

Redesign Of Retirement Benefits; An Opportunity To Rethink Income Adequacy For Individuals In Japan

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Abstract. Due to changes in the social security system and in the economic and statutory environment, many Japanese employers have to consider redesigning retirement benefits. This provides us with a good opportunity to rethink how individuals can prepare for their retirement.

I want to discuss how to provide necessary information about defined benefit plans granted by employers to their employees and job candidates in order for them to be able to plan for retirement. Especially I will deal with some measures that help us characterize some types of annuity/lump sum benefit provided by DB plans in Japan.

By using the measures, I will also address the comparability of benefits between DB plans, DC plans and other investment vehicles in terms of expected return and their respective volatility.

Employers should make an effort to disclose fairly information about their retirement benefits, to help their employees and job candidates to plan for retirement, as retirement preparation of Japanese workers will otherwise be scant because of changes in the social security system and in the economic environment.

I believe that these matter are another challenge that we should address in future. Actuaries' expertise may play a role in the solution by providing the ability to communicate financial matters to people.

Key-words:

Retirement planning; lump sum benefits; annuitisation.

1. Lump sum plans for voluntary pension

1.1. The importance of voluntary pensions in filling the retirement-savings gap

According to an OECD report¹, the compulsory pension level varies from country to country. Some countries have a comparatively small pension, for example US, UK and Japan. Voluntary retirement programs are decisive for retirees in these countries.

These countries have struggled to extend coverage of voluntary pension arrangements such as corporate DB pension plans. Changes to the economic environment have forced employers to abandon DB plans. UK and US seem to be shifting to DC plans, while Japan is coming back to traditional lump sum based plans as well as DC plans.

Pension benefit is measured in terms of replacement ratio on earnings. For example, the gross replacement ratio of the mandatory pension scheme in Japan is 34.4% of average earnings for average earners, according to OECD (2007), which is around 25% point under the OECD countries' average of 58.7% (Figure 1-1). This difference indicates the extent of the retirement-saving gap.

In general, employees are often covered by voluntary pension (or retirement benefit) provided by their employers. For adequate retirement income, we should encourage people to improve coverage and benefit levels to fill the gap.

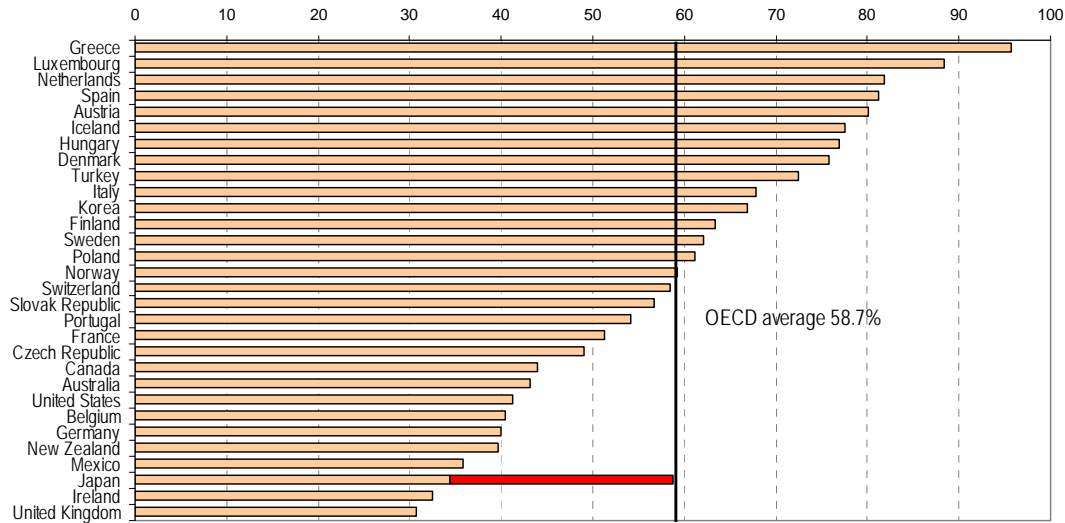
Retirement resources to fill the gap are usually measured by the replacement ratio, pension wealth, or contribution rate (or savings ratio), which are relevant to the resultant life annuity, lump sum at retirement, and deferred ratio on monthly/annual salary for each. The traditional DB plan has focused on life annuities to guarantee participants' standard of living, whilst DC plans focus on deferred income to accumulate money for retirement. Lump sum plans also focus on lump sum value at retirement to fill the gap in pension wealth.

It is necessary to compare lump sum plans and DC plans as well as DB plans when retirement programs are redesigned.

¹ OECD (2007)

Figure 1-1 The retirement-savings gap

Gross replacement rate for an average earner from mandatory pension schemes and comparison with the OECD average replacement rate



Source: OECD

1.2. Lump sum plans as DB plans

A lump sum plan literally makes a promise to pay the lump sum value on the employee's withdrawal. In general, no tax is imposed in the accumulation phase and cash out (or loan) is not available before withdrawal. In addition, where it is a statutory (funded) DB plan stimulated by the pension law, the special features are the following:

- Benefit promises are backed by plan assets with the strict funding standard
- Pension rights
- Comparatively high interest rates are guaranteed after separation of service without withdrawal penalty
- Income allowance is deferrable until payment, if applicable
- Annuity options are available

A retirement benefit promise will be useful for people if the plan offers special economic transactions between the employer (or the pension fund) and participants, providing participants with the special features described above to support a life in old age that would not be easily available for individuals in the financial markets.

2. Examination of the benefit features

2.1. The lump sum value approach

I will introduce some methodologies in this section, and discuss them in the specific context of consulting practice in Japan.

The lump sum value approach is a method often used in pension consulting practice in which the benefit design, especially the benefit curve, is discussed. A summary of the method is as follows:

Step 1: Plot the lump sum value for active participants

Plot pairs of participant age and actual amounts of lump sum value under current arrangements for each of the participants on a 2-dimensional graph.

Lump sum value is the cash amount, which could be paid to participants when they voluntarily (or involuntarily) withdraw from the DB plan

Step 2: Plot some characteristic values

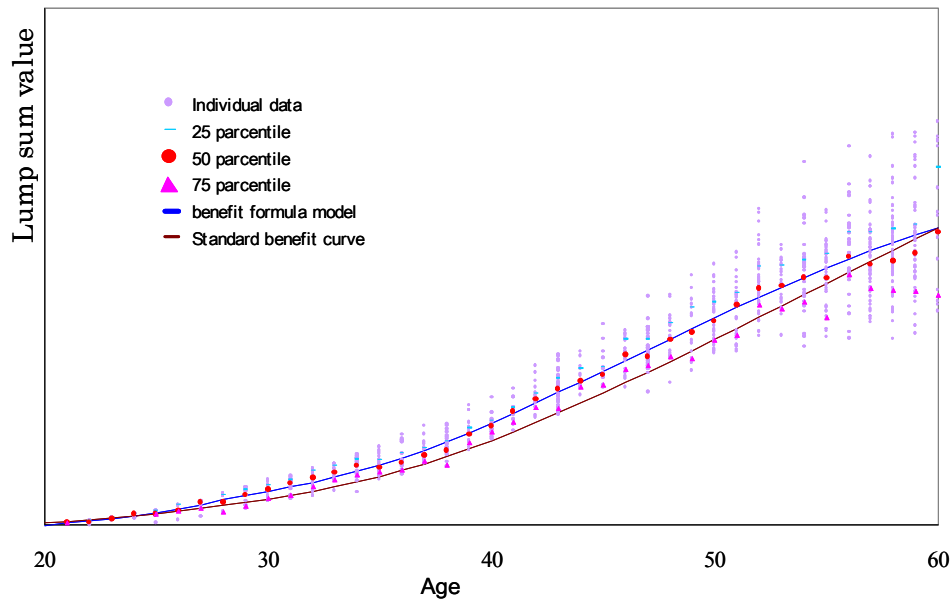
Calculate the median value for each age as well as the 25% and 75% percentile value from the distribution of individual amounts and plot them by separate markers.

Step 3: Compare the lump sum curve with the standard benefit formula

The standard benefit formula is defined so as to reach the target benefit at normal retirement age under certain assumptions. The interest credit rate is the fair value agreed between the employer and employees. The benefit amount from the standard formula is defined as the compound value of the annual credited amount based on the formula applied to each amount of salary in the same way as for a cash balance plan. Consider the gap between the two curves and discuss whether the current curve should be modified.

Figure 2-1 is an example of actual experience data of the accrued lump sum expressed by blue points in the figure, which individuals have in a specific scheme. The benefit formula model (a blue line in the figure) is accrued lump sums calculated for average participants based on the plan document. The standard benefit curve expresses the standard benefit formula that reaches the target benefit amount at age 60 with flat rates of pay credits and interest credits.

Figure 2-1 The lump sum value approach



The lump sum value approach is appropriate in the pension-consulting arena, at least in Japan, because the lump sum value is regarded as a sort of “accrued benefit” in a retirement pension plan. Employees think employers promise the lump sum value instead of the annuity value in the context of employer-labor relations. Lump sum value reflects only each worker’s service, whereas pension value also reflects economic and actuarial factors such as interest rates and mortality tables. We can discuss both of DB plans and non-DB plans, such as DC plans, by using this approach. Plotted data of lump sum value for each employee give us rich information that helps the stakeholders to recognize the benefit features on the examined arrangement as exemplified by:

- Benefit curve for average workers
- Benefit level
- Virtual guaranteed benefit
- Volatility of the benefit, depending on the specific benefit provision

2.2. Benefit amount and uncertainty

We can find the volatility of the benefit on the plots graphically and sometimes find greater uncertainty than expected when real client data is plotted, depending on the specific benefit provision. It can be recognized that the defined benefit promise does not mean “guaranteed benefit”.

We should discuss with the client how to measure the volatility from present data under the lump sum approach. In practice, principals grasp intuitively rates of return on lump sum values obtained by comparing the benefit curve and the standard formula curve.

There is another approach in which mean-variance relationship of the rate of return on lump sum value is utilized. The Rate of Return on Lump sum value (RRL) for each employee is defined by:

$$RRL(x) = \{V(x+1) - V(x) - p*S(x)\} / \{V(x) + (1/2)*p*S(x)\}$$

, where $V(t)$ is a lump sum value accrued at attained age x , p is the flat rate of pay credit of the standard formula, and $S(x)$ is the amount of salary at age x .

In the analysis bellow, we adopt the national average salary approach, in which it is assumed that everyone can potentially earn the national average salary at each age and that they want to or must put aside some flat rate part of salary for their retirement to supplement the public pension or compulsory pension. Actually, people choose jobs for various reasons and the earnings vary from job to job. They also select retirement benefit program with/without realizing the details.

2.3. Mean-variance structure for a complex benefit formula

While it is easy to calculate RRL for a simple benefit formula such as the flat dollar formula, complexity of benefit formula may complicate the calculation. This is illustrated by an example of the formula called by “Pile-up formula” defined by:

1. Pile-up formula provide benefits that vary from employee to employee in line with their performance on the job as assessed by employers
2. The benefit accruals for each period of service change when promotion or demotion occurs

The pile-up formula may enable employers to design various benefit patterns to meet their HR strategies.

When we calculate RRLs and their volatility for a specific pile-up formula promise, we would use the following approaches:

Approach 1: Modeling approach

Construct a stochastic model based on the provisions of the plan and real data from the lump sum approach. Calculate the RRLs and the volatility. It is necessary to develop a goodness-of-fit test for the model.

Approach 2: Statistical analysis approach

Calculate the statistical values of RRLs and volatility directly from real data. It is necessary to get historical data for each person.

I will illustrate the modeling approach below.

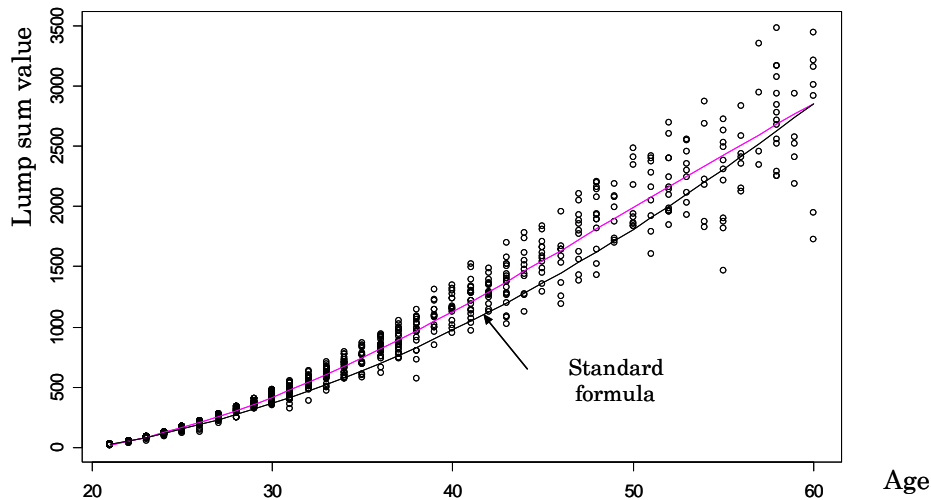
The standard formula has a flat rate on national average earnings and a RRL. A RRL of the system is a specific interest rate, which is not necessarily a single rate. Interest rate changes disturb the equivalence of the system. The given formula is generally different from the standard one in terms of amount of benefit according to service and/or age of participation. The benefits are volatile between employees. (See Figure 2-2)

In practice, some plans explicitly implement the pile-up formula for the benefit formula in the plan provision. These plans are called the “points system” in Japan.

We adopt a stochastic model and determine probability functions for promotion and demotion at each age to reflect realities of a specific company’s benefit plan (Figure 2-3). Then, we can generate individual data and calculate the mean and standard deviation of the RRLs (Figure 2-4) by Monte Carlo simulation (Figure 2-5).

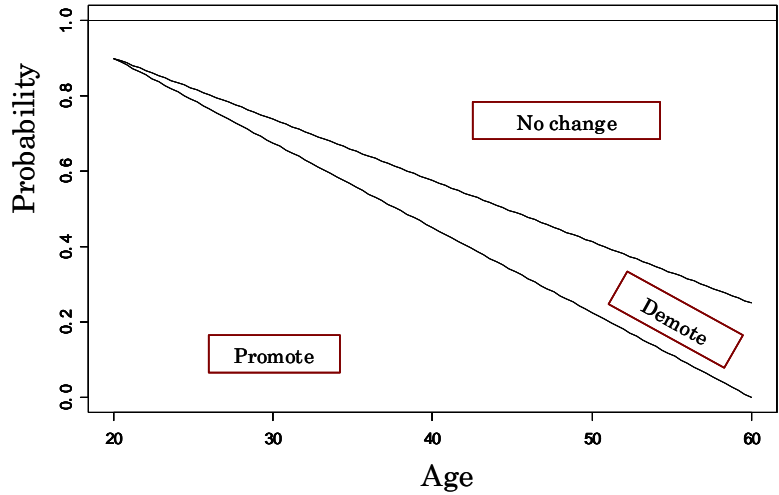
There is a mean-variance structure for the RRLs and volatility. By means of this we can in a broad sense compare a DC plan and a DB plan. The Figure 2-5 is a plot that illustrates a mean-variance relationship in the formula modeled by the pile-up formula. The relationship resembles one that a life cycle fund or a target year fund should aim at in their investment policy. With this feature, we can interpret the lump sum plan as an investment class that isn’t easily available for individuals in the financial market. The mean-variance structure, which employers can disclose, is beneficial for workers to select effectively retirement program, job and company.

Figure 2-2 Lump sum values for an each participant, generated by the stochastic model



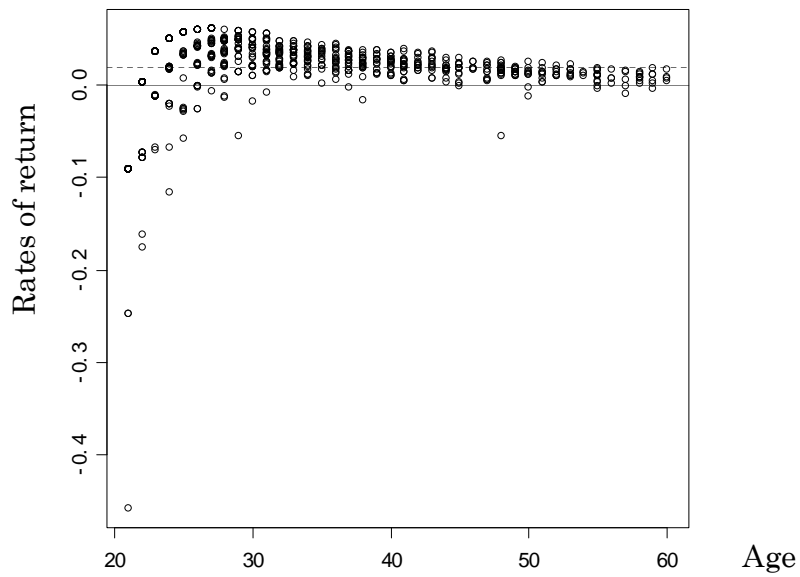
Note: Plotted data are generated by the pile-up formula model. Red line is average for each age. The Black line is the standard formula that reaches the target benefit implied by the model at age 60

Figure 2-3 Promotion and demotion probabilities in the Pile-up formula



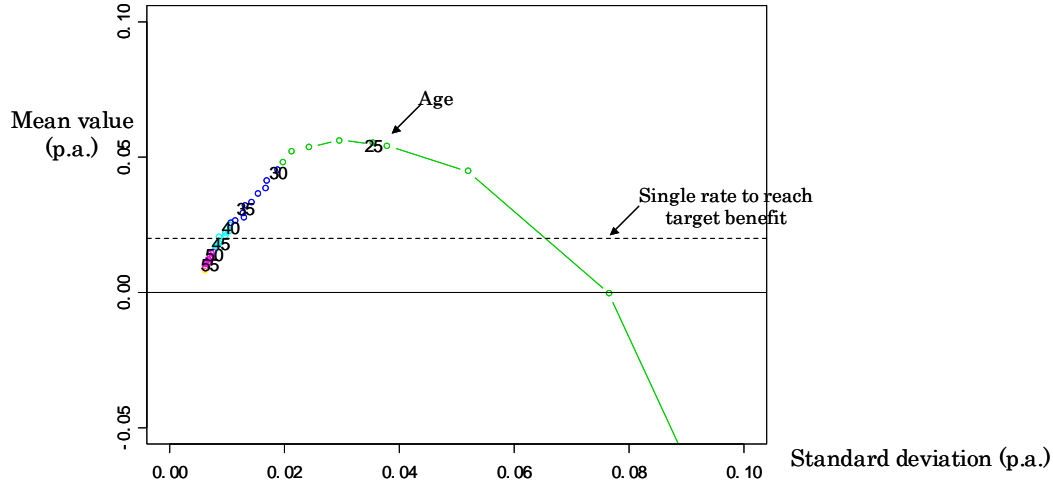
Note: The probability function should be defined for each model to reflect the realities of the specific company's benefit promise

Figure 2-4 Rates of return on lump sum value (RRLs) in the pile-up model



Note: Calculated for individual data on the pile-up formula model

Figure 2-5 Mean-variance relationship derived from the model



Note: Calculated by Monte Carlo simulation for the pile-up formula model

3. Is an annuity better than a lump sum?

3.1. Annuity or lump sum; one of the major questions in the redesign of corporate retirement benefits

It is generally recognized that an annuity is better than a lump sum in terms of retirement benefit. The reasons from an employee's 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 practice that pension funds provide a life annuity benefit. Corporate pensions are often regarded as a major part of the social security system. For example in Japan, the Employees' Pension Funds (EPFs) substitute for a part of the public pension and therefore the EPFs are required to grant life annuities to participants.

Many employers, however, are freezing their traditional defined benefit (DB) pension plans and adopting hybrid type plan or defined contribution (DC) plans instead of the DB plans. These plans do not necessarily provide an annuity as a primary benefit (i.e. the benefit formula primarily determines the lump sum value and then it is converted to an annuity amount, if applicable). We also know that some employees tend to welcome the introduction of a DC plan.

In addition, it is well known (for example, in the UK) that some people prefer to hold their pension wealth in non-annuity form. The fact that annuity demand is typically low in spite of 'mortality drag' increasing utility constitutes the 'annuity puzzle'.²

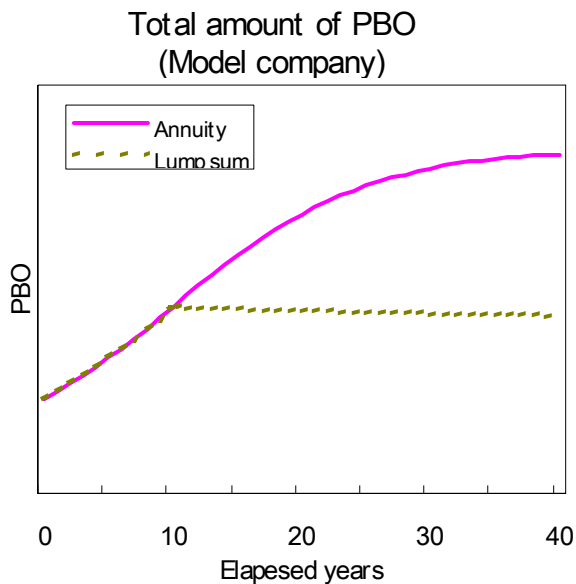
We will discuss whether annuities are better than lump sums for corporate retirement benefits from both employers' and employees'.

3.2. Lump sum plans have relatively less financial risk for employers' standpoints

Lump sum plans as DB plans can reflect an intermediate position between traditional DB plans and DC plans, which play an important role in employees' planning for retirement. Meanwhile, employers should also welcome a lump sum plan. Lump sum plans bear no longevity risk and less interest change risk on pension liabilities than traditional DB plans.

Pension funds providing annuities hold significantly more financial assets in the case of funded plans, which increases the volatility of price changes of the fair value of the asset. It can be shown by simple simulation that the amount of the projected benefit obligation (PBO) when only a lump sum benefit is provided is a little more than 50% of what it would be in the case of a life annuity in the stationary state, even if the service costs are the same (Figure 3-1).

Figure 3-1 Difference between lump sum and annuity in the development of the pension liability



Note: Calculated on a model company

² Cannon, Edmund and Ian Tonks (2005),

3.3. Lump sum is a realistic way of retirement income for employers' standpoints

Optimal allocation between annuity and lump sum, with budget constraint, and numerical illustrations for benefit design

We want to show 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.

'Years of adversity' is defined as a random variable denoted by "y" which represents the 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 for each age, an expected rate of return on his/her money account, the amount of annual consumption, the annuity in respect 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 economic adversity during their retirement. We suppose that how they feel when they are in adversity throughout retirement could identify a value of K. The quantity of monetary shortage does not turn out to influence the loss function L, because lack of money to cover the cost of living during old age means that they must borrow money, without any reasonable prospect of repayment, or decide to get public assistance and despair of their future.

We shall attempt to characterize the 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 reasonable allocation plans. In other words, we wish to minimize the expected value of L(y):

$$(2) \quad \text{Minimizing } \varphi(r) = E [L] \text{ over the set of parameter } r$$

Subject to:

$$(3) \quad (\text{Cost of annuity and lump sum}) = C \text{ (constant)}$$

where the parameter r is a vector of each amount of retirement incomes, and the cost of an annuity is actuarially measured at age 60. The C is a constant amount depending on the employer's budget constraint. The function $\varphi(r)$ can be calculated

approximately by Monte Carlo simulation. The result of the simulation is illustrated in a graph below, which is a contour plot of $\varphi(r)$ for the example described below:

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

The assumptions are as follows:

- (a) Times of iteration in the Monte Carlo simulation for expected value of random variable $L(y)$: 1000 times per parameter r
- (b) Annual consumption of elderly households: 3.2 million yen per annum
- (c) Annual payment of a life annuity granted by social security: 2.1 million yen per annum
- (d) Annual compensation that the employees earn from 60 to 65: 2.0 million yen per annum
- (e) The interest rate applied in calculating the actuarial factor for a life annuity: 2.0% per annum
- (f) The expected return on the savings account: 2.0% per annum
- (g) The mortality rate: the statutory standard rate of Defined Benefit Corporate Pensions, 2005, female, Japan
- (h) The coefficient K of the Loss Function: 0.1
- (i) Initial account balance: 0 yen.

Assumptions (b) and (c) stem from the average consumption and income of age 60 and older in the Household Survey³. Assumption (c) takes into account the decrease of real value of the annuity compared to salaries of active workers. Assumption (d) doesn't seem to be too big a number, since the statistics⁴ 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 the expected value of the random variable. The coefficient K of assumption (h) was experimentally assumed in order to draw out a moral (i.e. no retirement preparation leads to a bad result.) Assumption (i) means that household savings are not

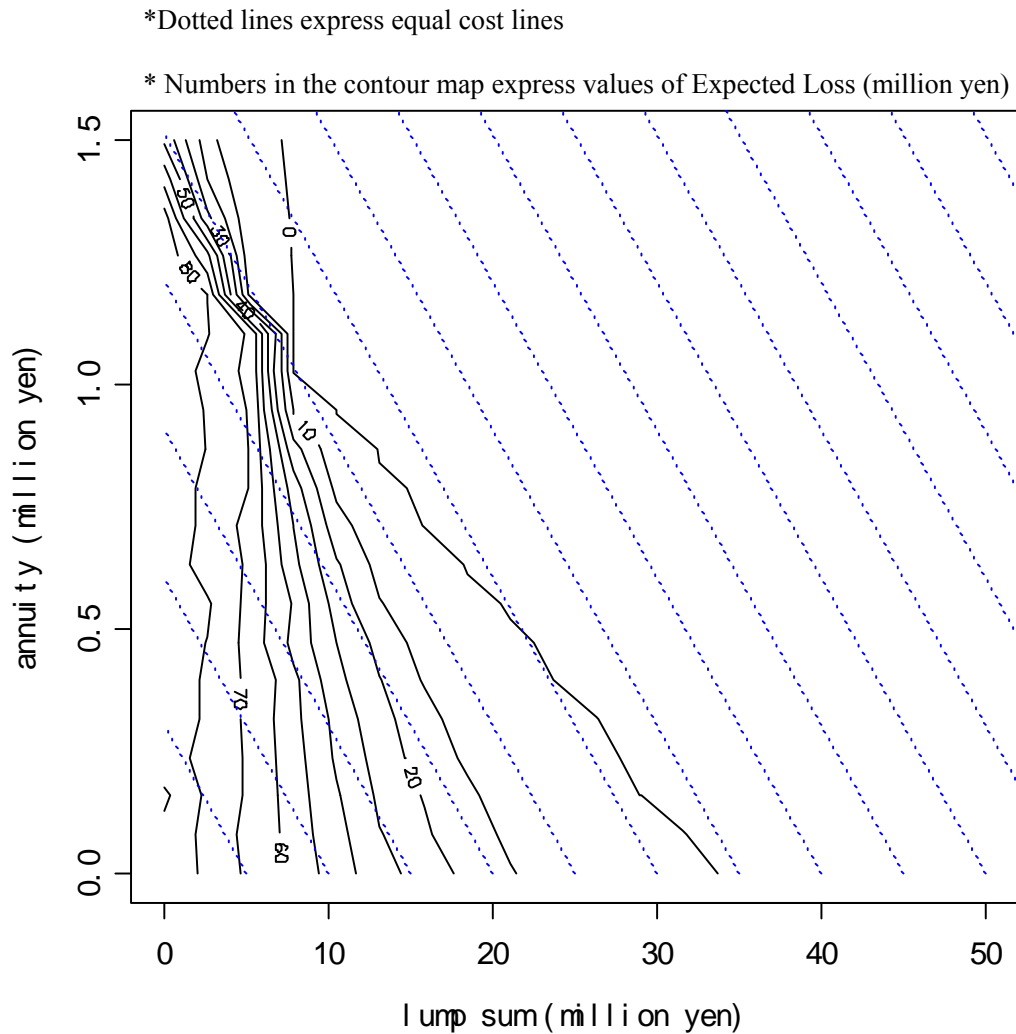
³ Statistics Bureau (2006), "Annual Report on the Family Income and Expenditure Survey" (in Japanese), (<http://www.stat.go.jp/data/kakei/2006np/gaikyo/index.htm>)

⁴ Ministry of Health, Labor and Welfare (2006), "Basic Survey on Wage Structure", (<http://www.mhlw.go.jp/english/database/db-1/index.html>)

considered in this simulation not only for simplicity of calculation but also because it significantly varies between employees.

The result of the numerical simulations is as follows:

Figure 3-2 Expected Loss in the example for each benefit allocation



The required amount of funding for retirement will adjust to the planned benefit level. If 30 million yen is planned, they can afford to get sufficient annuity to minimize the L function. If funding is less than 25 million, lump sum only is an optimal solution.

The numerical illustration above implies that a lump sum only benefit may be an optimum allocation of benefit for an employee in the case of funding shortage,

although a large share in annuity form is the better option when enough money is available.

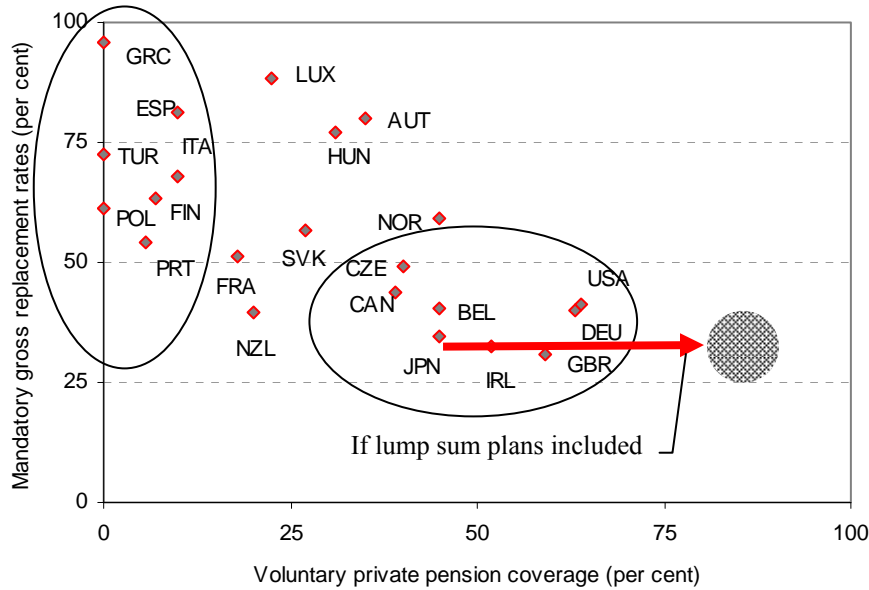
4. Lump sum plans for workers in Japan

4.1. Coverage of traditional lump sum plans

A mainstream retirement benefit program in the private sector in Japan is a traditional lump sum benefit paid on withdrawal or retirement. In some lump sum plans, it is possible to convert the lump sum amount into an annuity. Due to changes in the social security system and in the economic and statutory environment, we have to think of redesigning the retirement benefit. There are two important themes: which is better – annuity or lump sum – for future retirees, and how to deal with delayed retirement, i.e. delaying the age of eligibility for the public pension.

According to OECD (2007), 45% of workers in Japan are covered by a voluntary pension scheme such as Tax Qualified Pension Plan (TQPP) and EPF, which doesn't include traditional lump sum plans, newly constituted DC plans, and other funded lump sum plans.

Figure 4-1 Average projected mandatory pension and coverage of voluntary private pensions



*JPN shows the total covered by tax-qualified pension plans, employees' pension fund or both

Source: OECD

Table 4-2 Survey on employers which provide retirement benefit

Number of employees	Retirement benefit			
	Available			N/A
	LS only	Pension only	Both	
1000 and more	11.0%	19.1%	69.9%	2.9%
100 - 999	31.6%	22.9%	45.5%	9.0%
Less than 100	54.1%	18.3%	27.7%	15.3%
Total	46.5%	19.6%	33.9%	13.3%

Source: Ministry of Labour, Health and Welfare, General Survey on Working Conditions, 2003,
<http://www.dbtk.mhlw.go.jp/toukei/kouhyo/data-rou8/data15/24.xls>

Statistics from the national survey (Table 4-2) imply that lump sum plans cover a large proportion of workers. The “Point-system” is an implementation of the “pile-up formula” and gets popular thanks to flexibility on design. (Table 4-3)

Table 4-3 Survey on employers which provide lump sum plan

Number of employees	Benefit basis		
	Final Pay	Point	Other
1000 and more	45.9%	35.9%	18.2%
100 - 999	65.0%	15.6%	19.4%
Less than 100	73.9%	6.9%	19.2%
Total	69.6%	11.2%	19.2%

Source: Ministry of Labour, Health and Welfare, General Survey on Working Conditions, 2003,
<http://www.dbtk.mhlw.go.jp/toukei/kouhyo/data-rou8/data15/26.xls>

The lump sum plan may have a deferment feature, indexed with a long-term government bond rate. So the plan provides a CMS (Constant Maturity Swap) feature to early leavers. Vested lump sum benefits are portable on changing jobs. They can be transferred to a new employer’s DB plan, DC plan or national pension aggregation center, or be taken as cash. These features enable a lump sum to be deferred to retirement and annuitised in some situations.

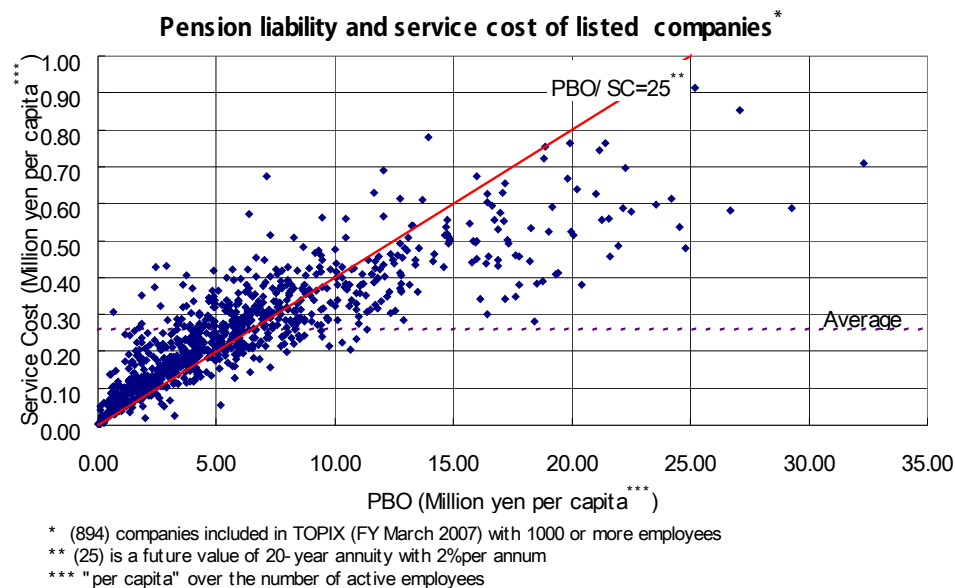
There is preferential tax treatment for lump sum benefits in Japan. In general, lump sum benefit on withdrawal is fully deductible for personal income tax to the extent that the benefit amount does not exceed the limit based on years of service. This tax

break helps coverage of lump sum plan be relatively high compared to pension plans.

I believe that the preferential tax treatment is essential in encouraging lump sum plans, not only because retirees get a tax break, but also because employers experience less interest risk on lump sum benefits than annuity benefits as a result of workers' preference for lump sum plans.

Figure 4-4 is statistic of pension liability and service cost of listed companies, which show that the durations of benefit of most plans, implied by PBO/SC ratio, are too short to have numbers of annuity holders in the plans. This makes it seem likely that most of retirement promises are virtually lump sum plans.

Figure 4-4 Statistic of pension liability and service cost



4.2. Mandatory employment extension; another measure for retirement planning

There is another remedy for the retirement-savings gap, which may counter the weakness of lump sum plans for longevity improvement.

In recent years, employment extension policy has also been expected to play a role as a source of retirement income. Most companies have a mandatory retirement age. It was typically 60. The amendment of Law Concerning Stabilization of

Employment of Older Persons was enacted in 2006. This law made employment extension policy compulsory for employers. They have to raise the mandatory retirement age to 65, or introduce a continuous employment program (CEP) (refers to the system of continuing to employ an older person wishing to be employed beyond the employee's retirement age), or to abolish the mandatory retirement age completely. The statistics show that this policy can be found in a lot of companies. Therefore, the CEP may affect retirement benefit design.

Table 4-5 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 4-6 Statistics 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%
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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 would prefer to continue working after age 60. The statistics show that 64.4% of middle-aged or elderly people want to work as long as they can. This is not just because Japanese workers are diligent. They are worried about uncertainty of retirement income.

The CEP may have some features differentiating the policy from an annuity and lump sum, in that it might not cost employers much additional money. They just pay compensations for their employees' work. Labor practice allows employers to reduce pay by a material amount when they continue employment or re-employ elderly after the traditional retirement age, to a level much less than that before retirement age. Some employers might gain economic advantage rather than be giving a subsidy to elderly workers because experienced labors are expected to make a contribution to improving business performance.

Another feature from the employees' perspective is that continuation of salary after retirement age may be uncertain for retired people because illness or lack of skills restricts them from getting jobs. This is a disadvantage of the lump sum benefit. This feature is also just one reason why a social safety net is needed.

4.3. "Lump sum first, annuity second" strategy for filling the gap

According to the numerical illustration and the statistics referred above, we may speculate that there is a deficiency of retirement resources because people refrain from putting a large part of their wealth into any sort of annuity. Retirees may still need liquidity of wealth because of possible contingent expenditure or consumption for recreation. The numerical illustration shows that they may tend to accept the risk of outliving their life expectancy in order to retain financial resources.

For life planning during retirement, no one will dispute that providing employees with a life annuity at a high enough level to meet their consumption needs is one of the most complete answers. But neither the government nor employers have the capability to grant them such an amount of annuity. When we redesign an employees' benefit, we face strict budgetary constraints. It follows that most employers must have their employees plan their retirement by assuming inadequate amount of annuity and counting on their savings as well as other types of corporate retirement benefit such as lump-sum benefit and/or the continuous employment program now being introduced.

When we see that retirement resources are inadequate, we should address this. In the accumulation phase, we should vigorously plan our own career and investment. Introducing a DC plan for employees' benefit is often regarded as a motivator for them to consider their own retirement plan. In general, applicants for employment are not informed of the retirement benefit in detail. Employees sometimes don't

understand their retirement benefit very well until they are reaching retirement age. For planning purposes, benefit plans should be more transparent for employees as well as for future employees in the labor market. We need targeted information in order to choose expected benefits and risk of retirement benefits to bridge the information gap between employers and (future) employees. Actuaries should help employers redesign retirement benefits to deal not only with the financial stability of pension arrangements, but also with individual planning for retirement, where we should consider economic issues for each worker's old age. I believe that these matters are another challenge that we should address in future. Actuaries' expertise may play a role in their solution by providing the ability to communicate financial matters to people.

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