

## **Privatization of Social Security: A simple model**

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This document presents a simple model for what happens under a partial or complete privatization of the retirement benefits currently paid under Social Security. The official name for this retirement part of Social Security is Federal Old-Age and Survivors Insurance (OASI). It does not include disability insurance or Medicare, which are also administered by the Social Security Administration. Medicare has serious problems, but they should not be confused with those of OASI.

OASI is currently accumulating a surplus. For instance, in 2003, OASI took in \$543.8 billion and expended \$406.8 billion, for a net increase in assets of \$137.8 billion. This left OASI with accumulated assets of \$1,355.3 billion. The present surpluses in the system are a consequence of a deal struck in the early 1980s, which gradually increased the payroll tax rate and the maximum on which the payroll tax is collected, all in order to build a surplus to deal with the now impending retirement of the post-WWII baby boomers. Notable features of the current system are its low administrative costs (\$2.6 billion in 2003), which mean that nearly all expenditures go directly to benefits (\$403.4 billion in 2003), and its reasonable earnings on assets (\$75.2 billion in 2003), which come from investing all assets in interest-bearing securities of the US Government (at an effective annual rate of just over 6% in 2003).

The present positive cash flow in OASI will turn negative as the baby boomers' retirement increases the benefits-receiving retirement-age population relative to the tax-paying working-age population. This will eat up the system's assets by some point in the middle of the 21st Century. How to manage this situation, which is caused by the aging of the overall population, is the real question facing Social Security or any partial or complete replacement of Social Security. Under the present system, the problem would have to be dealt with by some combination of increased taxes, an increase in the retirement age, and decreased benefits. Under a partially or completely privatized system, the problem would have to be dealt with in exactly the same way, except that increases in taxes would be replaced by increases in mandatory contributions to private retirement accounts. This problem of an aging population—the real problem facing Social Security—has nothing to do with the effects of privatization, so I will neglect it in order to focus on what happens during privatization.

In order to concentrate on the effects of privatization, I will ignore changes in the retirement-age and working-age populations, simply assuming that both are constant. This assumption makes the present system very simple. It becomes a strictly pay-as-you-go operation, with the working-age population paying payroll taxes at a constant rate that is the same as the constant rate at which the retirement-age population receives benefits. This does not mean that the contribution rate per worker is the same as the benefit rate per retiree, because there are more workers than retirees. From an individual's perspective, this difference in the contribution rate and the benefit rate is a consequence of the fact that the time spent in the work force is a few times larger than the time spent in retirement.

What we want to explore is what happens when the government eliminates some portion of the payroll tax, directing wage earners to invest the saved taxes in private

retirement accounts. We are only interested in this portion of overall taxes and benefits, so we ignore the remainder, which continues under the pay-as-you-go system. I will let  $b_0$  denote the reduction in the overall rate at which taxes are collected. Clearly  $b_0$  becomes the overall rate at which workers contribute to private accounts.

I assume that the objective is to maintain precisely the same level of benefits for retirees. As distributions from the private retirement accounts kick in, the government can reduce its contribution to benefits. The transition occurs as workers just now entering the work force pay into the private accounts over a working lifetime, retire and receive benefits from the private accounts, and then die. During the transition, the government must borrow to pay its part of benefits, since it is no longer receiving tax revenue for this purpose. The government's ultimate objective is to reduce its rate of contribution to benefits by  $b_0$  or more.

Now let's introduce some mathematical notation to describe this model. Let  $t$  denote the time since the new system went into effect,  $I(t)$  be the total amount invested in private retirement accounts at time  $t$ , and  $G(t)$  be the total amount of government debt at time  $t$ , as a consequence of borrowing to pay the government's part of benefits. The other ingredients we need are the following:  $r$  is the rate of earnings on the private accounts,  $i$  is the interest rate the government pays on its debt, and  $b_p(t)$  is the rate at which the private accounts pay benefits at time  $t$ . I assume that  $r$  and  $i$  are constants, independent of time, and I use constant dollars, so  $r$  and  $i$  represent real returns above inflation. There is a question of what is meant by constant dollars. The present system calculates benefits in constant dollars indexed to general wage increases, but there are proposals to index to price inflation instead. This choice is irrelevant to the substance of my analysis; the only difference comes in the values of  $r$  and  $i$ , which will be smaller (one hopes) if they represent real returns relative to general wage increases. The functional form of the withdrawal rate  $b_p(t)$  depends on the details of how retirees withdraw funds from their private accounts, but the main conclusion of the analysis is independent of these details.

The thing we want to know is how much debt the government takes on during the transition compared to the assets in the private accounts. We get at that by first looking at the rate at which the money in private accounts changes:

$$\underbrace{\left( \begin{array}{c} \text{rate at which} \\ \text{total amount in} \\ \text{private accounts} \\ \text{changes} \end{array} \right)}_{= \frac{dI}{dt}} = \underbrace{\left( \begin{array}{c} \text{rate of} \\ \text{contributions} \\ \text{to private} \\ \text{accounts} \end{array} \right)}_{= b_0} + \underbrace{\left( \begin{array}{c} \text{rate of} \\ \text{earnings} \\ \text{on private} \\ \text{accounts} \end{array} \right)}_{= rI} - \underbrace{\left( \begin{array}{c} \text{rate of} \\ \text{dispersal of} \\ \text{benefits from} \\ \text{private accounts} \end{array} \right)}_{= b_p(t)} . \quad (1)$$

The result is a differential equation for  $I(t)$ :

$$\frac{dI}{dt} = b_0 + rI - b_p(t) . \quad (2)$$

While the private accounts are accumulating assets, the government is borrowing at a rate  $b_g(t)$  to pay its part of benefits. The total rate at which benefits are paid is  $b_p(t) + b_g(t)$ .

If, as we assume, total benefits are maintained at a constant level, this total rate has to be  $b_0$ . Thus we have

$$b_0 = b_g(t) + b_p(t) . \quad (3)$$

This equality is the key to the entire model, so it is worth emphasizing that *it has to be true if total benefits are maintained at the same level as the system undergoes privatization*. Notice that the key equality has built into it the feature that if the withdrawal rate from private accounts exceeds the benefits rate, i.e.,  $b_p(t) > b_0$ , this does not mean that the benefits rate increases, but rather that the government's contribution rate goes negative, i.e.,  $b_g(t) < 0$ , effectively becoming a tax that allows the government to keep its debt under control. Now we can write an equation for the rate at which the government accumulates debt:

$$\underbrace{\left( \begin{array}{c} \text{rate at which} \\ \text{government} \\ \text{accumulates debt} \end{array} \right)}_{= \frac{dG}{dt}} = \underbrace{\left( \begin{array}{c} \text{rate of government} \\ \text{borrowing} \end{array} \right)}_{= b_g(t) = b_0 - b_p(t)} + \underbrace{\left( \begin{array}{c} \text{rate of interest} \\ \text{on government} \\ \text{debt} \end{array} \right)}_{= iG} . \quad (4)$$

The result is a differential equation for  $G(t)$ :

$$\frac{dG}{dt} = b_0 + iG - b_p(t) . \quad (5)$$

Equations (2) and (5) are the crucial results. They say that *the government accrues debt as fast as the private accounts accumulate assets, unless the private accounts earn a higher return than the interest rate on government securities*. Of course, it is the prospect of such higher returns on a mix of investments that advocates of privatization use to sell the idea. It is easy to see, however, that this will be difficult to arrange in practice. The reason, as I now argue, is that higher returns are only available because the investments that pay them have a higher risk than government securities and that these risks are unacceptable for most Social Security recipients.

The present Social Security system is a compact between successive generations, mediated by the federal government. Current workers pay taxes to support their parents in retirement with the assurance that their children as workers will pay taxes to support them. Adjustments have to be made to deal with changes in the age structure of the population, such as the boomer bulge, but the compact, consummated in FDR's New Deal, continues today because a publicly financed retirement system provides stability and security for retirement benefits.

Social Security is meant to provide the assured, low-risk component of retirement benefits, the other two components being employee pension plans and individual retirement savings. For many people on the lower end of the income spectrum, Social Security is the *only* component, so it must be assured. You can't trifle with the Social Security because for much of the population, losing even part of the Social Security component would be a disaster. The country can't afford to get into a situation where many people lose

a substantial portion of their Social Security retirement benefits through fluctuations in high-risk investments in private accounts. To avoid that disaster, the federal government will have to devise for most people a pool of investments with a risk comparable to that of government securities. Having done so, however, the return on this new investment pool cannot be greater than that on government securities, because if it were, those who currently buy government securities—individuals, institutions, and governments who are averse to risk—would quit doing so, preferring to invest at the same low risk in the new higher-return pool. The conclusion is that for the bulk of investments in the new private accounts, the return on investments is unlikely to exceed the interest on government securities, especially when the costs of administering the small, new private accounts are factored in.

Another way to make this point comes from Paul Krugman's recent columns in *The New York Times*. Suppose the pay-as-you-go OASI system is left in place, but as a side operation to raise cash, the federal government begins borrowing money at a rate  $b_g(t)$ . The government pays the preferred government interest rate  $i$  on this debt and invests all the funds at the higher rate  $r$ . This scheme is clearly a money maker for the feds as long as  $r > i$ —indeed, it is easy to see that the government accumulates a slush fund of size  $I(t)$  and a debt of size  $G(t)$ , just as described by the differential equations (2) and (5)—so why do we all instinctively know that the scheme is nuts? The reason is that if the federal government is invested at greater risk to get a higher return, its debt is also that risky, so lenders will demand the higher return  $r$  from the government to compensate for the additional risk. Privatization differs from this crazy scheme in that individuals, rather than the government, hold the riskier investments, so the government technically does not assume the higher risk. Nonetheless, there will be enormous pressure on the federal government to assume the risk, at least for the predominant low- and middle-income parts of the population, and this will inevitably force the return on the private accounts to fall till it is close to  $i$  or the interest on government securities to rise till it approaches  $r$ .

If we assume  $r = i$ , which we have just argued will apply in practice, we can appreciate what happens during privatization. The government's debt is the same as the amount invested in private accounts. Indeed, the whole process becomes easy to think about if we simply regard the private accounts as being invested entirely in government securities. During the transition, the government forgoes a portion of the payroll tax, which workers lend to the government so that it can pay its part of the retirement benefits that were previously paid by the cancelled portion of the payroll tax. Once the workers who enter the work force at  $t = 0$  clear the system, it operates in a steady state in which each working generation lends money to the federal government to refinance its debt, allowing the government to pay off the retirement accounts of the previous generation. The government never gets out from under its debt, except through an increase in taxes at some point in the future. *Instead of the original Social Security compact between generations, mediated by the federal government, in which each generation agrees to be taxed to pay for its parent's retirement, privatization substitutes a compact in which each generation is obligated by the government's full faith and credit to be taxed to pay off the bonds held in its parents' retirement accounts.*

This final formulation makes one wonder why the right is so keen on privatization.

Advocates would, of course, dispute this formulation, claiming that it is flawed because private accounts can earn a higher rate of return than the interest on government securities. They are not making a stupid, purely ideological argument here, as is so often the case with the right on economic matters (e.g., supply-side economics), but my view, as stated above, is the following. If Social Security provided a very generous pension, part of which many individuals would be willing to put at risk to achieve a yet bigger pension, there would be good reasons to expect to achieve  $r > i$  on private accounts, at least on the average, but the facts are that a Social Security pension is barely enough to live on, which means that for most recipients, who rely on it and little else, no part of it is available for gambling on higher returns.

The extreme economic conservatives now in charge of the US believe in their ideology because it serves their direct economic interests, and there is no question that powerful economic interests will be rewarded by a partial privatization involving, say, a third of the system. I can think of two economic interests that would be served by privatization of Social Security. The wealthier portion of the population would certainly be rewarded. Privatizing a third of the system would make available about \$3,635 per year to individuals whose income exceeds the maximum on which the payroll tax is collected. Removing these contributions from the current Social Security system would free them from the income-redistribution aspects of the system and permit the money to be invested at higher return. Having plenty of other resources for retirement, the wealthier portion of the population would generally be keen to accept a higher risk in exchange for the resulting generally higher returns. The other economic interest that plainly benefits is investment firms. Privatizing a third of the system would transfer about \$135 billion per year to private accounts. A lot of money would be made managing those accounts.

These amounts, especially for management fees, are certainly large enough to get the right's economic juices flowing, but in the end, I think the right's primary motivation is ideological. The economic right has an extreme ideological aversion to social contracts between the government and the people. They believe that individuals should be responsible for themselves and that government should not assume responsibility for the welfare of individuals. In accordance with this ideology, they would prefer to see the entire Social Security system privatized. OASI is undeniably the most successful government social program and has been for the 70 years since its introduction as part of FDR's New Deal. The very success of the program is what attracts the right's attention, because that success confronts them every day with a stark repudiation of their ideology. The right's current strategy is to deny that the system is a success. They seize on the distant problems in the retirement portion of Social Security, conflate them with the more immediate problems in Medicare, and portray the whole system as in crisis so they can start dismantling it.

The right's real objective now is to get a foot in the door with a major partial privatization, so that later on they can push for complete privatization. Then we're talking about \$400 billion per year. That's real money for the right's economic interests to play with even as they bury the great contradiction to their ideology.

The analysis of privatization here is essentially a mathematized version of the argument Michael Kinsley has advanced in recent columns in the *Los Angeles Times*. I suggest that you start demanding answers to the questions Kinsley is asking our policy makers.

*Addendum: 2005 January 6*

Articles in the national press today make it clear that the GOP is going to steer hard right over the next two years, intending to dismantle the OASI program entirely, knowing that the next two years is their chance to shoot for the moon. A group of Republicans led by Senator Sununu of New Hampshire has introduced legislation to privatize completely the employee's part of the payroll tax, with no reduction in future benefits, while more "moderate" elements in the White House are said to be pushing privatization of a third to a half of the employee's contribution, together with a reduction in guaranteed benefits based on changing from wage indexing to price indexing. This is a classic case of creating the conditions for a "compromise" between two hard-right positions.

These articles do make it clear, however, that the current plans do not involve privatizing the employer's portion of the payroll tax, which means that figures in my analysis for a one-third privatization should be halved.

*Addendum: 2005 January 18*

Anyone interested in privatization of Social Security should read Roger Lowenstein's article "A Question of Numbers" in the January 16 *New York Times Magazine*. Among other things, this article makes clear that under the "optimistic" scenario of Social Security's actuaries, which in recent years has been the most accurate of the three scenarios used by the actuaries, the system will be able to pay full benefits for over 75 years. There is no crisis. Even under the "intermediate" scenario, which supplied the figures at the beginning of my essay, the potential deficit can easily be handled by small adjustments in the payroll tax and in benefits and retirement age. The other key thing this article makes clear is that conservatives are willing to outright lie in order to make the case that the system is in crisis, so they can build the momentum to destroy it. It is absurd to hear the conservative flacks, whose tax cuts, aimed overwhelmingly at the wealthy, have given us systemic federal deficits as far as the eye can see, talking about our sacred responsibility to guard future generations from an uncertain, but smaller deficit looming half a century hence in Social Security.

*Addendum: 2005 February 1*

In his column, "Many Unhappy Returns," in today's *New York Times*, Paul Krugman makes the point that the advocates of privatization assume a rate of return on stock investments that is inconsistent with the rate of economic growth that is used to forecast the eventual insolvency of the present Social Security system. In terms of my analysis, this is the point that if benefits are pegged to wages—and thus to the general standard of living—the real rate of return  $r$  cannot be very large.

Let's explore this by adding one further example to those listed at the end of the Appendix, which assume a privatization of a third of the present system:

$$\begin{aligned} r &= 0.5\%, T = 40 \text{ years, and } L = 15 \text{ years gives} \\ b_p &= 1.15b_0 = \$153 \text{ billion per year and } I = G = 0.745(b_0T) = \$4.0 \text{ trillion.} \end{aligned} \tag{6}$$

With this low rate of return, the essence of privatization is seen most clearly. As stated above, during the transition, the government forgoes a portion of the payroll tax, which workers lend to the government so that it can pay its part of the retirement benefits that were previously paid by the cancelled portion of the payroll tax. Once the workers who enter the work force at  $t = 0$  clear the system, it operates in a steady state in which each working generation lends money to the federal government to refinance its debt, allowing the government to pay off the retirement accounts of the previous generation. The government never gets out from under its debt, except through an increase in taxes at some point in the future. Assuming that increase in taxes eventually has to occur, the whole exercise is a transfer of resources from the future generation that pays off the debt to the present generation of workers and retirees.

*Addendum: 2005 February 3*

GW's State of the Union message last night makes clear some points that my analysis struggled to establish. First, the private accounts are going to be tightly managed by the federal government to minimize risk. Second, the federal government is going to require that at least part and perhaps all of the account, depending on what the account has earned, be used to purchase an annuity at retirement. These first two points mean that the program GW is proposing will be essentially equivalent to the government's investing the payroll tax in the market and, consequently, that returns are not going to exceed the interest on government securities. Third, so-called White House advisors confirmed that the privatization scheme by itself will not address the retirement system's long-term solvency problems. That will require cuts in benefits, unless new sources of revenue are found.

*Addendum: 2005 February 28*

GW and his neocon flacks spend a lot of time these days selling younger workers the idea that they will be losers under the present Social Security system and winners under a transition to private accounts. Younger workers need to approach this claim with the skepticism that any Bush argument requires. Under a transition in which the revenue lost to private accounts is replaced by government borrowing to pay current benefits, it is easy to identify the winners and losers. The winners will be present and near-future retirees, whose retirement will be paid wholly or partially out of borrowed funds during the transition; the losers will be those taxpayers who ultimately have to pay off the resulting government debt. For Bush and his neocon backers, who are promoting privatization for the purely ideological reason of eliminating a part of the social contract they consider illegitimate, the attraction of a transition financed through borrowing is obvious: the ultimate losers can't be reliably identified—they might be 50 or 100 years out—so the program can be sold as a winner for the entire present voting population. Younger workers need to beware, however, because the Bush argument is a scam. The world economy will require that we restore fiscal discipline on a time scale much shorter than 50 years. If you're a younger worker, you should know that you and your children will be big losers unless you think the US can forestall a return to fiscal discipline for longer than about 30 years, and that's a dream.

A responsible neocon would promote a pay-as-you-go transition to privatization in which the costs are explicit. Current workers would contribute to private accounts to finance their own retirement, but would continue to pay the payroll tax to support the retirement of those who worked under the old Social Security system. The payroll tax would gradually be reduced as the number of retirees covered by the old system decreased. The responsible neocon would say something like the following: “I’m promoting a responsible privatization of Social Security in which the government does not borrow vast sums to finance current benefits. Such borrowing would be a hidden cost, to be charged to some future, unspecified generation. The transition to private accounts is good for Americans because it will make each American responsible for his own retirement through investments in our great capitalist economy. It is true that current workers, especially younger ones, will bear a large burden under this transition, because they will have to fund not only their own retirement, but also that of their parents and grandparents, and it is also true that this new system will eliminate the progressive aspects of traditional Social Security, thereby leaving many retirees in poverty, but these costs are worth it to move to a system in which each person is responsible for his own destiny.” If neocons would make this honest case, then we could all decide on the merits, but don’t hold your breath waiting to hear it.



## Appendix: A More Detailed Model

The analysis leading to equations (2) and (5) is very general, but because it doesn't include a detailed model of the way an individual accumulates assets in the private account and then pays them out after retirement, it doesn't allow one to answer such questions as how much the debt the government ultimately takes on. Here I present a very simplified, but detailed model. The presentation is telegraphic and can be understood only by someone with a knowledge of calculus.

I assume that all workers join the work force at the same age from birth. Each cohort of workers is labeled by a parameter  $u$ , which at  $t = 0$  is the amount of time since that cohort entered the work force. Thus a cohort with  $u = 0$  is just entering the work force at  $t = 0$ , a cohort with  $u > 0$  has been in the work force for a time  $u$  at  $t = 0$ , and a cohort with  $u < 0$  will join the work force at time  $t = -u$ . At a time  $t > -u$ , workers in the cohort labeled by  $u$  have been working for an amount of time given by  $t + u$ . I assume that all workers work for a duration  $T$ , earning a constant salary throughout their working lifetime, and that they then retire, expiring after a further period  $L$ .

The key quantity in the detailed model is

$$I(t, u) du = \left( \begin{array}{c} \text{total amount in private} \\ \text{accounts for the cohort whose} \\ \text{label is between } u \text{ and } du \end{array} \right). \quad (7)$$

We can write a differential equation for  $I(t, u)$ :

$$\frac{dI(t, u)}{du} = \begin{cases} 0, & t \leq \min(0, -u), \\ b_0/T + rI(t, u), & \min(0, -u) \leq t \leq T - u, \\ rI(t, u) - K(u), & T - u \leq t \leq T + L - u, \\ 0, & t \geq T + L - u. \end{cases} \quad (8)$$

The first case on the right is for the period before a cohort joins the work force, the second case describes the period when a cohort is contributing to the private accounts, the third case describes the period when a cohort is withdrawing retirement benefits from the private accounts, and the last case is for the period after a cohort has died. For a given cohort  $u$ , withdrawal during retirement occurs at a constant rate  $K(u)du$ , which will be adjusted so that all funds are withdrawn by the time of death.

The solution of the differential equation during the investment phase is

$$I(t, u) = \frac{b_0}{rT} \begin{cases} e^{rt} - 1, & u \geq 0, 0 \leq t \leq T - u, \\ e^{r(t+u)} - 1, & u \leq 0, -u \leq t \leq T - u, \end{cases} \quad (9)$$

which gives a total accumulation at retirement of

$$I(T - u, u) = \frac{b_0}{rT} \begin{cases} e^{r(T-u)} - 1, & u \geq 0, \\ e^{rT} - 1, & u \leq 0. \end{cases} \quad (10)$$

The solution of the differential equation during the withdrawal phase is

$$I(t, u) = \frac{K(u)}{r} (1 - e^{r(t-T+u)}) + I(T - u, u) e^{r(t-T+u)}, \quad T - u \leq t \leq T + L - u. \quad (11)$$

To have withdrawn all funds at death requires that  $I(T + L - u, u) = 0$ . This implies that

$$K(u) = \frac{rI(T - u, u)}{1 - e^{-rL}} = \frac{b_0}{T(1 - e^{-rL})} \begin{cases} e^{r(T-u)} - 1, & u \geq 0, \\ e^{rT} - 1, & u \leq 0, \end{cases} \quad (12)$$

which gives

$$I(t, u) = \frac{I(T - u, u)}{1 - e^{-rL}} (1 - e^{r(t-T-L+u)}), \quad T - u \leq t \leq T + L - u. \quad (13)$$

An individual's contribution rate while working is proportional to  $b_0/T$ , and his benefit rate in retirement is proportional to  $b_0/L$ . As in any retirement plan, the benefit rate can only exceed the contribution rate if individuals work a longer time than they spend in retirement or, equivalently, if there are many more workers than retirees. Notice, however, that the equations of the model don't object if  $L > T$ ; they simply report that the benefit rate is not very good.

The total amount accumulated in all private accounts is obtained by integrating  $I(t, u)$  over all cohorts:

$$I(t) = \int_{-\infty}^T du I(t, u) = \int_{-t}^{\min(T, T+L-t)} du I(t, u). \quad (14)$$

The expression on the right restricts the integral to those cohorts that have funds in the private accounts at time  $t$ . It is easy to show that

$$\frac{dI(t)}{dt} = b_0 + rI(t) - b_p(t), \quad (15)$$

in accord with equation (2). In this model, however, we can evaluate the rate of withdrawal from private accounts as

$$b_p(t) = \int_{T-t}^{\min(T, T+L-t)} du K(u). \quad (16)$$

It is not hard to evaluate  $b_p(t)$  and  $I(t)$  for all times, but the most interesting case is the system's ultimate fate, which it reaches when one cohort has gone all the way through the system, i.e., for times  $t \geq T + L$ . In this case both the withdrawal rate and the total assets in private accounts are constants:

$$\begin{aligned} b_p &= \int_{T-t}^{T+L-t} du K(u) = b_0 \frac{L}{T} \frac{e^{rT} - 1}{1 - e^{-rL}}, \\ I &= \int_{-t}^{T+L-t} du I(t, u) = \frac{b_0}{r} \left( -1 + \frac{L}{T} \frac{e^{rT} - 1}{1 - e^{-rL}} \right) = \frac{b_p - b_0}{r}, \end{aligned} \quad t \geq T + L. \quad (17)$$

It is easy to see that the ultimate withdrawal rate exceeds  $b_0$ . As was mentioned in the main text, whenever  $b_p(t) > b_0$ , the government not only stops its contribution to benefits,

but also taxes away the surplus withdrawals, thus allowing the government to reduce its borrowing. Without this built-in feature, the government's debt would continue to grow exponentially over time. Recall that for  $r = i$ , the government's ultimate debt  $G$  is equal to  $I$ .

To get an idea of what these last equations tell us, I list below several examples for reasonable values of the parameters. The returns are small because they are assumed to be relative to wage inflation. The final dollar values are based on privatizing a third of the system today, which means that  $b_0 = \$400/3 = \$133$  billion per year.

$r = 1.5\%$ ,  $T = 45$  years, and  $L = 15$  years gives

$$b_p = 1.59b_0 = \$211 \text{ billion per year and } I = G = 0.881(b_0T) = \$5.3 \text{ trillion}$$

$r = 1.5\%$ ,  $T = 40$  years, and  $L = 15$  years gives

$$b_p = 1.53b_0 = \$203 \text{ billion per year and } I = G = 0.884(b_0T) = \$4.7 \text{ trillion} \quad (18)$$

$r = 1.0\%$ ,  $T = 40$  years, and  $L = 15$  years gives

$$b_p = 1.32b_0 = \$175 \text{ billion per year and } I = G = 0.810(b_0T) = \$4.3 \text{ trillion}$$