



Social Security Advisory Board
Technical Panel on
Assumptions and Methods

Actuarial Metrics

November 5, 2010

Trustee Report Actuarial Metrics

- Short-range Estimates
 - Trust fund ratios
- Long-range Estimates
 - Annual cash flow measures
 - Trust fund ratios
 - Summary measures
 - Actuarial balances
 - Unfunded obligations

Other Actuarial Metrics

- Modern Actuarial Theory and Practice
- Actuarial Standard of Practice No. 32
- Financial Accounting Standards Advisory Board
- International Actuarial Association
- Congressional Budget Office
- A Fresh Look at Policy Alternatives
- Canada Pension Plan Actuarial Report

Trust Fund Ratios

- Assets at beginning of year (BOY) expressed as a percent of Cost during the year
- Assets do not include advance tax transfers
- Cost includes benefit payments “scheduled” under the current law
- Ratios used for both short- and long-range estimates

Trust Fund Ratio - Short-range Test

- Ratio of 100% is considered reasonable “contingency reserve”
- Financial adequacy test applies to OASI and DI separately and combined
 - If ratio greater than or equal to 100% at beginning of projection period, then must remain above 100% for 10-year projection period
 - If ratio less than 100% at beginning of projection period, then must reach 100% within five years (without first reaching zero) and stay there for remainder of 10-year projection period

Trust Fund Ratio - Long-range test

- Trust fund ratios are indicators of adequacy of financial resources at any point in time
- Trust fund ratio of zero indicates exhaustion of trust fund implying insufficient assets to pay all scheduled benefits
- Year of exhaustion and stability during, and trend at end of, period are important in assessing actuarial status
 - For example
 - Near-term exhaustion indicates the need for action sooner
 - If ratio is positive during the projection period and level or increasing toward end of period, then projected adequacy is likely to continue

Other Long-range Estimates

- Projected annual balances, defined as difference between
 - Annual income rate
 - and
 - Annual cost rate
- Actuarial balance
- Unfunded obligations

Annual Income Rate

- Sum of
 - Income from payroll taxes
 - Taxation of benefits for the year

Expressed as a percent of

- OASDI taxable payroll for the year

Annual Cost Rate

- Sum of
 - Scheduled benefit payments for the year
 - Administrative expenses for the year
 - Net transfers to Railroad Retirement plans for the year
 - Payment of vocational rehabilitation services for disabled participants for the year

Expressed as a percent of

- OASDI taxable payroll for the year

Balance for the Year

- Income rate minus cost rate (or net cash flow rate)
- Similar to trust fund ratios, particular attention is paid to level and trend of the annual balances at the end of the long-range period

Summarized Income Rate

- Ratio of
 - The sum of present value of scheduled tax income for the period
 - to
 - The sum of present value of taxable payroll for the period
- For assessing adequacy, income is adjusted to include the present value of the trust assets at beginning of period

Summarized Cost Rate

- Ratio of
 - The sum of present value of cost for the period
to
 - The sum of present value of taxable payroll for the period
- For assessing adequacy, cost is adjusted to include the present value of the targeted ending trust fund level

Actuarial Balance

- Difference between
 - Summarized Income Rate
and
 - Summarized Cost Rate

Actuarial Balance

- Actuarial balances for 25-year, 50-year and 75-year periods are developed
 - Useful in analyzing financing adequacy over varying periods

Long-range Close Actuarial Balance

- 66 separate valuation periods
 - First 10-year period
 - First 11-year period
 - First 12-year period
 - Etc. through full 75-year projection period
- Test is met if Actuarial Balance is
 - Not less than zero or
 - If negative by no more than specified percent of summarized cost rate for same time period (maximum of 5% at end of 75-year period)

Open Group Unfunded Obligations

- Includes taxes and cost for past, current and future participants
- Projected for 75-year period and infinite horizon
- Equal to
 - Present value of future cost minus
 - Present value of future taxes minus
 - Trust fund at beginning of period
 - Expressed in dollars, as percent of taxable payroll, and as percent of GDP

Unfunded Obligations

- Infinite horizon results disaggregated into components for past, current & future participants
 - Important for understanding intergenerational equity
- “Closed Group” unfunded obligation only includes individuals age 15 and older during first year of projection period

Modern Actuarial Theory and Practice

- Textbook Equation of Pay-As-You-Go Principle
- Dependency Ratio for any period
 - $c \times \text{Number of active members} = b \times \text{Number of pensioners}$
 - Where c = contribution per active member in units and b = annual pension in units
 - Hence, $c = b \times (\text{number of pensioners} / \text{number of active members})$

Modern Actuarial Theory and Practice (continued)

- Equation works in a stable population, problems if dependency ratio is increasing
- Viability of plan depends on:
 - Whether benefit outgo will increase or decrease relative to contribution income
 - Whether and how much it is possible to increase contributions

Actuarial Standards of Practice

No. 32 (ASOP 32)

- Consider mechanism for setting level of income
- If statutory, meaning income and benefit levels set by law and changed through legislative action
 - Establish a test for financial adequacy
 - May be based on criteria such as:
 - Required trust fund levels under best estimate assumptions
 - Positive trust fund levels under pessimistic assumptions
 - Sufficiently low probability of ruin or an acceptable range of possible outcomes under a stochastic model
 - Apply test to both short- and long-range period
 - Note significant differences between income and cost toward end of valuation period

Financial Accounting Standards Advisory Board (FASAB)

- Focus on Closed Group Metric
- Management Discussion and Analysis
- Table of Key Measures
 - Net Costs – Costs minus taxes and other revenue
 - Net Position – Assets net of liabilities
 - Social Insurance Commitments – Net present value (NPV) of future cash flows for current participants (closed group) at end of fiscal year minus NPV of future cash flows for current participants at beginning of fiscal year
 - Unified Budget Deficit
 - Fiscal Gap

Financial Accounting Standards Advisory Board (FASAB) (continued)

- Pro-Forma Balance Sheet
- Pro-Forma Statement of Social Insurance
- Pro-Forma Statement of Changes in Social Insurance Amounts
- Required Disclosure
- Required Supplementary Information other than MD&A

International Actuarial Association

- Focus on gap between expected asset-income and liability-outgo cash flows over various future periods
- Benchmark to determine if too low or too high
- Sample useful metric – Lifetime net benefit rate
 - Present value of net lifetime social security benefits aggregated for all members of a birth cohort,
 - Equal to value of cohort benefits minus value of corresponding revenues (contributions or taxes and investment income) / cohort lifetime payroll

International Actuarial Association

(continued)

- Look at deviation from zero base
- Measures extent to which each generation is funding its own scheduled benefit entitlements
- Where possible, stochastic projections would be preferable

Congressional Budget Office

- Tax Revenues as a percentage of gross domestic product (GDP)
- Outlays as a percentage of GDP
- Shade an area around each line indicating 80% range of uncertainty in 500 simulations
- Percentage of 500 simulations where outlay exceeded revenue by specified percentages
- Summarized outlay – present value of outlay (including additional final year outlay to include a cushion) divided by present value of GDP
- Summarized revenue – present value of revenue (including trust fund balance) divided by present value of GDP

Congressional Budget Office

(continued)

- Trust Fund Ratios
 - Probability that trust funds will be exhausted by a given year
- Distribution of Taxes and Benefits by 10-year cohorts
 - First-Year Social Security Benefits in current year dollars (net of income taxes) assuming age 65 claiming age
 - Median First-Year Replacement Rates
 - Median Present Value of Lifetime Social Security Benefits (net of income taxes)
 - Present value of net lifetime benefits and present value of payroll taxes paid, by earnings quintile

A Fresh Look at Policy Alternatives

- Macro Measures
 - 75-year and Infinite Horizon Open Group Unfunded Obligation – present value of projected benefits minus present value of projected future tax receipts minus value of trust fund for current and future participants
 - Closed Group Unfunded Obligation – present value of projected benefits minus present value of projected future tax receipts for current participants
 - Difference between Infinite Horizon Open Group Unfunded Obligation and Closed Group Unfunded Obligation is present value of net benefits of future generations

A Fresh Look at Policy Alternatives

(Continued)

- Micro Measures
 - Lifetime Net Tax Rate - Equal to present value of lifetime taxes minus present value of lifetime benefits divided by present value of lifetime earnings
 - Analyzed over birth cohorts, gender, race, and lifetime earnings

Canada Pension Plan Actuarial Report

- Steady-state funding – build a reserve of about 5.5 years of benefit expenditures or about 25% of plan liabilities
- Assets/Expenditure Ratios
- Minimum contribution to meet steady-state funding vs. legislated contribution rate
- Three types of Sensitivity
 - Based on two scenarios portraying generally younger and older populations
 - Impact of equity market shocks and alternative investment portfolios
 - Vary key assumptions individually

Proposed Recommendation

- Overall, actuarial metrics are good
- Stochastic results, which are shown in appendices, should be given greater prominence