

Asset-Liability Modeling in National Pension Plans

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What Risk Should we Manage in a Pension Plan?

- ▶ A pension plan has a specific (real) obligation to meet at each future date

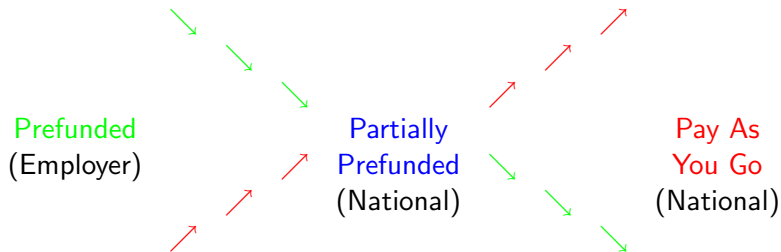
What Risk Should we Manage in a Pension Plan?

- ▶ A pension plan has a specific (real) obligation to meet at each future date
- ▶ Pension plans ought to manage

$$\text{Surplus} = \text{Assets} \text{ minus } \text{Liabilities}$$

rather than Assets alone

Pension Plan Types



- ▶ Ability to Invest Assets to Offset Liability Risk
- ▶ Importance of Age Distribution

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Partially Prefunded:

- ▶ AAL is not considered
- ▶ No consensus on how to do ALM

Proposed Stability Notion in Partially Prefunded Plans: Stable Funded Ratio

Theorem (Stable Funded Ratio)

Define the Stable Funded Ratio Contribution Rate as

$$\text{SFRCR}_t = \text{FR}_t \times \text{PNC}_t + (1 - \text{FR}_t) \times \text{PAYGC}_t \quad (1)$$

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then the Funded Ratio is stable

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$$PA_{t+1} - FR_{t+1} \times AAL_{t+1} \quad (2)$$

- ▶ Equation (2) is *exactly* the Sharpe-Tint Surplus [11] with κ set equal to the target Funded Ratio

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 - ▶ Takes into account age distribution, which is unimportant in Prefunded plans
 - ▶ Allows planning for deteriorating demographics
 - ▶ Takes into account the effect of macroeconomic variables

References I

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