

## Privatized Alternatives to Social Security

One easy introduction to the subject of growth models is obtained by considering an accounting situation, since such systems are relatively well defined. A pension and annuity plan is generally axiomatized clearly. To set up the model itself is, consequently, almost totally an exercise in problem solving. Suppose that we set up a pension plan for an individual who starts working for a firm at age  $N1$ , retiring at age  $N2$ . The starting salary is  $S1$  at age  $N2$  and will increase at rate  $\alpha$  annually. The employer and employee both contribute a fraction  $\beta$  of the salary each year to the employee's pension fund. The fund is invested at a fixed annual rate of return  $\gamma$ . We wish to find the value of the employee's pension fund at retirement. Further, we wish to know the size of the employee's pension checks if he invests his pension capital at retirement in a life annuity (i.e., one which pays only during the employee's lifetime, with no benefit to his heirs at time of death). Let the expected death age given survival til  $N2$  be denoted by  $N3$ .

To put things in the context of the current taxes for Social Security (FICA), both employees and their employers must each pay 6.2% of the employees salary, for a total of 12.4% up to a (current) salary cap around \$75,000. In addition, both employee and employer must pay 1.45% additional tax for the Medicare part of the Social Security package (there is no salary cap here). The total for the entire FICA tax is 15.3%. It should be noted that the income tax is applied even to the employee's share of the FICA tax, i.e., the income is taxed twice. Thus, a middle class employee with marginal tax rate of 28% is actually being taxed at the rate of 43.3%. Naturally, in addition to all these taxes, the taxpayer is being charged for sales taxes, real estate

taxes, state income taxes, inheritance taxes, etc. It is not unfair to state that middle class tax payers, for each new dollar they earn, are paying at around a 50% total tax burden.

In the campaign of 2000, Governor George W. Bush made the proposal that a portion of the FICA tax might be invested (tax free until retirement) in a stock/bond fund managed by the individual employee. The figure produced as to the size of the portion was 2%, presumably really meaning 4%, since the employer's share might reasonably be supposed to match that of the employee.

For our enlightenment, let us suppose that we consider what would happen if the worker were allowed to invest all 15.3% in a private IRA. Many investigators find it convenient to consider first a pilot study with concrete values instead of algebraic symbols. For example, we might try:  $S1 = 30,000$ ;  $N1 = 21$ ;  $N2 = 65$ ;  $\alpha = .02$ ;  $\beta = .0765$ ;  $\gamma = .10$ ;  $N3 = 75$ . The value of  $\alpha$  is rather low, assuming a low inflation economy. The value  $\gamma = .10$  is actually below the annual increase in the value of common stocks since records have been kept starting in 1926<sup>1</sup>. The value of  $\beta$  is roughly the value used at present in the United States Social Security System. The value of  $N2$  is the same as the present regular Social Security retirement age of 65. No allowance is made for annual losses due to taxation, since pension plans in the United States generally leave the deposited capital untaxed until the employee begins his annuity payments (although the employee contributions to Social Security are taxed at full rate). First, we note that at the end of the first year she will have approximately

$$P(1) = 2\beta S(1) = 2(.0765)30,000 = 4,500 \quad (1)$$

invested in the pension plan. This will only be an approximation, since most salaried employees have their pension fund increments invested monthly rather than at the end of the year. We shall use the approximation for the pilot study. At the end of the second year, the employee will have approximately

$$P(2) = 2\beta S(2) + (1 + \gamma)P(1) = 2(.0765)S(2) + 1.1(4,500), \quad (2)$$

<sup>1</sup>Actually, the arithmetic mean is above 12% as shown by Ross, S.A., Westerfield, R.W. and Jaffe, J. in *Corporate Finance, Chicago: Irwin*

where

$$S(2) = (1 + \alpha)S(1) = 1.02S(1) = 1.02(30,000) = 30,600.$$

Thus we have that  $P(2) = 9,631.80$ . Similarly,

$$P(3) = 2\beta S(3) + (1 + \gamma)P(2) = 2(.0765)S(3) + 1.1(9631.80), \quad (3)$$

where

$$S(3) = (1 + \alpha)S(2) = 1.02S(2) = 1.02(30,600) = 31,212.$$

So  $P(3) = 9,063$ . By this point, we see how things are going well enough to leave the pilot study and set up the recurrence relations which solve the problem with general parameter values. Clearly, the key equations are

$$S(j + 1) = (1 + \alpha)S(j), \quad (4)$$

$$P(j + 1) = 2\beta S(j + 1) + (1 + \gamma)P(j), \quad (5)$$

for  $j = 1, 2, \dots, N2 - N1$ .

Moreover, at this point it is easy to take account of the fact that pension increments are paid monthly via

$$S(j + 1) = (1 + \alpha)S(j); \text{ for } j = 1, 2, \dots, N2 - N1. \quad (6)$$

This system can be readily programmed on a handheld calculator or microprocessor using the simple flowchart in Subroutine Annuity. We find that the total stake of the employee at age 65 is a respectable 4,402,151.

#### **Subroutine Annuity** ( $N1, N2, S, \alpha, \beta, \gamma$ )

$N1$  = starting age of employment

$N2$  = retirement age

$S$  = starting salary

$P$  = starting principal

$\alpha$  = annual rate of increase of salary

$\beta$  = fraction of salary contributed by employee

$\gamma$  = annual rate of increase of principal in fund

Year =  $N1$

Month = 1

\*\*  $P = (\beta/6)S + (1 + \gamma/12)P$

```

Month = Month + 1
Is Month = 13?
If "no" go to **
If "yes" continue
Year = Year + 1
 $S = S(1 + \alpha)$ 
Month = 1
Is Year =  $N2 + 1$ ?
If "no" go to **
If "yes" continue
Return  $P$ 
    
```

We now know how much the employee will have in her pension account at the time of retirement. We wish to decide what the fair monthly payment will be if she invests the principal  $P(N2)$  in a life annuity. Let us suppose that actuarially she has a life expectancy of  $N3$  given that he retires at age  $N2$ . To do this, we first compute the value to which his principal would grow by age  $N3$  if he simply invested it in an account paying at the prevailing interest of  $\gamma$ . But this is easily done by using the preceding routine with  $S = 0$  and setting  $N1$  equal to the retirement age  $N2$  and  $N2$  equal to the expected time of death  $N3$ . So we determine that using this strategy, the principal at the expected time of death is computed to be  $P(N3)$ . The monthly payments of the life annuity should be such that if they are immediately invested in an account paying at rate  $\gamma$ , then the total accrued principal at age  $N3$  will be  $P(N3)$ . Let us suppose a guess as to this payment is  $X$ . Then we may determine the total principal at age  $N3$  by using the flowchart **Subroutine Annuity** using  $S = X$ ,  $\alpha = 0$ ,  $\beta = 6$ ,  $\gamma = \gamma$ ,  $N1 =$  (retirement age)  $N2$ ,  $N2 =$  (expected age at death)  $N3$ . We can then find the fair value of monthly payment by trial and error using the program flowcharted in **Program Trial and Error**.

#### Program Trial and Error

```

 $X$  = guess as to fair monthly return
 $P(N2)$  = principal at retirement
 $\gamma$  = annual rate of return on principal
 $N2$  = retirement age
    
```

$N3$  = expected age at death given survival til age  $N2$   
 \*\*Call Annuity ( $N2, N3, X, 0, 6, \gamma$ )  
 Compare  $P$  with desired monthly payout  
 Make new guess for  $X$  and return to \*\*

Now on a monthly basis, the pensioner should receive an amount such that if she invested each month's payment at 10% , then at age 75 her stake would have increased from 0 to 11,418,046. We find that a monthly payout of 60,000 dollars yields 13,243,405. Since this is a bit on the high side, we next try a payout rate of  $11,418,046/13,243,405 \times 60,000 = 51,730$ —producing a stake at age 75 of 11,418,022.<sup>2</sup>

These numbers may seem way on the high side. Not really. We have essentially used figures that allow for an inflation rate of around 2%, i.e., the dollars we have presented are roughly year 2000 dollars. We will now forget about the monthly payout, for most retirees using such a pension plan will elect not to annuitize it, but to leave the funds in such instruments as mutual funds. Let us put in some numbers to see how much the alternative social security plan would have grown to under other scenarios. For example, let us see what happens if our investor decided to invest in a portfolio of bonds which pay at the rate of 6%, that of long term Treasury Bonds. This gives our investor, starting work at 21 and quitting at 65, a stake at age 65 of 1,305,457 dollars. If she elects to keep her principal untouched, a 6% return will still give her an annual income of \$78,372. This is really not a very good strategy, for it invests too much in conservative bonds. Few financial advisors would advise such a strategy. Suppose, however, the advisor puts half the money in an index fund of stocks and half in the conservative bonds. Then, at age 65, our pensioner would find a principal of  $.5 \times (1,305,457 + 4,402,151) = \$2,853,804$ . If at that age she decided to become very conservative and put everything in super secure bonds paying 6%, she would have an annual income (not touching her investment) of \$171,228. If she wished to purchase a lifetime annuity, she would receive much more even than

---

<sup>2</sup>We note, in passing, the essentially linear nature of the monthly payout. That means if a payout of 60,000 produces an age 75 output of 13,243,405, then we can get to the desired output of 11,418,046 by multiplying 60,000 by  $(11,418,046/13,243,405)$ . This does not work if we change interest rates. That effect is highly nonlinear.

that. All these computations, recall, have been done in the light of returns on investment consistent with low inflation, i.e., we have largely maintained a constant value of money.

Now, the Bush proposal apparently asks only for the option for a worker to use 2% of his/her salary for private investing. (It is not clear whether the employer's share would be added to make this 4% or not.) What would be the value of the retiree's stake using the 50-50 bonds and stocks portfolio? For 2% it would be  $(2/15.3) \times 2,853,804 = \$373,046$ . For 4% it would be \$746,093. You can figure out what it would be for the stock index fund. In summary, the Bush proposal may well be worth trying. It would retain the Medicare insurance plan, and would also pay a substantial fraction of the FICA annuity which would be accruing to those employees who decided not to opt for the Bush plan. It would provide investment resources for the economy as well. The money going into markets makes possible the purchase of buildings, computers, equipment, etc.

On the other hand, even the partial privatization of Social Security terrifies many politicians, who very much enjoy having control of 15.3% of the salaries of all workers. They might well fear that the 2% will quickly grow to, perhaps, 10%. Some have tried to frighten workers by noting that stock markets can go down. That is, of course, true, but for the long haul of a worker's lifetime employment, the average growth of securities in excess of 10% may be a fairly safe bet. This is true for people who would have had such a plan including all the years of the Great Depression. Moreover, any catastrophe in the economy would impact the current Social Security as well. The state gets its money rather directly from the economic engine of the nation through taxes. If the country is occupied by a hostile power, then all bets are, of course, off (unless we would be fortunate enough to be occupied by a power that treated us the way we treated the Germans, Italians and Japanese).

After it became clear that Governor Bush's plan had some traction with the electorate, Vice-President Gore countered with his own plan which would retain the current Social Security Program but would provide the 2% for workers out of the general revenues, i.e., out of other people's taxes.

Many economists are constantly kvetching that Americans

save too little. Low savings rates hurt the growth of the economy, for capitalism needs capital. But the reality is that workers feel squeezed. If they take care of themselves and their families, then the month frequently ends with little in the way of discretionary funds for saving. But recall that an amount equal to 15.3% of his salary is charged at every pay interval to the worker and to his employer. Allowing the worker to keep some of this money in a private Investment Retirement Account (which is what Governor Bush is suggesting) would make it possible for a worker to put some money aside for a rainy day instead of “contributing” the money to FICA, with the assurance that the government will see to it that it is spent appropriately.

The Social Security program in the United States provides an enormous source of funds to be used for projects having nothing whatever to do with Social Security, but with projects which politicians may find useful in the gathering of votes. Anyone who believes that his or her Social Security monies are sitting in a private account for them somewhere is sadly mistaken. The correlation between benefits to a Social Security beneficiary and the amount paid into the system by the worker is typically weak, frequently negative, so that those who put in the more get less. The difference between Social Security payments and taxes is almost nonexistent. The Bush plan would change all that, to the terror of some, the hope of others.