Individual Life Insurance Mortality Improvement Scale Recommendation – for Use with AG38/VM20

American Academy of Actuaries' Life Work Group and the Society of Actuaries Research Institute's Mortality and Longevity Oversight Advisory Council

September 2022

Purpose

This document describes the 2022 individual life insurance historical mortality improvement (HMI) and future mortality improvement (FMI) recommendations approved by the National Association of Insurance Commissioners (NAIC) Life Actuarial Task Force (LATF) on the September 22, 2022 call.

Background

As part of the work conducted by the American Academy of Actuaries' Life Work Group and the Society of Actuaries Research Institute's Mortality and Longevity Oversight Advisory Council (MLOAC) to develop the 2015 Valuation Basic Table, the Mortality Improvements Life Working Group (MILWG) (a subgroup of MLOAC) was tasked with reviewing recent mortality improvement levels based on available data for the individual life insurance policyholder population.

Since yearend 2014, the MILWG has been tasked with studying and annually recommending updates to the mortality improvement scales for use with AG38 and VM20 (specific to the individual life insurance product lines). Each year, the MILWG presents a recommendation for a set of HMI factors, and starting in 2022, a set of FMI factors to be used in conjunction with the 2015 Valuation Basic table. Both the HMI and FMI scales vary by age and sex. The FMI scale also varies by calendar year.

The HMI & FMI scales presented in this document were accepted for use for the 2022 valuation year in conjunction with AG 38 and VM20. See Appendix A of this document for background on the development of the current methodology for producing these scales.

The SOA Research Institute's Mortality and Longevity Steering Committee is simultaneously working on a general framework for developing product-neutral mortality improvement scales, which will subsequently be used as a guide by the MILWG to revisit the current approach for creating these scales each year.

Recommendation

HMI and FMI Scales

The MILWG, as well as other industry groups working on valuation mortality and mortality improvement rates, considered appropriate methods to reflect the impact of a shock mortality event like COVID-19. In order to ensure consistency in thinking about how to reflect the impact of a shock mortality event, an industry group was formed in January 2022 to discuss and develop a set of principles to reflect the impacts of COVID-19 on life insurance and annuity valuation mortality. This group included representatives from the life insurance industry, the American Academy of Actuaries, the Society of Actuaries, and the NAIC. A key principle agreed upon by the group was that the initial shock impact of the COVID-19 event should be reflected in valuation mortality <u>only</u> to the extent it is expected to continue into the future.

In practice, this principle was reflected in the current recommendation by implementing the following revised methodology for HMI and FMI for 2022.

It is recommended that the HMI and FMI rates provided in the accompanying spreadsheet be used for 2022.

For HMI, this will result in a reduction in mortality improvement levels from the 2021 scale of approximately 0.40 percent for males and 0.30 percent for females. For FMI, for the first three reserve projection years, the rates will project deterioration in mortality to reflect a reasonable estimate of potential ongoing impacts of COVID-19. This will result in an increase in mortality over pre-pandemic levels for approximately ten years. See below for a more detailed description of the methodologies applied to develop the 2022 HMI and FMI scales and an example of how the HMI and FMI scale rates should be applied in practice.

2022 Historical Mortality Improvement (HMI) Scale Methodology

The raw, unsmoothed HMI rates are equal to the average of a historical component and a future-looking component as described below:

- Historical component
  The historical component is represented by the 10-year average annual historical mortality improvement levels implied from general population historical mortality data published by the Social Security Administration (SSA). The SSA results are published with a 2-year lag (so for 2022 the historical data is available through 2020). For 2022, in order to reflect the principle of not including the initial shock impact of COVID-19 to develop the HMI or FMI scales, the historical average was calculated as the 10-year average from 2010-2020 but assumed that 2020 mortality was at the same level as 2019. So, no change in the rate of improvement or deterioration for 2020 was assumed.

- Future-looking component
  The future component is represented by the 20-year average annual mortality improvement levels (for 2022, this covers the period from 2020 to 2040), based on the most recent SSA Trustees report (2022) intermediate assumption.

For AG38/VM20 purposes, the "future/unknown" period is relatively short (for 2022, final historical data only exists through 2020, so that the "unknown" future component is 2 years). However, applying the 20-year period for averaging generally results in smoother patterns by age and calendar year, as well as allowing for greater weight being given to the long-term average.

The average annual rates calculated as above are then smoothed using simple linear interpolation to produce final scales by gender and age (as well as calendar year for FMI).

2022 Future Mortality Improvement (FMI) Scale Methodology

The FMI rates are calculated as follows.

- The starting point for FMI is the 2022 HMI scale.
- The FMI rates grade from the 2022 HMI level to a long-term MI assumption that is based on the average of years 10-15 of the SSA 2022 Trustee's Report intermediate projected mortality assumption. The FMI rates grade to the long-term level over the first 10 years of the projection.
- The FMI rates then remain level at the long-term rate from 2032-2037 (5 years).
- The FMI rates then grade to zero at year 20 (2042).

A reasonable estimate of the deterioration in mortality for years 2023-2025 was determined by calculating an initial 2023 deterioration level that reflects the full impact of COVID in determining the initial FMI starting point. This leads to an initial "alternative" HMI scale that reflects deterioration rather than improvement in mortality at most ages. This initial HMI deterioration then grades to the long-term mortality assumption over 10 years as the standard FMI approach would dictate. The resulting implied deterioration in the first year is reflected in full for the 2023 FMI rates. In 2024, deterioration is expected to be 50% of the 2023 level. In 2025, mortality improvement rates are expected to be zero. Then FMI rates grade from zero to the long-term assumption over the remaining 7-year period to 2032, remain level at the long-term assumption until 2037 and then grade to zero in 2042 and later.

Example Application

The recommended HMI and FMI scales are intended to be applied to update ("improve or deteriorate") valuation basic table mortality rates to the end of the current valuation year and into the future for the length of the projection period used in the reserve calculation.

The following is an example of how to determine the mortality rate to be used in the reserve projection for calendar year 2027, for male 40, using the 2022 approved HMI and FMI scales.

Step 1: Improve 2015 VBT q_{40} mortality rate to year-end 2022.		
$q_{40,2022} = q_{40}*(1-HMI_{40})^{(7.5)} = q_{40}*(1-0.0011)^{(7.5)}$ q_{40} is the mortality rate from 2015 VBT. HMI_{40} is the mortality improvement rate from the 2022 recommendation. Improvement applied to q_{40} from the middle of 2015 to the end of 2022 or **7.5** years.	**Attained Age**	**HMI Males (2022)**
	36	0.0011
	37	0.0011
	38	0.0011
	39	0.0011
	40	0.0011
	41	0.0011
	42	0.0011
	43	0.0011
Step 2: Improve $q_{40,2022}$ from year-end 2022 to the start of calendar year 2027, using the FMI rates for male, attained age 40, for each calendar year 2023 to 2027: So, $q_{40,yyyy}$ is mortality rate used at the start of calendar year yyyy +1 in the projection in the reserve calculation.		
$q_{40,2027} = q_{40,2022}$ $* (1 - (-0.0042585))$ $* (1 - (-0.0021292))$ $* (1 - 0.0000000)$ $* (1 - 0.0009003)$	**Calendar Year**	**FMI Males Attained Age 40**
	2023	-0.0042585
	2024	-0.0021292
	2025	0.0000000
	2026	0.0009003
	2027	0.0018005
	2028	0.0027008
	2029	0.0036011
	2030	0.0045013
	2031	0.0054016

APPENDIX A:

Considerations in developing mortality improvement factors for application with VM38 and VM20.

- Recent Historical Experience Impact – The desire for a methodology that weights the impact of recent historical rates of improvement with a longer-term assumption (i.e., SSA intermediate mortality projections) in determining projected improvement rates. This approach is (at a very high level) consistent with the current U.K. Continuous Mortality Investigation ("CMI") projection models, as well as methods commonly used to develop other insured mortality projection scales. These methods project rates based on past experience, but trend toward a long-term assumed average annual improvement level.

- Insured Data – Aggregate insurance company data for the period 2002-2009 from the Society of Actuaries regular studies of individual life insurance mortality was initially examined. It was eventually decided that, given (1) the relatively short period over which historical insured experience is available and (2) the year-over-year volatility of industry specific results (likely in part the result of both industry factors - such as changes in target market, distribution channel or underwriting mix and changes in underlying mortality rates), general population data is a preferable source for determining both an improvement scale for use in VBT table development efforts and as annual AG38/VM20 scale recommendations, at least for the near term.

- General Population Data Source – The MILWG examined several sources of general population data, including data from the U.S. Vital Statistics, the Human Mortality Database (HMD), and the SSA. The SSA data was selected as the source for general population analysis for several reasons, including the fact that it is strongly vetted, that it may have better data regarding age at death for the oldest ages than HMD, and that it includes projections of future estimated mortality.

- Additional Factors Considered (Gender, Attained Age, Smoker Status, Socioeconomic Status, Differences in Cause of Death for Insured vs. General Population) – In addition to data sources discussed above, the subgroup also researched and considered additional factors that could impact mortality improvement experience. The decision was made to regularly review the use of alternative or further adjustments to population mortality to eliminate potential basis risk (differences between the results using general population data in lieu of industry specific data) at the same time any changes for consistent framework recommendations are incorporated.

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