April 2013

Social Security Forecasting

Katherine M. Whittier
Worcester Polytechnic Institute

Matthew K. Townsend
Worcester Polytechnic Institute

Michelle Tamie Guertin
Worcester Polytechnic Institute

Mung Wong
Worcester Polytechnic Institute

Social Security Forecasting:

An Actuarial Study of the OASDI Trust Fund balance projections & proposals for delaying fund exhaustion

A Major Qualifying Project submitted to the faculty of

Worcester Polytechnic Institute

In partial fulfillment of the requirements for the Degree of Bachelor of Science in Actuarial Mathematics

By:

Michelle Guertin

Matthew Townsend

Katherine Whittier

Mung Wong

Date: April 25, 2013

Report Submitted to:

Jon Abraham

Worcester Polytechnic Institute

Abstract

The goal of the project was to offer mathematical solutions to the issue of Old Age Social Security Trust Fund's dissipating as a result of the Baby Boomer generation retiring in numbers too great to sustain. We constructed a model in Microsoft Excel that uses a number of adjustable factors to save the program and found that raising the retirement age eligible to collect benefits and simultaneously increasing the contribution tax rate would prevent the expiration of the program.

Authorship Page

Through each team members' considerable contribution towards the research on the Social Security program, the construction of the deterministic model, and the writing of the project report, we were able to successfully complete the Social Security Forecasting project. Each team member had equal participation in the research and writing components of the project. For the construction of our model, only one member could program in Microsoft Excel at a time. Katherine Whittier created the initial components to model the U.S. population, Matthew Townsend and Mung Wong took turns calculating the average U.S. worker income and the average retiree benefit payment, and Michelle Guertin documented the functionality of each piece of the model and edited the final product. The final model and report represent the culmination of our ideas, thoughts, and work on the project. The equal division of work throughout this project, with each member working to the best of his or her ability, resulted in the successful and effective completion of the project.

Acknowledgments

The project team would like to extend our collective thanks to our project advisor, Professor Jon Abraham, for his guidance not only during this project but also throughout our college careers and towards our bright futures beyond.

Executive Summary

Social Security is the largest federal program in the United States. More than 20 percent of Americans receive Social Security benefits. That number is set to rise over the next several years. This is because the “baby boomer” generation has begun shifting from working age to retirement age. The actuaries of the Social Security Administration release a report on the current state of the program and develop projections using stochastic techniques to determine how long the program can last. While the contribution income outweighs the benefit payments, the surplus which is reasonably small goes into a trust fund where it gains interest. The trust can sustain the program for only a few years after contribution income is no longer sufficient. Recent trustee reports have suggested the program will reach a period where the benefit payments will outweigh the contribution income within the next few years. The problem is only expected to get worse.

There is currently no contingency plan set up to counteract the trust fund’s eventual exhaustion. Such a plan would have to be done through legislation. Several different variables influence the rate of the fund’s exhaustion. Because of this it is relatively easy to change enough variables to have the program run forever. For example, doubling the contribution rate would fix the program, but would also draw in too much money. Also the population of the US wouldn’t support such an extreme measure. Also increasing this rate would increase costs to companies which would prevent them to hire more employees. The models which have been previously produced by the Social Security Administration do not allow for someone to see the direct effects theses variable changes would have.

The project began with the construction of the deterministic model. To construct this model, we had to first gather data on the population, employment, and retirement. First we used actuarial methods to project the US population into the future, keeping specific totals at each age. Then we used the data gathered on retirement and employment to predict both the income taken into the program each year, and the benefits paid out. Any surplus goes into the trust fund, gaining interest, any deficit is taken out. This model then used several different variables to predict the balance of trust fund. These include, but are not limited to, fertility rates, the interest rate of the trust fund, and the rate of the payroll tax used to fund the program.

We then manipulated these variables, increasing them, at set increments to determine how they each impacted the date of exhaustion for the program. After manipulating all the variables individually, we found that none of them could permanently remedy the problem if we kept the changes made within realistic ranges. However, after changing several variables at once, we were able to identify realistic changes that keep the trust fund from depleting. After looking at each of the scenarios individually, we determined that a .4% increase to the contribution rate and a 3 year increase of the retirement age to reflect updated retirement data would save the program while doing the least amount of total change. The plan would need to be revisited and as the economy and society progressed.

Table of Contents

Table of Figures

1. Introduction

In the United States today, retired American workers receive monthly Social Security payments from the U.S. Government. The benefit payments are funded by a taxable portion of workers' monthly earnings, known as the payroll tax. The contributions are deposited in the Old-Age, Survivors, And Disability Insurance (OASDI) Social Security Trust Fund, from which payments are distributed to beneficiaries. Any surplus in the fund after benefits are paid is invested into special issue Treasury bonds and collects interest.

The current system has functioned only as long as the amount of contributions collected exceeds the benefit payments issued from the OASDI Fund. In 1950, there were 15 employed workers for every retiree in the system. Today, there are only 2.9 workers for every retiree. The ratio of covered workers to beneficiaries will continue to decrease as the baby boomer generation enters into retirement in large numbers. The decline in the ratio of workers to retirees directly contributes to the declining ratio of scheduled benefit payments to contribution income. Although the United States Social Security Administration (SSA) recognizes this problem and has stated that benefit payments exceeded contributions collected in 2012, no attempts have been made by legislators to address this issue, with the exception of the existing incremental increases to the normal retirement age from 65 to 67. The SSA projects that the current OASDI Trust Fund will not be able to distribute retirees' benefit payments in full past the year 2037[1].

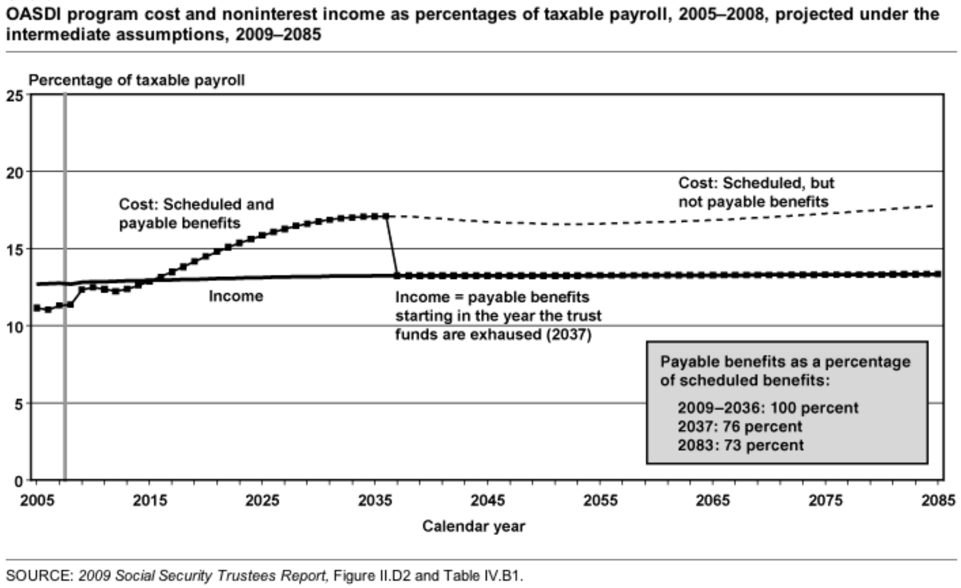

Figure 1 SSA Trustee Report Graph of scheduled payments vs. income

As new entrants to the workforce, our project team finds this issue particularly relevant—we are hesitant to contribute to retirees benefit payments without a guarantee that we will also receive benefit in promised amount in the future. We gathered data from a variety of resources and develop a deterministic model projecting the future financial status of the Social Security Program in the United States. The project team applied fertility, mortality, employment, and inflation and executed a variety of mathematical algorithms to study how these factors will affect the future of the OASDI Social Security Trust Fund. Using our model, we tested the effect of variable assumptions of population and economic conditions and the effect of policy change on the near-term solvency of the Social Security trust fund. This paper will detail the process our team engaged in during the construction of the model, as well as the conclusions drawn from the results of our testing.

[1] http://www.ssa.gov/policy/docs/ssb/v70n3/v70n3p111.html

2. Background

Beginning in the 1920s, Americans became conscious of the need for a social welfare program to assist older citizens through their peaceful retirement. Abraham Epstein, an economist and leading advocate in the social welfare movement in the U.S., began implementing such a program for the elderly in Pennsylvania with the Old-Age Assistance Law of 1923. After the law was deemed unconstitutional, Epstein lobbied for national support for old-age assistance. During the Great Depression, President Roosevelt worked with Epstein to develop The Social Security Act, passed in 1935, to help elderly citizens during the challenging economic times.[2]

The Social Security Act of 1935 originated as a program to provide welfare and insurance to aged persons. Since its creation in 1935, the program has expanded to include disabled persons and survivors of deceased workers. As written in the original act, the government collects a portion of covered workers' earnings and distributes welfare payments to beneficiaries on a monthly basis. Modifications have been made in eligibility of payments, size of benefit payments, and contribution rates for employed persons since the act was created to adjust for inflation and other factors of the changing economy. Today, the role of the Social Security Act is carried out by the SSA using the Old-Age, Survivors, And Disability Insurance (OASDI) Social Security Trust Fund.[3] This OASDI is funded generated using payroll tax including a percentage of an individual's earnings matched by the same amount from employers. As the name of the fund suggests, payments are issued to retirees, survivors, and disabled people. Up until 2012 more money is collected from employed Americans than scheduled payments to eligible beneficiaries

[2] http://ezproxy.wpi.edu/login?url=http://search.proquest.com.ezproxy.wpi.edu/docview/227695550?accountid=29120

[3] http://www.ssa.gov/history/35actpre.html

from the fund. The resulting surplus has been invested in special issue Treasury bonds where it collect interest (4.4% effective per annum in 2012) and constitutes the fund reserve to be used in the future.

Since 1935, this program remained effective because contributions from the working population have been sufficient in covering the payments to the retired population. However, recent census data suggests that this may not continue to be the case as the aging baby boomer generation population enters into retirement and eclipse the size of the working population. Since a ratio of three covered workers per beneficiary barely allows the OASDI to generate a surplus for its reserve, it is clear that the government needs to identify and implement alternations to the system so that worker contributions will continue to generate enough income for the fund to satisfy the growing amount of benefit payments.

Although the problem of Social Security solvency is widely acknowledged, there is no consensus on which combination of modifications will resolve the issue and is politically feasible. A variety of changes to the program have been proposed prevent its possible demise. By SSA's estimates, the current reserves in OASDI will continuously decline in the years from 2012 to 2037, at which point the reserve is exhausted and tax income will only cover 73% to 76% of schedule costs. Our own results confirm this projection (see Section 5). Enacted legislation has already been steadily increasing the retirement age from 65 to 67. This was enacted to incentivize Americans workers to work longer and retire later, thus increasing contribution into and decrease payments from the trust fund.

However, recent studies suggest that more drastic measures will be needed to save the program.[4]

3. Project Goals and Objectives

The primary goal of the project was to build a working, deterministic model of the future activity and financial status of the OASI Trust Fund in Microsoft Excel. Using historical and present demographic and economic data as inputs, the model was to project the fund balance from 2012 through 2100. Special interest was to be paid to the date of the potential depletion of the fund balance, and how the results of our model compare with the results from the Trustee Report.

The secondary goal of the project was to study the effects of potential changes in program policies, demographics, and economic conditions on the fund balance using the completed model. Specifically, we wanted to see how inflation, interest rates, retirement age, fertility, wage increases, and contribution rates affected our results. If the fund was projected to run out during the time scope of the study, the project team was to propose a solution to prevent fund exhaustion via policy changes.

4. Methodology

In order to create a model that accurately depicted the current Social Security program in the United States, it was vital that we implemented working projections in three major areas: U.S. population, income of working citizens, and the average benefit eligible retirees can expect to receive.

---

[4] http://wpi.summon.serialssolutions.com.ezproxy.wpi.edu/search?s.q=the+future+of+social+security+in+US

4.1 Population Modeling

The first step in building our model was to create a distribution of the U.S. population by age for the year 2012, which formed the basis for projecting the future population distribution. To form the 2012 population, we obtained the 2011 U.S. demographics data, whose values represent the number of people in 10-year age blocks, and applied the SSA mortality table for the U.S. population[5] in order to estimate the number of Americans alive at each individual age.

The task of estimating how many people were alive at each individual age within each 10-year range involved the usage of Microsoft Excel's What-If function.[6] The What-If function computed the number of people needed in the youngest age group within each 10-year age blocks so the population number decrease according the mortality rate while the total number of people in each 10-year age block remains unchanged from Census data. For example, we were given the number of people who were between the ages 20 and 29. An random value is assigned to the number of people at age 20, and an excel formula outputs the number of 21 year-olds as the number of 20 year olds multiplied by 1 minus the mortality rate (a.k.a. the survival rate). This formula was repeated up to the age 29. A separate cell summed the number of people from age 20 to age 29. The What-If function was then used to solve for the number of 20 year-olds that would result in the value of the sum cell to be equal to the given total number of people in the 20-29 age block from Census data. This method was deemed superior to estimating the age-distribution using uniform kernels for each age, which would have resulted in overestimation of population values in the older age ranges.

---

[5] http://www.ssa.gov/oact/STATS/table4c6.html
[6] http://www.census.gov/prod/cen2010/briefs/c2010br-03.pdf

After creating the base population, we applied fertility rates to it so that the number of newborn in any given year is equal to the product sum of the previous year's population vector (a vector with values of population in each age above 0) and the age-specific fertility vector, resulting in a future projection of population distribution for the U.S.[7] The U.S. senate website only provided fertility rates that represent the fractional number of birth per women, and we divided these values by two to obtain rates that can be applied to the entire population.[8] The result was a projection of the U.S. population from 2012 to 2100 that accounts for both mortality and fertility rates.

After creating a model of the overall U.S. population, we needed to determine the portion of those population that was in employed, and was therefore contributing to the OASDI Trust Fund. Based on our research, it was determined that employment rates are dependent on the age. We gathered U.S. Census data from 2011, which are divided into 10-year age ranges, that quantified the number of Americans employed.[9] To find the rate of employment for each 10-year age bracket, we divided the amount of workers in employment according to Census by the total number of people alive in that age range according to our model. Once we had employment rates for each 10-year age range, we applied the rates to the appropriate ages in the rest of our population model, resulting in a model of the employed U.S. population into the future.

The final step in modeling the U.S. population was to define the number of retired workers in each age group. This is necessary for the computation of aggregate benefit payments from the OASDI Trust Fund. This population model involved many assumptions since there exist limited data on the pattern of retirement by age. We were

[7] http://www.census.gov/compendia/statab/2012/tables/12s0080.pdf
[8] http://aging.senate.gov/crs/pension34.pdf
[9] http://www.census.gov/hhes/www/cpstables/032011/perinc/new01_001.htm

able to model their projected retirement by: We determined the retirement rate at each age by calculating the ratio of the number of retirees at any given age, between 62 to 70, to the number of retirees of the previous age in the previous year, after discounting the latter by the relevant survival rate. We assumed in our model that all individuals will retire by age 70, since the real rates of retirement past age 70 are negligible. This produced a distribution of the number of retirees at each age between 62 and 70 in each year.

We made a number of assumptions in the process of creating a model of the total, employed, and retired populations. Whenever possible, we adjusted raw data, which were often given in brackets of 10 ages, to improve the accuracy of the projected values. The population model is used later to compute the aggregate contribution and benefit amount in each year (see Section 4.3 and 4.4).

4.2 Income Modeling

The next part of the overall model involves the projection of income distribution. Past and future income distribution were needed for the determination of future Cost-of-Living Adjustments (COLA) values (see Section 4.4.11), lifetime earnings, contribution calculation, and benefit calculation components of the model. We needed an accurate way to project income into the future to effectively calculate these sections and to estimate income by age for each year in the past.

The current average income distribution by 5-year age brackets was obtained from the Department of Labor Statistics. We then smoothed this data to estimate the average income for each individual age. By assuming every worker earns the average income each year, our model did not account for the number of high income earners who paid payroll tax only up to a percentage of the contribution base (see Section 4.4.4). We could not model the income distribution by both age and income level because such data are not available during the course of our research. By using average income data by age only, our model accurately represented the aggregate amount of income earned by the working population.

We projected these average incomes per age into the future using inflation rates. The group did not have access to historical data on average income levels, so estimating past income amounts proved a challenge. We were able to overcome this issue by looking at historical wage index amounts, which are based on average income through the years, and projecting income levels per age backwards by using the ratio of the index amounts.

The result of this process was the annual income of an individual for every age. The next step was to compile lifetime earnings, the amount of money an individual made each year of their life. Since the columns represented each year, and the rows represented each age, we had to follow the diagonal to create a list of an individual's lifetime earnings.

4.3 Contribution Calculation

The amount of contribution made into the OASDI fund is a flat percentage of each worker's earnings. Currently, workers pay 6.2% of their earnings into the trust fund, matched by 6.2% by their employers, for a combined 12.4%.

To project aggregate contribution amount into the Social Security trust fund in our model, the average income values were multiplied by the matching number of population in employed in each year. This value is then multiplied by 12.6%. The contribution amount at each age in a year is summed to produce the amount of contribution in each year.

4.4 Benefit Calculation

A key component in modeling the OASDI fund was to determine retirees' benefit payment amounts. The project team researched the method of benefit calculation through information and examples given by SSA's website. The calculation involves multiple steps and is dependent on numerous variables and data series. The project team developed a thorough understanding of the mechanism underlying the calculation steps, and expressed them as a set of algebraic formulas. These formulas are then implemented into Excel using build-in Excel functions.

A retired worker's benefit determination involves three main steps. First, the worker's Average Indexed Monthly Earnings is determined based on the worker's earnings history. Second, the worker's Primary Insurance Amount is determined using the worker's AIME. Third, depending on the worker's age of retirement, a percentage of the worker's PIA may be credited or deducted. Additionally, a retiree already receiving benefit checks may see the amount increase by Cost-of-Living Adjustments.

4.4.1 Variables

$w_y = wage\ index\ for\ year\ y$
$x = person's\ year\ of\ retirement\ eligibility,, which\ is\ when\ the\ person\ is\ age\ 62$
$i_{x,y} = index\ factor\ in\ year\ y\ for\ a\ person\ eligible\ for\ retirement\ in\ year\ e$
$b_y = contribution\ and\ benefit\ base\ for\ year\ y$
$a = Average\ Indexed\ Monthly\ Earnings\ amount$
$r_y = reduction\ or\ credit\ factor\ for\ retirement\ at\ age\ y$
$n = normal\ retirement\ age, which\ depends\ on\ the\ year\ a\ person\ is\ born$

4.4.2 Average Indexed Monthly Earnings

Upon retirement, a worker's **Average Indexed Monthly Earnings** (AIME) is determined by indexing the worker's past earnings using the wage levels during those years of earnings[10].

4.4.3 National Average Wage Index

The SSA uses its **national average wage index** to adjust a worker's past earnings (see Appendix A.1). Such indexing is done to account for the changes in the standard of living during the worker's lifetime. The wage index in any given year is equal to the previous year's wage index multiplied by the percentage change in average wage since the previous year.[11]

$$w_y = w_{y-1} * (1 + percentage\ change\ in\ average\ wage)$$

4.4.3 Index Factors

To index the worker's individual yearly earnings, a series of **index factors** are determined using the wage index. Index factors are dependent on the year in which the worker is first eligible for retirement (currently this is at the age of 62). The index factor used for adjusting any given year's earning is equal to the ratio of the wage index two years prior to the year of eligibility to the wage index in the year of earning.[12]

$$i_{x,y} = \frac{w_{e-2}}{w_y}$$

---

10 http://www.ssa.gov/oact/COLA/Benefits.html#aime

11 http://www.ssa.gov/oact/cola/AWI.html#Series

12 http://www.ssa.gov/oact/cola/awifactors.html

4.4.4 Contribution and Benefit Base

There exists a limit to the amount of earning in any given year that is subject to payroll tax. This amount is known as the **contribution and benefit base** (see Appendix A.2). It represents the maximum amount of a worker's earnings subject to taxation and the maximum amount that is indexed as part of AIME determination.

The value of the base in any year after 1994 is calculated as the base in 1994 times the quotient of the wage index two years prior and the wage index in 1992, rounded to the nearest 300.

$$b_y = \max\left(b_{y-1}, \left[\frac{\left[b_{1994} * \left(\frac{w_{y-2}}{w_{1992}} \right) \right]}{300} \right] * 300 \right)$$

$$b_{1994} = 60{,}600 \quad w_{1992} = 22935.42$$

A new base is applicable only if a Cost-of-living Adjustment becomes effective in the December of the year. A new base is used only if it is larger than the base in the previous year[13].

4.4.5 AIME Determination

Up to 35 years of earnings are used to compute the AIME. A worker's yearly earnings, up the base amount, are multiplied by year-specific index factors. Up to 35 years of highest indexed earnings are summed, and then divided by total months in those years, resulting in the numerical value of the worker's AIME.

$$a = \frac{sum\ of\ up\ to\ 35\ years\ of\ indexed\ earnings}{number\ of\ months\ with\ earnings}$$

[13] http://www.ssa.gov/oact/cola/cbb.html

4.4.6 Primary Insurance Amount

Having determined a worker's AIME, the next step in calculating the worker's benefit amount is the determination of his **Primary Insurance Amount** (PIA). The Primary Insurance Amount represents the amount a worker would receive if the worker chooses to begin receiving benefit checks at the worker's normal retirement age.[14]

4.4.7 Normal Retirement Age

The **normal retirement age** (NRA) is the age at which a worker's retirement benefit amount is equal to the worker's PIA. The NRA is predetermined by legislation and is currently increasing until it reaches 67 for workers born in 1960 and later. See Appendix A.3 for a table of NRA values.[15]

4.4.8 Bend Points

The PIA is calculated using three different percentages of three portions of the AIME. The portions depend on the year in which a worker becomes first eligible for retirement, currently at the age of 62. Two bend points separate the three portions. The bend points after year 1997 is calculated using the bend points in 1997 and adjusted by the ratio of the wage index two years prior to the year of eligibility and the wage index in 1997, rounded to the nearest integer.[16]

$$d_x = \left[d_{1997} * \left(\frac{w_{x-2}}{w_{1997}}\right)\right]$$
$$d'_x = \left[d'_{1997} * \left(\frac{w_{x-2}}{w_{1997}}\right)\right]$$
$$d_{1997} = 180 \quad d'_{1997} = 1085$$

---

14 http://www.ssa.gov/oact/COLA/piaformula.html
15 http://www.ssa.gov/oact/ProgData/nra.html
16 http://www.ssa.gov/oact/COLA/bendpoints.html

4.4.9 Primary Insurance Amount Determination

After obtaining the values of the bend points, the PIA is calculated as the sum of three percentages of the three portions of AIME separated by the bend points. The PIA is equal to the sum of 90 percent of the AIME up to first bend point, 32 percent of the AIME between the first and second bend points, and 15 percent of AIME beyond the second bend point. This amount is rounded down to a multiple of $0.10.

$$p_x = \left\lfloor \frac{(0.47 * \min(a\,,\ d_x) + 0.17 * \min(a\,,\ d'_x) + 0.15 * \mathrm{a}}{0.1} \right\rfloor * 0.1$$

The PIA is calculated in this fashion to ensure a progressive distribution of benefits in relation to differing income levels.

4.4.10 Actuarial Reduction, Delay Retirement Credit, and Cost-of-Living Adjustments

A worker's Primary Benefit Amount is equal to the worker's retirement benefit amount only if the worker retires or chooses to start receiving retirement benefits at the normal retirement age. If the worker begins to receive retirement benefits before or after the NRA, then the worker's PIA is adjusted by actuarial reduction or delayed retirement credit, respectively. Such adjustment is applied to ensure the actuarial value of the PIA remains the same for different age of retirement. An early retiree is expected to receive more benefit checks, so their amount would be reduced. Similarly, a late retiree is expected to receive fewer benefit checks, and their amount would be increased.

In the case of early retirement, the benefit is reduced by 5/9 of one percent for each month before the normal retirement age up to 36 months. For retirement more than 36 months before the normal retirement age, the benefit is reduced by an additional 5/12 of one percent for each month beyond the month 36. Retirement before the age of 62 is treated as retirement at the age of 62 for the purpose of PIA reduction.

For delayed retirement, a pre-determined percentage of credit, currently 8% (see Appendix A.4), is applied for each year after the normal retirement age up to age 70. No additional credit will be given for retirement after the age of 70.

$$r_y = \begin{cases} 1 - \max\left(3, (n-y)\right) * \left(\frac{1}{15}\right) - \max\left(0, (n-y-3)\right) * \left(\frac{1}{20}\right) & y < n \\ 1 & y = n \\ 1 + (y-n) * 8\% & y > n \end{cases}$$

The amount of benefit a worker receives upon retirement is the worker's PIA multiplied by the factor representing either reduction or credit.[17] [18]

4.4.11 Cost of Living Adjustments

The adjusted Primary Insurance Amount represents a worker's retirement benefit amount at the time of retirement. However, the standard of living during a retiree's remaining lifetime is expected to increase. Therefore, since 1973, a **Cost-of-Living Adjustment** (COLA) may be applied to the adjusted PIA from year to year.

The COLA is based on increases in Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W). A COLA effective for December of the current year is equal to the percentage increase in average CPI-W for the third quarter of the current year over the average for the third quarter of the last year in which a COLA became effective, rounded to the nearest tenth of one percent.[19]

---

[17] http://www.ssa.gov/oact/quickcalc/early_late.html#calculator
[18] http://www.ssa.gov/oact/ProgData/ar_drc.html
[19] http://www.ssa.gov/oact/cola/latestCOLA.html

4.4.12 Relevance in Model

The benefit paid out from OASDI trust fund is determined by first writing the abovementioned benefit formulas in Microsoft Excel. Using obtained wage index and our model's lifetime earnings values as input, we were able to compute the amount of benefits schedule to be paid to the retired population of each age in each year. The benefit amounts by different age groups within a single year are summed to produce the aggregate benefit payments removed from the trust fund in each year.

4.5 Net OASDI Balance

After projecting the aggregate contribution and benefit amount in each year, the net balance of the OASDI fund in any given year is determined by adding the difference of the year's contribution and benefit amount to last year's net balance, then multiplying this sum by 1.058. The 5.8% increase represents the interest accumulation from special issue Treasury bonds.

5. Analysis and Discussion

After completing our model and projecting our population to the year 2100, we were able to analyze our findings. When comparing the balance between the contributions collected from employed Americans to expected total benefit payment made to retirees, we have concluded that the OASDI Social Security Trust Fund will be depleted in 2029. Our project team felt we had achieved a high level of accuracy with only a 6-year difference from the U.S. Social Security Administration's projection (2035) due to the number of assumptions we implemented when creating the model. It is important to note that our projected negative balance in 2029 includes paying the retirees' benefit payments with the surplus of contribution payments, which have been saved in a trust fund. Without including this surplus of contribution payments, we predict the OASDI Fund will reach a negative balance in the year 2020.

After determining the demise of the OASDI Fund, we began adjusting our model to determine if there were possible alterations that could be made to the program to prevent a negative balance in the fund. We began by adjusting the retirement age where retirees will be eligible to receive Social Security Benefit payments. Increasing the retirement age to 70 would not stop the program from breaking in the short term, but does cause it eventually repair itself in the future. This makes sense as it increases the number of people contributing to the program while decreasing the amount that have benefits being paid out. The system still comes close to breaking in 2037. However, the program is designed in a way that allows it to run a large deficit for any amount of time.

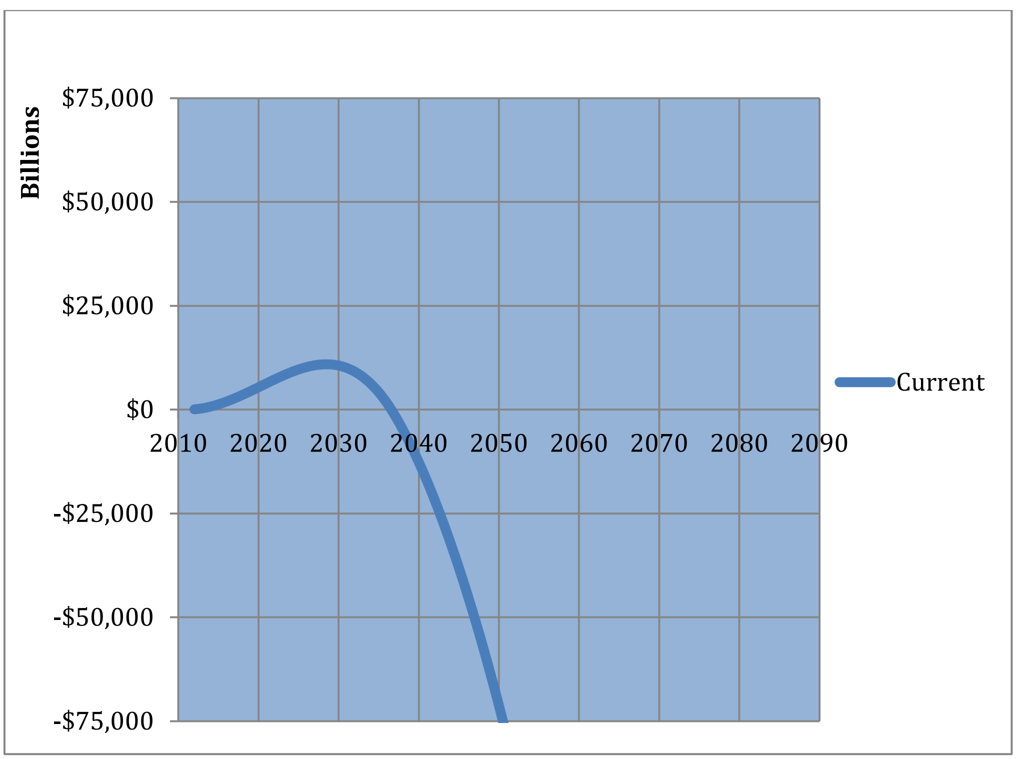

Figure 2 Graph of current projected trust fund balnce

The next variable we adjusted was the fertility rate. We multiplied all current and future projected fertilities by a flat multiplier that took place immediately. We used multipliers of 2, 3, and 4. No higher number would be realistic. While changing the fertility rates does cause wide deviations in the number in the future, no change in fertility stops the program from breaking in the short term. While producing more children will eventually produce more workers, this process takes 18 years. The program breaks before those children can enter the workforce. Furthermore, in the long term, this huge influx of children would need to also be supported by the workforce. A similar jump in fertility rates, the baby boom, is what caused this original problem in the system.

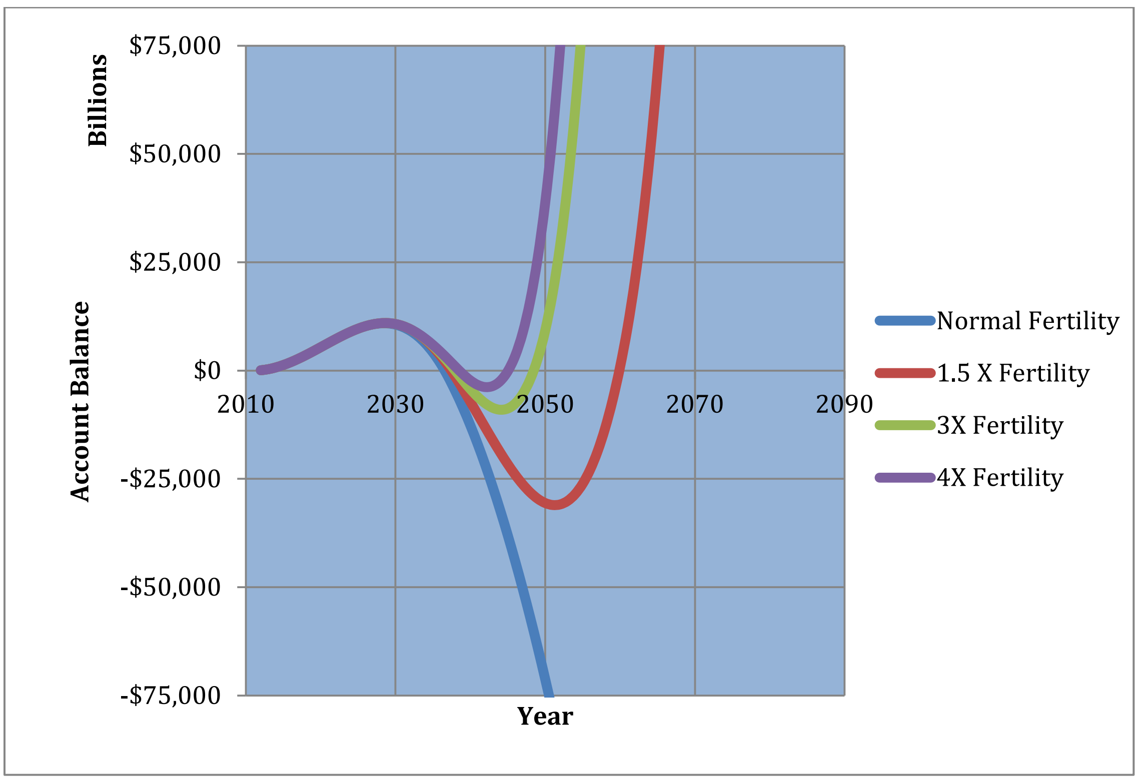

Figure 3 Graph of Projected Trust Fund Balance for multiple fertility rates

The next variable we adjusted was the contribution rate, the percentage of the working population's income that is take straight from paychecks and used to fund the program. We looked at rates of 12.4 (the current rate), 12.6, 12.8 and 13. These rate changes don't change the shape of the graph, but is able to push back the year it breaks significantly. This makes sense since it puts more money into the program in the short term, without having any sort of negative effect on the program.

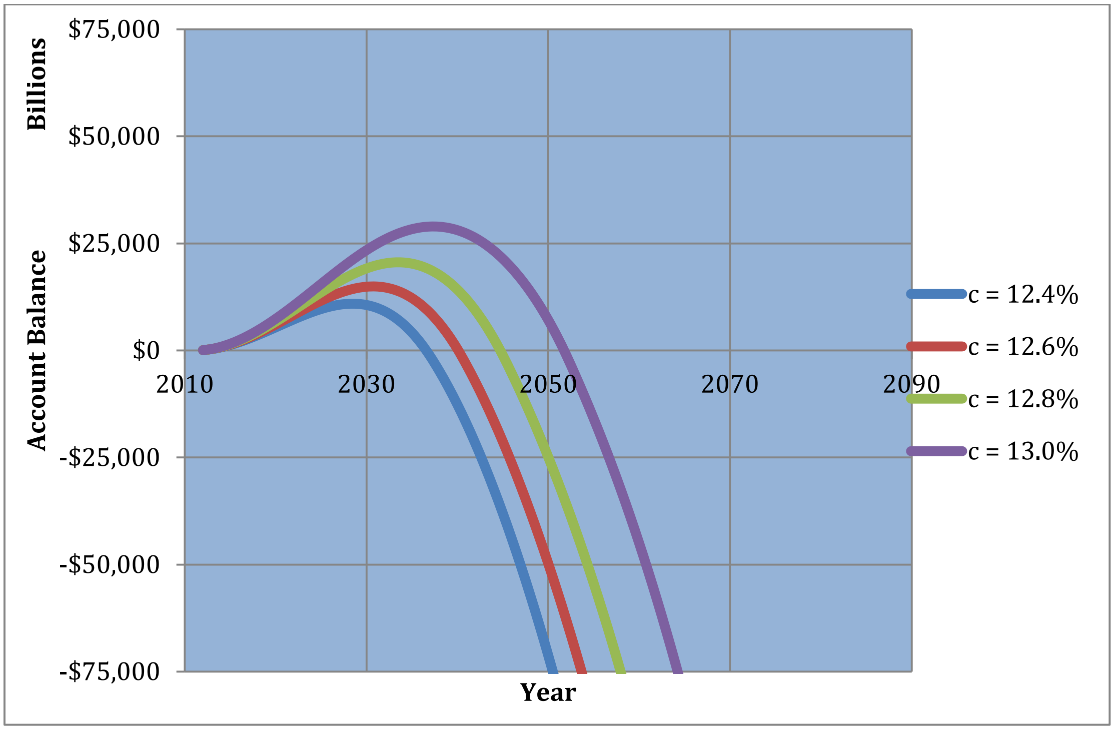

Figure 4 Graph of Trust Fund Balnce with multiple contribution rates

The next variable we adjusted was immigration. We looked at multipliers of 1.5, 2, and 3. All three of these rates prevent the model from breaking. This is because people that enter the US via immigration, as opposed to begin born there, start working immediately. This means that the social security program gets more income right away. This doesn't equate to an increase in payments to older citizens because far more working age people immigrate to the US than older people.

The last variable we adjusted was the interest rates used for years the program earns a surplus. We looked at the current rate, as well as rates of 5, and 7. No higher rates would be realistic. None of these rates change the shape of the graph much or change the year it breaks much.

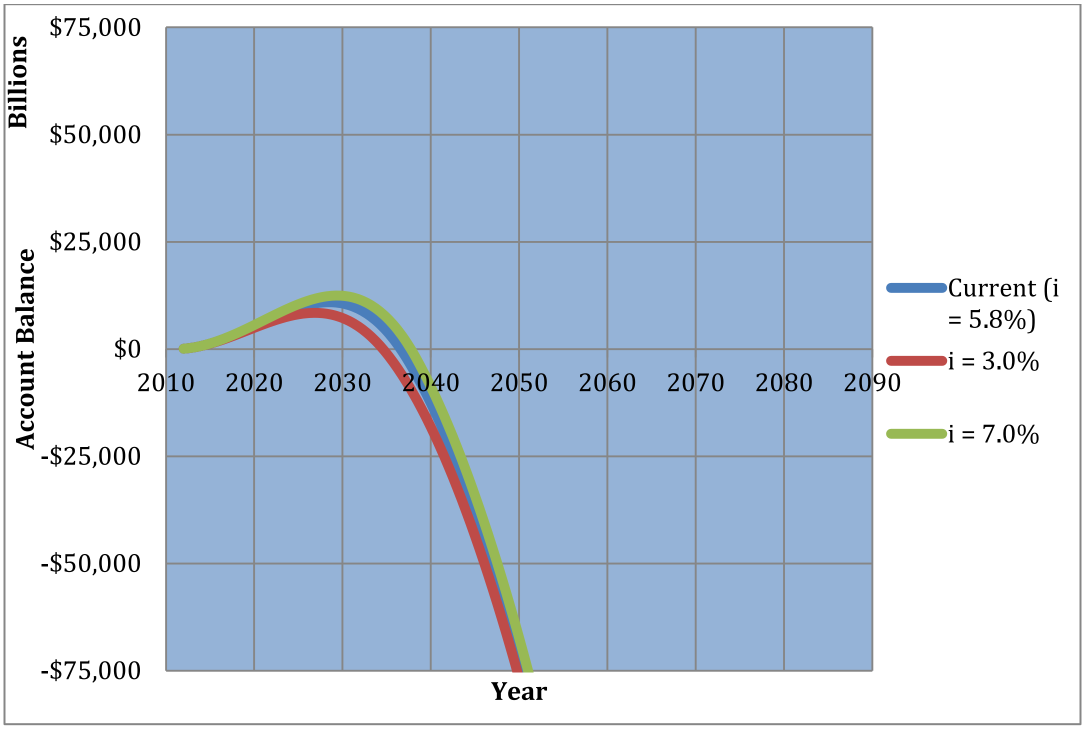

Figure 5 Graph of Trust Fund balnce with multiple interest rates

6. Conclusions and Recommendations

Manipulations to our model have produced a wide range of possible solutions to the Social Security Problem in the future. We have discussed a variety of possible modifications, including fertility rate, immigration rate, interest rate, retirement age, and contribution rate, as well as combinations of these factors. The project team chose to study these factors due to their publicity in the news as well as their likelihood of success in preventing the OASDI Fund's failure.

As the project team took a deeper look into the feasibility of enacting our proposed changes to the Social Security Act, we have discovered that a mathematical solution to the depleting balance will not necessarily be the same as a social solution to the problem.

While the National Legislation has previously enacted a gradual increase in the age in which retirees are able to collect benefit payments, other factors, such as raising the fertility rate, are a more complex social issue.

Although an increase in the U.S. population's fertility rate seems like the simplest solution to the increased number of retirees, this is a difficult modification to implement. The democratic government in the U.S. does not have to capabilities to increase the U.S. population's fertility rate. Legislation's best option to achieve increased birth rates would be following France's lead to offer government incentives to families with children. For example, the French government offer three-year paid parental leave with guaranteed job protection upon returning to the workforce; universal, full-time preschool starting at age three; subsidized daycare before age three; stipends for in-home nannies; and monthly childcare allowances that increase with the number of children per family.[20] However, when considering the economic crisis in Europe that has resulted from generous government social problems paired with the current economic hardship the United States is experiencing, the project team does not believe that this is a viable option. Additionally, increasing the number of births in the U.S. population will lead to secondary affects on the Social Security Program, which will not necessarily help sustain the program in the future. For instance, the current problem with the Social Security program is a direct result of the increased births that occurred during the baby boomer generation. Finally, as discussed previously, increasing the birth rate in 2012 will not provide a solution to the OASDI fund's depleting balance, since it will take between 18 and 22 years before new births will be able to work and contribute to the OASDI Trust Fund. The project team believes that an increase in the fertility rate in the United States is not a practical solution to legislate.

[20] http://www.medicalnewstoday.com/releases/52654.php

Since a key component to sustaining the Social Security welfare program is funding, increasing the immigration rate to the United States is option worth examining. As it stands in the today, the number of immigrants entering the United States is not large enough to adequately increase funding to the OASDI Trust Fund. However, with even a twenty percent increase in immigration into the U.S., employed immigrants' contributions would be sufficient to sustain the current Social Security Program. This is assuming that all immigrants entering the country would be old enough to begin working immediately upon entering the country, and that there would be sufficient jobs available for all new immigrants. In that respect, there would not be a delay before the OASDI account would see increased contributions, as there was when the project team examined increasing the fertility rate. In reality, the 2008 economic crisis has resulted in an unemployment rate of roughly 7.9% in the United States, which does not include an increased number of immigrants entering the workforce. Therefore, the project team believes that increasing immigration into the U.S. is not a likely solution to Social Security's situation.

After observing that the surplus in the OASDI account will be adequate in funding the Social Security Program for about 9 years post failure, the project team considered possible increases to the trust fund's interest rate that may help increase the account's surplus for future use. Currently, the surplus in the OASDI account grows at a rate of 5.8% annually, which is enough to sustain the Social Security Program until 2029. By modifying the interest rate to 7%, the project team found that the account would not reach a deficit until the year 2038. This is not a permanent solution to the problem, but it may be a viable option to pair with another long-term solution. That being said, it is not be reasonable to manually increase a trust fund's interest rate by 2%, which indicates that modifications to the interest rate will not be a government controlled solution. If the U.S. economy can bounce back from these hard economic times, it may be possible for the trust fund's interest rate to increase.

An example in conceivable but not achievable solution to today's depleting account balance is adjusting the retirement age were workers are eligible to collect benefit payments. In the original Social Security Act of 1935, it was stated that only aged persons 65 years of age and older were eligible for benefit payments.[21] According to the Social Security Administration, the life expectancy of U.S. workers in 1935 was 58 for men and 62 for women, which is lower than the eligible age to collect Social Security benefit payments. This suggests that this program was created in such a way that the majority of workers would work for their entire life, and not live long enough to collect benefits.[22] It follows that a simple solution to this problem would therefore be to increase the eligible retirement age to about 80 years old to match the structure of the original program. Nevertheless, increasing the retirement age by approximately fifteen years would cause a great deal of social unrest in today's society. Beginning in the 1980s the government enacted gradual, 2-month increases to the retirement age each year so that they would not create unrest among the American population. Therefore, a steep increase to a retirement age of 80 would leave Americans deeply upset and likely to protest the change. Additionally, it is speculative that this drastic increase in retirement age will cause many older workers to take jobs from the young college graduates, which would not help increase contributions to the OASDI fund either.

---

[21] http://www.socialsecurity.gov/history/35acti.html

[22] http://www.ssa.gov/history/lifeexpect.html

Since it is unrealistic that the retirement age will increase to 80 years old, the project team studied other more feasible increased retirement ages. As was discussed above, changing the retirement age to 70 years old was not enough to stop the account from running a deficit in the short term, although it did recover in the long term. From this, we concluded that increasing the eligible retirement rate has great potential but will not be enough to solve the problem on its own.

Increasing workers' contributions to the OASDI Trust Fund will result in a similar manor to increasing the retirement age. Since the contribution rate as been relatively stable for many years, it is likely Americans will strongly resist an increase in their contribution rates to the OASDI fund. That being said, our hypothetical modifications to the contribution rate were able to push back the date in which the account runs a negative balance, but were not able to permanently solve the problem. Once again, modifying the contribution rate will help solve Social Security's funding problem in the short term, but will not be enough to be the sole solution to the problem.

Based on our findings, the project team believes that combining modifications to two or more different factors will achieve the best solution to the social security balance problem. We believe that combining an increased retirement age of 70 years old with an increased contribution rate of 12.8% will produce an adequate increase in contributions. Our results show that combining these two factors will keep the balance just about 0 in the short-term, but in the long term will be more than adequate in sustaining a positive account balance. By the year 2080, these modifications may bring in excessive funding, at which point it is likely that the government will have to modify the program further.

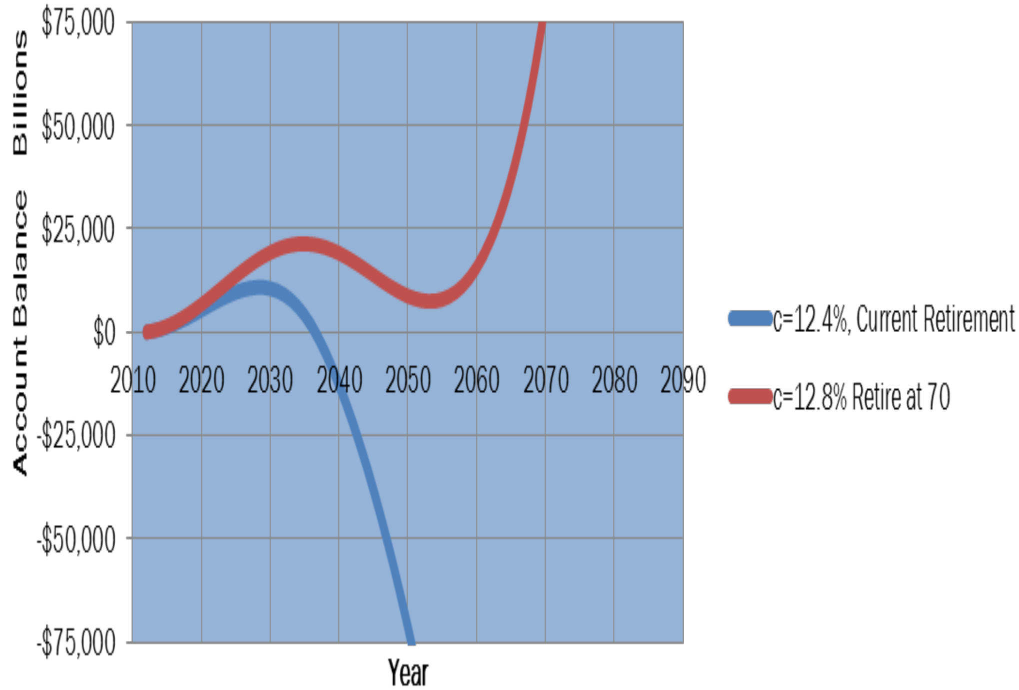

Figure 6 Graph of proposed solution to prevent exhaustion

In conclusion, the project team believes that modifications to the Social Security Program will be the only way to sustain its functionality in the future. After researching the effects of primary modification steps, the project team believes we have been able to recognize the top solutions. Nevertheless, it is important to note that our model does not account for secondary effects of modifying the Social Security program; such as the affect increasing the retirement age will have on the employment rate. Before authorizing any of our suggested modifications, or others to the Social Security Program, the project team suggests that further modeling should be conducted to account for secondary effects of changing the current system.

Works Cited

"Current Population Survey (CPS)." *US Census Bureau*. N.p., 2011. Web. Oct. 2012. <http://www.census.gov/hhes/www/cpstables/032011/perinc/new01_001.htm>.

Howden, Lindsay M., and Julie A. Meyer. "Age and Sex Composition 2010." *US Census Bureau*. N.p., May 2011. Web. Oct. 2012. <http://www.census.gov/prod/cen2010/briefs/c2010br-03.pdf>.

Martin, Barbara. "France's High Birth Rate Partly Due To Government Incentives." *Medical News Today*. MediLexicon, Intl., 27 Sep. 2006. Web. 15 Apr. 2013. http://www.medicalnewstoday.com/releases/52654.php.

"Origin of the Term 'Social Security'." *Social security bulletin* 1992: 63-. *ProQuest.* Web. 17 Apr. 2013 .

Purcell, Patrick. "Older Workers: Employment and Retirement Trends." *Congressional Research Service*. N.p., 16 Sept. 2009. Web. Oct. 2012. <http://aging.senate.gov/crs/pension34.pdf>.

"Social Security." *Actuarial Life Table*. N.p., 10 Apr. 2012. Web. Oct. 2012. <http://www.ssa.gov/oact/STATS/table4c6.html>.

"Social Security." *Benefit Amounts*. N.p., 16 Oct. 2012. Web. 25 Oct. 2012. <http://www.ssa.gov/oact/COLA/Benefits.html>.

"Social Security." *Benefit Formula Bend Points*. N.p., 16 Oct. 2012. Web. Oct. 2012. <http://www.ssa.gov/oact/COLA/bendpoints.html>.

"Social Security." *Early or Late Retirement*. N.p., 25 Nov. 2008. Web. Oct. 2012. <http://www.ssa.gov/oact/quickcalc/early_late.html>.

"Social Security." *Effect of Early or Delayed Retirement on Retirement Benefits*. N.p., 19 Aug. 2010. Web. Oct. 2012. <http://www.ssa.gov/oact/ProgData/ar_drc.html>.

"Social Security." *History*. N.p., 3 Jan. 2013. Web. Feb. 2013. <http://www.ssa.gov/history/35actpre.html>.

"Social Security." *Indexing Factors for Earnings*. N.p., 19 Feb. 2013. Web. Feb. 2013. <http://www.ssa.gov/oact/cola/awifactors.html>.

"Social Security." *Latest Cost-of-Living Adjustment*. N.p., 16 Oct. 2012. Web. Oct. 2012. <http://www.ssa.gov/oact/cola/latestCOLA.html>.

"Social Security." *National Average Wage Index*. N.p., 16 Oct. 2012. Web. Oct. 2012. <http://www.ssa.gov/oact/cola/AWI.html>.

"Social Security." *Normal Retirement Age (NRA)*. N.p., 12 Nov. 2009. Web. Oct. 2012. <http://www.ssa.gov/oact/ProgData/nra.html>.

"Social Security." *Primary Insurance Amount*. N.p., 16 Oct. 2012. Web. Feb.-Mar. 2013. <http://www.ssa.gov/oact/COLA/piaformula.html>.

"Table 80: Births, Birth Rates, and Fertility Rates by Race, Sex, and Age: 1980 to 2008." US Census Bureau, 1 Dec. 2010. Web. Oct. 2012. <http://www.census.gov/compendia/statab/2012/tables/12s0080.pdf>.

Tanner, Michael. "The Future of Social Security, In Us We Trust." *The Washington Post*. N.p., 22 Mar. 1998. Web. 1 Mar. 2013.

United States. Social Security Administration. *Social Security Administration*. By Chief Actuary of SSA. N.p., 2010. Web. Mar. 2013. <http://www.ssa.gov/policy/docs/ssb/v70n3/v70n3p111.html>.

Appendices

Appendix A

A.1

National average wage indexing series, 1951-2011

Year	Index	Year	Index	Year	Index
1951	2,799.16	1976	9,226.48	2001	32,921.92
1952	2,973.32	1977	9,779.44	2002	33,252.09
1953	3,139.44	1978	10,556.03	2003	34,064.95
1954	3,155.64	1979	11,479.46	2004	35,648.55
1955	3,301.44	1980	12,513.46	2005	36,952.94
1956	3,532.36	1981	13,773.10	2006	38,651.41
1957	3,641.72	1982	14,531.34	2007	40,405.48
1958	3,673.80	1983	15,239.24	2008	41,334.97
1959	3,855.80	1984	16,135.07	2009	40,711.61
1960	4,007.12	1985	16,822.51	2010	41,673.83
1961	4,086.76	1986	17,321.82	2011	42,979.61
1962	4,291.40	1987	18,426.51		
1963	4,396.64	1988	19,334.04		
1964	4,576.32	1989	20,099.55		
1965	4,658.72	1990	21,027.98		
1966	4,938.36	1991	21,811.60		
1967	5,213.44	1992	22,935.42		
1968	5,571.76	1993	23,132.67		
1969	5,893.76	1994	23,753.53		
1970	6,186.24	1995	24,705.66		
1971	6,497.08	1996	25,913.90		
1972	7,133.80	1997	27,426.00		
1973	7,580.16	1998	28,861.44		
1974	8,030.76	1999	30,469.84		
1975	8,630.92	2000	32,154.82		

A.2

Contribution and benefit bases, 1937-2013

Year	Amount	Year	Amount	Year	Amount
1937-50	$3,000	1986	$42,000	2006	$94,200
1951-54	3,600	1987	43,800	2007	97,500
1955-58	4,200	1988	45,000	2008	102,000
1959-65	4,800	1989	48,000	2009	106,800
1966-67	6,600	1990	51,300	2010	106,800
1968-71	7,800	1991	53,400	2011	106,800
1972	9,000	1992	55,500	2012	110,100
1973	10,800	1993	57,600	2013	113,700
1974	13,200	1994	60,600		
1975	14,100	1995	61,200		
1976	15,300	1996	62,700		
1977	16,500	1997	65,400		
1978	17,700	1998	68,400		
1979	22,900	1999	72,600		
1980	25,900	2000	76,200		
1981	29,700	2001	80,400		
1982	32,400	2002	84,900		
1983	35,700	2003	87,000		
1984	37,800	2004	87,900		
1985	39,600	2005	90,000		

A.3

Normal Retirement Age

Year of birth	Age
1937 and prior	65
1938	65 and 2 months
1939	65 and 4 months
1940	65 and 6 months
1941	65 and 8 months
1942	65 and 10 months
1943-54	66
1955	66 and 2 months
1956	66 and 4 months
1957	66 and 6 months
1958	66 and 8 months

1959	66 and 10 months
1960 and later	67

A.4

Benefit, as a percentage of Primary Insurance Amount (PIA), payable at ages 62-67 and age 70

Year of birth	Normal Retirement Age (NRA)	Credit for each year of delayed retirement after NRA (percent)	Benefit, as a percentage of PIA, beginning at age-						
			62	63	64	65	66	67	70
1924	65	3	80	86 2/3	93 1/3	100	103	106	115
1925-26	65	3 1/2	80	86 2/3	93 1/3	100	103 1/2	107	117 1/2
1927-28	65	4	80	86 2/3	93 1/3	100	104	108	120
1929-30	65	4 1/2	80	86 2/3	93 1/3	100	104 1/2	109	122 1/2
1931-32	65	5	80	86 2/3	93 1/3	100	105	110	125
1933-34	65	5 1/2	80	86 2/3	93 1/3	100	105 1/2	111	127 1/2
1935-36	65	6	80	86 2/3	93 1/3	100	106	112	130
1937	65	6 1/2	80	86 2/3	93 1/3	100	106 1/2	113	132 1/2
1938	65, 2 mo.	6 1/2	79 1/6	85 5/9	92 2/9	98 8/9	105 5/12	111 11/12	131 5/12
1939	65, 4 mo.	7	78 1/3	84 4/9	91 1/9	97 7/9	104 2/3	111 2/3	132 2/3
1940	65, 6 mo.	7	77 1/2	83 1/3	90	96 2/3	103 1/2	110 1/2	131 1/2
1941	65, 8 mo.	7 1/2	76 2/3	82 2/9	88 8/9	95 5/9	102 1/2	110	132 1/2
1942	65, 10 mo.	7 1/2	75 5/6	81 1/9	87 7/9	94 4/9	101 1/4	108 3/4	131 1/4
1943-54	66	8	75	80	86 2/3	93 1/3	100	108	132

1955	66, 2 mo.	8	74 1/6	79 1/6	85 5/9	92 2/9	98 8/9	106 2/3	130 2/3
1956	66, 4 mo.	8	73 1/3	78 1/3	84 4/9	91 1/9	97 7/9	105 1/3	129 1/3
1957	66, 6 mo.	8	72 1/2	77 1/2	83 1/3	90	96 2/3	104	128
1958	66, 8 mo.	8	71 2/3	76 2/3	82 2/9	88 8/9	95 5/9	102 2/3	126 2/3
1959	66, 10 mo.	8	70 5/6	75 5/6	81 1/9	87 7/9	94 4/9	101 1/3	125 1/3
1960 and later	67	8	70	75	80	86 2/3	93 1/3	100	124

Appendix B

This section contains notes for each tab used in the model.

MortalityFertility

Mortality rates from http://www.ssa.gov/oact/STATS/table4c6.html
Fertility rates from http://www.census.gov/compendia/statab/2012/tables/12s0080.pdf
Age range population data from http://www.census.gov/prod/cen2010/briefs/c2010br-03.pdf (page 4)

Function: Data for population was given by age ranges so to smooth out population data instead of using uniformly distributing population, the survival rate was used to calculate more accurate numbers. The What-If function in Excel was used so that the population for ages 0 to 4 totaled to the population data found. The What-If function found the number of newborns needed so that a number die off by the survival rate and the total adds up to the data.

References: None.

Mortality

Mortality rates are taken from http://www.ssa.gov/oact/STATS/table4c6.html

Function: The top row allows changes to be made to see how different mortality rates can change the data. For example, with growing technology the mortality rate has been reduced over the years so that people are living much longer. The longer people are alive, the more benefits they collect.

References: None.

Fertility

Fertility rate data are taken from
http://www.census.gov/compendia/statab/2012/tables/12s0080.pdf

Function: This page also allows the rates to be changed by the number inputted at the top to see how changing fertility rates affect the data. For example, the birth rate has been slowing down over the years, which means that more people are retiring than new people entering the work force.

References: None.

New Lives

Function: Uses Column J from MortalityFertility in Column B of New Lives. This is the smoothed population over each age range after the survival rate is applied. Cell D4 takes a SUMPRODUCT of FertilityB2:B124 and NewLivesC2:C124. This applies the fertility at each age to the population at each age to find out how many babies will be born the following year.
The rest of column D applies the mortality rate to the population from the previous year to determine how many people survived to the next year. Then it adds immigrants at each age. The process in Column D is continued for the rest of the columns.

References: MortalityFertility, Mortality.

NewWorkLives

Function: This sheet takes the Employment rates from the sheet “Employment” and multiples them against the number of living people in sheet “new lives”. This sheet keeps track of the ages of our working population through the future.

References: New Lives, Employment.

RetiredLives

Function: This sheet takes retirement rates from “smorgasbord” and applies them to the current population. This keeps track of the retired population through the rest of their lives.

References: New Lives, Smorgasbord.

Retirement Rate

Function: This sheet has the historical number of retired people from ages 62 to 120 from years 2008 to 2012. This sheet also contains the average collected benefit at each age as well as the ratio of retired people for every age (i.e. retired people at age 63 divided by number of retired people at age62).

References: None.

Benefit2 Experiments

Function: Projection of the total number of benefits collected at each age and year starting at 2012. The diagonal tracks where the two different methods of benefit amount are calculated. The values in the first column are the present data, and up to the diagonal is just a linear interpolation of values up to the values in the diagonal. The values on and past the diagonal uses a recursive formula to sum the aggregate benefit amount, adjusted for reduction/credit and COLA, from different age groups within a single year.

References: Retirement Rate, Benefit, PIAadjust (ranges: benadj, bthyr, indexyr), WageIndex+Base+COLA (range: COLA).

PIAadjust

Data are from http://www.ssa.gov/oact/ProgData/ar_drc.html and http://www.ssa.gov/oact/quickcalc/early_late.html#calculator
Function: This is a table of actuarial reduction/delayed retirement credit.

References: None.

Benefit

Data is from http://www.ssa.gov/oact/cola/Benefits.html and http://www.ssa.gov/oact/ProgData/ar_drc.html.

Function: First displays the 35 highest values in column of IndexLifetimeEarn, representing the 35 highest indexed-earning years for a person who retired at age 65 in year y. The values are sumed, then divided by number of months with earning which respresents AIME. The First Bend and Second Bend points are calculated based on given formula. Then PIA is calculating by summing 15% of earning up to first bend, 32% between two bend points, and 90% above 2nd bend. PIA is multiplied by 12 to get the annual benefit amount collected by an individual who retires in year x in his first benefit year.

References: IndexLifetimeEarn.

R62-R70

Function: These sheets contain populations of people who retired at age 62 to 70.

References: New Lives, Smorgasbord, Mortality (ranges: mort, mrtage, mrtyr).

Contribution

Disability insurance data from http://www.nasi.org/learn/socialsecurity/disability-insurance

Payroll tax data from http://ssa-custhelp.ssa.gov/app/answers/detail/a_id/240/~/social-security-and-medicare-tax-rates%3B-maximum-taxable-earnings

Function: This sheet calculates the average taxes a person at a certain age will pay toward Social Security. For a given year, this takes a tax rate of 12.4%, combined from employers and employees, minus the 1.8% that goes toward disability insurance and multiplies this number by the income of a person at a certain age. The income is the lower of the income in IncomeDistr for that year and age and the wage base in WageIndex+Base+Cola, since incomes are taxed up until that base.

References: IncomeDistr, WageIndex+Base+Cola.

AggregatedCont

Function: This takes the number of people working at a certain age and multiplies that number by the amount that those people are contributing.

References: NewWorkLives, Contribution.

WageIndex+Base+Cola

Data is from http://www.ssa.gov/oact/cola/AWI.html,http://www.ssa.gov/oact/cola/cbb.html, http://www.ssa.gov/oact/cola/cbbdet.html, and http://www.ssa.gov/oact/cola/colaseries.html.

Function: This sheet is a prediction of future wage indexes, wage bases, and COLAs.

References: Inflation.

IndexFactor

Data is from http://www.ssa.gov/oact/cola/awifactors.html.

Function: The index determined in for individual reaching age 62 in year x for earning in year x+y is the ratio of the wage level in year x-2 and the wage level in year x+y.

References: WageIndex+Base+COLA.

IncomeDistr

Function: The average income of a person for ages 18 to 64 for each year.

References: WageIndex+Base+COLA.

LifetimeEarn

Function: This sheet rearranges the data from IncomeDistr. It tracks an individual's average income across his lifetime.

References: IncomeDistr.

IndexLifetimeEarn
Function: This applies the index factors to the LifetimeEarn data.
References: Index Factor, LifetimeEarn.

Benvs.con
Function: This sheet measures the total number of contributions yearly as well as the benefits paid out each year. When the difference between the two is negative, the program will end.

References: Variable Rates, Benefit2 Experiments.

Mess with Seniors
Function: Experimental sheet with proposed solutions, such as increasing retirement age to 70 and higher fertility rates.

References: None.

Variable Rates
Function: This sheet is for adjusting the inflation, wage increases, interest, and retirement rate at any given year.

References: None.

Employment
Function: This sheet has the employment rate for any age at a given year and can be adjusted to account for changing employment rates.

References: None.

Smorgasbord
Data are from http://aging.senate.gov/crs/pension34.pdf, http://www.census.gov/hhes/www/income/data/historical/people/, and http://www.dhs.gov/sites/default/files/publications/immigration-statistics/yearbook/2011/ois_yb_2011.pdf.

Function: This sheet is a collection of miscellaneous data such as the percentage of 62-64, 65-69, and 75+ year-olds who are working and the percentages collecting benefits. There is also data on how wages change annually for age groups from 15 to 75+. This sheet also contains data on the number of immigrants in 2011 for age ranges from 0 to 75+.

References: None.