ECON 442

Pensions

Winter 2015

Introduction

Why do we need a (public) pension system beyond private savings?

If so, which type of system is efficient and why?

Two basic systems:

- fully-funded system (private savings)
- pay-as-you-go (intergenerational transfers)

Separate issue – risk (defined contribution vs. defined benefit).

Model

Gov't:

- levies contributions $\tau(t)$ on the young
- pays out pension $a(t)$ to the old as a transfer
- invests into capital $K^s(t+1)$

Gov't Budget Constraint

$$k^s(t+1)N_{t+1} + a(t)N_{t-1} = r(t)k^s(t)N_t + \tau(t)N_t$$

In steady state, any social security policy (τ, k^s) yields pensions:

$$\frac{a}{n} = (r-n)k^s + \tau$$

Social security policy differs according to τ and k^s.

Fully-Funded System

Contribution by the young of generation t ...

$$\tau(t)N_t$$

... are invested by gov't to yield ...

$$r(t+1)\tau(t)N_t = r(t+1)K^s(t+1) = r(t+1)N_{t+1}k^s(t+1)$$

Return in $t+1$ is paid out to the old of generation t

$$a(t+1)N_t = r(t+1)N_{t+1}k^s(t+1)$$

Hence:

$$\frac{a(t+1)}{r(t+1)} \quad = \quad \tau(t)$$

Crowding Out

Household's budget constraints with perfect foresight

$$\begin{aligned} c_t(t) + s(t+1) &= w(t) - \tau(t) \\ c_t(t+1) &= r(t+1)s(t+1) + a(t+1) \end{aligned}$$

Intertemporal budget constraint

$$c_t(t) + \frac{c_t(t+1)}{r(t+1)} = w(t) - \tau(t) + \frac{a(t+1)}{r(t+1)} = w(t)$$

Private savings adjust 1-1 with pensions (lump-sum transfers):

$$s(t+1|a=0) = nk(t+1|a=0) = s(t+1|a>0) + nk^s(t+1)$$

Conclusion: Fully funded pensions are a perfect substitute to private savings.

Why do public pensions matter then?

- Investment Constraints
- Risk and Insurance
- Inefficiency in Savings Behavior
  - myopic behavior
  - overaccumulation of capital

Question:

Can we achieve socially optimal capital accumulation through a social security system?

Pay-As-You-Go-Scheme

Consider again a social security policy

$$\frac{a(t)}{n} = r(t)k^s(t) - nk^s(t+1) + \tau(t)$$

There is no government investment in capital, but only intergenerational transfers:

- $k^s(t+1) = 0$
- young pay $N_t \tau(t)$
- old receive $N_{t-1} a(t)$

We require that the system is balanced

$$a(t) = n\tau(t)$$

Inefficiency in equilibrium:

Equilibrium	Golden Rule
$MRS = f'(k) = r$	$MRS = f'(k_{GR}) = n$

where $r \neq n$ and $k \neq k_{GR}$.

Idea:

PAYG pensions can influence capital accumulation to restore efficiency.

How? Change incentives to save for the old.

Achieving the Golden Rule in SS

Step 1: Set $k = k_{GR}$ so that the new interest rate is $r = n$.

From the household's problem we have

$$\begin{aligned} \frac{u'(c_1)}{\beta u'(c_2)} &= r \\ c_1 &= w - \tau - s \\ c_2 &= rs + a \\ s &= nk \end{aligned}$$

Step 2: Use the fact that $w = f(k)$ and that $a = \tau n$. This gives one equation in τ with $k = k_{GR}$ and $r = n$.

Step 3: Solve for τ and recover a from the definition of the social security system.