Optimal degree of funding of public sector pension plans

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Agenda

1. Motivation and background

2. Our Approach

3. Analytical Framework

4. Results

Features public sector pension plans

- Most countries separate pension plans government workers
  - Guaranteeing integrity, independency and security
  - Relatively generous to offset lower wages vis-à-vis private sector

- Large diversity in finance practice
  - Range from full paygo to full funding
  - High fiscal burden, but often not accounted for explicitly
  - Low transparancy

- Strong role labour unions

Table 1: **Public sector pension liabilities as implicit debt compared to explicit government debt; as percentage of GDP end of 2008**

Country	Implicit debt	Explicit debt	Total debt	Financing method
France	91	61	152	PAYG primarily
Finland	77	38	115	PAYG primarily
UK	63	75	138	PAYG and funded
Germany	58	44	102	PAYG primarily
US	31	53	84	Funded
Norway	19	26	45	PAYG primarily
Sweden	8	38	46	PAYG primarily
Netherlands	5	50	55	Funded
Canada	5	36	41	Funded

cf. Ponds et al. 2011, OECD

Full funding is not the rule

- <u>Normative statetement</u> derived from Munnell *et al*. (2011):

  "Each generation of tax payers should pay the full cost of the public service it receives. If a public servant's compensation includes promised pension income in retirement, then the cost of that benefit should be recognized and funded at the time the employee is in service, not when the pension benefit actually is paid out"

- However the <u>practice</u> indicate full funding is rather the exception than the rule
  - Overall strong reliance on paygo
  - When full funding is aimed at, then often strong underfunding

Why less than full funding? (1)

1. Rational strategy to control strong unions
   – a-symmetric risk sharing in funding: surplus is converted in additional pensions and shortage leads to additional taxes

2. Tendency politicians to shift costs public pensions forward
   – Higher underfunding as an alternative for issuing more explicit debt
   – Discounting method easy to manipulate
   – Collaboration unions and politicians to be intransparant and to downplay real costs public sector service

Why less than full funding? (2)

3. Current funding practice reflection political preferences in 30s and the 50s

- LARGE PAYGO countries:
  - WWI -damage and large inflationary shocks => devastation middle class savings
  - political majority for social insurance and a strong role for state intervention.
  - Germany, France, Italy, Belgium
- SMALL PAYGO countries:
  - Countries without severe war destruction and price shocks
  - political majority for pension savings and free markets to
  - Scandinavia, Switzerland, the Netherlands
  - UK and its allies Canada, the US, and Australia.

- Once pension system parameters are set, they are difficult to reset

What is best from an economic perspective?

Economic approach as guide optimal degree of funding (1)

Limited number of papers

1. D'Arcy, S.P., James H.D. , & Pyungsuk O. (1999). Optimal Funding of State Employee Pension Systems. *Journal of Risk and Insurance*

   - Tax smoothing argument in deterministic setting
   - Full funding at the end horizon
   - Range of funding paths over time possible depending on growth rates pension costs and taxable income

2. Bohn, Henning (2011). "Should public retirement plans be fully funded?," *Journal of Pension Economics and Finance*

   - Comparison of taxpayers' borrowing cost with return on pension assets
   - Zero funding is optimal as taxpayers' borrowing costs (=credit card) are larger than the pension funds' rate of return

Economic approach as guide optimal degree of funding (2)

Limited number of papers

3. Lucas D.J. and S. Zeldes (2009): How should public penson plan invest?, *American Economic Review*

- Funding and investment policy irrrelevant in a completely frictionless market setting
- Ricardian neutrality: individuals able to offset any effect of tax policy on the timing of consumption
- Modigliani-Miller neutrality: taxpayers will undo impact risk taking by public sector pension fund by adjusting own asset allocation

Approach in our paper

- Tax payers ultimately bear all costs and risks of public sector plans, …

  … so taxpayers' perspective leading in defining optimal funding degree

- Two aspects in finding optimal degree of funding

  1. Optimal Portfolio perspective
     - Optimal mix of funding and PAYG
     - Trade-off level versus volatility tax rate

  2. Intergenerational redistribution perspective
     - Current taxpayers must be willing and be capable to prefund current public sector workers' pensions

- Benevolent planner (government) takes both perspectives into account in setting the parameters

Main findings in paper

1. Preference for paygo financing is larger the more <u>weight is given to current generation of tax payers</u>, or the more dominant the intergenerational perspective is above the portfolio perspective

2. Optimal degree appears to be <u>endogenous</u>, depending on the <u>actual</u> state of the economy (means to prefund) and the expectation on <u>next</u> state of the economy (relative attractiveness of funding vis-à-vis PAYG)

Framework

1. Private sector income

$$Y_t = X_t - W_t - T_t$$

2. Public sector income

$$Y_t^{pub} = W_t^{pub} + PV[B_{t+1}]$$

3. Taxation to pay for pension income

$$T_t = B_t - F_{t-1}(1 + R_t) + F_t$$

Framework (2)

4.   Standard CRRA Utility

$$E\{U(C_t^y, C_{t+1}^o)\} = \frac{(C_t^y)^{1-\gamma}}{1-\gamma} + \frac{1}{1+\rho} E\left\{\frac{(C_{t+1}^o)^{1-\gamma}}{1-\gamma}\right\}$$

- Social Welfare function

$$E\{V_t\} \equiv E\{\tilde{U}(Y_t)^\alpha \tilde{U}(Y_{t+1})\}$$

Framework (3)

4 Rewritten private sector income

$$Y_t = X_t - W_t^{pub} - T_t$$

$$= (1-a)X_t + F_{t-1}(1+R_t) - F_t$$

$$= (1-a)X_t\left[1 - \phi_t\right] + (1+R_t)\phi_{t-1}(1-a)X_{t-1}$$

$$= (1-a)X_t\left[1 - \phi_t + \phi_{t-1}\frac{1+R_t}{1+G_t})\right]$$

Net effect of funding is larger when:
- Previous generation has invested more in funding (ϕ_{-1})
- The larger the (excess) return on funding (1+R)/(1+G)

Framework (4)

Optimal degree of funding

$$\phi_t = \frac{[\mu_{r-g} + \frac{1}{2}\sigma^2_{r-g}] - \frac{\alpha}{(1-\phi_t+Q_t)}}{\gamma\sigma^2_{r-g}}$$

Quadratic equation in ϕ, can be solved but complex solution

Discussion of three cases:

1. $\alpha=0$: only Portfolio approach perspective
2. $\alpha>0$: also intergenerational perspective
3. $\alpha>0$ and $m>0$: role of subsistence level

Case 1: $\alpha=0$

$$\phi_t = \frac{\mu_{r-g} + \frac{1}{2}\sigma^2_{r-g}}{\gamma\sigma^2_{r-g}}$$

No weight to initial generation of tax payers

=> Optimal degree of funding ϕ depends solely on the tradeoff additional return versus additional risk of funding vis-à-vis paygo

Casus 2: $\alpha > 0$

$$\phi_t = \frac{[\mu_{r-g} + \frac{1}{2}\sigma^2_{r-g}] \left|- \frac{\alpha}{(1-\phi_t+Q_t)}\right.}{\gamma\sigma^2_{r-g}}$$

•funding will only be introduced if the government does not give a too large weight to initial generation (<u>low α</u>)

•if funding exist, it may well be abolished by future generations (<u>ϕ<0</u>)

•it is more likely that funding is introduced or extended if the initial generation is rich (<u>high Q</u> because of high net wage income and/or return funding is high)

•it is more likely that funding will be abolished in a period where the return on previous funding is low and/or low wage income (<u>low Q</u>)

Casus 3: $\alpha > 0$ and m>0

$$\phi_t = \frac{[\mu_{r-g} + \frac{1}{2}\sigma^2_{r-g}] - \frac{\alpha}{(1-\phi_t+Q_t)(1+m)}}{[1+(\gamma-1)(1+m)]\sigma^2_{r-g}}$$

• We extend the model with a <u>minimum subsistence level m</u>

• The higher this minimum *m* is, the lower funding ϕ is

Optimal degree of funding ϕ in benchmark setting

| ϕ_t	ϕ_{t-1}	μ_{r-g}	σ_r	σ_g	ρ	R	G	γ	m	α
0.1335	0.3	0.04	0.2	0.04	0	0.05	0.03	6	0.4	0.5

Sensitivity analysis: all variables +10%

Table 2: The optimal degree of funding ϕ_t

ϕ_t	ϕ_{t-1}	μ_{r-g}	σ_r	σ_g	ρ	R	G	γ	m	α
0.1335	0.3	0.04	0.2	0.04	0	0.05	0.03	6	0.4	0.5
0.1351	0.33									
0.1449		0.44								
0.1221			0.22							
0.1329				0.044						
0.1310					0.1					
0.1336						0.055				
0.1334							0.033			
0.1214								6.6		
0.1317									0.44	
0.1288										0.55

R, G, μ_{r-g}, σ_r, σ_g are reported on an annual base. One period is 25 years.

- Higher prefunding φt when pension fund residue is positive:
  - When (R-G>0)
  - The surplus is larger the higher the prevailing degree of funding ϕ_{t-1} in period t−1

- The better the prospect for funding (higher excess return μ_{r-g}, lower risks), the higher ϕ_t

- A higher subsistence level m implies less room to prefund

- Φt is lower when more weight is given to the current generation of tax payers, α

Sensitivity ϕ for weight current generation α
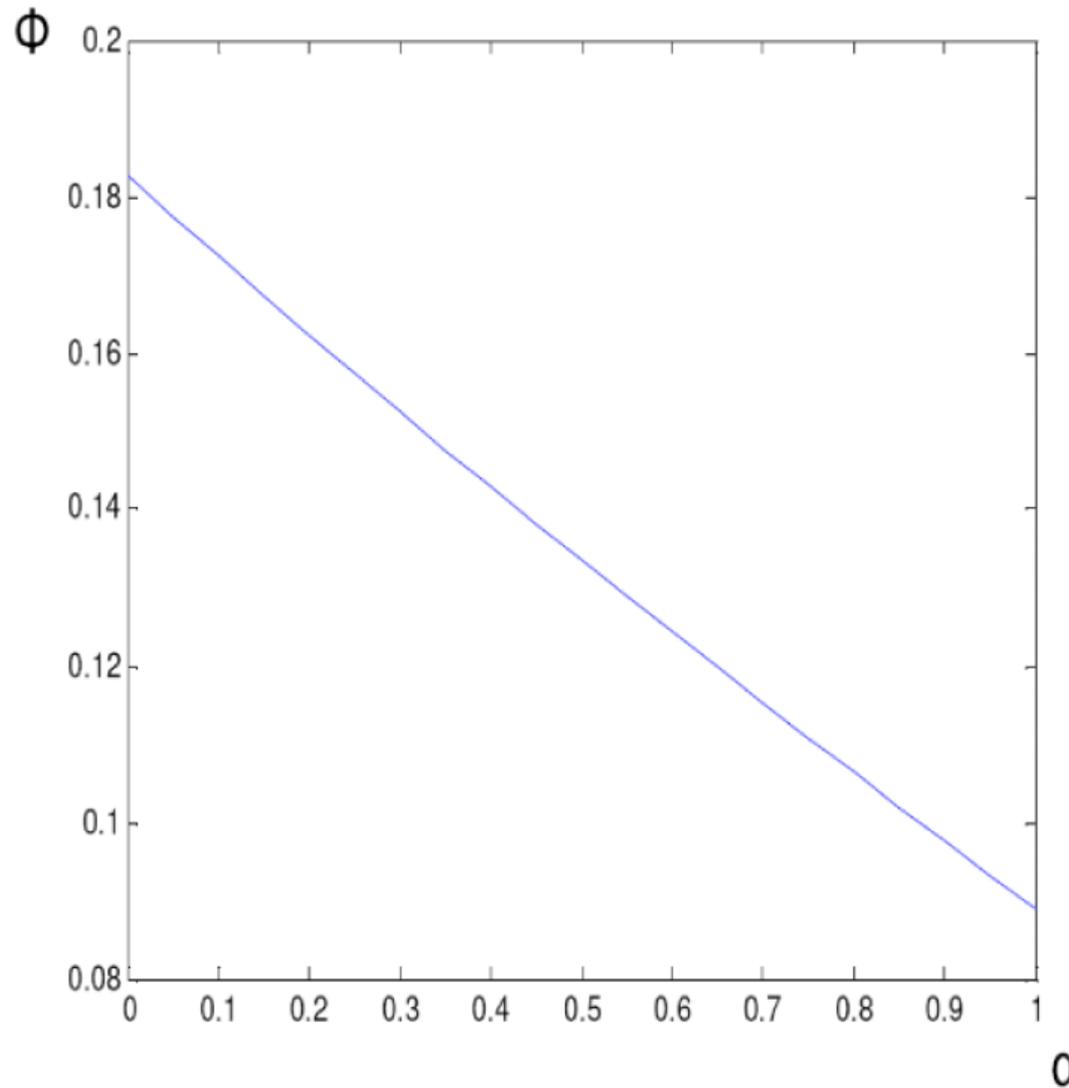
The higher α is, the more weight is attached to current generation and the smaller the willingness to prefund next period benefits ϕ is

Main findings in paper

1. Preference for paygo financing is larger the more <u>weight is given to current generation of tax payers</u>, or the more dominant the intergenerational perspective is above the portfolio perspective

2. Optimal degree appears to be <u>endogenous</u>, depending on the <u>actual</u> state of the economy (means to prefund) and the expectation on <u>next</u> state of the economy (relative attractiveness of funding vis-à-vis PAYG)

Historical roots current funding practice

- Our findings fits well with a strand in the literature that the across-country variety in pension plan design reflects differences in political preferences in the thirties and fifties during which most current plans were established (Perotti and von Thadden 2006).

- In turn these preferences can be seen as a reflection of the economic experiences in the interbellum period and WWI devastation

- Once set, pension system parameters can not easily be reset