Cum Laude Team Prize – $10,000
Herricks High School–Team #14, New Hyde Park, New York
Coach: Howard Huang
Students: Amulya Bhagat, Amol Jain Yaagnik Kosuri, Sam Yoon

Solving Social Security Insolvency—a Look at a Partially Privatized System

Team #014

Summary

The current model of Social Security cannot sustain itself. It faces the problem of sustaining an increasing elderly population with a wage-producing labor force that is unable to keep up. Our model stipulates a partial privatization of Social Security in which the portion of Social Security tax delegated to the private account is determined by a function given in the paper. In our model, everyone is taxed for Social Security at a flat rate of 12%. The taxpayer's money is distributed between a public fund and his private account at a ratio determined by his income. In our model, persons of lower income place more of their Social Security tax in mandatory private accounts. The wealthiest persons contribute almost entirely to the public fund. Our regulatory function, however, ensures that people of higher income always receive more Social Security benefits. Due to increasing life expectancy, we have raised the age of eligibility for Social Security to 70 years of age.

The model allows for the vast majority of Social Security beneficiaries to live solely off their private investments, and thus, the public fund is a large treasury which may be used to pay off any remaining Social Security obligations, such as to disabled workers and their spouses, and ensure that administrative costs will be attended to. Furthermore, this surplus can be used to pay for the cost of transitioning from the old system to our new Social Security model.

Our model has been calibrated such that a person of the mean income ($36,500) can collect slightly more money than he would after 45 years in the labor force. The mean income changes and we suggest that these changes be used to recalibrate the curve every five years.

To ensure our system's success, we must monitor several factors in the future. Data must be collected on the real return rate of private investment, which must be at or above 3.97%. Census data and other surveys must confirm that those collecting Social Security are living comfortable lives. We also suggest that the age of eligibility be reevaluated every 10 years to ensure that the ratio of benefactors to beneficiaries is maintained. According to our in-depth analyses, our system should remain solvent for an indefinite period of time.

The Present Model

Most objections to the existing model of Social Security have to do with increasingly tighter tolerances on government trust funds levied by the steadily increasing population of the elderly. The Social Security Administration estimates that the number of people 65 or over will rise by more than 90% within the next three decades (2005 to 2035) according to its intermediate assumptions.[1] The number of adults under 65, the ones diligently supporting their elders, will be overwhelmed, as their population increase is a meager 15%.[2] Consequently, under the current model, Social Security will consume two-thirds of the federal budget, double the share of the GDP, and deplete the trust fund by 2030.[3] To develop a new working model, therefore, it is critical to obtain a functional understanding of the present system.

Structure and Function

Social Security, enacted by Franklin Delano Roosevelt in 1935, sought to realize multiple, sometimes conflicting, goals. Future expansions added several more goals and amended the program. The current model, therefore, has multiple parts; it is an income redistribution program among generations, and it is a mandatory insurance program which compensates workers and their families for death or disability.

Simple History

The initial system was designed to help low-income workers prepare for retirement. Later initiatives provided for payments for spouses of deceased and disabled workers, mandated the system to compensate for inflation, increased the benefit age, and limited the growth of the DI program. The program did, therefore, repeatedly stumble over its obligations, both seeking to increase its goals and decrease its costs, two objectives markedly at odds with each other.

Distribution and Method

The Social Security program pays benefits to approximately 45 million people per year. The distribution is displayed in Figure 1.

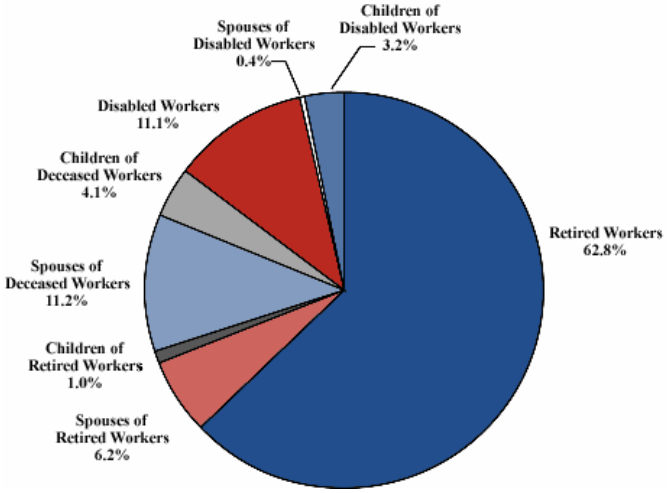


Figure 1: Distribution of Social Security Payments

At present, benefits for retired or disabled workers are based upon their monthly incomes just before retirement or disability. The formula for their monthly benefits is displayed below.

Benefits = **.9**(First $561) + **.32**(Income between 561 and 3381) + **.15**(Income over 3381)

Benefits, therefore, are based upon progressive income; this ensures that people are compensated based upon their contribution. This formula encompasses 96% of all outlays from Social Security trust funds. [4]

Funding

The primary revenue for the current model is obtained from a 12.4% on payroll taxes.[5] The maximum annual amount subject to Social Security taxes in 2006 is $94,200, and it has been increasing at an average rate of 12.8% over the last twenty years.[6] Revenue is accredited to the trust funds for the Old-Age and Survivors Insurance and Disability Insurance programs. The trust fund delegates benefit payments to Social Security beneficiaries, and it pays administrative costs from its funds.

Problems of the Current Model

At the time of its inception, the worker-to-beneficiary was 16.5 to 1. It is currently 3.3 to 1, and in 40 years it will be 2 to 1.[7] This worker deficit will inexorably result in a grievous financial shortfall, driving Social Security and its clients to financial ruin.

Federal Budget Limitation

Social Security, at present, accounts for 26% of the federal budget. In a period of 30 years, it will consume approximately 40% of the federal budget. At present, the government has too many obligations to provide such a great percentage to Social Security, and with a national debt of 8.2 trillion dollars, it cannot afford to borrow extra funds.

Economic Capacity Limitations

According to the Congressional Budget Office, Social Security will consume at least double the percentage of the GDP in 30 years as it does today. Clearly, an economy so dominated by unrestrained costs cannot sustain itself, and unless the program is reformed or productivity spikes, the United States' economy may crack under the strain.

Outlays Exceed Revenues

By 2028, the Social Security Administration's transfer payments will exceed the amount it receives in revenue. Furthermore, if the entire Social Security trust fund is exploited, Social Security in its present status will last only until 2043 before it needs to borrow titanic quantities of money to sustain its current level of benefits. This falls far short of the 75 years of solvency Congress has asked us to provide and proves the current system unviable for the future.

The Social Security Model

The current budget spent on Social Security is approximately $590 billion with a $25 billion annual increase.[8] If this system continues, the Social Security budget would be calculated by the following equation:

$$\$590 billion + \$25 billion \times (x - 2006),$$

where x is the year. However, if the government changes the current qualification of having to be 65 or older (12.6% of population) to collect benefits and instead makes the limit 70 years or older (9.3% of population) with the assumption of $25 billion constant value, the equation would change to the following:

$$\$590 billion(9.3/12.6) + \$25 billion(9.3/12.6) \times (x - 2006).$$

In 2006, the government would spend $435.4 billion on the Social Security budget. Raising the limit to 70 years would save $154.5 billion (590 – 435). Over time, the savings would increase. For example, in 2016, the government would normally spend $840 billion, but with our model, they would only spend $620.4 billion, resulting in a savings of $219.6 billion. Moreover, the population tends to shift toward the older generations; average life expectancy changed from 68 to 77 between 1970 and 2005. Since the ratio between benefactors and beneficiaries should remain constant, the age-qualification for Social Security benefits should increase at the same rate. We would recommend evaluating the criterion for qualification according to the life expectancy every 10 years.

The Social Security model created seeks to maximize the individual gain for the lower-income earners while giving a relatively constant degree of benefit to those of higher-income classes. We wanted the benefits of both government revenue and private investment, and thus created a hybrid model in which the degree of private investment is dependent upon the person's income.

The starting point for the model was based on the amount of payment the average person would collect over 15 years. According to a 2003 Social Security statistical supplement, the average Social Security recipient would get about $922 per month.[9] If, after beginning to receive money at the age of 70, the recipient lived another 15 years, he would get $165,960. Although the average life expectancy is actually 77, we decided to take estimates on the conservative side to provide a financial cushion for those living longer. We then set the point of reference that the average wage-earner, who makes $36,500[10], should be entitled to about $170,000 upon retirement.

The current rate of taxation for Social Security is 12.4%. We decided to reduce this slightly to 12% in order to take some financial pressure off of taxpayers and perhaps garner more support for the new system. Of this 12%, a certain amount of income is mandated to go into private investment, and the remaining part is required to go into a public fund.

In order for our model to be a viable alternative to the current model, we must prove that our model is profitable for our clients, the citizens of the United States of America. The Center for Economic Policy research states that healthy private account portfolios will use "50% equities, 30% corporate bonds, and 20% treasury bonds."[11] We will use this assumption–that our private accounts will diversify assets in this manner–to calculate the rate of return on private investments in our model.

$$1+N=\left[1+\frac{D/E}{P/E}\right](1+G).$$

The above equation calculates the nominal return *N* on stocks based upon nominal GDP growth *G*, price-to-earnings ratio *P/E*, and dividend-to-earnings payouts *D/E*. The implications of this equation are stupendous; since nominal return and GDP growth are directly related, we can assume, thankfully, that inflation is both matched and beaten by the return rate on our private accounts.

Several statistics are needed to compute the rate of return. The return on Treasury bonds is 3.3% real, and the return on private bonds nets a return of 3.8%.[12] We also assume that the price-to-earnings ratio is 21 and dividends are 60% of earnings.[13] This results in a nominal portfolio return of 6.26% and a real portfolio return of approximately 3.97% after administrative fees.

Having derived that the average rate of return on private investments is 3.97%, we may then attempt to find the percentage of the average income required for private investment. If we are given a certain interest rate *r* compounded annually, initial principle *P*, and further annual investment *c* occurring over *n* years, we can express the balance *B* as follows:

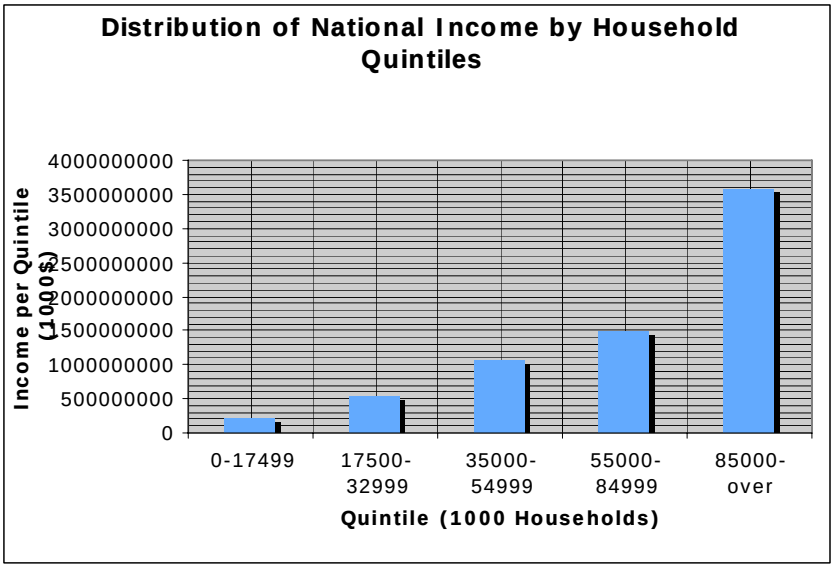
$$B=P(1+r)^n+c\left[\frac{(1+r)^{n+1}-(1+r)}{r}\right].$$

We assume that the average person will work around 45 years before turning 70 years old. Thus, we can find the amount of income needed to be invested yearly in order to achieve the appropriate amount of Social Security benefits needed for retirement by solving for *y*, the fraction of income invested, in the following equation:

$$170{,}000=36{,}500y(1+0.0397)^{45}+36{,}500y\left[\frac{(1+0.0397)^{46}-(1+0.0397)}{0.0397}\right].$$

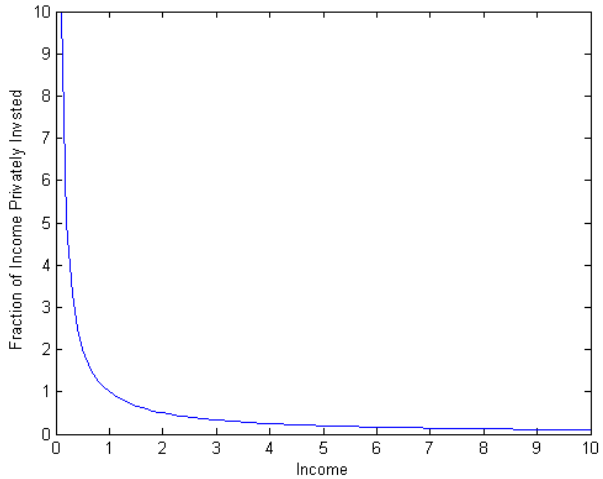
Solving, we find $y=0.03567$, meaning that approximately 3.5% or \$1301.96 of the average wage-earner's salary must be invested yearly in order to achieve the proper Social Security benefit. This also means that about 8.5% of this person's salary (the difference between the 12% tax and the 3.5% invested) is given to a public, government-controlled fund for Social Security.

From this reference point, we sought to construct a curve describing the amount of money privately invested and, consequently, given to the public fund, as a function of income. We believe that the poorest should be those with the greatest degree of private investment, and the rich should have the greatest degree of contribution to the public fund. This will allow the poor to ensure that their individual future funds are already allotted and safe and will also allow the government to pick up valuable revenue from the wealthy portion of society. Below is a graph we created from data from the Bureau of Labor Statistics.[14]



It demonstrates that the uppermost quintile of wage-earners have a disproportionate share of the country's wealth and therefore should have a greater amount of their Social Security tax money going into the public fund rather than their own private accounts. We assume that the wealthiest people probably have unmandated investments of their own or have saved an amount that would suit their spending behaviors after retirement. Thus, we do not feel that they are entitled to a Social Security benefit significantly greater than the average wage-earner. At the same time, however, because they did contribute more money to the system, we feel that they should get slightly more out of their mandated private investments.

The aforementioned factors were then considered in the construction of the curve relating income to the percent of income privately invested. We began with the simple graph of $y=1/x$, which has asymptotes along both the x and y axes.



The asymptote along the x axis is desirable, as we want the wealthier people to pay progressively less into their private investment accounts, but the asymptote along the y axis indicates that low wage-earners would be spending an infinite percentage of their income on private investment. The curve needs to be calibrated so that it intersects the y axis at 0.12, which

indicates that a person earning a wage of $0 would be putting 12% (all of the Social Security tax money he pays) into private investment.

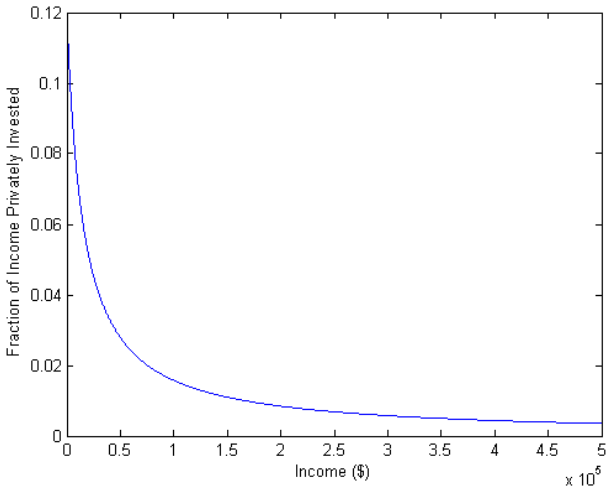
The curve can be shifted to the left by modifying it so $y=1/(x+1)$; now it intersects the y axis at 1. We then multiply by 0.12 to shrink the curve to the maximum allowable private investment of 12%: $y=0.12/(x+1)$. The curve must be a function of dollars, however, so x must be multiplied by constant k. We can solve for k because we already have a point relating the average wage-earner's income ($36,500) to the amount of the necessary investment (0.03567 of his salary) for his retirement. We can then set up the equation

$$0.03567 = \frac{0.12}{k(36500)+1}.$$

We find that $k=6.477 \times 10^{-5}$. The function is then established as

$$y = \frac{0.12}{6.577\times10^{-5} + 1}.$$

The graph is as follows:

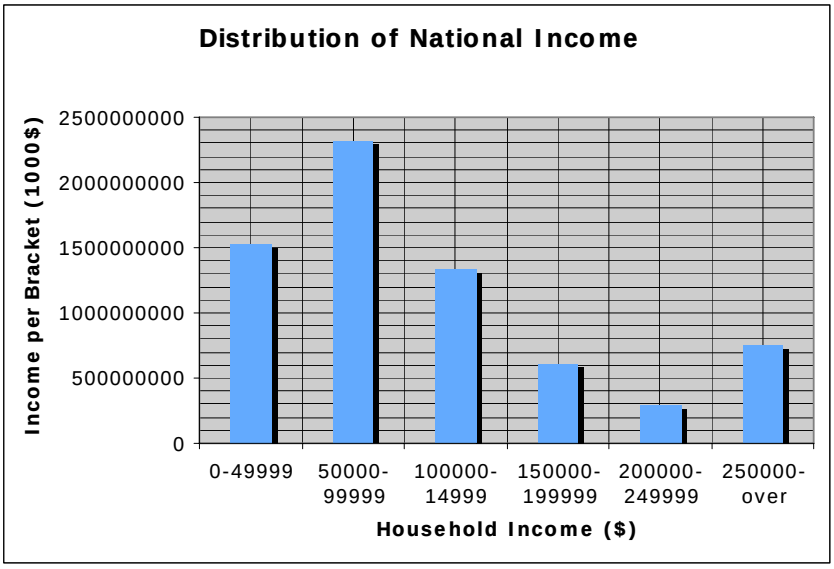


The Surplus

The graph below was created from data from the Bureau of Labor Statistics.[15] These data illustrate the distribution of national income by income brackets. We then analyzed the amount of money put into the public fund portion of the Social Security program by computing the average value of the above privatization graph on the intervals specified on the graph below:

$$\frac{\int_a^b 0.12 - \frac{0.12}{6.477\times10^{-5}x+1}\,dx.}{b-a},$$

where a and b are the lower and upper bounds of the income brackets delegated on the graph below. These average values were then multiplied by the total income per bracket and summed, yielding the total amount of money placed in the public portion of the Social Security fund. Our calculations showed that $663 billion would be deposited in the public fund every year. This is more than enough money to compensate for the disabled workers, who would earn $887 per month, on average, and their spouses would earn $417 per month. Our model yields a surplus, which can then aid in reducing the deficit and satisfying the costs of transition.



The Private Account Scheme

It is evident by the failures of several other countries throughout the world in their use of private accounts that the system must be designed carefully; only then can our system work, be tasteful to the American public, and serve as a model for economic system. The section of our model based upon the creation of private accounts is modeled after a study of Singapore, the world's most successful private account based country.

The derivation of our estimated percent earnings, 3.97%, is based upon a portfolio that diversifies itself into equities, corporate securities, and treasury securities, and it uses a specific amount of each. Similarly, the Singapore plan shoots for a particular diversification configuration for its citizens' accounts by establishing a minimum x% in equities, y% in real estate, etc.

We are willing to concede that our method of diversification may not be considered the optimal model by all of our clients; therefore, our model of private accounts allows for a leeway of plus or minus 5% in our recommended investment percentages in equities and securities. That is, since our recommended treasury security investment is 30% of the account, a client may have the choice of investing a minimum of 25% into securities and a maximum of 35%.

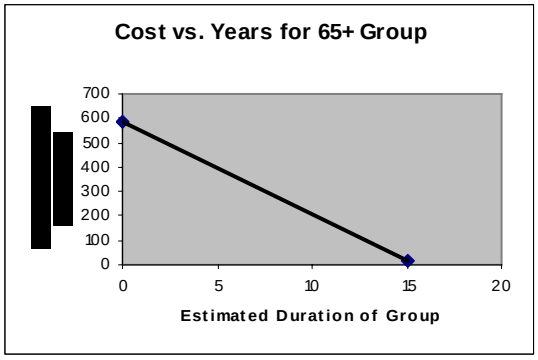
In this manner, we ensure that (a) our target rate of return, 3.97% is met, and (b) clients have the opportunity to slightly deviate from our recommended investment.

Costs of Transition

The transition to the new model incurs steep and formidable costs. By removing the burden of beneficiary payments from the working population, we are forced to keep members currently receiving Social Security payments under the old plan solvent. Additionally, those individuals 40 years and older who have no chance to properly establish a private account will also be using the

old system with no beneficiary payments. The essential questions will be, therefore, how much will it cost to keep these remaining people solvent, and how will this money be acquired?

In order to assess these costs, we broke this population into two groups–those recipients 65 and older, and citizens 40 to 64 years old who have yet to obtain benefits from the new minimum age of 70. The current budget for individuals 65 years and older is 590 billion, and this number drops over time as members of this group perish. Because life expectancy is 77 years, we have decided to use 80 as the projected age of death. Assuming that the death rate has been fairly constant for this age group over the past ten years, at approximately 5%, it is reasonable to assume that this group will perish at a fairly constant rate; consequently, cost will diminish at a fairly constant rate until it bottoms out at the group's expiration. With these assumptions, the following graph can be created.



A Riemann sum, taken at intervals of 1 year, will reveal that the projected cost to supply this group to its death is 4.425 trillion 2005 dollars.

With this approximation in mind, we can similarly ascertain the cost of providing for all workers 40 to 64 years old after they turn 70. The current population of the United States has been estimated to be 296 million, and 12.4% of it consists of 65+ individuals and 30% of it consists of 45 to 64 individuals. We can, therefore, relate the cost of the current 65+ population to the 45 to 64 population with a ratio, and the cost of this group has been totaled to be 10.71 trillion dollars.

Assuming that the life expectancy does not change more than 5 years in either direction, our total cost of transition will be the sum of the costs of the two groups, 15.14 trillion. This number will be paid off in 35 years, or the amount of time it takes for the 45 year olds to die.

The average cost per year to transition to our new model is, therefore, $432 billion per year, an amount easily paid by our $663 billion projected surplus.

Conclusion

Social Security's insolvency has become a major issue now that the population composition has shifted toward the elderly, and wage-earners cannot keep up with the benefits required to maintain the current system. We propose a model in which the benefits of a public and privatized Social Security system are fused. In our model, citizens pay money toward their own Social Security as well as a general public fund that can be used to reduce deficits and award compensation to other needy beneficiaries. Our model proposes that the wealthy contribute proportionally more to the public funds account whereas the poor place more money in their individual private accounts, even though both the rich and poor have the same taxation rate. Our model is a moral and capable solution to the Social Security crisis.

References

[1] Social Security Online. Social Security Administration, [Internet-Browser], http://www.ssa.gov , 5 Mar 2006.

[2] Social.

[3] Social Security: A Primer. Congressional Budget Office, [Internet-Browser], http://www.cbo.gov, 5 Mar 2006.

[4] Primer.

[5] Contribution and Benefit Base. Social Security Administration, [Internet-Browser], http://www.ssa.gov/OACT/COLA/cbb.html, 5 Mar 2006.

[6] Contribution.

[7] Social.

[8] The Fiscal Year 2006 Budget Press Release. http://www.ssa.gov/budget/2006bud.html

[9] Average Monthly Social Security Benefits. Infoplease. [Internet-Browser], http://www.infoplease.com/ipa/A0780010.html, 5 March 2006

[10] Baker, Dean and David Rosnick. "Basic Facts on Social Security and Proposed Benefit Cuts/Privatization," Center for Economic Policy Research, http://www.cepr.net/publications/social_security_2005_03.pdf, 5 Mar 2006.

[11] Baker.

[12] Primer.

[13] Primer.

[14] US Census Bureau, Current Population Survey, 2005 Annual Social and Economic Supplement. http://pubdb3.census.gov/macro/032005/hhinc/new06_000.htm.

[15] US Census Bureau.