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## Deferred Annuity Impacts of New Brazilian Mortality Tables

By Celina da Costa Silva, Geraldo de Mello Junior, and Michael W. Witt

Since the stabilization of the Brazilian economy with the implementation of the Real Plan in 1994, the deferred annuity market has grown, on average, about 30 percent per year, measured by total assets. Similar to deferred annuities in the United States and other countries, deferred annuities in Brazil offer annuitization benefits to provide lifetime income following the savings period. However, in their short history, the deferred annuities in Brazil have experienced significantly higher annuitization election percentages. As the annuitization benefits are defined at issue of the deferred annuity (using a mortality table and a defined interest rate), there is significant risk for insurers as mortality continues to improve. Further, the only tables available for determining the benefits were tables based on U.S. experience. The first generation of deferred annuities included a benefit based on the a-1949 annuitant table, and recent years have seen the market offer benefits based on the 1983 IAM or Annuity 2000 tables. Until recently, a mortality table based on the insured population in Brazil had never been developed. This article will examine the development of the new annuitant mortality table, and explore the current and future effects of this table.

In 2007, the groups that represent insurance companies in Brazil (FENASEG and FENAPREVI) proposed the development of mortality tables that represent the populations of annuitants and those with life insurance. To accomplish this, they contracted the Federal University of Rio de Janeiro (UFRJ), a leading research center for statistics and actuarial science

in Brazil. Mortality experience was provided by 23 companies, representing about 95 percent of the market, and the university was responsible for constructing the tables (BR-EMS 2010). Separate tables were developed for the annuitant populations, and for those with life insurance coverage, segregated by sex.

The BR-EMS 2010 tables were built with data from 2004 to 2006, with total person-years of exposures averaging about 19 million per year for males and 13 million for females. A total of about 114,000 deaths were included, and these deaths were cross-referenced with government systems and statistics to confirm the data.

In constructing the tables, UFRJ used the Heligman & Pollard method.<sup>1</sup> This model combines the mortality impacts of three distinct patterns—infant mortality, a “hump” for young adult mortality (primarily for accident-related deaths), and normal aging mortality. Each pattern has several parameters that can be changed to influence the shape, slope, and level of each piece. UFRJ used the raw mortality data to estimate the parameters of the Heligman & Pollard formula via non-linear regression tools.

Because of the relative immaturity of the Brazilian market, the data was somewhat scarce at older ages, making the calculation of mortality rates at older ages a little more art than science. The current plan is to repeat this study (and create new tables) every five years, thereby utilizing larger data sets and providing the industry with current experience.

<sup>1</sup> Heligman, Larry & Pollard, J. H. (1980). The Age Pattern of Mortality. *Readings in Population Research Methodology* v.2: pp. 97-104.

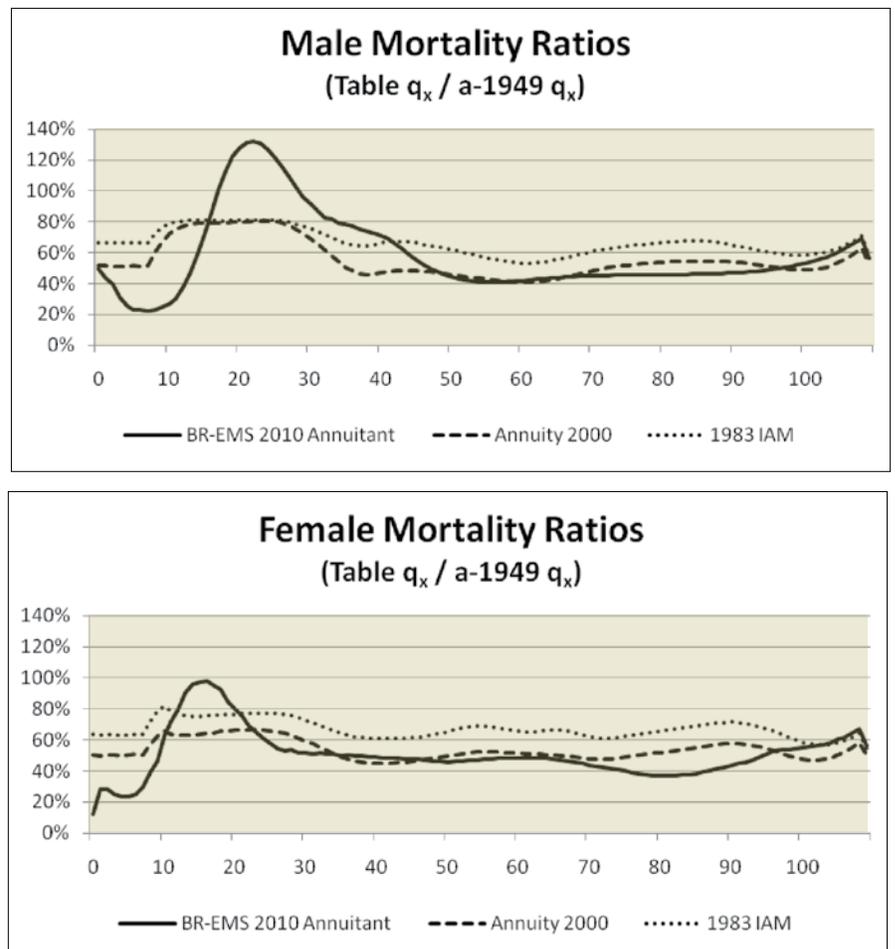
To provide some context for the impact that the new tables will have for Brazilian insurance companies, the graphs in Figure 1 compare the two most recent U.S. tables (the 1983 IAM and Annuity 2000) and the BR-EMS 2010 annuitant table. The rates are presented as a ratio to the a-1949 mortality table to better visualize the differences.

For both males and females, the BR-EMS 2010 annuitant tables track fairly close to the Annuity 2000 tables until about age 65 (excluding early ages, which have little relevance for annuities). Between ages 65 and 95, the BR-EMS 2010 annuitant tables have rates that are lower than the Annuity 2000 tables (with females significantly lower), before approximating the Annuity 2000 tables at very advanced ages.

In quantifying the differences, it is also useful to examine the annuity factors calculated from the different tables. The charts in Figure 2 show the annuity-immediate factors for 2010 issues, for males and females with issue ages between 65 and 85. The factors were calculated using the a-1949, 1983 IAM, Annuity 2000 (with and without G Scale improvement), and the BR-EMS 2010 annuitant tables, all at an interest rate of 3.0 percent. In the case of the improved table, improvement was assumed since 2000 and continuing in the future.

For both the male and female tables, the annuity factors using the BR-EMS 2010 annuitant tables fall between the unimproved and improved Annuity 2000 tables at age 65. As the issue ages increase, the BR-EMS 2010 annuitant tables approach the improved tables (and surpass the improved tables for some female issue ages).

**Figure 1: Male and Female Mortality Ratios**

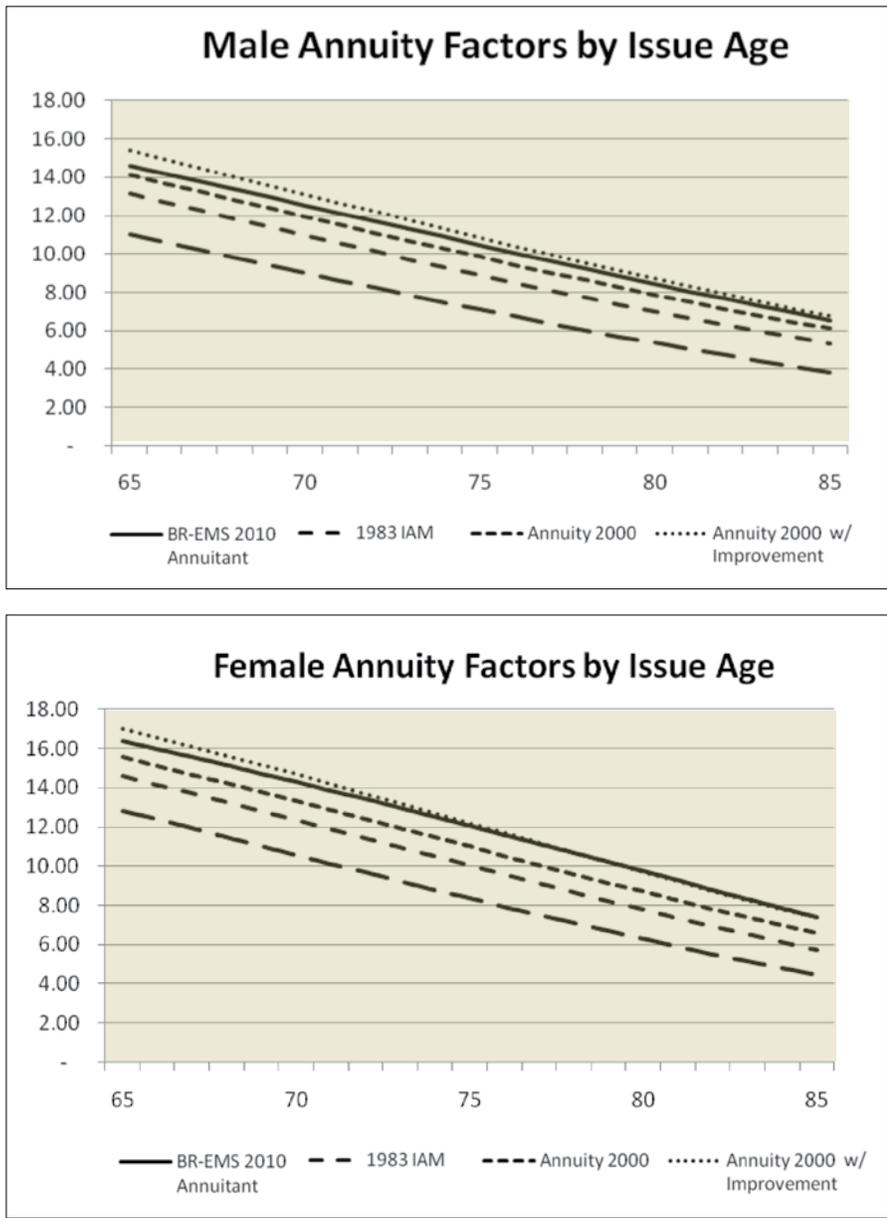


In immediate terms, the new tables will serve the purpose of significantly reducing the longevity risk for deferred annuities. The regulation has already been changed to allow companies to issue deferred annuities with the benefit calculated using the most recent table when the

CONTINUED ON PAGE 36

Deferred Annuity... | from Page 35

**Figure 2: Annuity Factors**



policyholder annuitizes, and not the most recent table at policy issue. Thus, a policy that annuitizes in 2030 will use the table released in 2030 to calculate the benefit, regardless of when the policy was issued. Prior to these new Brazilian tables, companies were forced to lock in the table used to calculate the benefit at policy issue, even though annuitization might not occur for 30 to 40 years.

Although companies will be able to use the new tables for calculating reserves, this will not be immediately required. The current regulations afford some liberty for companies to calculate reserves under their internal best-estimate assumption. It is possible that regulators will require that companies use the new tables for reserving purposes, possibly applying the assumption retroactively to in-force policies. As shown in Figure 2, this could have significant impacts for companies that have historically used weak improvement assumptions or the contractual tables used in calculating the benefits.

Finally, the new tables will certainly be tested by companies in embedded value calculations, asset-liability management (ALM) exercises, and other risk management activities. In the past, some combination of the Annuity 2000 table and improvement scales were used by most companies, without much confidence that the assumption represents the reality of the Brazilian annuity market.

It is still very early to determine all of the impacts that these new tables will have on the Brazilian annuity market, but it is clear that they are opening eyes and causing companies to think about how their business will be affected by mortality trends in the future. □