

OASDI Solvency Estimation using the PSG Models

Martin R. Holmer, Policy Simulation Group

November 10, 2006

Highlights

1. The Policy Simulation Group (PSG) offers three computer simulation models that together produce aggregate financial estimates and individual distributional estimates for both the government social security system and the employer-sponsored pension system in the United States.
2. **SSASIM** is a cell-based actuarial (CBA) model of social security trust-fund solvency plus an simulator of social security benefits, taxes, and money's worth statistics for a handful of exemplary cohort individuals (ECI). Both the CBA-mode and ECI-mode models can be driven by either deterministic or stochastic projections of key macrodemographic and macroeconomic assumptions, as in the annual OASDI Trustees Report.
3. **PENSIM** is a microsimulation model of employer-sponsored pension (ESP) benefit accumulation and withdrawal behavior that is driven by the macro projections generated by SSASIM and produces estimates for a sample of individuals born in a specified year.
4. **GEMINI** is a microsimulation model that simulates social security benefits, taxes, and money's worth statistics for a representative cohort sample (RCS) generated by PENSIM. The GEMINI microsimulation results for many overlapping cohorts (OLC) can be aggregated by SSASIM into social security trust-fund solvency estimates.

More information is available at <http://www.polsim.com>.

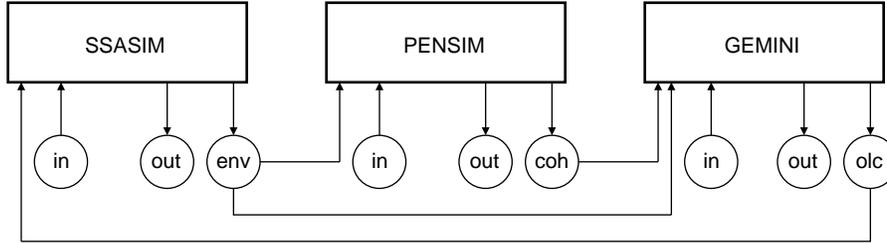


Figure 1: *Links between PSG Models.* The inputs and outputs of each model are represented by circles below the model. The *in* circle represents the input database, the *out* circle represents the output results files, the *env* circle represents the binary environment file, the *coh* circle represents the binary cohort file, and the *olc* circle represents the binary overlapping cohorts file.

Cell-Based Actuarial (CBA) Mode. This mode of SSASIM operation produces trust-fund solvency estimates using actuarial methods that represent the population as a collection of aggregate age-gender cells. These methods are similar to those used to produce estimates shown in the annual OASDI Trustees Report. While the average impact on each cell is easy to determine for reforms that have proportional effects across individuals, things are more difficult for reforms that have non-proportional effects across individuals. As with the Trustees Report model, estimating the effects of reforms that non-proportional effects requires use of a supplementary sample of individuals to estimate the average impact on each cell. A suitable supplementary sample, the Benefits and Earnings Public-Use File, is available from the Social Security Administration (SSA) Office of Policy website (<http://www.ssa.gov/policy/>).

The CBA mode of operation requires only SSASIM. SSASIM does not require an *olc* file as input and does not produce an *env* file as output.

Single-scenario, deterministic-assumption CBA-mode runs execute almost instantaneously on any Windows computer. CBA-mode runs with stochastic assumptions take somewhat longer. On an AMD Opteron 280 chip running at 2.4 MHz, it takes about 0.3 minutes to execute a CBA-mode run that assumes current-law policy and uses 500 stochastic scenarios of eighty-five years length.

Overlapping Cohorts (OLC) Mode. This mode of SSASIM operation produces trust-fund solvency results using microsimulation methods that represent the population as a sample of individuals born in many years. These methods are similar to those used by CBO to produce social security estimates using the CBOLT model. The solvency statistics produced in the OLC mode are the same as those produced in the CBA mode. But the use of microsimulation methods eliminates the need for the supplementary sample required by the CBA mode to analyze reforms that have non-proportional effects on the population. The size of the the cohort samples used in the OLC mode are specified by the model user.

The OLC mode of operation requires SSASIM, PENSIM, and GEMINI. SSASIM requires an `olc` file as input for each cohort born from 1935 through the last year of the solvency simulation. SSASIM gets these `olc` files by asking GEMINI to produce one for each cohort. GEMINI does this by asking PENSIM for a `coh` file for each cohort simulated assuming no employer-sponsored pensions. And PENSIM does this by asking SSASIM for an `env` file. An OLC-mode run with a seventy-five year solvency test period using 2006 Trustees Report assumptions requires 148 cohorts (1935–2082) to be simulated by PENSIM and GEMINI. Social security benefits for cohorts born before 1935 are supplied by the CBA mode.

In order to accelerate the execution of an OLC-mode run, SSASIM can request more than one cohort simulation at a time. This multi-threading logic can take advantage of multiple chip computers and multiple core chips. Using a computer with two dual-core Opteron 280 chips running at 2.4 MHz, a single-scenario OLC-mode run with 148 cohorts executes in about 2.5 minutes, when it uses a cohort sample size of 0.1 percent (*i.e.*, one-in-a-thousand sampling) and assumes current-law social security policy and no pensions. This means that the corresponding stochastic OLC-mode run with 500 scenarios takes almost 21 hours to execute, but that execution time will be cut roughly in half when quad-core Opteron chips become available sometime in 2007.

Pros

1. *Ensures logical consistency of trust-fund income and cost estimates* by using the same individual earnings history to estimate an individual's payroll tax during working years and an individual's benefit during retirement years.
2. *Ensures logical consistency of solvency and distributional estimates* by using the same methods and samples to generate both types of estimates.
3. *Allows inclusion of behavioral responses to policy* by providing an easy way to represent individual behavior at the micro level in model logic.

Cons

1. *Requires more computer time to execute runs* creating situations in which microsimulation models that are not designed with computational efficiency in mind may not be practical policy analysis tools simply because they take too long to execute runs.
2. *Produces solvency estimates that may differ from established estimates* creating awkward situations for those wanting capability of replicating Trustees Report results.