

Presenting Uncertainty About Social Security Projections in the Annual *Trustees Report*

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Technical Panel on Assumptions and Methods

Motivation

- Uncertainty is viewed as a **nuisance** to policy makers, not a useful input to decision process
 - Uncertainty can and should be relevant
 - Better presentation will improve understanding
- Quantifying overall uncertainty is probably **more uncertain** than choosing baseline
 - Sensitivity analysis is easier to understand
 - Both scenario and stochastic analysis start with sensitivity, and then require additional assumptions in order to vary multiple inputs

Scope of Uncertainty Analysis

- Focus here is on implications of uncertainty about values for key long-term assumptions
 - Ignoring uncertainty associated with modeling
- That is, not an analysis of “forecast errors” based on comparing actual financial outcomes to the predicted values from T periods ago
 - Potentially useful, but a different exercise
 - Total forecast error involves input assumptions, models, and policy (but models and policy evolve)

Summary of Suggested Changes

1. Extend list of key assumptions in Chapter II
2. Set high and low values for each key assumption with probabilistic interpretations
3. Show sensitivity analysis with respect to each key assumption in Chapter II
4. Remove overall uncertainty from general actuarial discussions (Chapters II, IV) and add new uncertainty chapter with both scenario (integrated, high/low) and stochastic results

Outline for Talk

- I. Overview of and comments about existing *Trustees Report* approach to uncertainty
- II. Review goals for presenting uncertainty
 - Relationship to past Technical Panel suggestions
- III. Details about proposed alternative strategy
 - Two new Summary section tables
 - New uncertainty chapter for scenarios/stochastics
 - Implications for other sections of *Trustees Report*

I. How is Uncertainty Presented Now?

- Current *Trustees Report* presents uncertainty using three approaches
 - High/low scenarios in Chapters II, IV
 - Stochastic analysis in Chapters II, Appendix E
 - Sensitivity analysis in Appendix D
- All three vary assumptions and measure changes in system finances as input(s) change
 - Different set of assumptions varied in each?
 - Inconsistency, esp. high/low versus stochastics?

Which Assumptions Vary?

Table II.C1.—Long-Range Values^a of Key Demographic and Economic Assumptions for the 75-year Projection Period

Long-range assumptions	Intermediate	Low-cost	High-cost
Total fertility rate (children per woman), starting in 2034	2.0	2.3	1.7
Average annual percentage reduction in total age-sex-adjusted death rates from 2034 to 208477	.35	1.24
Average annual net immigration (in thousands) for years 2010-84	1,065	1,370	780
Productivity (total U.S. economy), starting in 2020	1.7	2.0	1.4
Average annual percentage change in average wage in covered employment from 2019 to 2084	4.0	3.6	4.4
Consumer Price Index (CPI), starting in 2014	2.8	1.8	3.8
Average annual real-wage differential (percent) for years 2020-84	1.2	1.8	.6
Unemployment rate (percent), starting in 2019	5.5	4.5	6.5
Annual trust fund real interest rate (percent), starting in 2020 . .	2.9	3.6	2.1

^a See chapter V for details, including historical values and projected values.

Key Assumptions

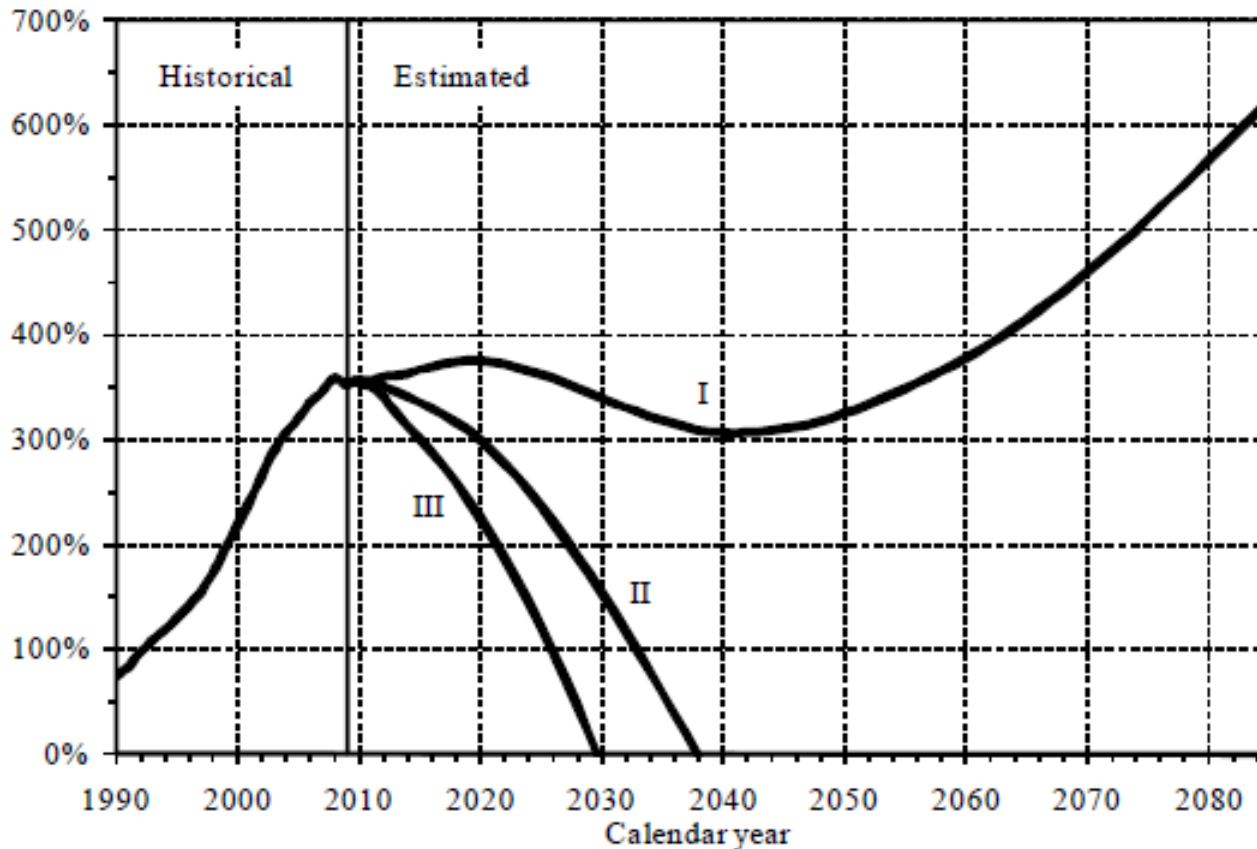
- List of key assumptions as presented in Summary Table II.C1 is incomplete
 - High/low values for disability incidence and termination in sensitivity analysis/stochastics
 - What exactly is varied in high/low scenarios?
- Thus, first suggestion: be explicit up front about all key assumptions to be varied
 - Comparing two uncertainty ranges with different inputs being varied obviously problematic

Uncertainty in Summary Section

- Summary Chapter II describes all three approaches to measuring uncertainty, refers reader to appropriate sections for details
- One key difference is whether or not varying inputs has a probabilistic or “range of possible future experience” interpretation
 - High/low and sensitivity based on this “range”
 - Stochastic based on probabilities

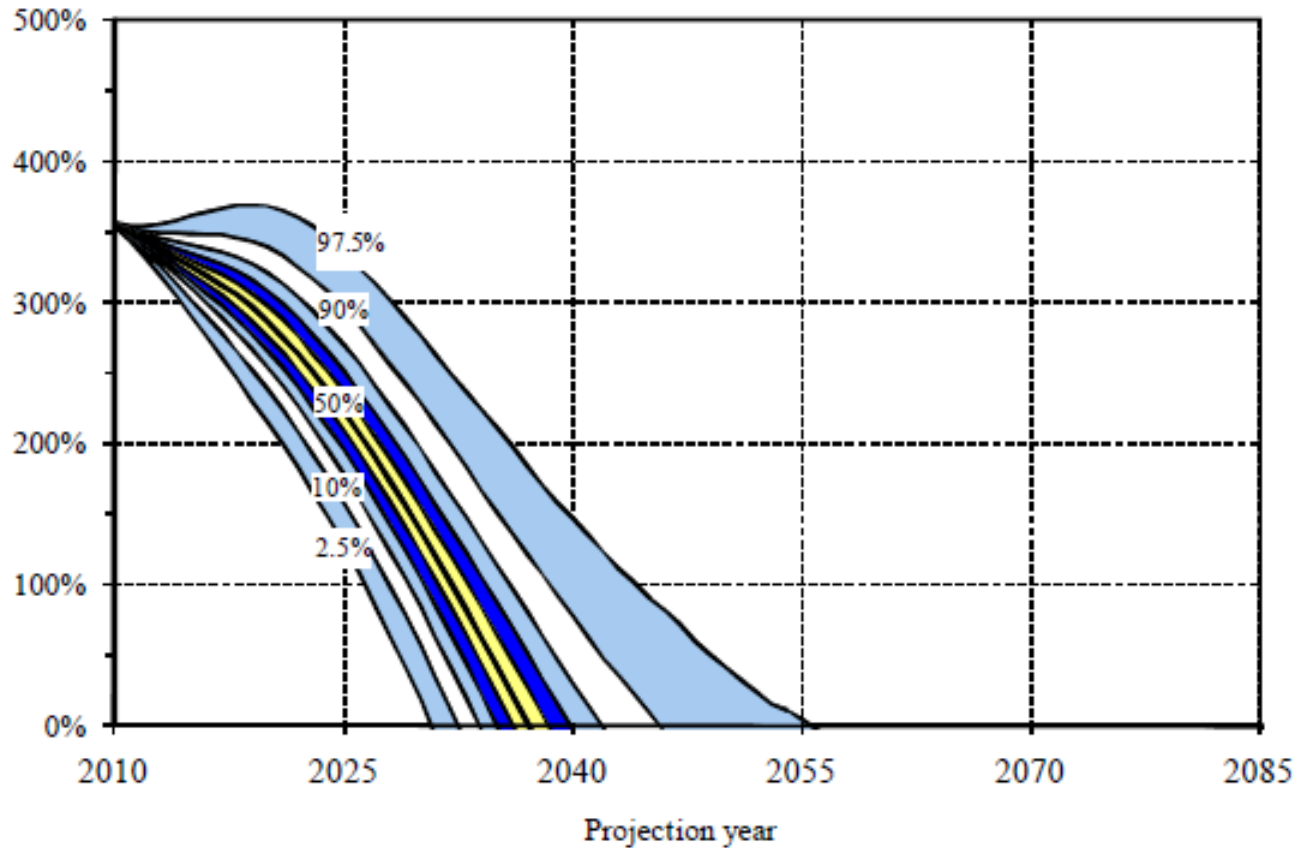
Summary High/Low Trust Fund Ratios

Figure II.D6.—Long-Range OASDI Trust Fund Ratios Under Alternative Assumptions
[Assets as a percentage of annual cost]



Summary Stochastic Trust Fund Ratios

Figure II.D7.—Annual Trust Fund Ratios



High/Low Versus Stochastics

- Apparent inconsistencies between high/low scenarios and stochastic analysis
 - Low-cost trust fund ratio in Chapter II is outside 97.5th percentile of stochastic simulations
- Description of methodologies includes clear statement of belief about which is better
 - “...the relationship between the stochastic results and the low- and high-cost alternatives may change as the methodology for the stochastic simulations is further developed.”

Criticisms

- What does “possible future range” for any given input even mean?
- No simple reconciliation
 - High/low has no practical interpretation
 - Stochastic analysis better, but hard to explain
 - Statement about expanding stochastic inputs just wrong; high/low range will expand also!
- In any case, the most useful information currently buried in the sensitivity appendix

Ex. Appendix Sensitivity Table

Table VI.D1.—Sensitivity to Varying Fertility Assumptions
 [As a percentage of taxable payroll]

Valuation period	Ultimate total fertility rate ^{a b}		
	1.7	2.0	2.3
Summarized income rate:			
25-year: 2010-34	14.98	14.99	14.99
50-year: 2010-59	14.25	14.23	14.22
75-year: 2010-84	14.06	14.01	13.96
Summarized cost rate:			
25-year: 2010-34	15.21	15.23	15.26
50-year: 2010-59	15.79	15.68	15.58
75-year: 2010-84	16.35	15.93	15.52
Actuarial balance:			
25-year: 2010-34	-.23	-.25	-.27
50-year: 2010-59	-1.54	-1.45	-1.36
75-year: 2010-84	-2.29	-1.92	-1.56
Annual balance for 2084	-6.37	-4.12	-2.30
Year of combined trust fund exhaustion	2038	2037	2037

^a The total fertility rate for any year is the average number of children who would be born to a woman in her lifetime if she were to experience the birth rates by age observed in, or assumed for, the selected year, and if she were to survive the entire childbearing period. The ultimate total fertility rate is assumed to be reached in 2034.

^b Ultimate total fertility rates used for this analysis are 1.7 from the alternative III assumptions, 2.0 from the alternative II assumptions, and 2.3 from the alternative I assumptions. All other assumptions used for this analysis are from alternative II.

What Does Sensitivity Show?

- Fertility will “likely” be between 1.7 and 2.3
- Variation within that range has basically no effect on system finances for first 25 or even 50 years, huge effect in 75th year
 - Failure to produce replacement workers means lower benefits or higher taxes, but way in future
- Tells policymakers how to think about fertility
 - If fertility rate drops, raise taxes or cut benefits for those workers who are not having children

II. Goals for Presenting Uncertainty

- Focus on uncertainty about key input assumptions, implications for system finances
- Key questions to address:
 - What assumptions are key for system finances at various time horizons, and why?
 - How do those assumptions interact with policy?
 - What should we do if trends start to diverge from expected values, and when should we do it?

Key Assumptions

- List of inputs to vary should be comprehensive
 - Criteria are that the input is uncertain, is not determined by other assumptions, and varying it across reasonable range impacts system finances
 - Current list is clearly missing labor force participation, also details about real wage growth
 - Other suggestions?
- Inputs not on list are by definition “modeling” decisions, and thus more subject to criticism

Assumptions/Policy Interactions

- In addition to informing reader about uncertainty, making list comprehensive helps inform about assumption/policy interactions
- Standard example: insulating system finances against mortality by indexing Full Retirement Age (can't eliminate risk, can shift it around)
- Another possible example: detaching taxable wage share trend from health cost growth by making health benefits payroll-taxable

What to Do and When to Do It

- Comprehensive list of key assumptions also helps to clarify what to watch for, how and when to react when deviations begin to occur
- If fertility drops, and the goal is to impose the burden on those choosing fewer children then
 - Increase their taxes or lower their benefits
 - But, don't need to act until fertility begins to fall
- Example of not waiting: delay benefit cuts now if labor supply of 62+ population is rising?

What About Overall Uncertainty?

- List of goals/questions did not include quantifying the probability that overall system finances lie within a certain confidence band
 - Why do we even care about overall uncertainty?
 - Policy makers only care about expected values
 - Useful for thinking about timing of policy, but what would we do different if uncertainty range expanded? (Sabelhaus and Topoleski, 2007)
- Focusing on key assumption uncertainty is the starting point for overall uncertainty

Building on Past Technical Panels

- Does shifting discussion away from high/low scenarios versus stochastics reflect a marked departure from past Technical Panels?
- Technical Panels in 1999, 2003, and 2007 all weighed in on uncertainty
 - Suggestions here are generally consistent with past Technical Panel recommendations
 - Past Panels expressed frustration about both measuring and presenting uncertainty

1999 Technical Panel

- Argued that high/low scenarios were “inadequate” for showing uncertainty
- Suggested explicit measure of uncertainty be attached to alternative projections; basis for introduction of stochastic projections
- Focused on interaction between program rules and uncertainty
 - Example is CPI inflation versus mortality; both uncertain, but system adjusts for CPI inflation

2003 Technical Panel

- Applauded introduction of stochastic modeling into annual *Trustees Report*
- Argued that high- and low-cost scenarios are “unrealistic” because they involved varying all assumptions in same direction
- Suggested adding “integrated” scenarios; vary assumptions in an internally consistent way
- Suggested adding chapter on risk/uncertainty

2007 Technical Panel

- Described high/low approach as “a traditional one whose limitations are well known” as it lacks “intuitive and statistical interpretation”
- Suggested introduction of asymmetry in high- and low-cost values for key inputs
 - Consistent with probabilistic interpretation
- Real examples of “integrated” scenarios
- Focus more on medium, rather than long term

III. Alternative Strategy

Reminder about four suggestions:

1. Extend list of key assumptions in Chapter II
2. Set high and low values for each key assumption with probabilistic interpretations
3. Show sensitivity analysis with respect to each key assumption in Chapter II
4. Remove overall uncertainty from general actuarial discussions (Chapters II, IV) and add new uncertainty chapter with both scenario (integrated, high/low) and stochastic results

1. Key Assumptions

- The list of key assumptions shown to the reader should be comprehensive, criteria are
 - The assumption is inherently uncertain
 - Varying the assumption affects system finances
- Components of real wage should be explicit
- Some assumptions now characterized as “model based” and tied to other assumptions
 - Best example is labor force participation

From Trustees Report, Chapter V

“The projected labor force participation rates are not basic assumptions. They are derived from a historically-based structural relationship using demographic and economic assumptions specific to each alternative. However, the participation rates are not highly sensitive to most of the demographic and economic assumptions. Accordingly, the projected labor force participation rates do not vary substantially into the future and across alternatives.”

List of Assumptions

- Suggested replacement for Table II.C1 adds labor force participation (above/below age 62) and decomposition of real wage growth
- There are certainly other candidates for the expanded key assumptions list
 - Anything on list will be sensitivity-tested
 - Anything on the list is part of the input assumption error as opposed to modeling error in retrospective forecast error analysis

2. Probabilistic High/Low

- Nothing inherently wrong with high and low values for inputs—easy to understand and use
- Reluctance to assign probabilistic ranges does not make high/low immune from criticism
- Building on 2007 Panel, range should have meaningful probabilistic interpretation
 - High and low outcomes should be equally likely
 - Ranges for all assumptions should be equally likely

3. Sensitivity Analysis in Summary

- If an input assumption is important enough to make the list, reader should see how varying that input affects finances at various horizons
- Proposed Table IIC.2 is one possible approach
- What does sensitivity analysis achieve?
 - Readers sees how reasonable deviations from expected outcomes will affect finances, and when
 - Other modelers can observe how changing an input affects OACT projections and compare

4. Overall Uncertainty Chapter

- Adopting four suggestions involves major restructuring of *Trustees Report*
- Comprehensive assumptions/sensitivity replaces uncertainty in summary (Chapter II)
- High/low scenario analysis also removed from long-range actuarial measures (Chapter IV)
- New chapter on uncertainty (Chapter VI?) added that gives equal treatment to scenarios (including integrated) and stochastics

Summing Up

- *Annual Trustees Report* is the most important component of communicating the state of Social Security finances
- Uncertainty as currently presented is confusing and even misleading—a nuisance
- Uncertainty can and should be an important part of the message, but that means...
 - Emphasis of sensitivity analysis
 - Equal weight to scenario and stochastics