OASDI Distributional Estimation using the PSG Models

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March 13, 2007

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⟩.

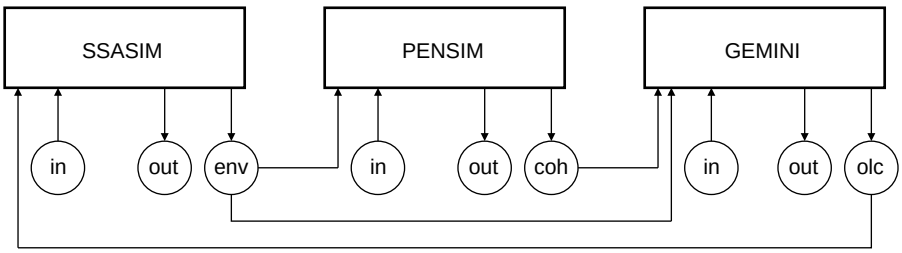

Figure 1: ***Links between PSG Models***. *The inputs and outputs of each model are represented by circles below the model. The in circle represents the input database, the out circle represents the output results files, the env circle represents the binary environment file, the coh circle represents the binary cohort file, and the olc circle represents the binary overlapping cohorts file, which is used by the macro model but not by the micro model.*

Exemplary-Cohort-Individuals (ECI) Mode. This mode of SSASIM operation produces estimates of social security taxes, benefits, and money's worth statistics for as many as nine men and nine women who are born in the same year and whose life histories have been specified. A typical use of the ECI mode is to produce estimates under current-law and reform policies for the OCACT scaled workers.

A wide range of statistics is automatically available in the output results file for each exemplary individual and couple. The statistics include lifetime present values of OASI and DI taxes and benefits (and account contributions and withdrawals, if the policy regime specifies accounts), internal rates of return, average real benefit levels, replacement rate (calculated in different ways), low-benefit avoidance rate (where low-benefit threshold can be set by model user), etc.

The ECI 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 ECI-mode runs execute almost instantaneously on any Windows computer. ECI-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 an ECI-mode run that assumes current-law policy and uses 500 stochastic scenarios of eighty-five years length.

Representative-Cohort-Sample (RCS) Mode. This mode of SSASIM operation produces distributional results using microsimulation methods to generate a synthetic sample of individuals born in any specified year beginning with 1935. The cohort sample and all associated spouses, who may be younger or older than the sample individuals, are simulated from birth to death. The size of the simulated cohort sample may be specified by the model user.

In addition to the range of lifetime money's worth statistics produced for the ECI-mode individuals, there is a benefit adequacy file that contains marital status and the OASDI benefit type and amount received at each age for each sample individual. The benefit amount is reported for the individual alone and as a couple total. In addition, to the OASDI benefits reported by age, an RCS-mode run can optionally include estimates by age of employer-sponsored pension benefits produced by PENSIM.

RCS-mode output is often converted to a cross-section sample of cohort individuals at a specified age in retirement. If there is a need for a multiple-age cross-section sample for some year in the future, many cohort cross-section samples can be combined into one.

The RCS mode of operation requires SSASIM, PENSIM, and GEMINI. In this mode, GEMINI does not produce an olc file because no solvency estimates are being produced. An RCS-mode run can use either a single-scenario deterministic environment or a multiple-scenario stochastic environment generated by SSASIM.

Executing a single-scenario RCS-run that simulates a two percent sample of the 1990 birth cohort on a computer with an AMD Opteron 280 chip running at 2.4 MHz takes about 2.2 minutes when simulating current-law OASDI policy and when not simulating employer-sponsored pensions in PENSIM. This two percent sample contains 104,384 sample individuals, and more than that many spouses who are not included in the cohort sample, but whose life histories may influence the OASDI benefits of sample individuals. Among these sample individuals, 90,708 are living residents at age 65. The GEMINI output files for this RCS-mode run are large: the lifetime summary statistics file is about 23 megabytes and the age-specific benefit file is about 139 megabytes.

In order to accelerate the execution of multiple RCS-mode runs, SSASIM can execute more than one RCS-mode run 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 chips, four RCS-mode runs can be executed in the same time as one.

Every model has its own distinctive set of strengths and weaknesses in producing distributional estimates. Here is a partial list for the PSG models.

Pros

1. *Ensures logical consistency of distributional and solvency estimates* by using the same methods and samples to generate both types of estimates.

2. *Flexibility of cohort sample size* permits use of large samples to study reform effects on small population subgroups or to study a particular reform provision that has a narrow, but policy relevant, impact.

3. *Ability to include employer-sponsored pension benefits* permits study of distribution of the two largest components of retirement income and investigation of how OASDI reforms affect benefits from integrated pension plans.

4. *Ability use simple run specification language* eliminates need to deal directly with the PSG models' input databases, and eliminates the need to reprogram the models in order to specify a change in assumption or policy.

Cons

1. *Does not now produce estimates of SSI benefits* restricting ability to analyze the distribution of total retirement income at the low end of the income distribution, or how OASDI reforms might induce changes in SSI benefits.

2. *Does not now produce estimates of private wealth accumulation* restricting ability to analyze the distribution of total retirement income at the high end of the income distribution.

3. *Does not now produce estimates of income tax liabilities* restricting ability to analyze after-tax retirement income.

4. *Does not now produce estimates of medical expenses* restricting ability to analyze an important determinant of the need for retirement income.