University of
Michigan Retirement Research Center

Chances are...Stochastic Forecasts of the Social Security Trust Fund and Attempts to Save it

Michael Anderson,
Shripad Tuljapurkar, and
Ronald Lee

IB 2001-008

Issues in Brief

Executive Summary

No government benefit program promises to impact the wallets of taxpayers and retirees more than Social Security. Declining mortality and the past baby boom have conspired to create an abundance of workers now on the verge of retirement with fewer workers left to support them. Because Social Security is essentially a pay-as-you-go system, there is little disagreement that this will result in a shortfall in the trust fund, or insolvency. At issue is when insolvency will occur and who will pay for it. Holding constant current policy, the question of when the shortfall will occur depends more on future economic and demographic outcomes. Who will pay depends on which of several available policy options are exercised.

In this *Issue in Brief*, we summarize a forecasting methodology that allows us to evaluate three such options for achieving long-term solvency of the trust fund: raising the normal retirement (NRA), increasing taxes, and investing some portion of the fund in the stock market. We note that we do not consider the possibility of creating additional federal debt as a means of fixing the problem. Nor do we address the issue of how the federal government will meet the bond obligations presently held by the SSA, which will be required for benefits starting in 2020.

The Problem

Knowing what to do to prevent insolvency is largely a problem of uncertainty in forecasting the future. In the system of accounting utilized by the federal government to keep things in balance, there are 4 major sources of uncertainty. The first is demographic. Since we cannot know future mortality, fertility, and immigration rates, it is impossible to know future population distributions exactly. The second, economic uncertainty derives from the fact that real wage growth and interest rates vary substantially from year to year. These Btwo factors are key to deter-

mining future taxation and benefits for Social Security. Third, the behavior of workers must be predicted with reasonable accuracy, in particular labor force participation. Last, it is difficult to predict broad economic structural changes that may occur, such as major technological innovations and the globalization of trade—changes that may affect economic factors listed above. In the methodology we describe below, we build a model the first three sources of uncertainty (treating immigration and some behavioral patterns as deterministic) in order to evaluate the potential effects of various policy levers on the problem of insolvency.

The Model

The basic model we start with is a stochastic model of demographic change developed in our previous work (put in best ref). This method of forecasting uses historical trends to model future economic and demographic outcomes. Because of this, we obtain less *precise* but more *accurate* estimates of potential insolvency. That is, the range of our estimates is wider but more realistic since it is based on history.

For a given starting point, the model generates a large number (about 1000) of alternative future trajectories. If we use the size of the population in the year 2022 as an example of an outcome we are interested in predicting, these trajectories would give us a probability distribution of population values in that year. From this distribution, we are able to obtain statistical descriptors such as a range, probabilities, means, and standard deviations. Population values at the minimum and maximum ends of the range would have the smallest chances of occurring while those toward the middle would be more likely to occur. In the experiments we report on here, our outcome of interest is insolvency of the trust fund expressed as the percent chance (the probability) that insolvency will occur in a given year. The program is launched from initial conditions in 1997 (any date could be chosen) and is calibrated to the current tax and benefit levels reported by the Social Security Administration, using their population projections. The model is run in 1-year steps over the forecast horizon.

Summary of Major Findings

Using the Model to Forecast Insolvency

Starting with the trust fund balance in 1997, we use the model to forecast the probability of insolvency over a 100-year horizon. We use current policy in this baseline model: the tax rate is held constant at 12.4 percent, the NRA is raised to 66 and 67 starting in 2000 and 2017, and there is no investment in equities. Taking into account future mortality, fertility, real wage growth, interest rates etc, we find that the median year of insolvency is 2032 meaning that there is a 50 percent chance that the fund will last beyond 2032. This finding is in accord with the Social Security Administration's estimate. There is a 3.8 percent chance that the fund will reach insolvency by 2022 and a 90.7 percent chance that it will be exhausted by 2047. In the following experiments we test the effects of the three policy measures separately and then in combination

Increasing the Social Security Payroll Tax

We evaluated four different hypothetical tax increases that would be levied immediately. The current Social Security payroll tax rate is 12.4%. An immediate increase to 13.4% would extend the median date of insolvency to 2044. An increase to 14.4% would extend that date to 2064, and 15.4% to 2095.

Increasing the Normal Retirement Age (NRA)

Presently, the NRA is scheduled to increase by two months of age per year for six years starting in 2000 (raising to 66 by 2005), and again starting in 2017 (raising to 67 by 2022). Using the same six-year phase-in

period, we evaluated the impact of four different hypothetical schedules. The first two scenarios use the current rate of increase (two months per year), but the first scenario reaches the increase sooner and the second achieves an NRA of 70 by the end.

- Scenario One: increase NRA to 66 by 2005, and again to 67 by 2012;
- Scenario Two: to 66 by 2005, to 67 by 2012, to 68 by 2019, to 69 by 2026, and again to 70 by 2033
- In the next two scenarios we accelerated the rate of increase to 4 months of age per year so that only three years would be required to achieve an increase in NRA of one year. In the third scenario we evaluate an increase to 70 and in the fourth to age 71.
- Scenario 3: to 66 by 2002, to 67 by 2006, to 68 by 2010, to 69 by 2014, to 70 by 2018.
- Scenario 4: Same as scenario 3 with an additional increase to 71 by 2022.

Under the first scenario, the median year of insolvency is increased by only one year. The second scenario results in an increase to 2036 for the median year of insolvency.

The next two scenarios result in more dramatic changes. Scenario 3 would extend the median year of insolvency to 2044. The final scenario would achieve the goal of long-term insolvency. Raising the NRA to 71 on an accelerated schedule would shift the median year of insolvency out 100 years. The chance of insolvency by 2047 is only 27%.

Investing a Portion of the Trust Fund in the Stock Market

Returning the tax rate and NRA to current policy levels, we evaluated the impact of various levels of investment in the stock market. In this experiment, we invested 1% of the total fund balance in the stock market starting in 2000 and increase this percentage linearly over a 15-year period until the total invested is 10, 20, 30, or 40 percent. A 10 percent level of investment has a small effect and gives only one additional year to the median year of insolvency, and even a 40 percent level of investment only increases the median to 2035.

Combining Policy Options

We next tested the three possible pairs of combinations: tax and NRA increases, NRA increases and investment, and tax increases and investment and then all three simultaneously. We tested a large number of combinations of the various levels of increases and investment. We find evidence that the measures in combination would act synergistically, requiring less drastic action on any one. Combining an immediate tax increase of 1 percent, an increase in the NRA to 68 by 2020, and a 40% level of investment of the fund in the stock market would extend the median years of insolvency to 2072.

Conclusion

This study considered the impact of three major policy options for affecting the future insolvency of the Social Security Trust Fund both separately and in combination: taxation, changes to the normal retirement age, and investment of a portion of the trust fund in the stock market. When we consider each option separately, fairly dramatic measures are required to substantially extend the date of insolvency with a reasonable measure of certainty.

For example, an immediate tax increase to 14.8% would be required

to extend the fund beyond 2070. The NRA would have to be raised to 71 by 2022 to achieve a high chance of long-term solvency. And equities investment alone will not postpone insolvency more than a few years. A more effective alternative would incorporate some combination. Indeed, we find that a modest increase in the payroll tax and the NRA combined with a moderate level of investment in the stock market achieves the goal of long-term insolvency. Moreover, we find that investment in the stock market in no case leads to an increased probability of insolvency. Thus while it is not free of risk, it does nothing to worsen the situation but does act synergistically with moderate increases in the payroll tax and the NRA to substantially delay insolvency.

Michael Anderson is a Research Demographer at Mountain View Research (MVR), Los Altos, CA 94024 (mike@mvr.org)

Shripad Tuljapurkar is Morrison Professor of Population Studies and Professor of Biological Sciences at Stanford University Stanford CA 94035 (Tulja@stanford.edu).

Ronald D. Lee is a Professor of Demography and Economics at the University of California at Berkeley, Berkeley, CA 94720-2120 (rlee@demog.berkeley.edu)