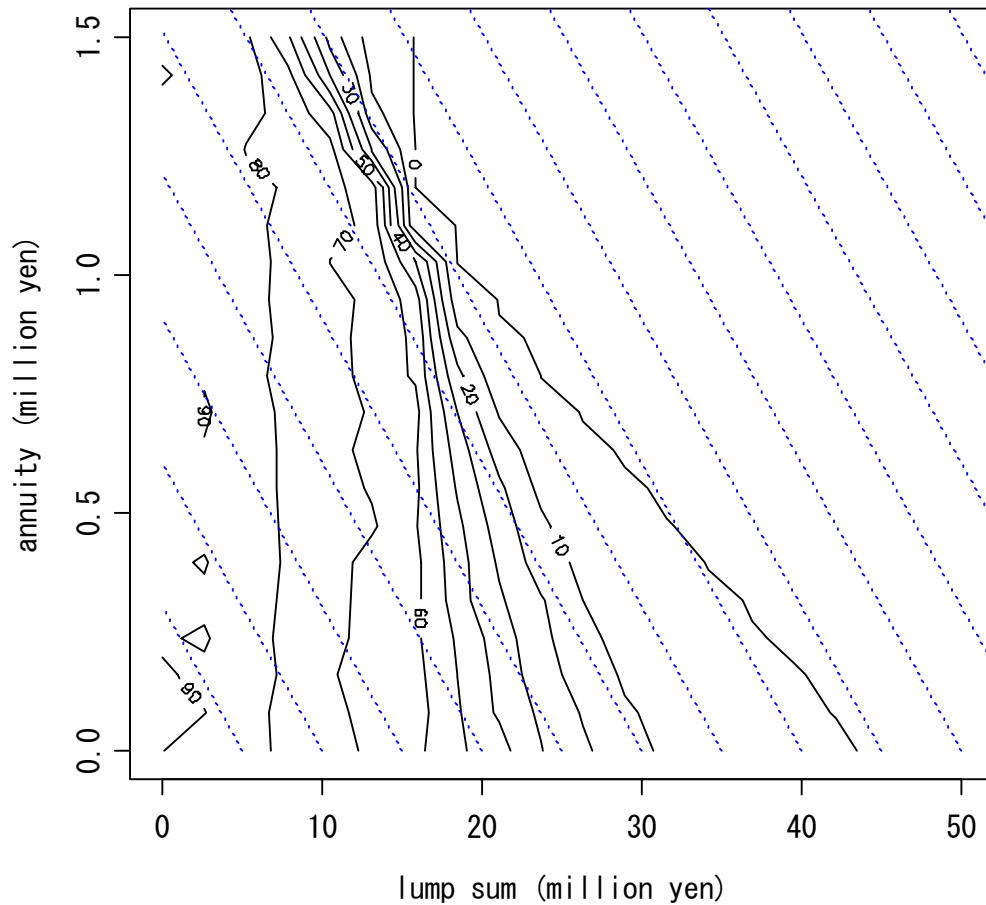
Traversing Graph 3-1, I have that an optimum allocation between annuity and lump sum depends on amount of funding (money prepared by employer). Dotted lines running from top left through bottom right in this graph signify a region where a sum of annuity and lump sum is the same amount of C. When the C is around 25 million yen, we get an optimal allocation in a case when annuity have large portion. On the other hand, large lump sum share leads the least loss when funding is not more than 20 million yen.

Some major surveys said that range between 25 million and 30 million yen of the typical (average) amount of lump sum as mentioned before. These statistics and Graph 3-1 express that average benefit can cover cost of living in this case.

Graph 3-2 Expected Loss in the Example B for each of benefit allocation

*Dotted lines express the equation (3) of each C (equal cost lines).

* Numbers in the contour map express values of Expected Loss (million yen)



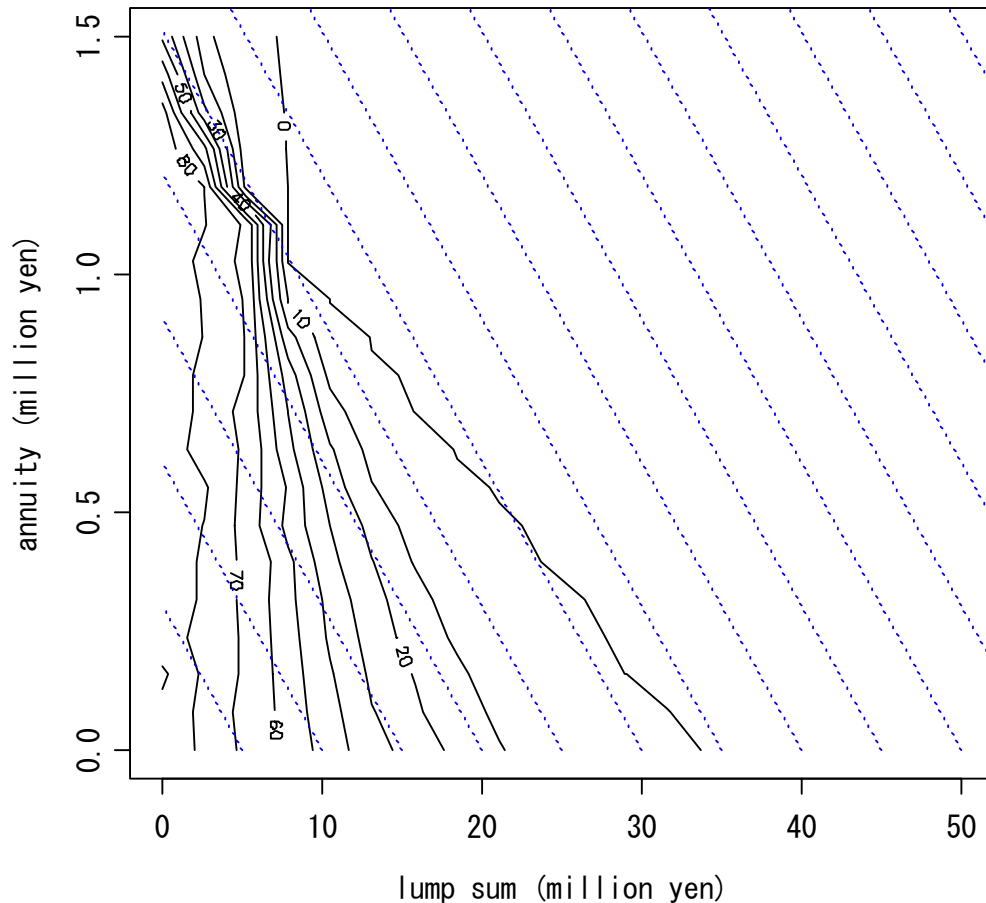
In the example B, there is so big gap between the retirement age (60) and the pensionable age (65) that an annuity does not purvey living expense without enough supplemental amount of lump sum. We can also say that stable retirement life requires funding of around 40 million yen, in which the typical benefit of 25 or 30 million yen would results in shortage.

Actually, the eligible age of public pension payment extended from 60 to 65 for future retirees. This amendment will result in a similar situation as the example B.

Graph 3-3 Expected Loss in the Example C for each of benefit allocation

*Dotted lines express the equation (3) of each C (equal cost lines).

* Numbers in the contour map express values of Expected Loss (million yen)



In the Example C, the continuous employment program will make up the deference between retirement age and the pensionable age. Required amount of funding for retirement will rein to the preparable benefit level. If 30 million yen is prepared, they can afford to get annuity enough to minimize the L function. If funding is less than 25 million, lump sum only is optimal solution. To put it the other way around, in the case where an average benefit is provided, people who has no chance to continue working may get into trouble due to shortage of retirement income.

3.2. Findings from the numerical illustration

The numerical illustration above implies the following:

A lump sum only benefit may be an optimum allocation of benefit for an employee in the case of funding shortage, although large share of annuity is the better option when enough money is prepared.

Average amount of retirement benefit has covered the cost for retirement so far, but recent pensionable age delaying will cause a shortage.

The continuous employment program (CEP) will make up differences between the retirement age (60) and the pensionable age (65) even when the compensation is considerably less than that of before traditional retirement age (60).

Because CEP doesn't cost any more in nature, in this sense, the CEP might improve utility for both employer and employees.

4. Treatment for insufficiency of retirement resources

According to the backgrounds and the numerical illustration described before, we may speculate that there is deficiency of retirement resources that refrain from putting a large part of their wealth into the sort of annuity. Retirees may still need liquidity of their wealth because of possibility contingent expenditure or consumption for their fun. The numerical illustration shows that they may tend to assume the risk of outliving their life expectancies in order to retain financial resources.

When we recognize inadequacy of retirement resources, we should address this matter. In accumulation phase, we should vigorously plan our own carrier and investment. Introduction of DC plan for employees' benefit is often regarded as a motivator to consider their own retirement plan. In general, applicants for employment are not informed the retirement benefit in detail. Employees sometimes don't understand their retirement benefit very well until they are reaching retirement age. As for planning, benefit plan should be more transparent for employees as well as future employees in the labor market. We need informative reference in order to choose expected benefit and risk on retirement benefit to fix information gap between employers and (future) employees.

I believe that these matter are alternative challenge that we should address future and actuaries' expertise may play a roll on this solution by providing their ability in communicating financial matters for people.

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