Original Paper

A Simulation of the Policy of Public Pension Finance in Japan

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Abstract

The purpose of this paper is to estimate the total sum of premium payments and benefit payments from 2005 to 2010 and make proposals for future policy. This study has made clear that there is a tendency of a total decrease in premium payments. Moreover, the sum of premiums will be less than the sum of benefit payments to be paid. Therefore, our proposal is benefit cutting, raising of the starting age of benefit payments and raising premium payments.

Thus we will be able to save a total of 17.42 trillion yen in finance for the public pension system.

1. Preface

The Liberal Democratic Party suffered an historic and crushing defeat in the House of Councilors election held on July 29, 2007. The pension system was one of the most important issues. In particular, the pension mismanagement scandal of unpaid benefits and lost pension records dominated the election. While the causes of the problem vary, the response of the government has been to create new laws[1] which mainly consist of stopgap measures to pay in full[2] those who may be victims of the omissions. Nevertheless, this scandal, rather than being a problem of the pension system itself, focused on the lowering of the moral standards of public employees (in particular, the staff of the Social Insurance Agency) and in the diminishment of *noblesse oblige* (i.e. the obligation of responsible behavior associated with high rank or birth). The central issue of the pension system in the election should have been the financial problems associated with a declining birthrate and a growing proportion of elderly people.

The policies of the political parties in the election concerning the pension system are listed in the table below.

This table indicates the diversity of the proposed policies to deal with the revelations exposed during the pension scandal. However, two points must be given attention. Namely, the fact that the Democratic Party proposed the consumption tax as the source of revenue for the pension fund while the People's New Party proposed the pension fund be financed entirely from tax revenues. As can be seen, there were few concrete proposals for pension financing in this election. Only two political parties, the Democratic Party and the People's New Party, had proposals, but even these proposals had problems. Namely, according to the Democratic Party's proposal, if the pension fund is covered by the consumption tax, the pension funding will deprive other programs of funds that are currently covered by the consumption tax, programs which in turn will need to be funded by yet another source. Moreover, the proposal by the People's New

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Table 1   A List of the Pension Policies for each Political Party in the Twenty-first House of Councilors Election
           Source: Yomiuri Shinbun, July 13, 2007 "Competition for the correct policies to deal with the Disparities"
           Compiled by the author from the Social Democratic Party's House of Councilors Campaign Pledge, reference
           dated August 17, 2007.

Political Party	Policy
Liberal Democratic Party	Forward a "Regular Pension Notice" to all insured persons Abolish the Five-year statute of limitations
New Komeito	Abolish the diet member pension system and eventually integrate it with the public pension system
Democratic Party	Distribution of new pension books Unification of the pension systems The consumption tax at its current rate to be the entire tax revenue source for the basic pension
Japanese Communist Party	Complete notification of all persons who face the possibility of "up-in-the-air" pension records
Social Democratic Party	Set up in the Diet a special committee to oversee the Social Insurance Agency and the Ministry of Health, Labor and Welfare Unification of the basic part of the pension and payment of 80,000 yen per month The creation of "My Pension Book"
The People's New Party	Introduction of a basic pension financed entirely from tax revenues
New Party Nippon	Introduction of a new pension book Clarification of actual savings(premiums) and future allowance payments(benefits)

Party of using tax revenue is similar in this way to the Democratic Party's. There is a need for more specific proposals to be made regarding the type of tax revenue to be used.

Notwithstanding the recent Social Insurance Agency fiasco, this paper places its focus on the financing of the public pension system which is one of its principal problems, and the following analyses will be made. Namely, after presenting a model to estimate the total sums of benefit allowances and insurance premiums from 2004 to 2010, we will perform three simulations of what occurs (1) as the starting age for receiving pension benefits is raised, (2) as the benefit allowances are decreased and (3) as the pension premiums are increased. Concrete proposals (such as an increase of the consumption tax and so on) will be made based on the results.

2. Presentation of the Model

We will present here a model, as mentioned in the first section, which generates the estimates of the total amounts of benefits (allowances) and the total amounts of insurance premiums.

2-1 Model Preconditions

Preconditions set for the model are as follows:

1. We will calculate individually each kind of system, namely the national pension (NP; KOKUMIN-NENKIN) under both the old and new systems[3], the employees' pension insurance (EPI; KOUSEI-

NENKIN) and the mutual aid pension(MAP; KYOUSAI-NENKIN) and their pension objective, namely old-age pension (OAP; ROUREI-NENKIN), disability pension (DP; SHOUGAI-NENKIN) or survivor's pension(SP; IZOKU-NENKIN) as to the total sum of benefits (allowances) and the total sum of insurance premiums. (However, NP will be the one-story basic pension of the new system.)

2. We will make the model a single-year model for each year.

3. The age categories will be in one-year intervals.

4. The age category for the beginning of the payment of benefits (allowances) will start at the customary age of 65 and extend to the age of 100. (However, provisional measures of payments will be dealt with according to individual ages.)

5. The age category for the commencement of premium payments will begin at the customary age of 20. (However, those under 20 will be dealt with in a separate system.)

2-2 Basic Model

The total benefit payments G^t in time t and the total premium amount paid R^t in time t are expressed as:

$$G^t = \sum_{\tau=n}^{k} g_\tau^t NG_\tau^t \qquad (1)$$

and

$$R^t = \sum_{\tau=m}^{n-1} r_\tau^t NR_\tau^t \qquad (2)$$

where NG_τ^t is the number of recipients, NR_τ^t is the number of participants, g_τ^t is the total sum of pension benefit payments per person and r_τ^t is the total sum of the amount paid for insurance premiums per person in τ's age category respectively.

And suffix t represents the observation year and suffix τ represents the age categories and range of τ is given as follows:

$\tau = 0, 1, 2, \cdots, m, \cdots, n, \cdots, k$, where m is the commencement of premium payments, n is the beginning of the payment of benefits.

The data in Equation (1) for the total sum of pension benefit payments per person in each age category g_τ^t and in Equation (2) for the total sum of the amount paid for insurance premiums per person in each age category r_τ^t do not actually exist. In the actual calculation, because the total benefit payments G^0, the number of recipients $\sum_{\tau=n}^{k} NG_\tau^0$, the total premium amount paid R^0 and the number of participants $\sum_{\tau=m}^{n-1} NR_\tau^0$ insured exist as the initial values in time 0, the total average benefit payments per person g^0 and the total average premium payments paid per person r^0 will be used. In other words, the average allowance per person g^0 can be expressed as:

$$g^0 = \frac{G^0}{\displaystyle\sum_{\tau=n}^{k} NG_\tau^0} \qquad (3)$$

and the average amount of insurance premiums paid r^0 can be expressed as:

$$r^0 = \frac{R^0}{\sum_{\tau=m}^{n-1} NR_\tau^0} \qquad (4)$$

Here, when you assume the average allowance per person g^0 since the time 1 to be dependent on the change rate of policy variable on amount of benefit payment $\dot{p}_1$ [4] in which prices, a living standard or a pension financial situation, etc. are considered, it can be expressed as:

$$g^t = (1 + \dot{p}_1)^t g^0 \qquad (5)$$

On the other hand, when you assume the total average premium payments paid per person r^0 since the time 1 to be dependent on the change rate of policy variable on amount of premium $\dot{p}_2$ in which prices, a living standard or a pension financial situation, etc. are considered as well as the pension provision amount, it can be expressed as:

$$r^t = (1 + \dot{p}_2)^t r^0 \qquad (6)$$

And the number of recipients and the number of participants over time 1 can be expressed as:

$$\sum_{\tau=n}^{k} NG_\tau^t = \sum_{\tau=n-t}^{k} NG_\tau^0 \prod_{\tau=n}^{k} \theta_\tau \qquad (7)$$

and

$$\sum_{\tau=m}^{n-1} NR_\tau^t = \sum_{\tau=m-t}^{n-1} NR_\tau^0 \prod_{\tau=m}^{n-1} \theta_\tau \qquad (8)$$

If the above is arranged, by substituting equation (5) and equation (7) for equation (1), the total benefit payments G^t in time t are given as:

$$G^t = (1 + \dot{p}_1) g^0 \sum_{\tau=n-t}^{k} NG_\tau^0 \prod_{\tau=n}^{k} \theta_\tau \qquad (9)$$

In the same way, by substituting equation (6) and equation (8) for equation (2) the total premium amount paid R^t in time t are given as:

$$R^t = (1 + \dot{p}_2) r^0 \sum_{\tau=m-t}^{n-1} NR_\tau^0 \prod_{\tau=m}^{n-1} \theta_\tau \qquad (10)$$

Thus, we can calculate G^t and R^t with equation (9) and equation (10) by giving the total average benefit payments per person g^0, the total average premium payments paid per person r^0, the number of recipients $\sum_{\tau=n}^{k} NG_\tau^0$ and the number of participants $\sum_{\tau=m}^{n-1} NR_\tau^0$ as the initial values and by giving the change rate of policy variable $\dot{p}_1$, the change rate of policy variable $\dot{p}_2$ and average survival probability θ_τ as the exogenous variables[5].

The above model, however, does not deal with the type of pension system such as NP, EPI and MAP, and the objective of the pension, such as OAP, DP and SP. Thus, the actual calculation was performed in the following way. Namely, in the new system, the populations of the target periods are sorted according to the actual number of recipients and the actual number of participants of NP, EPI and MAP to obtain $\sum_{\tau=n}^{k} NG_\tau^t$ in equation (7) and $\sum_{\tau=m}^{n-1} NR_\tau^t$ in equation (8). In the older system, the number of retirement

pensioners was reduced by multiplying θ_τ, the survival probability rate of the time. As for the various pension objectives, we made a preliminary calculation by estimating the number of retirees to receive the basic pension while hypothetically assuming the rate of those with DP and SP to be uniform in the above model.

3. Simple projections and simulation experiments

The calculations of this paper are observed under the following premises:

(1) Projection period: 6 years from the initial period of 2004 to 2010

(2) Population projections: life table of 2004

(3) Policy variables

    1.   A simple projection based on the immutability of the current policy variables $\dot{p}_1$ and $\dot{p}_2$ [6]. (Standard Case)

    2.   The phased raising of the starting age of benefit payments. (Case 1)

        For example, the current starting age of 65 for payments is raised to 66 in 2008, and finally to 68.

    3.   Lowering the amount of benefit payments g^0. (Case 2)

        For example, the change rate of policy variables $\dot{p}_1$ is changed by a 1% reduction every year.

    4.   Raising the insurance premium r^0. (Case 3)

        For example, the change rate of policy NP $\dot{p}_2$ is changed by 2010 up to 16,900 yen, and EPI and MAP is raised by 18.3%[7].

3-1 The Procedures and results of the Projection

1. Standard Case

The estimates of the standard case are divided into the total benefit payments (old and new system) and the total sum of premiums payments. Firstly, we focus on the total benefit payments of new system, as the main factor of the financial expenditures. The sum of benefit payments in table 2 consist of three systems, namely NP, EPI and MAP. And each system has OAP, DP, SP and its subtotal. This table shows that for six years from 2004 to 2010, the subtotal of NP will increase 2 trillion yen from 12.6 trillion yen to 14.5 trillion yen. Especially, the old-age pension's increase is 1.6 trillion yen from 2004 to 2010. For the estimated value of the second story of EPI and MAP, the former will increase 2.9 trillion yen from 19 trillion yen to 21.9 trillion yen. The latter will increase 700 billion yen from 4.4 trillion yen to 5.1 trillion yen. Especially, the old-age pension will show a dramatic increase of 2.8 trillion yen. The reason of these increases may be thought to be the increase of the population of elderly people.

Table 3 shows the total benefit payments in the old system. From this table we can conclude that for six years from 2004 to 2010, the subtotal of NP will decrease about 1.2 trillion yen from 2.0 trillion yen to 766 billion yen. In addition, EPI will decrease about 3.7 trillion yen from 5.9 trillion yen to 2.2 trillion yen. MAP will decrease 1.3 trillion yen from 2.1 trillion yen to 808 billion yen. The reason for these decreases may be thought to be the decrease of the number of the recipients.

Table 4 shows the total sum of the premiums paid as the main factor of financial revenues. The total revenue of premium paid tends to decrease as a whole. More precisely speaking, for six years from 2004 to 2010, NP will decrease 270 billion yen from 1.9 trillion yen to 1.7 trillion yen, and EPI will decrease about 900 billion yen from 19.5 trillion yen to 18.6 trillion yen. And MAP will decrease about 200 billion yen from 4.3 trillion yen to 4.1 trillion yen. The reason for these decreases may be thought to be the decrease

Table 2　The Total Benefit Payments in the New System (in 1 billion yen)
　　　　　2004's values are actual total benefit payments.

		2004	2005	2006	2007	2008	2009	2010
	OAP	11,009	11,271	11,588	11,912	12,204	12,494	12,631
NP	DP	1,333	1,423	1,463	1,504	1,540	1,577	1,594
	SP	233	262	269	276	283	290	293
	subtotal	12,575	12,956	13,320	13,692	14,027	14,361	14,518
	OAP	15,387	15,754	16,197	16,649	17,058	17,463	17,655
EPI	DP	252	262	269	277	284	290	294
	SP	3,367	3,519	3,618	3,719	3,810	3,900	3,943
	subtotal	19,006	19,535	20,084	20,645	21,152	21,653	21,892
	OAP	3,441	3,523	3,622	3,723	3,815	3,905	3,948
MAP	DP	42	42	43	45	46	47	47
	SP	950	988	1,016	1,044	1,070	1,095	1,107
	subtotal	4,433	4,553	4,681	4,812	4,931	5,047	5,102

Table 3　The Total Benefit Payments in the Old System (in 1 billion yen)
　　　　　2004's values are actual total benefit payments.

		2004	2005	2006	2007	2008	2009	2010
	OAP	1,878	1,596	1,357	1,153	980	833	708
NP	DP	118	98	83	70	60	51	43
	SP	23	33	28	24	20	17	15
	subtotal	2,019	1,727	1,468	1,247	1,060	901	766
	OAP	4,774	4,058	3,449	2,932	2,492	2,118	1,800
EPI	DP	175	146	124	105	90	76	65
	SP	956	797	677	576	489	416	354
	subtotal	5,905	5,001	4,250	3,613	3,071	2,610	2,219
	OAP	1,870	1,589	1,351	1,148	976	830	705
MAP	DP	36	30	26	22	19	16	13
	SP	242	203	173	147	125	106	90
	subtotal	2,148	1,822	1,550	1,317	1,120	9,512	808

Table 4　The Total Sum of Premiums (in 1 billion yen)
　　　　　2004's values are actual total benefit payments.

	2004	2005	2006	2007	2008	2009	2010
NP	1,935	1,754	1,749	1,746	1,722	1,694	1,666
EPI	19,454	19,334	19,175	19,009	18,851	18,689	18,598
MAP	4,263	4,242	4,211	4,175	4,142	4,105	4,084

of the number of the participants in the public pensions.

To summarize the result of the standard case, financial deficit of the public pension system, or the difference between the total benefit payments paid and the total premiums payments will stay unchangeably at about 20 trillion yen. But taking the increase of the ratio of participants of the new system to the total public pension system into consideration, the financial conditions of public pension system will be more restrictive. To solve this kind of financial problem, we try to simulate three cases concerning the policies of benefit payments and premium payments by measuring the effects of these policies.

2. Case 1

In this case, we estimate the effect of the policy in which the starting age of benefit payments will be raised from 65 in 2007 and finally to 68 in 2010. Because the benefits of the old system have already been paid from 65, this simulation is done only in the new system for OAP. Table 5 shows the differences between the standard case and case 1 for three years from 2008 to 2010. According to table 5, NP will decrease from 1.2 trillion yen in 2008 to 2.1 trillion yen in 2010. And EPI will decrease from 1.7 trillion yen to 3 trillion yen. MAP will decrease from 380 billion yen to 661 billion yen. The total decrease from 2008 to 2010 will be 13.1 trillion yen.

Table 5   The Variation of Total Benefits Payment Attended by Raising of the Starting Age (in 1 billion yen)
2004's values are actual total benefit payments.
The lower row shows the difference from the standard case.

	2004	2005	2006	2007	2008	2009	2010
The starting age of benefit payments					66	67	68
Old–age NP	11,009	11,271	11,588	11,912	10,989 (1,215)	10,989 (1,505)	10,516 (2,115)
Old–age EPI	15,387	15,754	16,197	16,649	15,359 (1,699)	15,359 (2,104)	14,699 (2,956)
Old–age MAP	3,441	3,523	3,622	3,723	3,435 (380)	3,435 (471)	3,287 (661)

3. Case 2

In this case, we estimate the effect of the policy of reducing the benefit payments by 1% per year. The effects of this policy can be calculated with $(0.99)^n$ multiplied by estimated value of the standard case, where n is a time term of the projection period. The result of table 6 shows that differences of the total benefit payments between the standard case and case 2 for six years from 2004 to 2010. The difference of NP will increase from 129 billion yen to 849 billion yen. And the difference of EPI will increase from 195 billion yen to 1.28 trillion yen. The difference of MAP will increase from 45 billion yen to 298 billion yen.

Table 6　The Total Benefit Payments in the New System (in 1 billion yen)
　　　　2004's values are actual total benefit payments.
　　　　The lower row shows the difference from standard case.

		2004	2005	2006	2007	2008	2009	2010
NP	OAP	11,009	11,158 (112)	11,357 (230)	11,557 (353)	11,723 (480)	11,881 (612)	11,891 (739)
	DP	1,333	1,408 (14)	1,433 (29)	1,458 (44)	1,479 (60)	1,499 (77)	1,501 (93)
	SP	233	258 (2)	263 (5)	268 (8)	272 (11)	275 (14)	275 (17)
	subtotal	12,575	12,826 (129)	13,054 (265)	13,285 (406)	13,474 (552)	13,656 (703)	13,668 (849)
EPI	OAP	15,387	15,596 (157)	15,875 (322)	16,154 (494)	16,385 (672)	16,607 (855)	16,621 (1,033)
	DP	252	259 (2)	264 (5)	268 (8)	272 (11)	276 (14)	276 (17)
	SP	3,367	3,483 (35)	3,545 (71)	3,608 (110)	3,659 (150)	3,709 (191)	3,712 (230)
	subtotal	19,006	19,339 (195)	19,684 (399)	20,031 (613)	20,318 (833)	20,592 (1,061)	20,610 (1,281)
MAP	OAP	3,441	3,488 (35)	3,550 (72)	3,612 (110)	3,664 (150)	3,713 (191)	3,717 (231)
	DP	42	41 (0)	42 (0)	43 (1)	43 (1)	44 (2)	44 (2)
	SP	950	978 (9)	995 (20)	1,013 (31)	1,027 (42)	1,041 (53)	1,042 (64)
	subtotal	4,433	4,508 (45)	4,588 (93)	4,669 (142)	4,736 (194)	4,800 (247)	4,804 (298)

4. Case 3

According to the policy schedule of the government, premiums will be raised from 13,300 yen per month in 2004 to 16,900 yen in 2017 for NP and the ratio of premium payment will be raised from 13.54% in 2004 to 18.3% in 2017 for EPI and MAP. In our case, we assume that the premium for NP and the ratio of premium payment for EPI and MAP will be completed by 2010. Table 7 shows that the effect for NP will be an increase from 77 billion yen to 440 billion yen. The effect for EPI will be an increase from 84 billion yen to 497 billion yen. The effect for MAP will also be an increase from 27 billion yen to 160 billion yen. The total effect will be an increase of about 3.9 trillion yen.

Table 7　The Total Premium Payments Paid (in 1 billion yen)
　　　　2004's values are actual total benefit payments.
　　　　The lower row shows the difference from the standard case.

	2004	2005	2006	2007	2008	2009	2010
NP	1,935	1,899 (77)	2,038 (154)	2,178 (230)	2,290 (303)	2,393 (373)	2,491 (440)
EPI	19,454	19,486 (84)	19,478 (167)	19,461 (250)	19,451 (332)	19,436 (414)	19,494 (497)
MAP	4,263	4,281 (27)	4,290 (54)	4,293 (80)	4,298 (107)	4,300 (133)	4,318 (160)

3-2 Considerations and Policy Proposals

From the effects of the three cases of simulations, we propose a mixed policy of cutting benefit payment and increasing premium payments as follows:

benefits cut 1% per year and the raising of the starting age of benefit payments from 65 to 68.

the gradual raising of the premium payments from 2004 to 2010.

Thus we will be able to save 17.42 trillion yen in total over six years from 2004 to 2010 totally.

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Footnotes

1. The pension prescription exception law: The prescription of five years was set to application of the pension claim before. Therefore, when five years were passed, we were not able to receive the pension. However, the pension applicable to all periods of the past became possible to be received by this law [1].

2. However, only when it doesn't grant a pension to all members but the Third-party panel (pension record confirmation independent committee) admits, it is supposed to provide it.

3. The difference between an old system and a new system is before or behind the law revision of 1986. In that case, the government pension plan is assumed to be NP in one story part, and two story part of ERI and MAP. In a former system, NP, EPI and MAP were separate.

4. $\dot{p}_i = \dfrac{dp_i}{dt}(i = 1, 2)$

5. See master's thesis archives, Hirata, 2007 [2] for more detailed information.

6. In the current government policy, NP is raised by 280 yen every year (the figure for 2004) and will be set at 16,900 yen in 2017, while EPI and MAP are being raised 0.354% and 0.129% respectively and set at 18.3% higher in 2017 [3-5]. Normally, this must be taken into consideration when estimating the total amount of premiums. However, here, since the percentage distribution of the total payment of premium payment of every insured person is unknown, the average premium r^0 is used, we cannot take these policies precisely into account. As a result, for the total amount of insurance premiums received, we calculate the average premium payment made per person in the earliest year of 2004 and do not consider the rise each year mentioned above from the start in our estimate of the total amount of insurance premiums.

7. Concerning footnote 5, the premium standard is being raised as mentioned in footnote 5 according to the revision to set the standard for premiums. Therefore, we will look at the effect of the raising of the premium standard up to the year 2010 here.

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