Investment Risk-taking and Benefit Adequacy under Automatic Balancing Mechanism in Public Pension System in Japan

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Background of the public pension (PP) system in Japan

- **The automatic balancing mechanism (ABM) was introduced** in 2004, accompanied by a fixed (capped) pension premium.
- To re-establish the financial equilibrium, real benefits are reduced according to the ABM, such that the predicted **the reserve-to-expenditure ratio (RER: reserved fund / benefit expenses) holds one in 100 years.**
- The government has a **target replacement rate (RR: pension benefit / income of working generation)** to measure the adequacy of pension benefits. The current RR is 60%, and **the target is at least 50%**.
- The government can control the investment risk-taking (**stock investment weight: SW**) of reserve funds, which could cause significant fluctuations in the RR and RER under the ABM.

Contribution of this study

- We provide evidence that the **RR and RER** have **considerable downside risks (red zone: RER < 0 and RR < 40%)** despite the existence of the ABM
  - The RR can be below half of the current level and the RER can be exhausted (RER < 0).
- We examine the appropriate level of risk-taking in the pension reserve fund
  - We find that it should take **adequate risks in investing in stocks**;
  - low-risk investments, such as 100% domestic bonds (**SW** = 0%), result in a locked-in low RR,
  - whereas high-risk investments such as 100% equity (**SW** = 100%) could incur considerably lower RR and RER.

Simulation method

- Using the **government's computer program**, the inflation rate, wage growth rate, investment return are generated and calculate **RR and RER 9000 times**.
- The average inflation rate and wage growth rate are based on economic assumption **Cases 3 (statdard)** and **5 (pessimistic)** in the financial verification.
- Set the average investment yield to match Case 3 when the **SW =** 50%
- The **SW** other than 50% are calculated based on annual data for the past 25 years.

The modified indexation rate that is used to adjust benefits under the ABM

- the modified indexation rate (M)

$$\mathbf{M} = \mathrm{Min}[f(\theta,\varphi), \mathrm{Max}\{f(\theta,\varphi) + \mathrm{Min}(\delta-\gamma, 0), 0\}] \cdot I_{\{t \le t^*\}} + f(\theta,\varphi) \cdot I_{\{t > t^*\}},$$

$$t^* = inf_{2010 \le t \le T}\{t | RER_T = 1\}$$

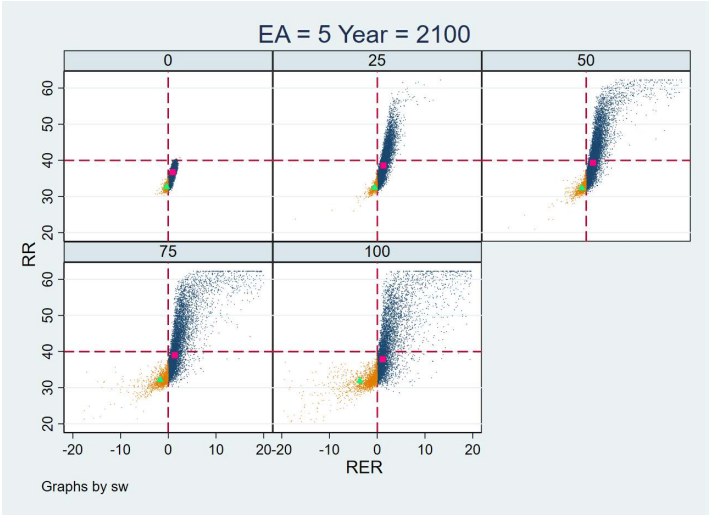
- θ and φ are the inflation and wage growth rates, respectively
- f differs depending on the insured persons and pensioners: $f(\theta,\varphi) \equiv \varphi$ for insured persons, and $f(\theta,\varphi) \equiv \min(\theta,\varphi)$ for pensioners
- δ represents the annual growth rate of the number of insured persons
- γ is constant and set to 0.003

Simulation assumption for EA 5

SW	0%					25%					50%					75%		100%	
	AVG	STD	CORR			AVG	STD	CORR			AVG	STD	CORR			AVG	STD	AVG	STD
			Inf	Wag	Inv			Inf	Wag	Inv			Inf	Wag	Inv				
Inflation	0.8%	0.9%	1.0	0.5	0.3	0.8%	0.9%	1.0	0.5	-0.1	0.8%	0.9%	1.0	0.5	-0.1	0.8%	0.9%	0.8%	0.9%
Wage	1.6%	1.6%	0.5	1.0	0.0	1.6%	1.6%	0.5	1.0	0.1	1.6%	1.6%	0.5	1.0	0.1	1.6%	1.6%	1.6%	1.6%
Investment	0.5%	2.6%	0.3	0.0	1.0	2.0%	8.4%	-0.1	0.1	1.0	2.8%	12%	-0.1	0.1	1.0	3.6%	17%	4.5%	22%

Result for EA 5

- The **0% SW** shows the lowest median RR.
- The **25-75% SW** have a higher median RR with the limited risk of negative RER



Animation

Pink square represents the median RR and RER.
Green triangle represents the mean RR and RER in the red zone.

Risk and return of Japanese PP under ABM according to (stock weight) **SW** for EA5

Year 2060

Stock weight (SW)	0	25	50	75	100
Median RER	1.4	2.3	2.6	2.6	2.3
Median RR	41.8	43.0	43.4	43.4	43.0
Prob (Red zone)	0.0%	0.1%	0.4%	1.6%	3.9%
Mean RER in the red zone	-0.9	-0.9	-1.4	-1.6	-1.9
Mean RR in the red zone	39.8	39.7	39.4	39.3	39.1

Year 2100

Stock weight (SW)	0	25	50	75	100
Median RER	0.9	1.3	1.4	1.4	1.1
Median RR	36.7	38.6	39.3	39.0	37.9
Prob (Red zone)	7.2%	10.1%	14.5%	20.0%	24.5%
Mean RER in the red zone	-0.4	-0.6	-0.9	-1.7	-3.7
Mean RR in the red zone	32.6	32.4	32.3	32.2	31.9

Conclusion and policy implication

- The government outlook may be overestimated for **RR** in both the standard case (EA 3) and pessimistic case (EA 5).
- A certain amount of equity investment is required, but the **SW** in equities should not be too high (preferably 25% to 75%).
- With the ABM, temporary borrowing is an option, rather than immediately shifting to a fully pay-as-you-go system when the reserve is depleted.