A Primer on Social Security

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Some Basics About Social Security

- In recent years, Social Security has accounted for nearly half of all federal, state, and local government transfer programs.
- It encompasses three major programs:
  - Old Age and Survivors’ Insurance
  - Disability Insurance
  - Medicare (health insurance for the elderly)
- Enacted in 1935, OASDI in 2002 paid $454 billion to 46 million retired and disabled workers and their surviving spouses and dependent children.
  - 32 million retired workers and their dependents.
  - 7 million survivors of deceased workers
  - 7 million disabled workers
- The fastest growing component of Social Security is Medicare, introduced in 1965. Since 1980, Medicare payments have doubled as a share of GDP. In recent years, they have been growing three times faster than the economy.
• Social Security payments are financed through payroll taxes assessed on wages and salaries. The payroll taxes rate:
  – in 1950: 3.0%
  – in 2001: 15.3%
• 153 million people paid $627 billion into the system in 2002.
• Trust fund worth $1.4 trillion in 2002.
Two types of ways to fund a Social Security system

1. **pay-as-you-go** – overlapping generations, collect taxes from working generation, transfer to elderly.

2. **fully-funded** – collect taxes from people during the working period, save it until that generation get old.

Current system is pay-as-you-go.

Recently been talk about going to a fully funded system. Currently Chile run as a fully funded system.
A fully-funded system I

- Recall the following model:

\[
\max_{C_1, C_2} \ln(C_1) + \beta \ln(C_2)
\]

subject to:

\[
C_1 + \frac{C_2}{1 + r} = Y_1 + \frac{Y_2}{1 + r}
\]

- Rewrite the constraints as:

\[
C_1 + S = Y_1 \\
C_2 = Y_2 + (1 + r)S
\]

- Add the constraint

\[
S > \bar{S}
\]

- Can we make agent’s better off?

- Ignore the constraint for a minute. Recall we solved for the following consumption and saving functions:

\[
C_2 = (1 + r) \left( \frac{\beta}{1 + \beta} \right) \left( Y_1 + \frac{Y_2}{1 + r} \right)
\]

\[
C_1 = \left( \frac{1}{1 + \beta} \right) \left( Y_1 + \frac{Y_2}{1 + r} \right)
\]

\[
S = Y_1 - \left( \frac{1}{1 + \beta} \right) \left( Y_1 + \frac{Y_2}{1 + r} \right)
\]

- This policy works just like a borrowing constraint.
A fully-funded system II

• Consider of the following fully funded system

  – The government taxes agents in the first period of their life $\tau$.
  – The government invests the money for the agents.
  – The government then pays the agents $(1 + r)\tau$ when the agents are old.

• We can write the agent’s two period problem as:

$$\max_{C_1, C_2} \ln(C_1) + \beta \ln(C_2)$$

subject to:

$$C_1 + S + \tau = Y_1$$

$$C_2 = Y_2 + (1 + r)S + (1 + r)\tau$$
• Let’s add up the budget constraints

• The period 1 constraint is in period 1 goods. The period 2 constraint is period 2 goods.

• So rewrite the second period budget constraint in term of period 1 goods.

\[
\frac{C_2}{1+r} = \frac{Y_2}{1+r} + S + \tau
\]

• Add the two constraint together:

\[
C_1 + \frac{C_2}{1+r} = Y_1 + \frac{Y_2}{1+r}
\]

• While the consumption function remain unchanged, saving is reduced by exactly \( \tau \).

\[
C_1 = \left( \frac{1}{1+\beta} \right) \left( Y_1 + \frac{Y_2}{1+r} \right) \\
S = Y_1 - \tau - C_1
\]
Is there a role for government in this simple two period model?

• Can we design a government program of taxes and transfers that we will make our agents better off?
  
• In a word, No.
  
  – Consumption function unchanged
  
  – Ricardian equivalence argument.
  
  – Some economists argue that Social Security lowers privative savings.

• Does this model fit the real world? Are you perfectly smoothing your consumption over your lifetime?
  
  – imperfect access to credit markets, cannot put your human capital up as collateral.
  
  – uncertainty about the future (income, expenses)

• In particular, many economists have found that the elderly do not dis-save as much as this permanent income model would predict.
  
  – precautionary savings – they don’t know how long they will live, worry about possible large medical bills (uncertainty)
  
  – but they could buy annuities
  
  – bequests – they want leave something for their kids
A pay-as-you-go system

- An overlapping generation structure
  - superscript denotes generation
  - subscript denotes period of life

- Each generation born at date $t$ solves the following problem.

\[
\begin{align*}
\max_{C_1^t, C_2^t} & \quad \ln(C_1^t) + \beta \ln(C_2^t) \\
\text{subject to:} & \quad C_1^t + S^t + \tau = Y_1^t \\
& \quad C_2^t = Y_2^t + (1 + r)S^t + \tau
\end{align*}
\]

- Let’s add the two budget constraints together.

- Rewrite the second period budget constraint in term of period 1 goods.

\[
\frac{C_2^t}{1 + r} = \frac{Y_2^t}{1 + r} + \frac{S^t + \tau}{1 + r}
\]

- Add the two constraint together:

\[
C_1 + \frac{C_2}{1 + r} + S^t + \tau = Y_1 + \frac{Y_2}{1 + r} + \frac{S^t + \tau}{1 + r}
\]

- or

\[
C_1 + \frac{C_2}{1 + r} = Y_1 + \frac{Y_2}{1 + r} - \frac{r}{1 + r} \tau
\]
• This pay-as-you-go scheme lowers the present value of the agent’s lifetime resources. By how much?

  – By the amount equal to the interest each young person loses by having to pay \( \tau \) when young before getting it back when old.

• Consider the budget constraints of the agents who are old when the system starts ...

\[
C_1^t + S^t = Y_1^t \\
C_2^t = Y_2^t + (1 + r)S^t + \tau
\]

The initial old love this system.

• If we allowed population growth, we could improve the situation. If the population grows faster than \((1 + r)\), agents could be better off under this system.

• Also if we allow for wage growth, we can improve the situation. If wage income grows faster than \((1 + r)\), agents would be better off. Again the importance of productivity growth.
A model with untimely deaths

Consider the following two period model. In our model economy there are:

1. There are two agents in the economy
   - one agent will live for two periods (agent A)
   - the other agent will live for only a single period (agent B)
2. Neither agent know his/her type until period 2
3. No discounting (we set $\beta = 1$)
4. Set the interest rate to $r = 0$. (Note $\beta = \frac{1}{1+r}$ holds.)
5. In period 2 agent A consumes his/her savings from period 1.
6. In period 2 agent B consumes 1.
7. Each agent earns income during the first period ($Y_1$) and no income during the second period. So ($Y_2 = 0$).
• If each agent solves his or her problem individually, each agent’s objective function is:

\[
\max_{C_1, C_2} U(C_1) + EU(C_2),
\]

where \( E \) stands for “the expected value of ...”

• Expected value of utility in the second period is the sum of all the possible utilities weighted by the respective probabilities.

\[
\max_{C_1, C_2} U(C_1) + \text{prob type A} U(C_2) + \text{prob type B} U(1)
\]

We assume log utility.

\[
\max_{C_1, C_2} \ln C_1 + \frac{1}{2} \ln C_2 + \frac{1}{2} \ln 1
\]

And since we know \( \ln 1 = 0 \) we can write the objective function as:

\[
\max_{C_1, C_2} \ln C_1 + \frac{1}{2} \ln C_2
\]

• Each agent’s budget constraint is:

\[
C_1 + C_2 = Y_1
\]
• We solve the model. First we substitute the budget constraint into the objective function:

$$\max_{C_1, C_2} \ln(Y_1 - C_2) + \frac{1}{2} \ln C_2$$

We compute the first-order necessary condition for a maximum:

$$\frac{1}{Y_1 - C_2} = \frac{1}{2} \frac{1}{C_2}$$

Solving for $C_2$ yields

$$C_2 = \frac{1}{3} Y_1$$

From the budget constraint we know

$$C_1 = \frac{2}{3} Y_1$$

• So in the first period each agent eats $2/3$ of their income and saves $1/3$ of the income.
• During the second period agent B dies and his/her savings disappears and agent A consumes $1/3Y$

• Ex post each agent has regrets:
  – Agent A wishes he/she had set $C_1 = C_2 = 1/2Y$
  – Agent B wishes he/she had set $C_1 = Y$ and $C_2 = 0$
Stalin

- Benevolent social planner
  - She can dictate how much these two agents save and how much they consume.
  - She cannot identity until the beginning of period 2 which type each agent is; but this planner can pool the two agents’ resources.

- The social planner chooses $C_A^1$, $C_B^1$, and $C_A^2$ to
  \[
  \max \ln C_A^1 + \ln C_A^2 + \ln C_B^1 + \ln 1
  \]

subject to:
\[
C_A^1 + C_A^2 + C_B^1 = 2Y_1
\]
• Substituting the constraint into objective function yields:

\[ \max \ln \left(2Y_1 - C^A_2 - C^B_1\right) + \ln C^A_2 + \ln C^B_1 + \ln 1 \]

• Taking first order conditions yields:

\[ \frac{1}{2Y_1 - C^A_2 - C^B_1} = \frac{1}{C^A_2} \]

and

\[ \frac{1}{2Y_1 - C^A_2 - C^B_1} = \frac{1}{C^B_1} \]

• \( C^B_1 \) must be equal \( C^A_2 \). From the budget constraint:

\[ C^A_1 = C^B_1 = C^A_2 = 2/3Y_1 \]

• Which model would our agent want to live in? Stalin’s world. Why?

  – The agent who live for two periods get utility

\[ \ln(2/3Y_1) + \ln(2/3Y_1) > \ln(2/3Y_1) + \ln(1/3Y_1) \]

  – Both types of agent’s want to live in Stalin’s world.
Why does the government run Social Security?

In the models we have studied, there is no reason a private intermediary could not offer this form of insurance (annuities). So why the government?

Here are three candidate explanations

2. Adverse selection.
Why are people worried about the future feasibility of Social Security?

• A pay-as-you-go system works fine if each cohort is larger than the previous one. This is not the case with the baby-boom.

• More precisely, future benefits depend on the payroll tax contributions of future generations. Two problems:
  – decline fertility rates after 1964
  – decline in real wage growth since 1970.

• In 1960 there were five workers contributing to Social Security for every one person receiving benefits.

• Today there are three workers contributing to Social Security for every one person receiving benefits.

• When the baby boom retires this number is expected to drop to two.
• Currently have surplus, Social Security Trust Fund, invested in government securities, counted against the deficit.

• by 2018 benefit pay-outs will exceed revenues, by 2042 the Trust Fund will run out.

• Government faces three choices
  1. reduce promised Social Security benefits
     – directly cut benefits
     – increasing the eligibility age
     – inflation – reduce the degree to which increases in benefits are tied to the CPI.
  2. increase Social Security taxes
  3. earn a higher rate of return on assets of the Social Security Trust Fund
• President Bush wants to switch from a pay-as-you-go system to a fully funded system.
• See Paul Krugman’s notes in the course packet.
• How do you pay for the current generation of retirees?
• This is the big unanswered question.