Internal Rates of Return and Money's Worth Ratios

Differential Mortality and Disability Incidence

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Definitions

- Internal Rate of Return (IRR)
  - IRR is the real (above inflation) interest rate which results in:

    PV(Benefits Received) = PV(Taxes Paid)
  - If one thinks of Social Security taxes paid as an investment, then the IRR is the return on the investment.
- Money's Worth (MW)
  - MW is PV(Benefit Received) / PV(Taxes Paid)
  - Measure of whether the worker gets his/her "money's worth" from the program.
  - Effective interest rates of the Trust Funds are used in present value calculations.
- In this presentation we will focus mainly on IRR. The analysis for MW is similar.

Hypothetical Scaled Workers

A worker with a *scaled* earnings pattern has earnings that vary with age as a percentage of the national average wage index (AWI).

- Four scaled earnings patterns:
  - Very Low — Career Average Earnings (CAE) ≈ 25% of AWI
  - Low — CAE ≈ 45% of AWI
  - Medium — CAE ≈ AWI
  - High — CAE ≈ 160% of AWI
- One steady maximum worker
  - Earnings at or above the OASDI contribution and benefit base for each working year

Hypothetical Worker Assumptions

- Workers begin working on his/her 21st birthday and remain in continuous employment until either retirement at age 65, disability, or death.
- If a worker becomes disabled, he/she may continue receiving benefits until death or may recover before age 65 and return to the workforce.
- Family members will receive all benefits for which they are eligible.

Hypothetical Worker Assumptions (cont.)

- We analyze four types of family structures:
  - Single Male Worker
  - Single Female Worker
  - One-earner Couple with Male Worker
  - Two-earner Couple
- Couples are assumed to:
  - be the same age
  - marry at age 22 and stay married for life
  - have two children – the first is born when they're 27 and the second when they're 29

Progressive Benefit Formula

The Social Security benefit formula is intended to be progressive, so that workers with lower earnings get a higher benefit relative to their earnings.

However, workers with higher earnings tend to live longer, which raises the question:

> "Is the effect of the progressive benefit formula (favoring lower paid workers) offset by their shorter expected lifespans?"

Differential Mortality and Disability Incidence

- Our previous IRR and MW analysis used uniform mortality and disability incidence rates for all earnings levels (EL).

- The 2024.5 edition of the IRR note introduces differential mortality and disability incidence.

  https://ssa.gov/OACT/NOTES/ran5/an2024-5.pdf

Mortality Adjustment Factors

We use overall mortality rates (by age, sex) from demography, and apply adjustment factors by EL

Data Sources:

- Continuous Work History Sample (CWHS)
- Numerical Identification System (Numident)
- Actuarial Study Number 129, “Mortality by Career-Average-Earnings Level”

To Calculate the Adjustment Factors (for ages 22-68):

We sum deaths and lives by EL for years 2001-2020 and compute a 5-year average relative mortality level by age and sex, relative to total deaths and lives across all ELs

Factors for ages 69-84 come directly from Actuarial Study 129

Disability Incidence Adjustment Factors

We use overall disability incidence rates (by age, sex) from beneficiaries, and apply adjustment factors by EL

Data Sources:

- Continuous Work History Sample (CWHS)
- Numerical Identification System (Numident)

To Calculate the Adjustment Factors:

We sum DIB entitlements and DI insured by EL for years 2001-2020 and compute a 5-year average relative DI incidence level by age and sex, relative to total DIB entitlements and DI insured across all ELs

What's New?

- 2024.5 introduces adjustments for observed differences in mortality and disability incidence by career earnings levels of workers. This analysis shows that the difference in lifespan by earnings level is roughly offset by the difference in disability incidence by earnings level.

General Trends

- Increased mortality
  - For single worker -> reduced retirement benefits
  - For family -> increased survivor benefits offset reduced retirement benefits
- Increased disability incidence
  - For single worker -> higher disability benefits but increased mortality
  - For family -> higher auxiliary and survivor benefits

General Trends

- Lower earners
  - Higher mortality
  - Higher disability incidence
  - Lower retirement benefits
  - Higher family survivor benefits
  - Higher disability benefits
  - Higher disability auxiliary benefits
- Higher earners
  - Lower mortality
  - Lower disability incidence
  - Higher retirement benefits
  - Higher retirement auxiliary benefits
  - Mixed survivor effects since survivor also has lower mortality
  - Lower disability benefits

Table 1.–Internal Real Rates of Return for Various Earning Level Scaled Workers

OASDI Program–Current Law Scheduled Scenario

(Percent)

Earnings Level	Year of birth	Year attains age 65	Single Male	Single Female	One-earner couple	Two-earner couple
	1920	1985	5.43	6.19	9.30	6.69
	1930	1995	4.52	5.04	7.42	5.30
	1937	2002	4.47	4.85	7.04	5.12
	1943	2008	4.33	4.70	6.72	4.92
	1949	2014	4.34	4.73	6.59	4.85
Very Low	1955	2020	4.35	4.81	6.52	4.84
	1964	2029	4.19	4.71	6.22	4.69
	1973	2038	4.36	4.86	6.30	4.81
	1985	2050	4.51	4.94	6.46	4.95
	1997	2062	4.54	4.93	6.44	4.96
	2004	2069	4.57	4.95	6.42	4.98
	1920	1985	4.48	5.30	8.11	5.56
	1930	1995	3.37	3.93	6.22	4.07
	1937	2002	3.33	3.75	5.83	3.90
	1943	2008	3.19	3.61	5.52	3.71
	1949	2014	3.20	3.63	5.43	3.67
Low	1955	2020	3.23	3.72	5.42	3.71
	1964	2029	3.09	3.62	5.15	3.59
	1973	2038	3.28	3.79	5.26	3.73
	1985	2050	3.43	3.87	5.40	3.86
	1997	2062	3.47	3.87	5.38	3.87
	2004	2069	3.51	3.90	5.38	3.90
	1920	1985	2.92	3.81	6.51	3.91
	1930	1995	2.23	2.85	5.13	2.95
	1937	2002	2.25	2.73	4.79	2.83
	1943	2008	2.12	2.60	4.49	2.65
	1949	2014	2.13	2.60	4.41	2.62
Medium	1955	2020	2.16	2.69	4.40	2.66
	1964	2029	2.03	2.57	4.15	2.54
	1973	2038	2.23	2.75	4.27	2.70
	1985	2050	2.39	2.84	4.41	2.83
	1997	2062	2.44	2.86	4.40	2.85
	2004	2069	2.49	2.89	4.40	2.88
	1920	1985	2.61	3.53	6.11	3.53
	1930	1995	1.76	2.41	4.68	2.45
	1937	2002	1.64	2.15	4.17	2.19
	1943	2008	1.46	1.97	3.81	1.95
	1949	2014	1.48	1.98	3.74	1.93
High	1955	2020	1.52	2.07	3.75	1.99
	1964	2029	1.38	1.95	3.50	1.87
	1973	2038	1.60	2.13	3.64	2.04
	1985	2050	1.76	2.22	3.77	2.17
	1997	2062	1.82	2.24	3.77	2.20
	2004	2069	1.87	2.27	3.77	2.24
	1920	1985	2.36	3.30	5.85	3.27
	1930	1995	1.36	2.05	4.38	2.03
	1937	2002	1.17	1.72	3.78	1.69
	1943	2008	0.85	1.39	3.25	1.31
	1949	2014	0.71	1.24	2.98	1.14
Maximum[1]	1955	2020	0.61	1.18	2.80	1.06
	1964	2029	0.41	0.98	2.46	0.86
	1973	2038	0.62	1.15	2.59	1.03
	1985	2050	0.79	1.25	2.73	1.16
	1997	2062	0.85	1.28	2.74	1.21
	2004	2069	0.90	1.31	2.74	1.24

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OASDI Program–Current Law Scheduled Scenario

(Percent)

Earnings Level	Year of birth	Year attains age 65	Single Male	Single Female	One-earner couple	Two-earner couple
	1920	1985	4.64	6.32	13.01	8.71
	1930	1995	4.18	5.25	9.56	6.49
	1937	2002	4.60	5.20	9.45	6.56
	1943	2008	4.64	5.18	9.01	6.32
	1949	2014	4.75	5.29	8.59	6.09
Very Low	1955	2020	4.69	5.44	8.20	5.94
	1964	2029	4.71	5.56	7.85	5.92
	1973	2038	4.81	5.73	7.73	5.91
	1985	2050	4.91	5.68	7.99	6.04
	1997	2062	4.94	5.65	7.86	6.00
	2004	2069	5.02	5.69	7.85	6.04
	1920	1985	4.36	5.43	9.13	5.96
	1930	1995	3.33	4.07	6.98	4.39
	1937	2002	3.38	3.90	6.52	4.22
	1943	2008	3.31	3.78	6.19	4.04
	1949	2014	3.39	3.81	6.09	4.02
Low	1955	2020	3.43	3.92	6.05	4.05
	1964	2029	3.36	3.86	5.80	3.98
	1973	2038	3.48	4.03	5.81	4.07
	1985	2050	3.64	4.08	5.97	4.18
	1997	2062	3.70	4.07	5.94	4.20
	2004	2069	3.75	4.10	5.93	4.23
	1920	1985	2.85	3.84	6.47	3.80
	1930	1995	2.14	2.87	5.08	2.84
	1937	2002	2.15	2.73	4.73	2.72
	1943	2008	2.03	2.56	4.44	2.53
	1949	2014	2.04	2.53	4.36	2.50
Medium	1955	2020	2.07	2.60	4.36	2.53
	1964	2029	1.94	2.44	4.10	2.39
	1973	2038	2.14	2.64	4.23	2.56
	1985	2050	2.32	2.74	4.37	2.70
	1997	2062	2.37	2.74	4.36	2.72
	2004	2069	2.42	2.76	4.36	2.75
	1920	1985	2.86	3.67	5.79	3.48
	1930	1995	1.92	2.54	4.40	2.39
	1937	2002	1.72	2.23	3.92	2.10
	1943	2008	1.49	1.98	3.57	1.84
	1949	2014	1.46	1.93	3.49	1.79
High	1955	2020	1.50	1.98	3.51	1.83
	1964	2029	1.32	1.78	3.24	1.65
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	1985	2050	1.71	2.10	3.54	1.98
	1997	2062	1.75	2.10	3.53	2.00
	2004	2069	1.79	2.12	3.53	2.03
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	1964	2029	0.63	0.98	2.33	0.85
	1973	2038	0.85	1.18	2.50	1.05
	1985	2050	0.98	1.27	2.60	1.17
	1997	2062	1.01	1.29	2.60	1.19
	2004	2069	1.03	1.30	2.60	1.20

Without Mortality and Disability Adjustments

Earnings Level	Year of birth	Year attains age 65	Single Male	Single Female	One-earner couple	Two-earner couple
	1920	1985	5.43	6.19	9.30	6.69
	1930	1995	4.52	5.04	7.42	5.30
	1937	2002	4.47	4.85	7.04	5.12
	1943	2008	4.33	4.70	6.72	4.92
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Very Low	1955	2020	4.35	4.81	6.52	4.84
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Earnings Level	Year of birth	Year attains age 65	Single Male	Single Female	One-earner couple	Two-earner couple
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	1937	2002	4.60	5.20	9.45	6.56
	1943	2008	4.64	5.18	9.01	6.32
	1949	2014	4.75	5.29	8.59	6.09
Very Low	1955	2020	4.69	5.44	8.20	5.94
	1964	2029	4.71	5.56	7.85	5.92
	1973	2038	4.81	5.73	7.73	5.91
	1985	2050	4.91	5.68	7.99	6.04
	1997	2062	4.94	5.65	7.86	6.00
	2004	2069	5.02	5.69	7.85	6.04

Old Method vs New Method

- The introduction of the adjustment factors results in large increases in IRRs for single men who are maximum earners. This increase occurs because longer expected lifespans increase lifetime retirement benefits by considerably more than lower disability incidence reduces lifetime disability benefits.
- For very low earners, moderate increases occur because shorter expected lifetimes reduce expected years of work and taxes paid, and higher disability incidence increases lifetime disability benefits considerably; these two factors are offset somewhat by lower expected lifetime retirement benefits.
- Medium and high earners generally show net decreases in IRRs with the application of the mortality and disability adjustment factors. These workers live long enough to pay higher payroll tax amounts but have lower disability incidence and medium life expectancy.

Old Method vs New Method

- For single women under the *Current Law Scheduled* scenario, we see some of the same patterns as for single men, but sometimes different in magnitude.
- For very low and low one-earner married couples, application of the adjustment factors leads to large increases because of: (1) reduced taxes paid due to higher mortality and disability incidence, (2) increased worker disability benefits, (3) increased survivor benefits.
- For two-earner couples, the patterns are similar to one-earner couples.

Old Method vs New Method

- *Current Law Scheduled* = current law; scheduled income will not fully finance scheduled benefits after 2034
- *Increased Payroll Tax* = Payroll tax rates increase from current law beginning in 2035 to fully finance benefits
- *Payable Benefits* = Reduce benefits below current law beginning in 2035 such that scheduled income is sufficient
- The relative reductions in internal rates of return from the *Current Law Scheduled* scenario to the *Increased Payroll Tax* & *Payable Benefits* scenarios are very similar with and without the adjustments in mortality and disability incidence by earnings level.