

Presentation to the 2019 Technical Panel

Office of the Chief Actuary
Social Security Administration
November 16, 2018

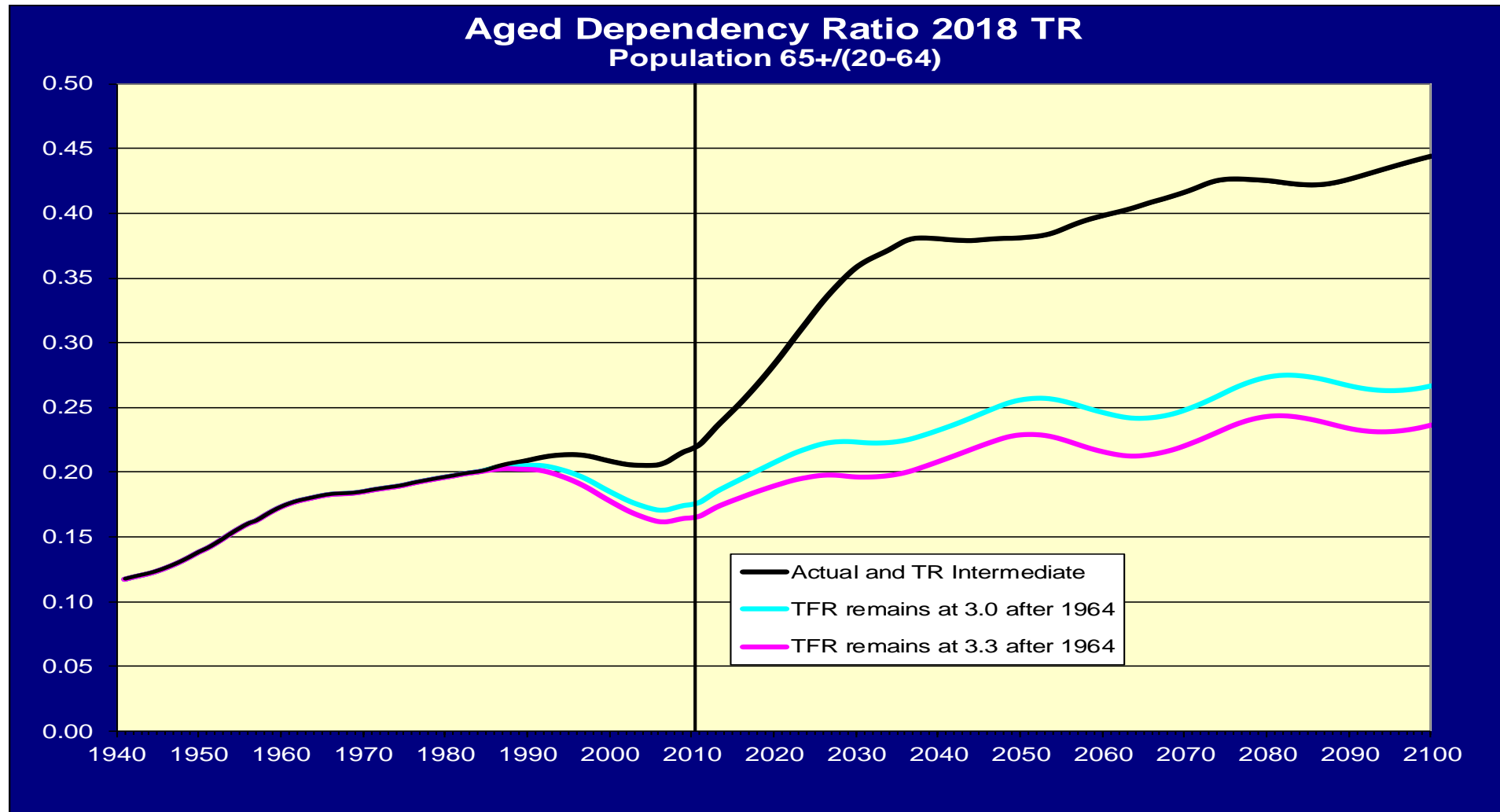
Overview of Models and Assumptions for Projections in the Trustees Report

- **Objective: assess the actuarial status of the Trust Funds as required by law**
 - Ability to pay scheduled benefits with scheduled revenue
 - Shortfall if any over the long range (75 years) and after reserve depletion
 - Basis for Congressional proposals and changes to the program
- **Actuarial model reflecting the population in the Social Security coverage area**
 - U.S. population and workforce, authorized and unauthorized, and abroad
 - Earnings in the economy, and those covered and taxable
 - Workers insured for benefit coverage, and numbers becoming entitled
 - Average benefit levels by type of benefit and duration since becoming entitled
 - Accumulation of starting reserves, income, and outgo for trust fund reserve status

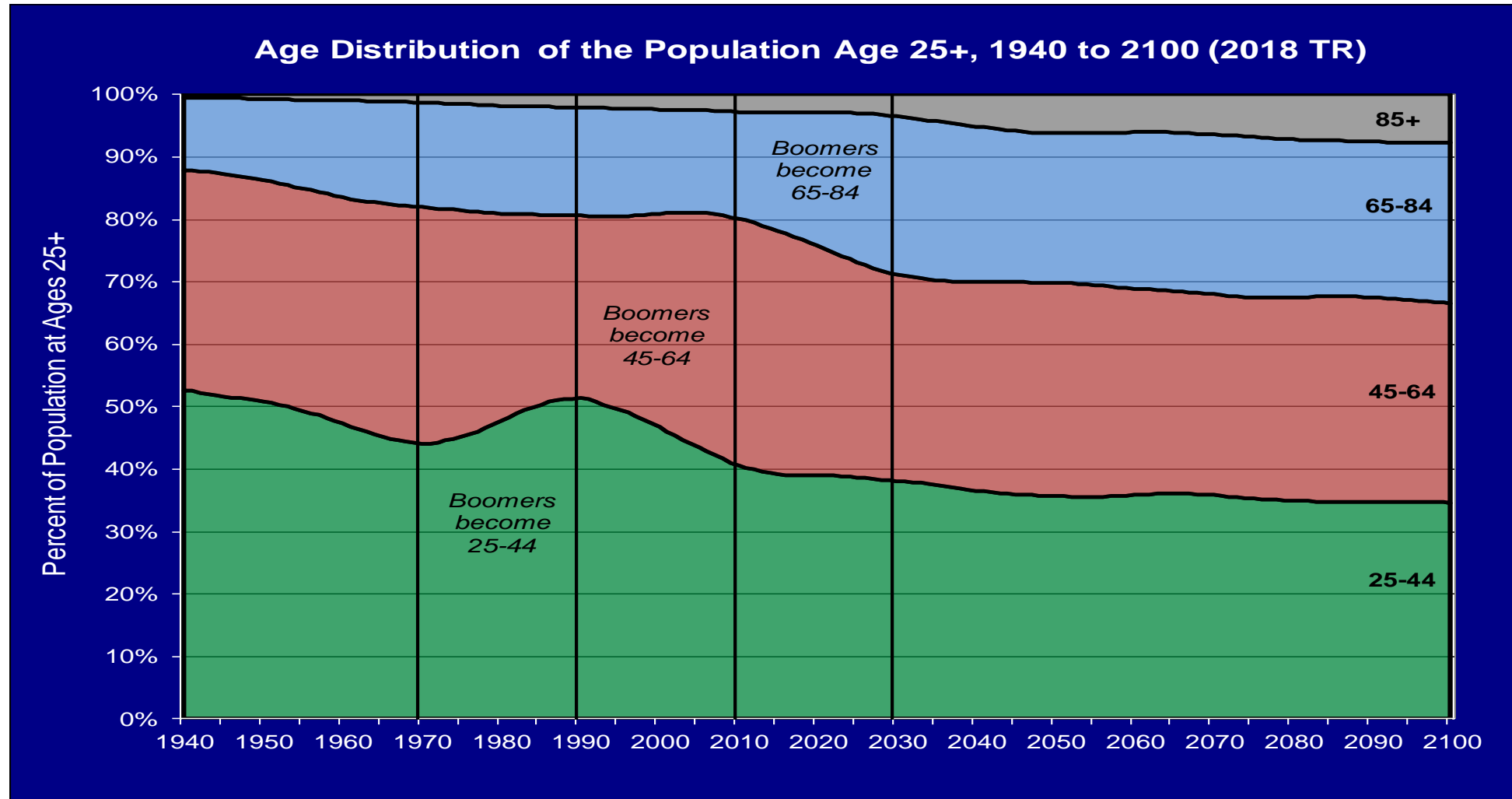
Overview of Models and Assumptions for Projections in the Trustees Report

- **Actuarial valuation depends on design of plan benefits and funding**
 - OASDI is pay-as-you-go financed by design; not advance funded
 - A small “contingency reserve” is needed because of lack of borrowing authority
 - Current payroll tax contributions finance benefits for retirees, disabled, survivors
 - Each generation transfers life, knowledge, and infrastructure to the next
 - In return for financial support from that next generation
 - So age distribution of the population is the most critical factor
- **Demographic assumptions shape the age distribution for the future**
 - Birth rates are most critical factor for age distribution
 - Mortality and immigration are also important
 - Earnings growth less important because income and outgo are both “indexed”
 - Interest rates less important because the program is essentially PAYGO

Overview of Models and Assumptions for Projections in the Trustees Report



Overview of Models and Assumptions for Projections in the Trustees Report



Overview of Models and Assumptions for Projections in the Trustees Report

- **Assumptions reflect expected long-term future conditions, not just the past**
- **Population**
 - Birth rates (fertility) under expected future average conditions
 - Mortality reflecting expectations by cause of death, influenced by growth in health spending and human limits
 - Immigration: authorized generally based on limits in law; unauthorized more difficult
- **Economy**
 - Complete current economic cycle to full employment and then stabilize
 - Labor productivity reflecting long-term past trend; assume continued technology gains
 - Employment by age, sex, and marital status; reflecting education, disability, longevity
 - Earnings dispersion has decelerated and is assumed to stabilize
 - Interest rates are currently below long-term average

Overview of Models and Assumptions for Projections in the Trustees Report

- **Projection uncertainty illustrated in three different ways**
- **Basic specified alternatives: intermediate, high-cost, low-cost**
 - Intermediate reflects most likely expectation
 - High-cost and low-cost vary all assumptions in same direction; changing relationships
- **Stochastic projection**
 - Complex variations around central tendencies from intermediate alternative
 - Useful illustration of ranges but limitations: assumptions applicable for cost or trust fund outcome at any percentile are not indicated
 - In need of further work as indicated in reports for several years
- **Sensitivity analyses**
 - Reflecting variation in key parameters—one at a time

Overview of Models and Assumptions for Projections in the Trustees Report

- **Additional illustrative information**
- **In the report:**
 - Aged dependency ratios (table V.A3)
 - Worker to beneficiary ratios (table IV.B3)
 - Future benefit levels (table V.C7)
 - Effects of changes in current and prior reports (tables IV.B7 and VI.B1)
- **Beyond the report:**
 - Replacement rates, internal rates of return, money's worth ratios
 - Vast documentation of methods, data, and projections
 - Estimates for proposals to modify Social Security under each report's assumptions
 - <https://www.ssa.gov/oact/pubs.html>

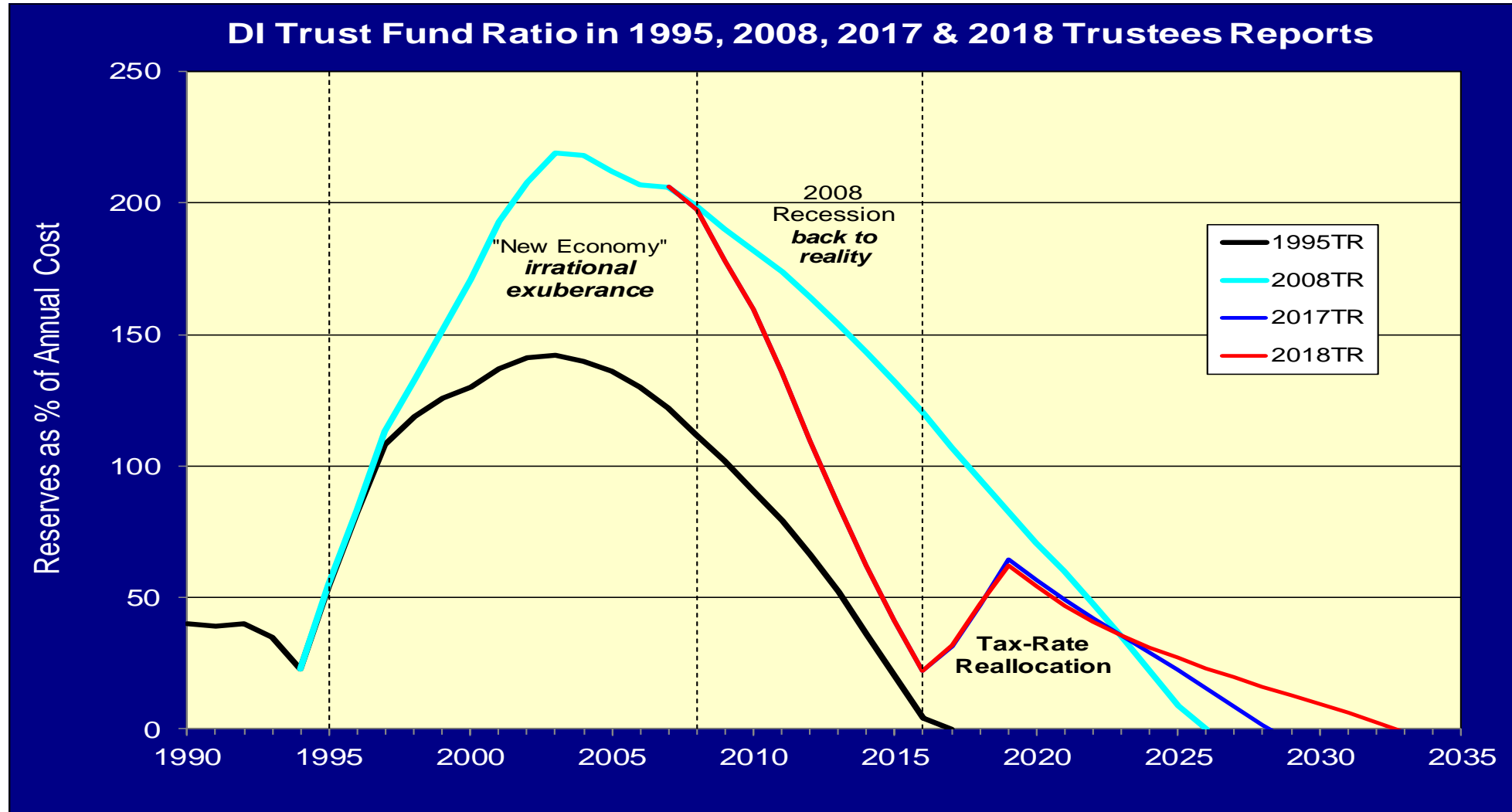
Question 1. Comparison of Past Projections to Actual Results

How do you evaluate the accuracy of past projections and how is this used to inform consideration of assumptions going forward. Does the range of deflections from realized values conform to high and low scenario assumptions?

- **Projections reflect explicit assumptions about average future conditions**
 - Annual variations are unpredictable; “inaccuracy” in near term is guaranteed
 - Unexpected variation over even 10 years or more can be cyclic or aberrant
- **Accuracy must be evaluated over longer periods of “complete” cycles**
 - Demographic parameters, as well as economic parameters, show cyclic variation
 - Most essential is to understand basis for evolving experience
 - Are variations explained? Temporary? New Normal?
- **Over the last 26 reports, OASDI Trust Fund reserve depletion has been projected between 2029 and 2042 under intermediate assumptions**
 - 2018 report projected 2034, 2030, never (intermediate, high cost, low cost)
 - 2008 report projected 2041, 2031, never (intermediate, high cost, low cost)
 - 1998 report projected 2032, 2022, never (intermediate, high cost, low cost)
 - 1988 report projected 2048, 2026, never (intermediate, high cost, low cost)

Question 1. Comparison of Past Projections to Actual Results

- Comparison of DI Trust Fund Ratios in various Trustees Reports



Question 1. Comparison of Past Projections to Actual Results

- Comparison of 20-Year projected cost rates

20 Year Projection of Cost Rate --- Actual vs. Projected								
Note: For prior to 1991 TR, Intermediate is actually Alt II-B.								
Note: The listed data in comment box are linearly interpolated after short-range period.								
Year of Trustees Report	Year Projected	<u>Actual</u>	Projected Low Cost	<u>Actual</u>	Projected Intermediate	<u>Actual</u>	Projected High Cost	<u>Actual</u>
1997	2017		12.43	13.69	14.20		16.19	
1996	2016		11.89		13.76	13.90	15.76	
1995	2015		11.47		13.40	13.89	15.44	
1994	2014		10.98		13.14	13.96	15.02	
1993	2013		10.56		12.25	13.98	14.39	
1992	2012		10.35		12.02	13.82	14.02	
1991	2011		9.89		11.47		13.13	13.47
1990	2010		9.36		11.08		12.84	13.47
1989	2009		9.19		10.59		12.29	13.05
1988	2008		8.92		10.39	11.55	11.84	
1987	2007		8.48		9.97	11.32	11.36	
1986	2006		8.48		10.00	11.06	11.58	
1985	2005		8.32		10.13	11.16	11.77	
1984	2004		8.22		9.94	11.05	11.51	
1983	2003		7.95		9.92	11.03	11.19	

Question 1. Comparison of Past Projections to Actual Results

- Comparison of life expectancy at age 65

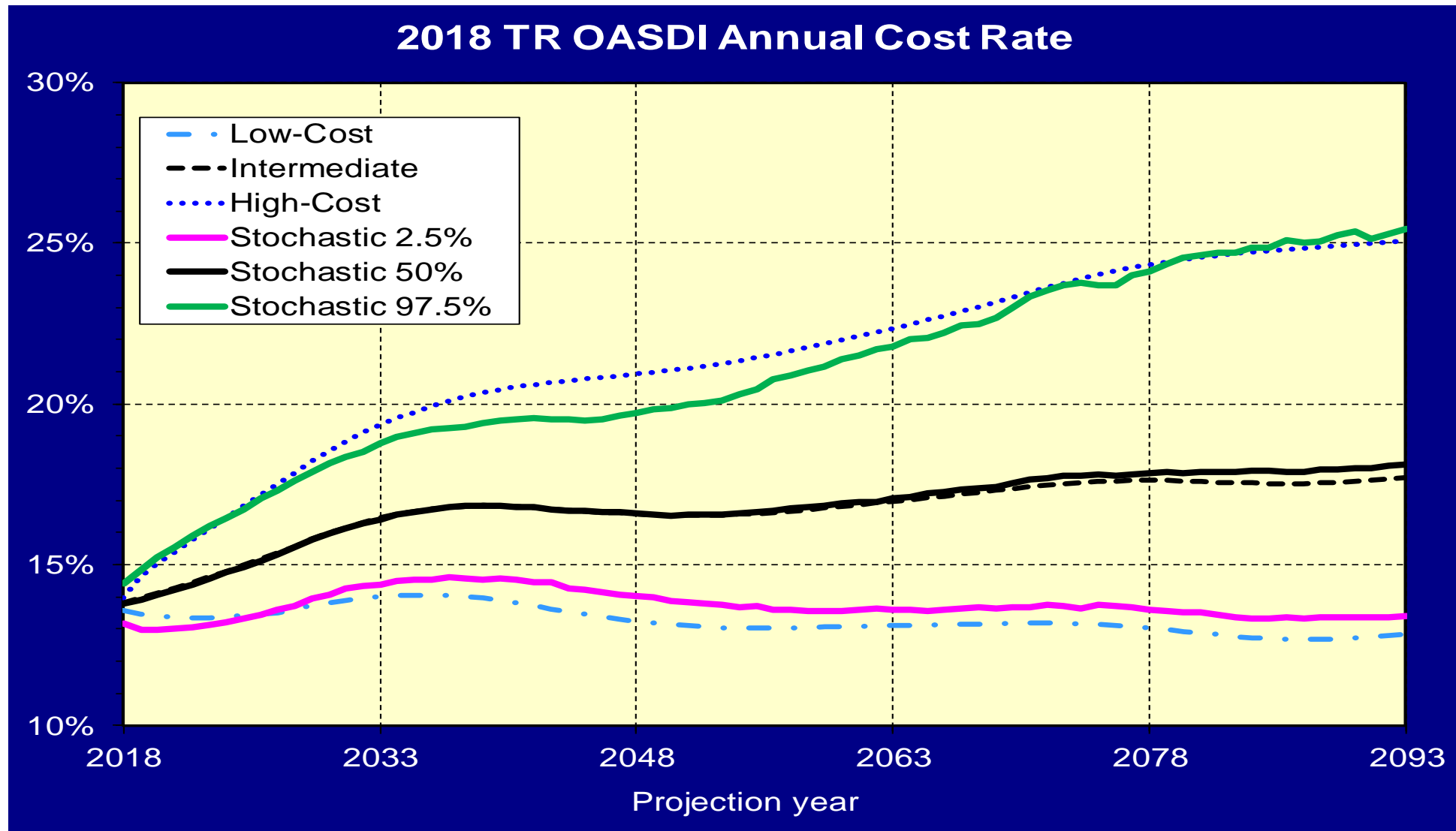
Comparison of Life Expectancy at Age 65 in the US																																									
Actual Experience vs. OASDI Trustees Report Intermediate Projection																																									
Year	Actual	Year of issuance of OASDI Trustees Report																																							
		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
1971	15.3																																								
1972	15.3																																								
1973	15.4																																								
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1979	16.5	16.7	16.6	16.6	16.5																																				
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1982	16.7				16.6	16.6	16.8																																		
1983	16.6				16.8	16.8	16.8	16.6																																	
1984	16.6				16.9	16.9	16.9	16.6	16.6																																
1985	16.6	17.3	17.3	17.0	17.0	17.0	16.7	16.7																																	
1986	16.7				17.1	17.1	17.1	16.8	16.8	16.8																															
1987	16.7				17.3	17.2	17.2	16.9	16.9	16.9	16.9																														
1988	16.8				17.4	17.3	17.3	17.0	17.0	17.0	16.9	16.7																													
1989	17.0				17.5	17.4	17.4	17.1	17.0	17.1	17.0	17.1	17.0	17.0																											
1990	17.2				17.6	17.5	17.5	17.2	17.1	17.2	17.1	17.2	17.1	17.0	17.2	16.9	17.0																								
1991	17.3				17.7	17.6	17.6	17.3	17.2	17.3	17.2	17.1	17.3	17.0	17.1	17.0	17.0																								
1992	17.4				17.8	17.7	17.7	17.4	17.3	17.3	17.3	17.2	17.4	17.0	17.1	17.2	17.0	17.3																							
1993	17.2				17.9	17.8	17.8	17.5	17.4	17.4	17.3	17.2	17.4	17.1	17.1	17.2	17.1	17.1	17.1																						
1994	17.3				18.0	17.9	17.9	17.6	17.5	17.5	17.4	17.3	17.5	17.1	17.2	17.3	17.2	17.2	17.2																						
1995	17.3	18.3	18.3	18.1	18.0	18.0	17.7	17.6	17.5	17.5	17.4	17.5	17.2	17.2	17.4	17.3	17.3	17.4	17.4																						
1996	17.3				18.1	18.0	18.1	17.8	17.6	17.6	17.5	17.4	17.6	17.3	17.3	17.4	17.3	17.4	17.4	17.5	17.3																				
1997	17.4				18.2	18.1	18.1	17.9	17.7	17.7	17.6	17.5	17.6	17.3	17.3	17.5	17.4	17.4	17.5	17.5	17.5	17.3																			
1998	17.4				18.2	18.1	18.2	17.9	17.8	17.7	17.6	17.5	17.7	17.3	17.4	17.5	17.4	17.5	17.6	17.5	17.5	17.6	17.4																		
1999	17.4				18.3	18.2	18.2	18.0	17.8	17.8	17.7	17.6	17.7	17.4	17.4	17.5	14.4	17.5	17.6	17.6	17.5	17.5	17.5	17.4	17.3																
2000	17.5	18.5	18.6	18.6	18.4	18.2	18.3	18.0	17.9	17.8	17.7	17.6	17.8	17.4	17.5	17.6	17.6	17.6	17.6	17.6	17.6	17.6	17.5	17.5	17.4	17.4	17.4														
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2030																																									
2040																																									
2050		20.1	20.4	20.4	20.4	20.2	20.3	20.1	19.9	19.7	19.7	19.9	19.6	19.6	19.6	19.5	19.5	19.6	19.6	19.5	20.1	19.9	20.3	20.2	20.1	20.2	20.2	20.2	20.4	20.7	21.0	21.3	21.3	21.8	21.8	21.7	21.6	21.6	21.5		
2060																																									
2070																																									
2080		20.9	21.4	21.4	21.6	21.5	21.4	21.1	20.9	20.8	20.9	21.0	20.8	20.8	20.8	20.7	20.7	20.7	20.7	21.5	21.4	21.4	21.3	21.2	21.2	21.2	21.2	21.2	21.3	21.8	22.1	22.4	22.3	22.8	22.8	22.7	22.6	22.6	22.5		
2090																																									
2100																																									

Question 2. Uncertainty and Stochastic Modeling

Describe how you think about uncertainty and provide an overview of the development of the stochastic model and its uses.

- **Recall earlier slide: alternatives, stochastic, sensitivity**
- **Stochastic is useful illustration**
 - However, legislators tend to focus on the intermediate
 - Policymakers are about equally averse to underfinancing and over-taxing
 - Automatic adjustments have appeal, but they lack certainty
- **Our stochastic model was unveiled in 2003**
 - We are aware the probability range is too narrow
 - No variation in central tendency, or in other parameters
 - Developing model with parameter uncertainty

Question 2. Uncertainty and Stochastic Modeling

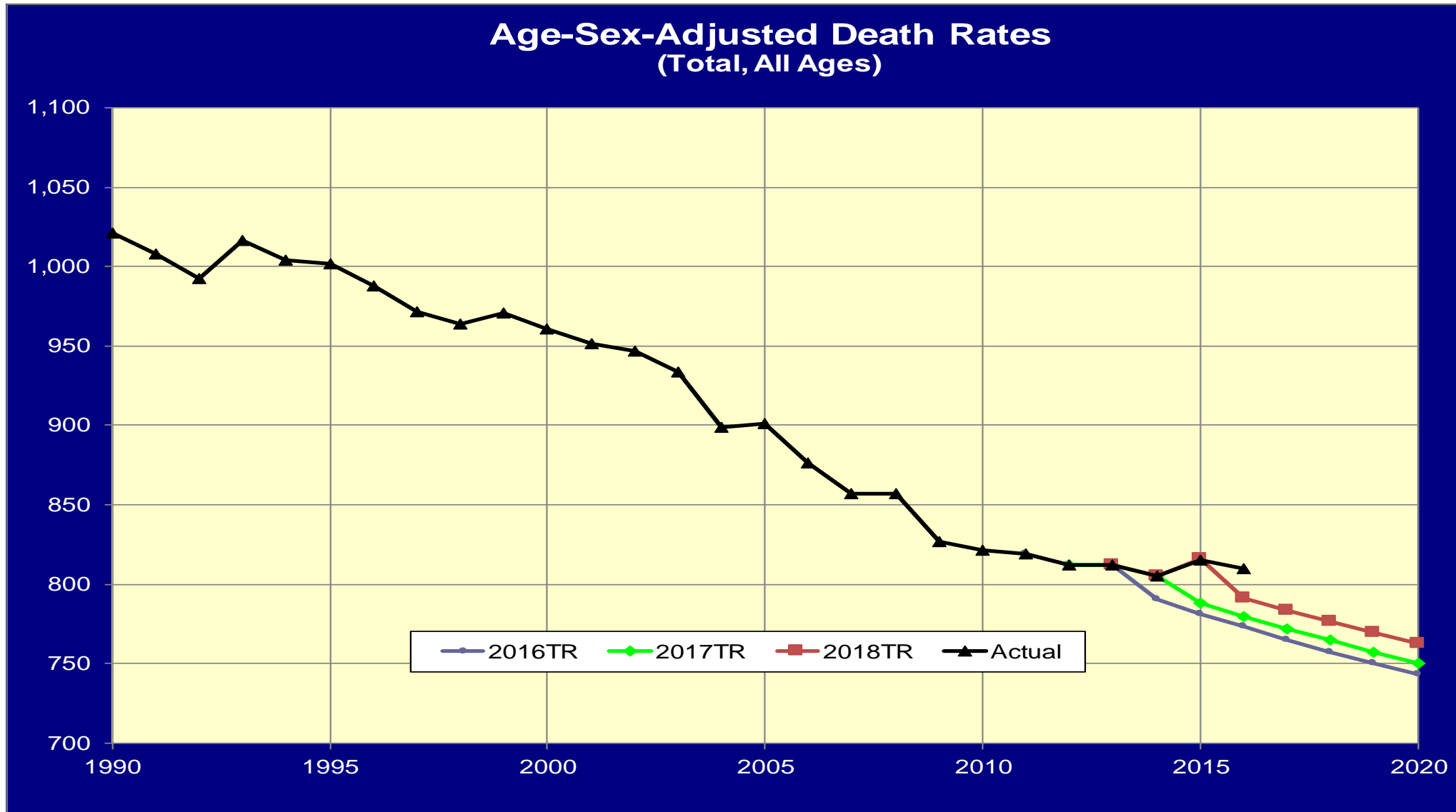


Question 3. Long-Range Assumptions: (a) Mortality

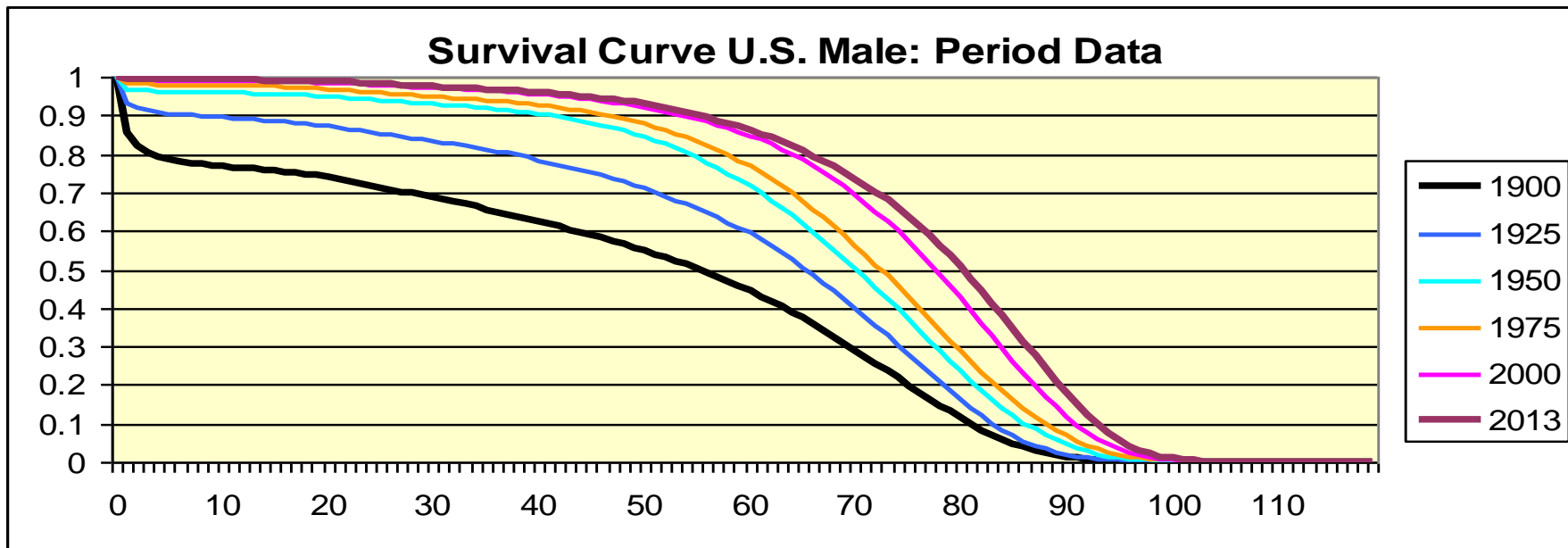
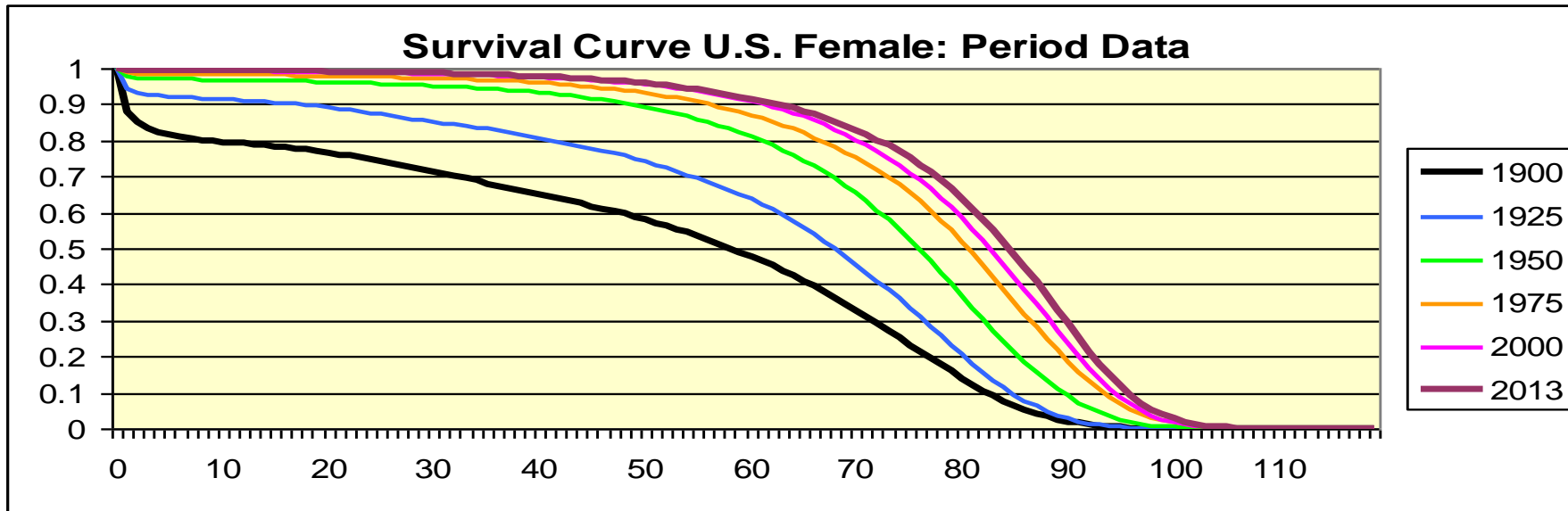
(a) Describe the thought process and justification for the mortality assumptions in the Trustees Report. What is the best case for why mortality improvement will likely be slower than what past technical panels recommended?

- **Past panels have tended, like most demographers, to extrapolate experience from past periods—as in Lee and Carter approach**
 - Mortality decline comes in waves—must avoid too much weight on recent experience
 - For example, 1999-2009 was a good period of rapid decline
 - But since 2009, decline has been very slow
 - Great progress in last century with public health, antibiotics, health care expansion
 - Can these improve at same rates in the future?
 - Critical to study by cause of death
 - Will medical advances be more difficult and less frequent in the future?
 - Are there limits to human longevity that we are slowly approaching?
 - As a result, will there be some deceleration in mortality declines?

Question 3. Long-Range Assumptions: (a) Mortality



Question 3. Long-Range Assumptions: (a) Mortality

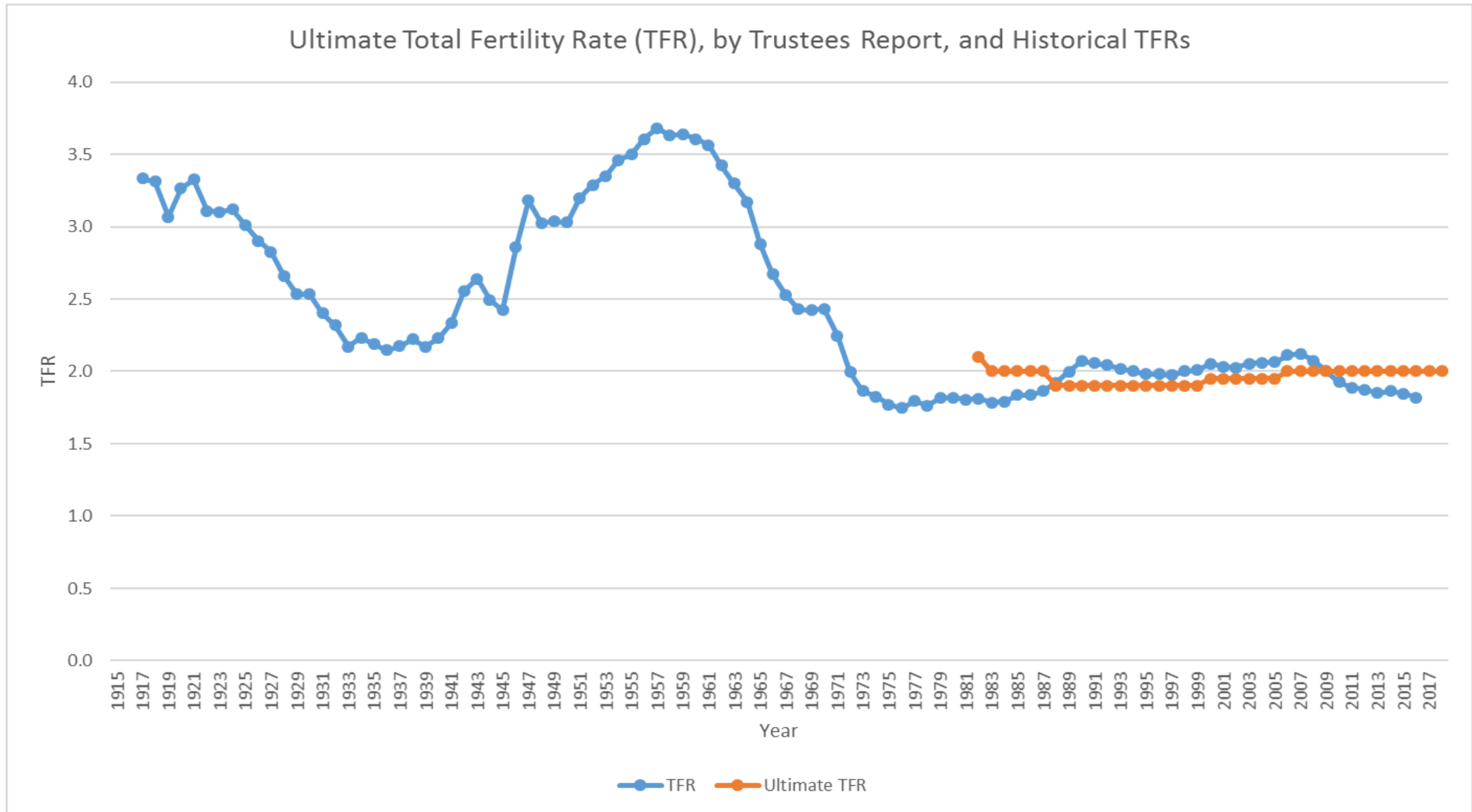


Question 3. Long-Range Assumptions: (b) Fertility

(b) Fertility rates have continued to fall even as the economy recovered from the Great Recession. What is the best rationale for assuming fertility rates will recover to pre-recession levels?

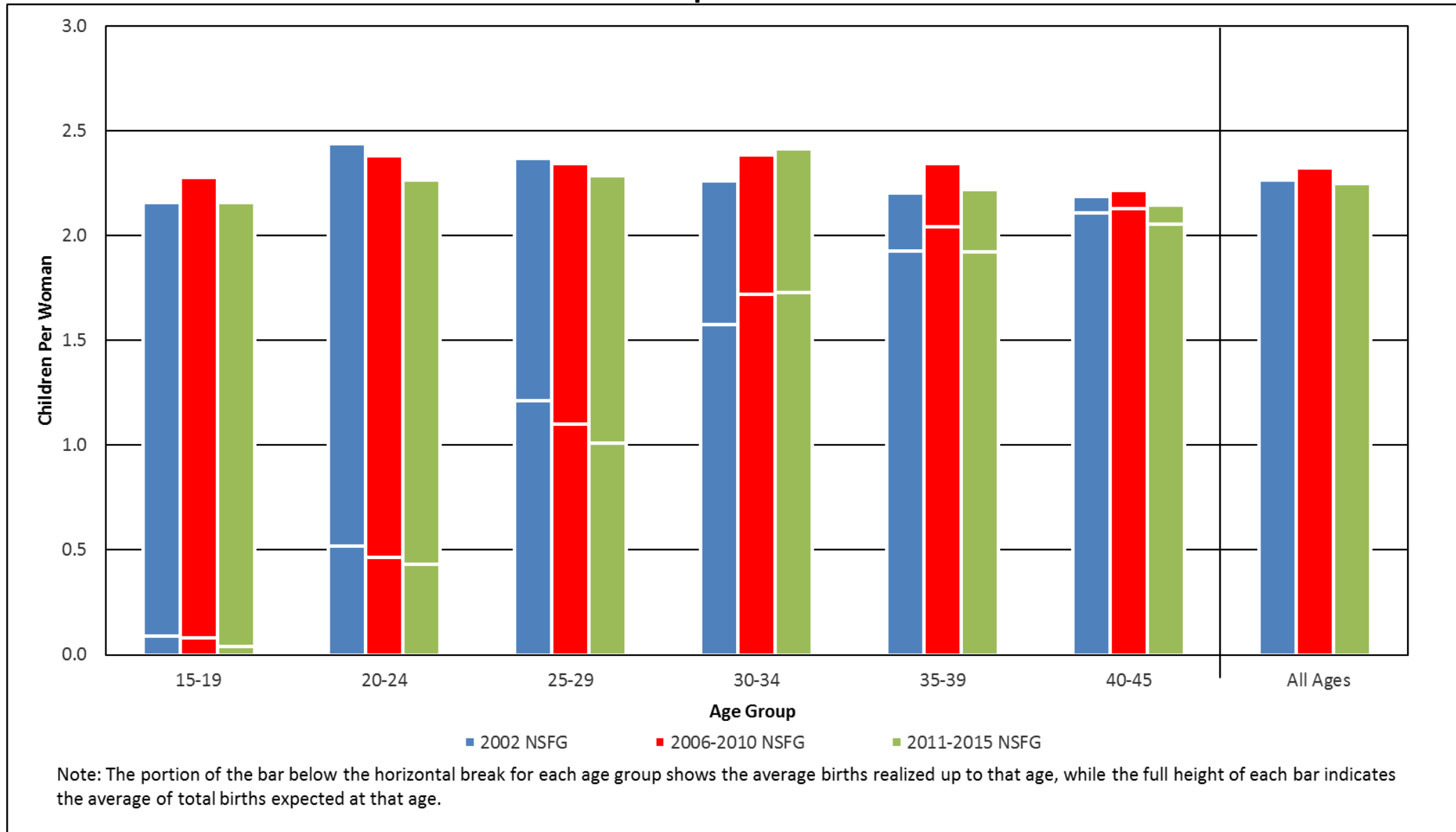
- Between 1990 and 2008 the total fertility rate averaged over 2.0
- Rates since 2008 have fallen
 - Due to: Recession job losses in 2009-11 and low real earnings growth more recently
- Birth expectations of younger women are still above 2.0
- Cohort analysis indicates completed cohorts are still tracking 2.0
- But are things changing?
 - Need to consider on a holistic basis
 - Economic opportunity and outlook for younger individuals
 - Many factors

Question 3. Long-Range Assumptions: (b) Fertility

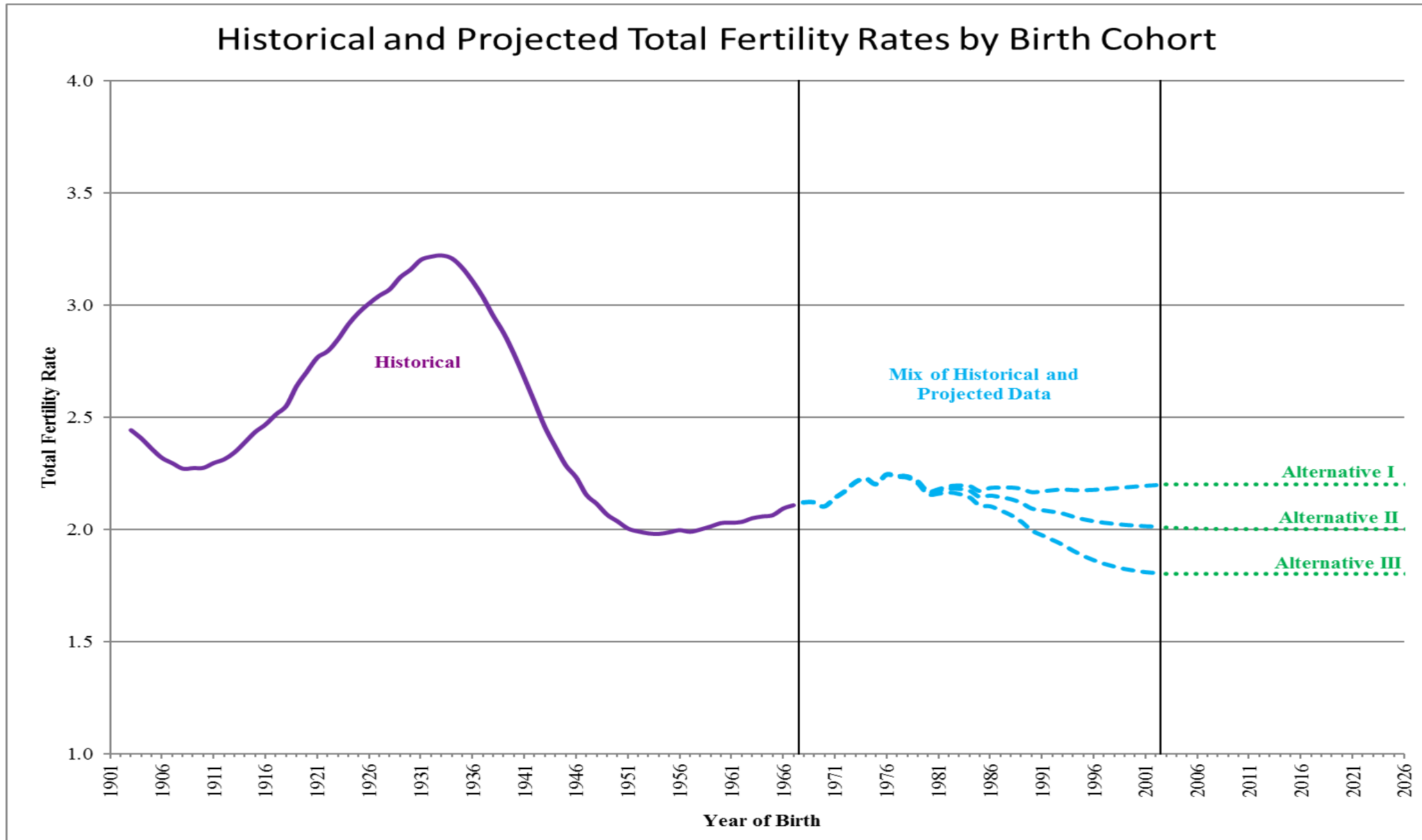


Question 3. Long-Range Assumptions: (b) Fertility

Birth Expectations



Question 3. Long-Range Assumptions: (b) Fertility



Question 3. Long-Range Assumptions

(c) Why do the trustees express the long-range net immigration assumptions as absolute number instead of a percent of the population? Why are net immigration assumptions constrained by "current law"?

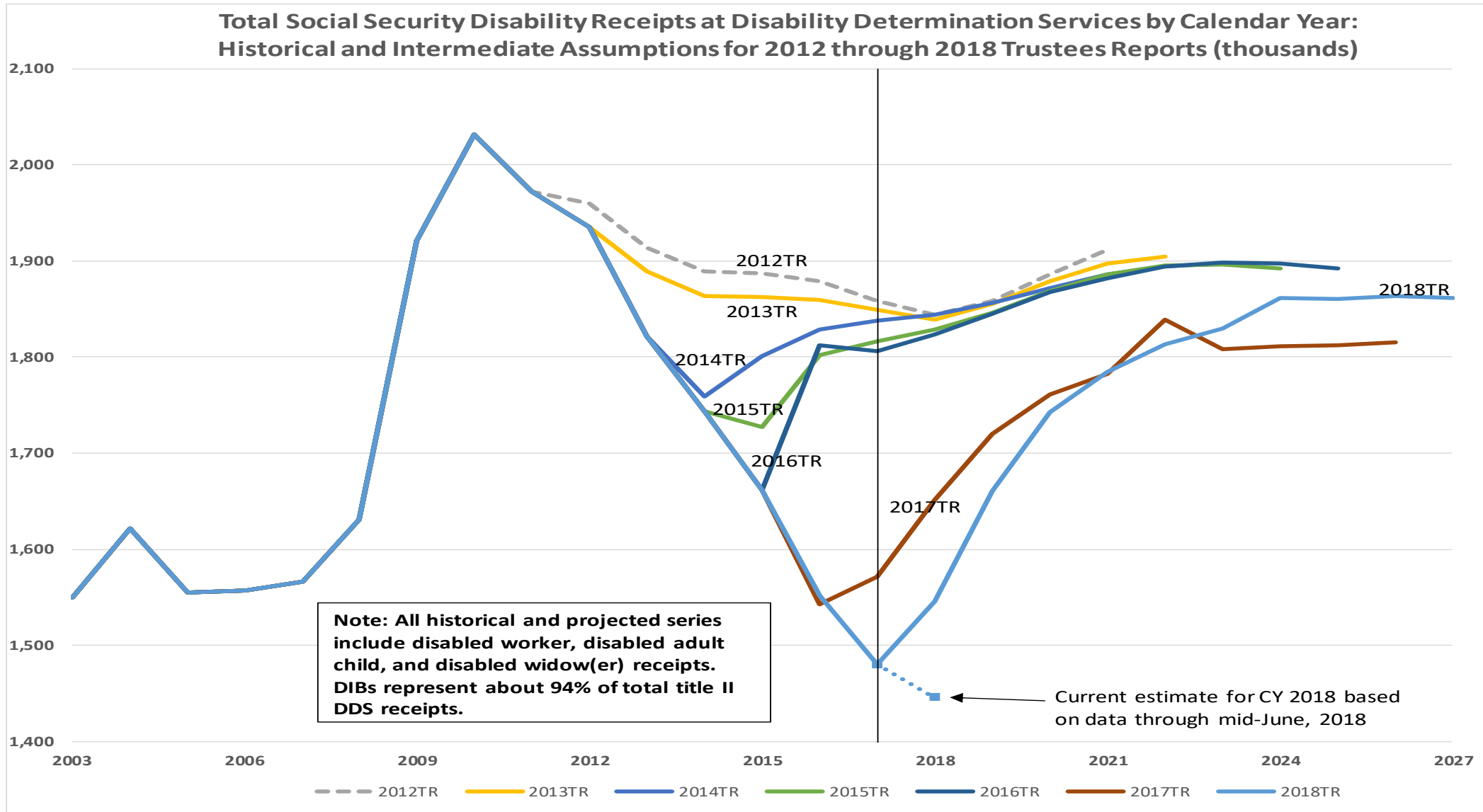
- **Lawful Permanent Resident, or LPR, immigration is limited**
 - Generally, we do not anticipate changes in law
- **Other-than-LPR immigration is more difficult to project**
 - Past panels have suggested rise in proportion to overall population size
 - But will “demand” for other-than-LPR change in the future?
 - Will the US be viewed as a land of relative opportunity?
 - Will other nations become more or less desirable, affecting their emigration?
- **Much to be considered**

Question 3. Long-Range Assumptions: (d) Disability Incidence

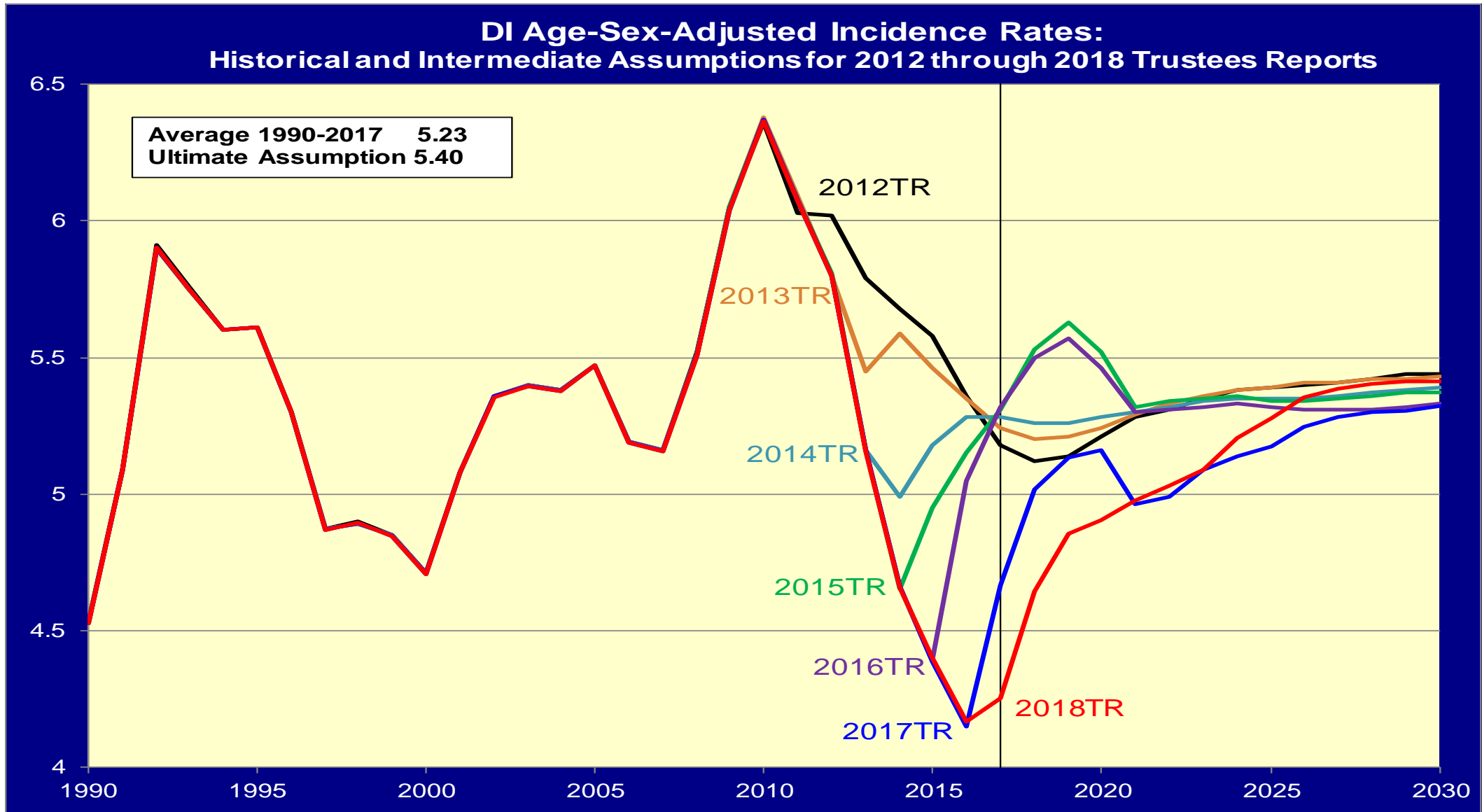
(d) Describe the thought process and justification for the disability incidence assumption in the Trustees Report.

- Disability applications and incidence rates peaked in the recession around 2010, but have fallen dramatically to historically low levels
- More than just economic opportunity
- Private disability insurers and SSI program are seeing similar drops
- Number of disabled workers receiving benefits is well below earlier expectations that fully reflected demographic changes
- How persistent will these changes be?

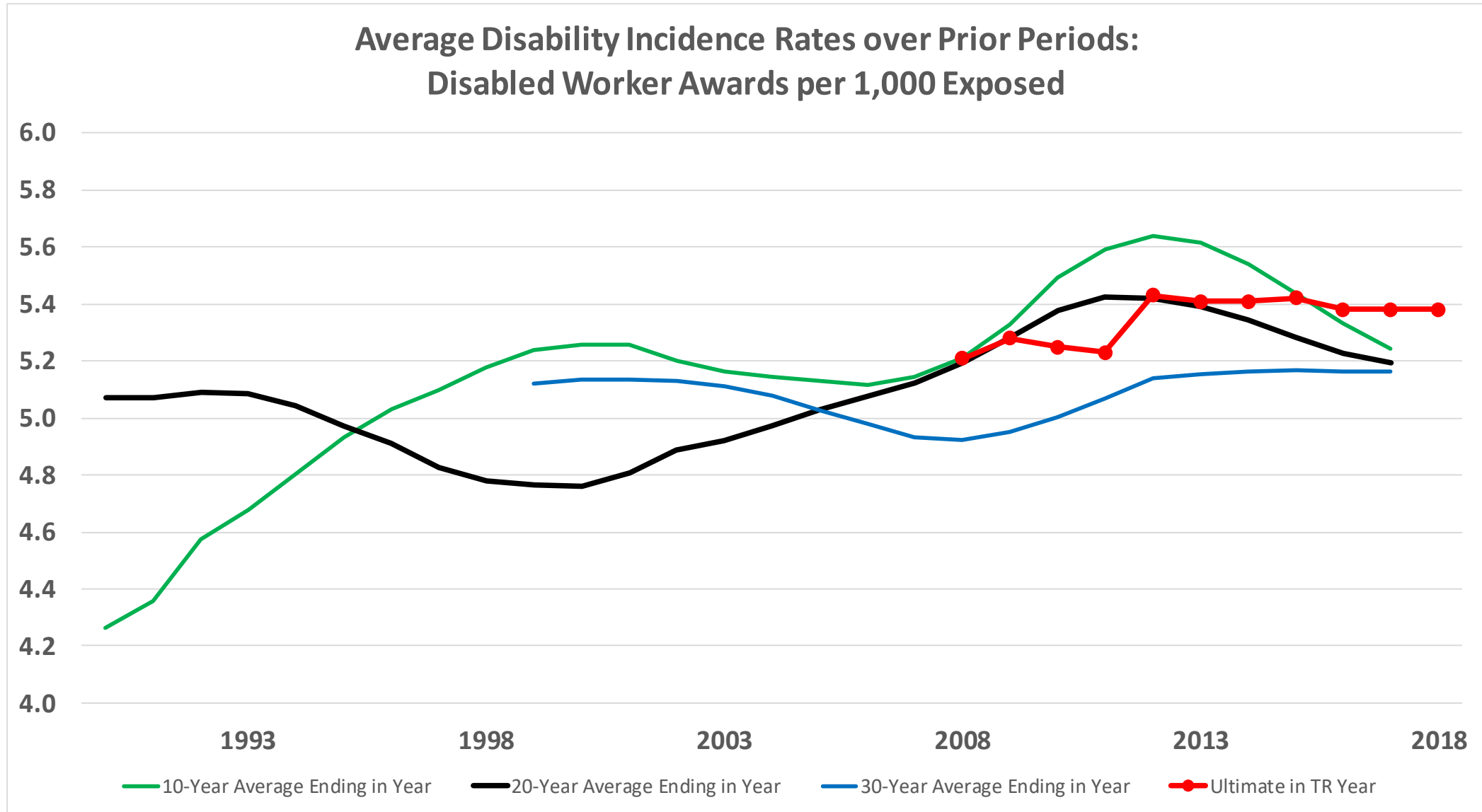
Question 3. Long-Range Assumptions: (d) Disability Incidence



Question 3. Long-Range Assumptions: (d) Disability Incidence



Question 3. Long-Range Assumptions: (d) Disability Incidence



Question 3. Long-Range Assumptions

(e) Describe the thought process and justification for the productivity and real wage gains assumptions in the Trustees Report.

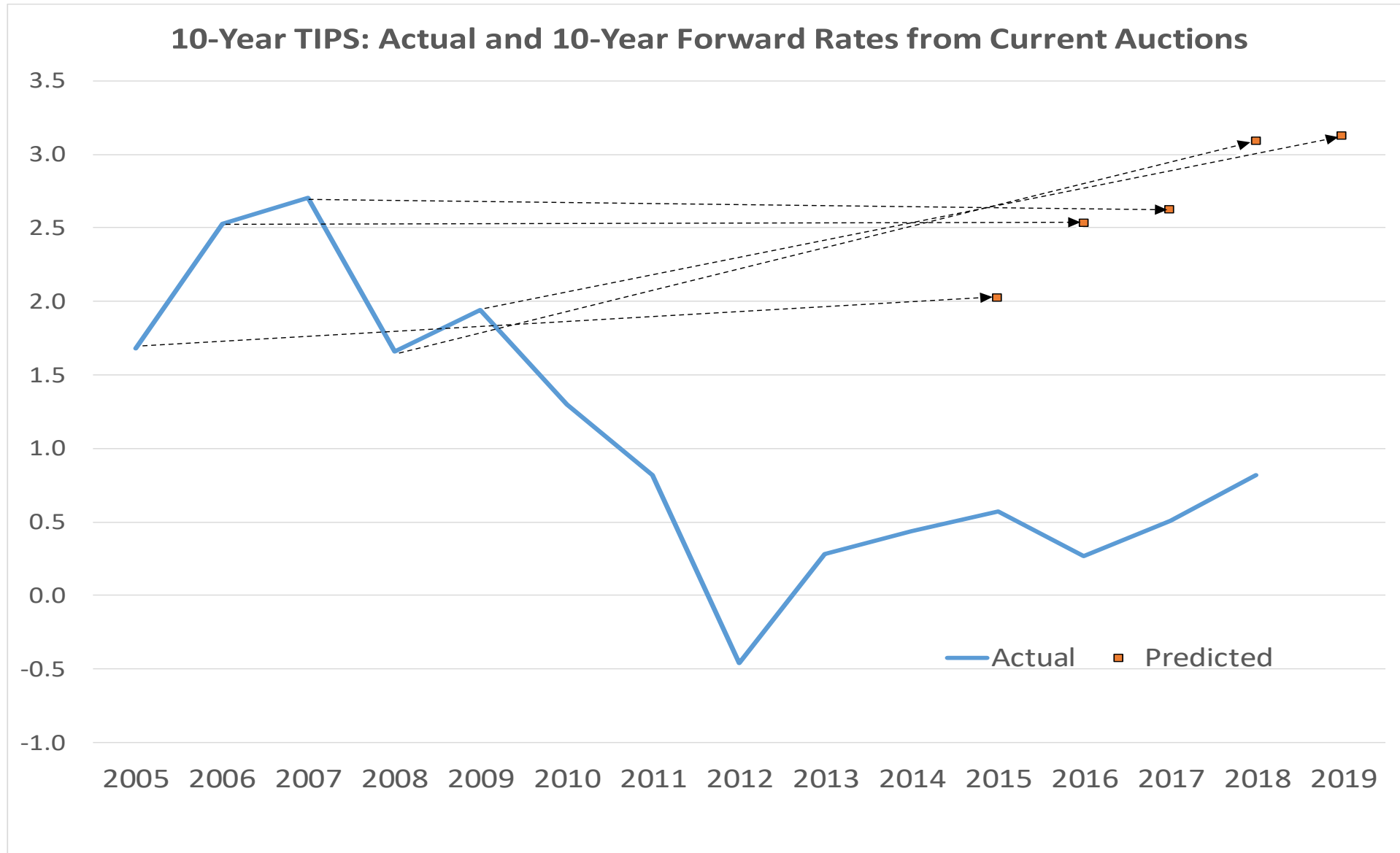
- **Competing viewpoints on labor productivity:**
 - Pessimistic view (Gordon and others): historical growth due to unique period of innovation unlikely to be repeated, expect slower growth in the future
 - Optimistic view (Brynjolfsson and others): new inventions and the development of general-purpose technologies will result in stronger annual growth in productivity than in the recent past
- **Assumption consistent with long-term historical averages**
- **Prior technical panels viewed productivity assumption as reasonable, as well as assumed linkages to growth in real wages**

Question 3. Long-Range Assumptions: (f) Real Interest Rates

(f) In setting assumptions on real interest rates, explain how you weigh the information provided by bond markets about expected futures rates?

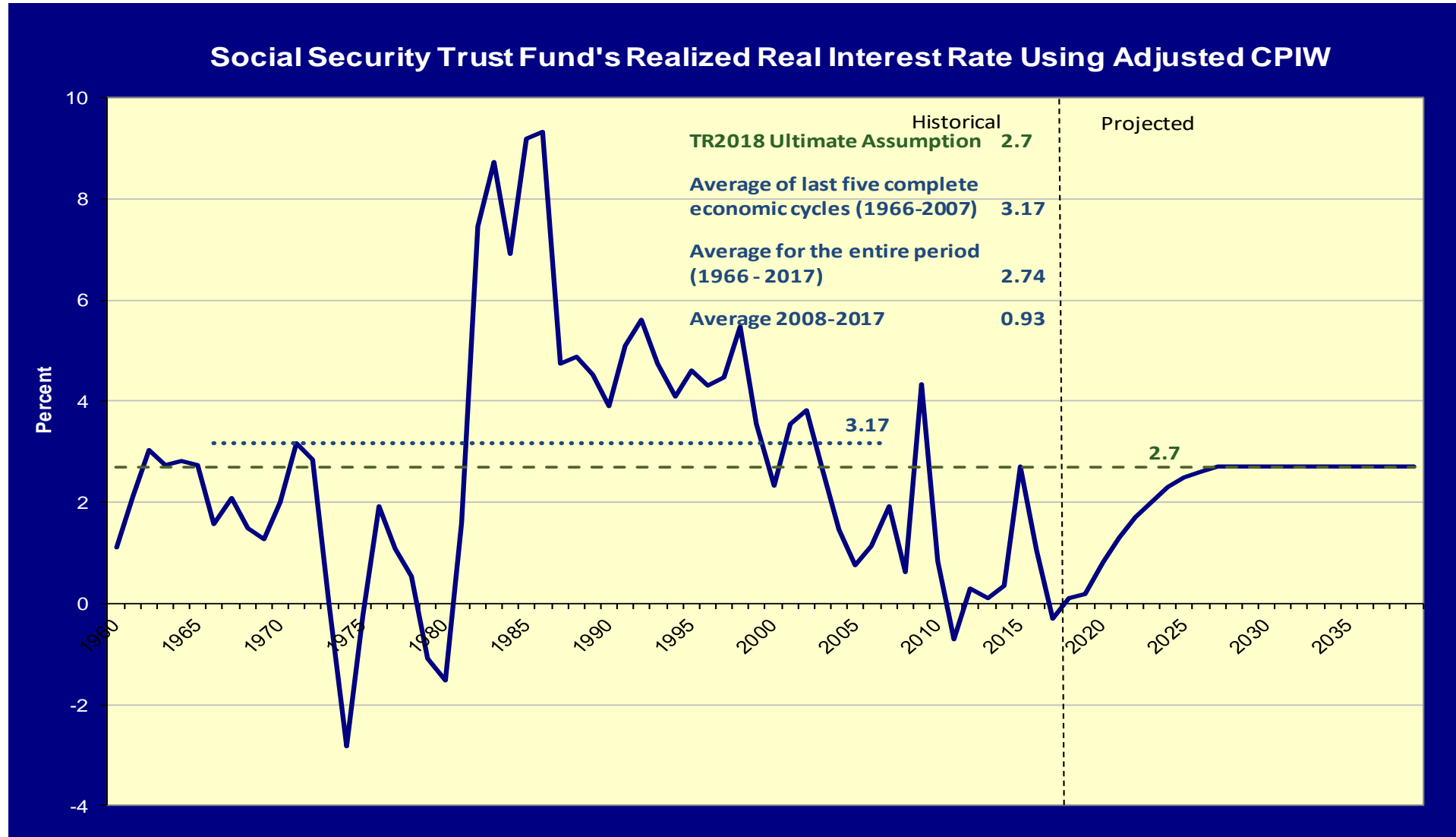
- Market “expectations” have changed dramatically in short periods of time, and have not proven to be a good predictor of future rates
- OCACT analyzed 10-year forward rates on 10-year TIPS
 - 10-year forward rates basically mirror current rates
 - Both have changed abruptly, and together
 - Forward rates do not anticipate changing conditions or rates
- Real interest rates are now on upward trend, likely to continue due to:
 - Federal Reserve “policy normalization”—reducing their holdings
 - Rising federal deficits relative to GDP, and historic debt-to-GDP levels

Question 3. Long-Range Assumptions: (f) Real Interest Rates



Question 3. Long-Range Assumptions: (f) Real Interest Rates

Note the 2015 Technical Panel recommended a 2.5% ultimate rate



Question 4. Composition of Population

(a) Do economic assumptions depend on the demographic composition of the population? For example, do assumptions of productivity growth depend on assumed distributions by age, sex, family structure, immigration status, education, etc...)?

- Yes, the employment projections are heavily influenced by the composition of the population
 - Employment is derived from the OCACT labor force participation rate (LFPR) model which explicitly accounts for changes in composition by age, sex, family structure, marital status, education, life expectancy, etc.
- OCACT model assumes lower average earnings for other-than-LPR immigrant population
- Assumed growth in labor productivity does not **directly** reflect changes in the composition of the population

Question 4. Composition of Population

(b) When does the degree of heterogeneity in the population (differential mortality by income, earnings inequality, skill level among immigrants) affect other parameter or outcomes of the model?

- Differential mortality by career-average earnings is reflected in the growth in average benefits after initial entitlement
 - Average benefit rises faster than COLA due to differential mortality as well as additional earnings
- Earnings inequality is reflected in the percent of OASDI covered earnings that is below the average-wage-indexed taxable maximum amount
 - This percent dropped from about 90 percent in 1983 to about 83 percent in recent years—this decline has roughly stabilized in the last decade
 - Benefit levels are also influenced by inequality
- Contribution of immigrants to the size and quality of labor supply are assumed to continue as in the past

Question 4. Composition of Population

(c) Which of the assumptions/parameters in the projection model are explicitly correlated?

- **A few examples:**

- Employment is affected by position in the economic cycle, by changing population composition (due to fertility, mortality, and immigration), by relative level of projected benefits, and by disability prevalence
- Insured status for disability, survivor, and retirement benefits is determined by cohort employment rates (microsimulation model)
- Disability incidence and retirement rates are affected by position in economic cycle and changes in normal retirement age (NRA)
- Average benefit levels are determined by cohort employment rates, average earnings growth, and CPI growth
- Trust fund reserve accumulation and present-value discount rates are determined by assumed Treasury market yield rates

Question 5. Determination of Benefit Levels

Describe how you model the determination of future benefit levels. What assumptions underlie these projections, and how much would these projections be affected by changes in assumptions about parameters like the future evolution of lifetime earnings inequality or Social Security claim ages?

- Across generations, benefit formula parameters are indexed to the average wage level; benefits rise only with CPI after initial eligibility
- Average benefit levels are projected in a microsimulation model affected heavily by employment rates; AIME is high 35 years for retirees
- After initial benefit eligibility, benefit levels reflect COLAs, differential mortality, and earnings after initial eligibility
- Continued increase in earnings dispersion (inequality) would lower the percent of earnings taxable, and also the growth in benefits across generations
- Effect of changes in start of retiree benefit receipt would depend on selection, but generally increase cost due to generous benefit adjustments

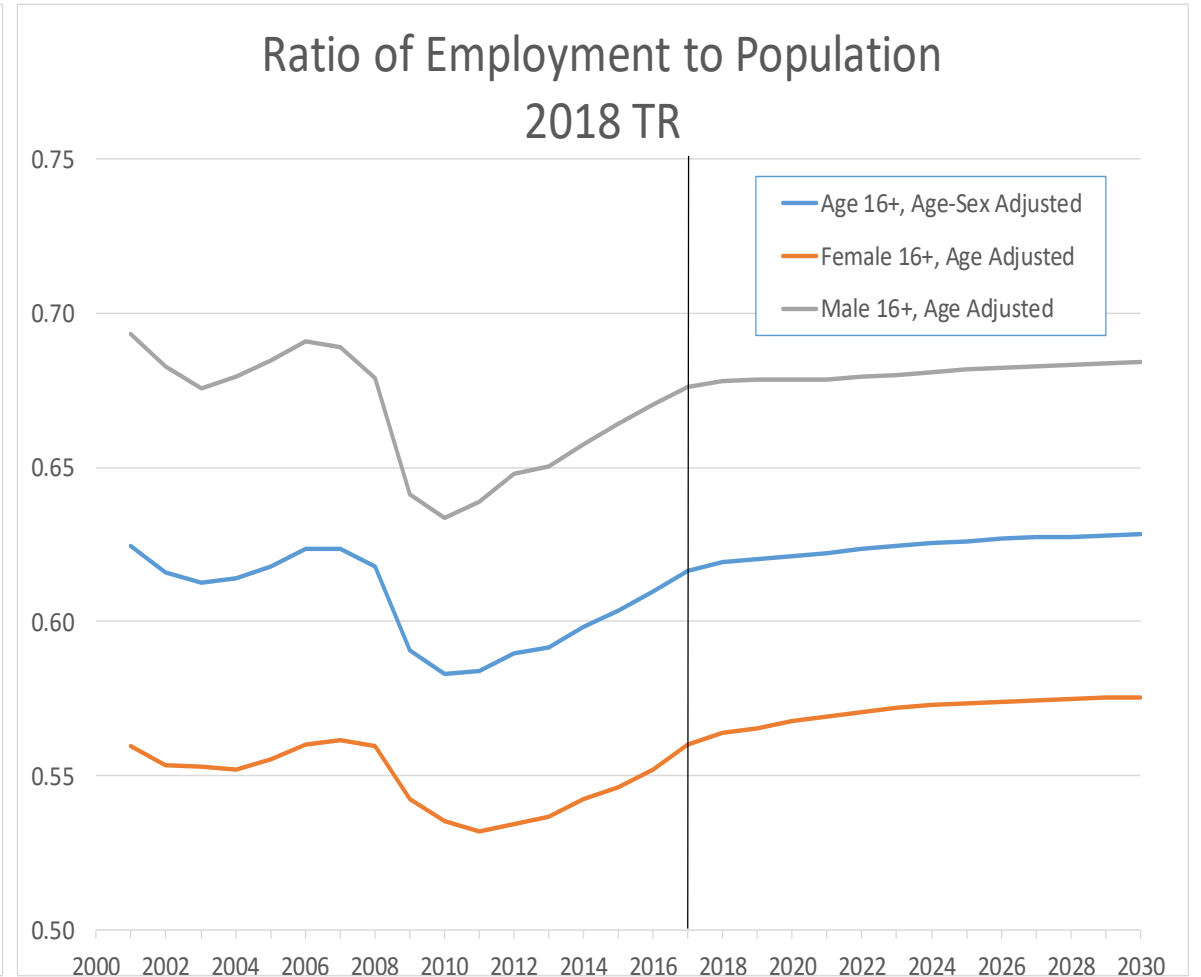
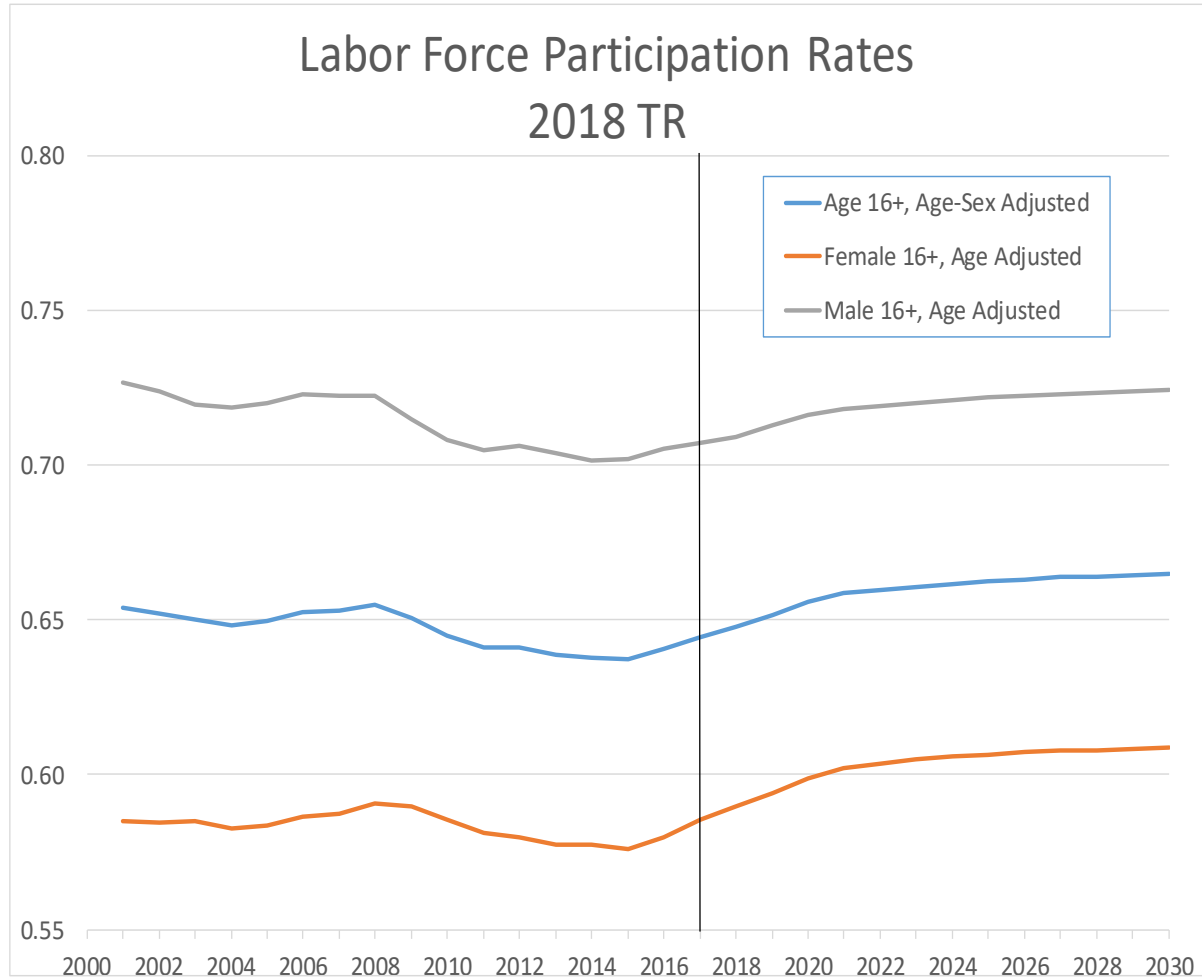
Question 6. Secular Stagnation

Do the Trustees mostly consider the Great Recession to be a largely cyclical event (with a much longer recovery period than typical), or have there been structural changes in the economy that permanently affect assumptions of the future?

- Trustees have lowered the *levels* of labor productivity and potential GDP due to the very slow recovery and slow growth in labor productivity, but have maintained the ultimate assumptions for the future growth rate in productivity and average earnings
- Employment-to-population ratio has mostly recovered to pre-2008 levels
 - Labor force and unemployment rate are both projected to rise in the future with little effect on employment-to-population ratio
 - Age-sex-adjusted labor force participation rates have been trending upward since the time of the last technical panel
- Labor productivity has lagged, but unclear whether slow growth will persist

Question 6. Secular Stagnation: Recovery of Employment

Employment has recovered: note disparity with measured labor force



Question 7. Macro (Debt) Feedback Effects

Explain your approach to macro (debt) feedback effects.

- OCACT does not explicitly model macro (debt) feedback effects when developing projections
- Unclear whether methods used to model feedback effects are useful for long-term OASDI projections, which are based on current Social Security law
 - Following a possibly unsustainable path to limitless federal debt may be a reasonable approach for Budget projections
 - But OASDI Trust Fund actuarial status presumes that unsustainable events due to current external laws will be changed in the future
 - For example, income tax bracket creep
- Note that OASDHI net redemption of Treasury securities produces a commensurate increase in public debt, anticipated by the markets, and no effect on total federal debt—no effect after reserve depletion

Question 8. Opioid Phenomenon

What are the implications of the opioid epidemic for the projections and in particular assumptions about mortality, disability and labor force participation. Has it had a differential effect on the mortality rate of (disabled) beneficiaries?

- To this point, we have essentially assumed that opioid abuse will be addressed and will diminish, similar to HIV in the past
 - We assume a resumption of mortality improvement after the current slowdown which began in 2009, for all causes at all ages
 - If negative effects from opioid abuse persist and affect largely individuals over age 35, this would have a small positive effect on the actuarial status
- To this point we are not seeing significant effects on disability beneficiaries; note that drug addiction and alcoholism by themselves are not bases for disability benefit eligibility

Comments and Questions from OCACT to the Panel, for Assistance and Insight

- **A few areas of thought and reflection that will be particularly useful:**
 - Ponder long-term “state” changes rather than just extension of recent trends
 - Are we moving into new conditions as a society and an economy?
 - Are succeeding generations still expecting and striving to exceed their elders?
 - What will be the U.S. position in the global economy, compared to the past?
 - Holistic consideration of possible changes and shifts
 - Discussion of and rationales for a range of possible future scenarios (states)
 - Is technological innovation going to decelerate slowing investment and productivity?
 - Effects of decelerating educational attainment and shift in age distribution