SOCIETY OF ACTUARIES

Mortality Improvement Scale MP-2015

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AUTHOR Retirement Plans Experience Committee
Society of Actuaries

Caveat and Disclaimer

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Section 1: Acknowledgements

The SOA would like to thank the Retirement Plans Experience Committee for their support, guidance, direction and feedback throughout the project.

Members of the Retirement Plans Experience Committee:
(Members of the Mortality Improvement subcommittee are denoted with an asterisk.)

- David T. Kausch,* *Chairperson*
- James G. Berberian*
- Elena V. Black*
- Feng Ling Chen
- Andrew D. Eisner
- Timothy J. Geddes*
- Robert C.W. Howard*
- Jeffrey Litwin*
- Eric John Minute*
- Francisco Javier Orduna*
- C. Allen Pinkham IV*
- Laurence Pinzur*
- Barthus J. Prien
- Patricia A. Pruitt
- Robert A. Pryor
- William E. Roberts*
- Kevin J. Woodrich
- Eva Sau Ying Yum
- Peter M. Zouras

- Cynthia MacDonald, SOA Senior Experience Studies Actuary
- Patrick D. Nolan, SOA Experience Studies Actuary
- Andrew J. Peterson, SOA Staff Fellow—Retirement
- Erika Schulty, SOA Academic Research Assistant

Section 2: Updated Mortality Improvement Scale

2.1 Introduction / Purpose

The Retirement Plans Experience Committee of the Society of Actuaries (RPEC) is pleased to present an update to Mortality Improvement Scale MP-2014, which was released in October 2014. This updated scale was created using two

additional years of historical data and the same RPEC_2014 model that was used to produce Scale MP-2014. For clarity, the updated mortality improvement scale is called MP-2015.[1]

Within the MP-2014 report, RPEC indicated an intention to publish updated improvement scales at least triennially. Subsequent to the development of Scale MP-2014, the Social Security Administration (SSA) released two years of additional mortality data. To reflect this latest available data, RPEC is now publishing this 2015 update and intends on providing future annual updates to the model as soon as practicable following the public release of updated data upon which the model is constructed. RPEC expects the release of such annual updates to have a number of advantages including:

- A decrease in the lag time between the most recent data used in the improvement scale and the date of application of that scale.
- More stable financial results, especially during multi-year periods over which mortality improvement is consistently increasing or decreasing.

With the publication of the MP-2014 improvement scale in 2014, RPEC provided a replacement for the 19 year-old Scale AA. The new scale utilized two-dimensional mortality improvement based upon the following underlying principles:

- Short-term mortality improvement rates should be based on recent experience.
- Long-term mortality improvement rates should be based on expert opinion.
- Short-term mortality improvement rates should blend smoothly into the assumed long-term rates over an appropriate transition period.

The first bullet above implies that as more experience emerges, the estimate of short-term mortality improvement rates may change. Any changes in the short-term rates will result in changes to the blending referred to by the third bullet. Accordingly, adding more recent experience will give rise to a new improvement scale, even though the underlying model remains unchanged.

2.2 Two Additional Years of Mortality Data Reflected

The RPEC_2014 model released in October 2014, which underpins RPEC's mortality improvement methodology, was applied to historical SSA mortality data between 1950 and 2009 to create Scale MP-2014. Two additional years of SSA mortality data (for 2010 and 2011) are now being incorporated to create Scale MP-2015. Importantly, there are no methodological changes to the RPEC_2014 model. Scale MP-2015 results from inputting the same "committee-selected" assumptions set used to develop Scale MP-2014[2].

2.3 Implications for Base Mortality Rates

As described in Section 5.4 of the Mortality Improvement Scale MP-2014 report, the base RP-2014 mortality rates implicitly reflect Scale MP-2014 assumptions for years 2007 through 2014. Some users might decide that it would be appropriate to adjust the RP-2014 tables to reflect the updated mortality improvement rates of Scale MP-2015.

Along with the MP-2014 mortality improvement scale, RPEC published a set of factors to adjust the RP-2014 values to base year 2006. These resulting values can be directly projected from 2006 using the newly released MP-2015 scale.

[1] RPEC requests that the RPEC_2014 model which now includes historical data through 2011 be referred to as "RPEC_2014_v.2011"
[2] Note that because the length of the committee-selected transition period remains at 20 years, the long-term improvement rates now apply to 2029 and later years in Scale MP-2015.

2.4 Impact of Updated Scale

The following tables present comparisons of 2015 monthly deferred-to-age-62 annuity due values calculated under three different sets of mortality assumptions:

- RP-2014 (unadjusted) projected with Scale MP-2014;
- RP-2014 (unadjusted) projected with Scale MP-2015;
- RP-2014 adjusted backward to 2006 with MP-2014 and projected with Scale MP-2015.

The monthly annuity values in Table 1 were calculated using discount rates of 4.0% and 6.0%. In each instance, the base mortality rates are Employee rates to age 61 and Healthy Annuitant rates for ages 62 and older.

		Monthly Deferred-to-62 Annuity-due Values Generational @ 2015			Percentage Change from RP-2014/MP-2014		Monthly Deferred-to-62 Annuity-due Values Generational @ 2015			Percentage Change from RP-2014/MP-2014	
	Base Rates=	RP-2014	RP-2014	Adjusted RP-2014*	RP-2014	Adjusted RP-2014*	RP-2014	RP-2014	Adjusted RP-2014*	RP-2014	Adjusted RP-2014*
	Proj Scale=	MP-2014	MP-2015	MP-2015	MP-2015	MP-2015	MP-2014	MP-2015	MP-2015	MP-2015	MP-2015
	Age	Discount rate = 4%					Discount rate = 6%				
Males	25	3.6081	3.5958	3.5747	-0.3%	-0.9%	1.4407	1.4373	1.4311	-0.2%	-0.7%
	35	5.2398	5.2196	5.1867	-0.4%	-1.0%	2.5415	2.5344	2.5225	-0.3%	-0.7%
	45	7.6142	7.5803	7.5290	-0.4%	-1.1%	4.4867	4.4716	4.4489	-0.3%	-0.8%
	55	11.1639	11.1049	11.0266	-0.5%	-1.2%	7.9927	7.9594	7.9169	-0.4%	-0.9%
	65	13.8167	13.7443	13.6198	-0.5%	-1.4%	11.4991	11.4524	11.3699	-0.4%	-1.1%
	75	9.9923	9.8943	9.7219	-1.0%	-2.7%	8.7399	8.6656	8.5315	-0.9%	-2.4%
	85	6.0175	5.9548	5.8141	-1.0%	-3.4%	5.5257	5.4726	5.3511	-1.0%	-3.2%
Females	25	3.8491	3.8272	3.7966	-0.6%	-1.4%	1.5218	1.5152	1.5061	-0.4%	-1.0%
	35	5.6018	5.5686	5.5221	-0.6%	-1.4%	2.6895	2.6773	2.6604	-0.5%	-1.1%
	45	8.1594	8.1092	8.0392	-0.6%	-1.5%	4.7577	4.7352	4.7042	-0.5%	-1.1%
	55	11.9569	11.8808	11.7731	-0.6%	-1.5%	8.4684	8.4269	8.3684	-0.5%	-1.2%
	65	14.7246	14.6268	14.4734	-0.7%	-1.7%	12.1197	12.0580	11.9591	-0.5%	-1.3%
	75	10.9097	10.7841	10.5804	-1.2%	-3.0%	9.4370	9.3447	9.1922	-1.0%	-2.6%
	85	6.8464	6.7479	6.5367	-1.4%	-4.5%	6.2239	6.1426	5.9644	-1.3%	-4.2%

Table 1

*Adjusted RP-2014 means that RP-2014 was adjusted to 2006 by removing improvement based on MP-2014 and then used as the base table as of 2006.

Section 3: RPEC Additional Research Regarding Mortality Improvement Model

The release of this update along with the intention to provide similar, annual updates going forward marks one step toward reducing the lag time between the data used to develop the mortality improvement scale and the release of such scale. However, even with annual updates, RPEC's exclusive reliance on data processed by the SSA will continue to result in a multi-year lag between the data underlying the improvement scale and the date that the scale is released. In an effort to reduce this lag, RPEC is actively investigating the possibility of obtaining more current information from the Centers for Medicare & Medicaid Services (CMS), the Centers for Disease Control and Prevention (CDC), and the Human Mortality Database (HMD).

Because future developments (e.g., medical breakthroughs, environmental changes and societal factors) could result in actual rates of mortality improvement varying significantly from projected levels, RPEC will continue to explore the parameters utilized in the committee-selected assumption set that led to MP-2014 and assess the appropriate way to balance recent experience and future expectations. If RPEC determines that changes resulting from this process are significant, there would be a full exposure cycle.

Section 4: Questions and Answers:

Q1: Why is an update being provided to reflect additional historical data only one year after the release of the MP-2014 scale?

A1: RPEC's continuing work and ongoing monitoring of emerging data has shown that it is prudent to reflect recent experience as soon as possible after being reviewed. Subsequent to the development of scale MP-2014, SSA has made two more years of data available. RPEC believes that the changes due to applying the RPEC_2014 model to the new data warrant publication at this time.

Q2: Will RPEC be publishing a revised series of base mortality tables adjusted to 2015 using the MP-2015 improvement scale?

A2: As stated on Page 18 of the RPEC Response to Comments on Mortality Improvement Scale MP-2014 Exposure Draft, the RP-2014 report contains a total of 22 separate tables. Instead of publishing 22 new versions of those tables (which would increase the chances of wrong tables inadvertently getting picked up), RPEC believes it is more efficient for those who wish to adjust their tables to "factor out" the Scale MP-2014 rates for years 2007 through 2014, and then apply the Scale MP-2015 factors to those years. This factoring out process is accomplished by dividing all of the rates in the selected RP-2014 table by the product of eight factors of the form $(1 - f(x,y))$ [for y = 2007, 2008, …, 2014], where f(x,y) is the gender-specific Scale MP-2014 factor at age x and calendar year y. RPEC has confirmed that this methodology produces base mortality rates that are extremely close to those that would have been produced by graduating the raw 2006 mortality rates.[3] Based on these considerations, RPEC will not be producing separate sets of revised tables. As noted in Section 2.3, RPEC published a table of the applicable adjustment factors.

Q3: When does RPEC intend to provide additional information with respect to the review of the sources of mortality data with reduced lag and / or consideration of updated model parameters?

A3: RPEC continues to collect additional information from various sources and perform further analysis. Specific timing is not yet known; however, RPEC does not expect to publish any additional information before the second quarter of 2016.

Q4: What issues exist with supplementing SSA historical data with data from other sources, such as CMS, CDC, and HMD?

A4: There are a number of technical issues with the CMS, CDC, and HMD datasets that must be resolved before RPEC would be in a position to reflect the resulting mortality improvement rates in the historical graduation phase of the update process. For example:

- The CDC does not publish gender-/age-specific mortality rates beyond age 84,
- The SSA and the CDC use two different techniques for reflecting CMS data, and
- The CMS and CDC annual counts of exposures and deaths are based on different underlying populations and on different snapshot dates.

[3] The extremely small differences are the result of switching between the "first project from 2006 to 2014, then graduate the resulting rates" methodology of Scale MP-2014 and the "first graduate 2006 raw rates, then project to 2014" methodology implicit in the "factoring out" approach described above.

As mentioned in the body of this update, RPEC is actively investigating how these data sources might be reflected in future updates.

Q5: Will the SOA be making software similar to those developed in connection with Scale MP-2014 available for the updated Scale MP-2015?

A5: Yes. The SOA has posted the "RPEC_2014_v2011 Model Implementation Tool" that reflects the updated history on http://www.soa.org/Research/Experience-Study/Pension/research-2015-mp.aspx. In the upcoming weeks, an updated version of the "2D to 1D Conversion Tool" will be posted as well.

Q6: If the updated model reflects additional SSA data for calendar years 2010 and 2011, why do some of the historical Scale MP-2015 mortality improvement rates in years prior to 2010 differ from the corresponding rates presented in the Scale MP-2014 report?

A6: For calendar years 2008 and 2009, the differences are primarily due to the two-year step-back technique utilized to mitigate the graduation-related edge effects described in subsection 3.2 of the Mortality Improvement Scale MP-2014 Report. The differences for calendar years prior to 2008 result from the fact that every graduated value developed using the two-dimensional Whittaker-Henderson methodology reflects the full range of the raw data being graduated; this is true for most two-dimensional graduation techniques. Because (1) the raw values closest to the specific rate being graduated have the largest impact on that rate and (2) all of the raw values prior to 2008 have remained unchanged, the absolute differences between the two scales generally tend to decrease as they move away from 2007 towards earlier years.

Society of Actuaries
475 N. Martingale Road, Suite 600
Schaumburg, Illinois 60173
www.SOA.org