BBVA | RESEARCH

Working Papers
Number 11/21

Longevity Risk in Latin America

Economic Analysis
30 June 2011

Longevity Risk in Latin America

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May 17, 2011

Introduction

A daily question that actuaries across the world ask is: How long will a retiree be receiving a pension? In other words, how will the life expectancy of the human race grow in the future? The answer raises many questions. In one extreme, as confirmed by Dr. Aubrey de Grey of Cambridge University, if the way to repair damaged cells is discovered, life expectancy of humans could rise to 1000 years.

While the possibility of a situation like that commented by Dr. Aubrey exists, the chances of it occurring are not high. However, what is true, is that people's life expectancy has not ceased to grow, especially among the last 60 years, and the majority of cases the demographers have underestimated the growth in their projections. This gap could be amplified if the recent trends continue: dramatic medical breakthroughs, superior standards of living and improved public health, all of these are principle factors that have contributed to the increase in life expectancy.

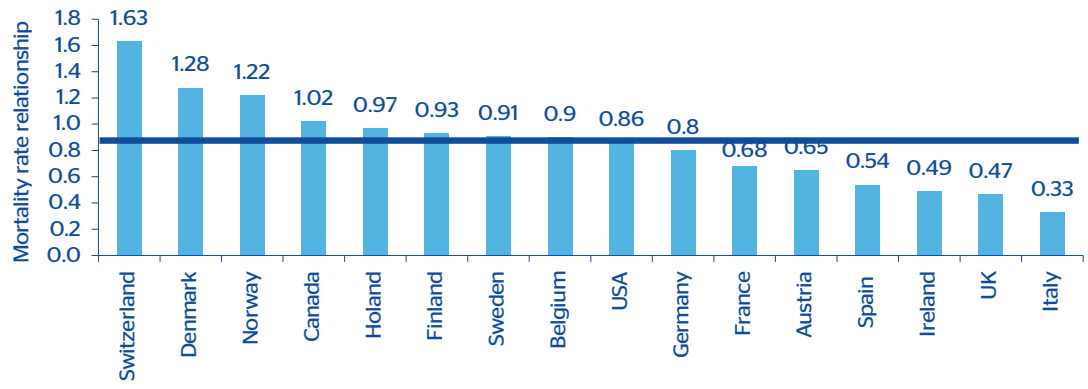
The implications of these changes differ by insurance sector. Life insurances would experience lower rates, because if people live longer, their compensation payments are delayed for many years, concurrently, the rates of pension products would increase, because they would have to be able to pay for a prolonged period of time.

According to the pension products point of view, we face a risk, the so-called longevity risk, ie the risk associated with the actuarial present value of benefits, in favour of a person needing to pay a lower current value for benefits under the terms and regulations of the Pension Plan. Depending on the retirement scheme (scheduled, life or mixed), these risks lie mainly in either the hands of the affiliate, the insurance company or both.

Longevity risk in the accumulation stage depends on if the contributions are adequate or not, and it ultimately comes down to whether the projected mortality tables are close to their real future values. Historical evidence shows that mortality tables have been quite conservative in many countries, as seen in graph 1.

Chart 1

Ratio of mortality rate considered by the industry in relation to that observed from the age of 65



Source: BBVA Research

The longevity risk observed by numerous developed countries that calculate with the best information on mortality, could be increased, as seen above, and within many Latin American countries with greater information problems, this risk is elevated.

[1]: This report was prepared for the Annual Meeting of the International Federation of Pension Funds Administrators (FIAP) held in Punta Cana, Dominican Republic, on 18 May 2011.

Background on Latin American Mortality Tables

Latin America has traditionally experienced a chronic lack of statistical information, including mortality information. The use of mortality tables are often based on the experience observed in other developed countries, with long delays in updating. The causes of this problem could be found in the lack of a demographic information base, inadequate technical training and a lack of sensitivity by the authorities on the risks associated with longevity risk.

Currently, Chile is the most advanced country in the region, and has already taken note of the importance of constantly updating mortality tables. In the rest of Latin America, there are still significant gaps in updating mortality tables. As we shall see, even the best cases, the corrections made are very recent.

In the case of Chile, up until 2004, they used the RV-85 mortality tables, established by the circular Nº 656 of the Superintendency of the AFP[2] . These tables were originally designed to be applicable for the United States population, but were adjusted to the Chilean population based on the Social Security Service (SSS) and the incorporation of the population information from CELADE, using the 1982 census.

However, after the year 2000, the RV-85 tables began to show signs of poor performance as an input for estimating life expectancy. This deficiency motivated the Superintendency of the Pension Fund Administrators and the Superintendency of Securities and Insurance to construct the mortality tables RV-2004.

These new tables updated the benefits calculations for scheduled retirement and annuities, using pensions data from old age pensioners during the 1995-2003 period. Through this data, by adjustment techniques and rankings, the longevity probabilities of pensioners were determined.

The most notable, was that the RV-2004 tables showed that the RV-85 tables were underestimating the life expectancy. For example, the life expectancy of 60 year old women had grown by 3.06 years, and in the case of men the error was slighter, an underestimation of around 0.51 years.

Colombia had used the same annuitant mortality tables since 1994 (RV89 on the year '89 experience). In the year 2000, the Banking Superintendency of Colombia, through the 071/2000 circular[3], requested information concerning the mortality of the active contributors, pensioners and the disabled, with the intent to produce tables that reflect the current trend in regards to mortality rates. As a result of the data analysis, it became necessary to update these tables, and in the year 2010, the resolution 1555/2010[4] replaced the RV89 for the RV08 tables.

Similar to the Chilean case, the updated Colombian tables indicated that the life expectancy had been underestimated. The RV08 calculated the life expectancy of 60 year women to be 27 years; while the calculations of DANE hovered around 22 years, a difference of 5 years, and for the case of males, the difference was slighter, around 3.3 years.

Since 1993, Peru had used the Chilean RV85 tables, and only after 13 years, in 2006, did the 354/2006 resolution approve the use of the Chilean RV-2004 modified mortality tables. More recently, the 17728/2010 resolution obligated the use of the RV-2004 tables modified and adjusted to the Peruvian experience[5].

As we observe, life expectancy can be underestimated up to 5 years if mortality tables are used inadequately, and more so, if the adjustment from the mortality tables of other countries is not appropriated calculated.

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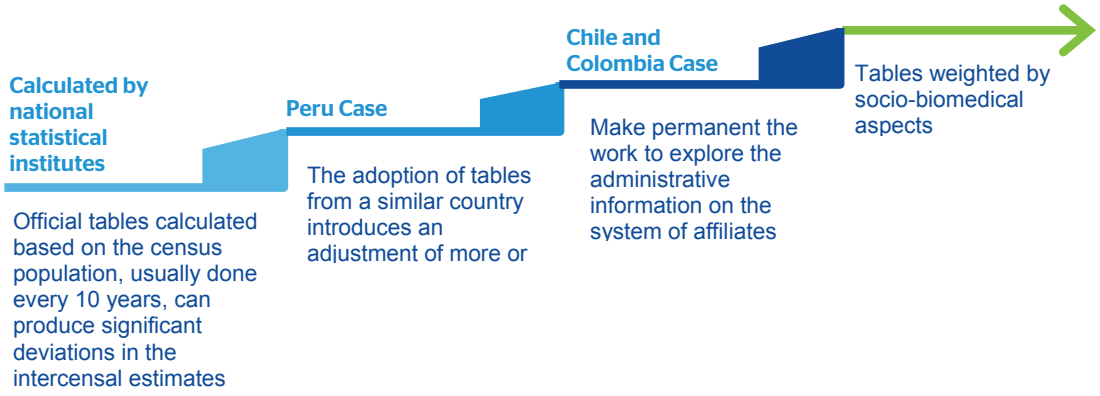
[2] For more information refer to:
http://www.spensiones.cl/redirect/files/normativa/circulares/CAFP656.pdf
http://www.safp.cl/safpstats/stats/files/normativa/circulares/CAFP1314.pdf , as communicted by the publication
http://www.svs.cl/comunicados/com_20041116-01.pdf
[3] For more information refer to the circular 071/2000
http://www.superfinanciera.gov.co/Normativa/PrincipalesPublicaciones/boletinminhda/2000/548-1000/ce071.rtf
[4] http://www.superfinanciera.gov.co/NormativaFinanciera/Archivos/r1555_10.doc
[5] For more information on resolutions, refer to:
http://intranet1.sbs.gob.pe/IDXALL/SEGUROS/DOC/RESOLUCION/PDF/0309-1993.R.PDF
http://intranet1.sbs.gob.pe/IDXALL/SEGUROS/DOC/RESOLUCION/PDF/0354-2006.R.PDF
http://intranet1.sbs.gob.pe/IDXALL/SEGUROS/DOC/RESOLUCION/PDF/17728-2010.R.PDF

Other points to keep in mind when performing a regional analysis are:

- Each country uses different methods to calculate their mortality tables (see graph 2).
- The official tables calculated by the census population, usually every 10 years, can produce significant bias in the estimates between censuses. .

Chart 2
Mortality Calculation Methods in Latin America



Source: BBVA Research

A review of the current projection methods

The methodology traditionally used to project mortality includes two main focuses. The first is based in a study of trends in time for mortality using econometric techniques. The second looks for references to countries with more advanced mortality rates in time or by choosing a target mortality table, including information about factors that have a significant influence on mortality and generating projections about its future from the expected behaviour of these factors.

Alonso et al (2011) follows the methods used by Alonso and Sosvilla (2007), estimating an econometrics model that best fits the historical trends and then calculates the projections of the generational tables.

In summary, the authors try to answer the following questions:

- What developed country resembles the Chilean mortality tables?
- How will life expectancy increase in the developed country selected?
- How will life expectancy in Chile converge with this country?

The first question "What developed country resembles the Chilean mortality tables?" is answered by using a statistical test of equal samples. The classic method of comparing mortality tables was proposed by Forfar et al (1988). These authors proposed a non-parametric tests that compare:

- Signs test: Determining if the level of mortality is sufficiently similar (from the statistical view point)
- Sequence test: Determining the similarity of the form of the mortality tables
- $\chi 2$ (chi) test: Identifying if there is a similar pattern that exists between the two distributions

The second question is "How will life expectancy increase in the developed country selected?" is answered using the predictions model ARMAX. The ARMAX model is an extension of the Box-Jenkins autoregressive moving average model (ARMA by its initials in English auto-regressive moving average) which includes exogenous explanatory variable (X).

And the third question "How will life expectancy in Chile converge with this country?", we will answer in the following section.

Results of the applied selected method

Alonso et al (2011) compared Chilean data with 20 countries and later analyzed 400 combinations to find that:

The dynamic generational tables of Chile are equivalent to Austria -4years in men and New Zealand -6 years in women (see table 1)

- The generational tables of Austria and New Zealand are available since 1948, allowing for long term projections to be made, while tables from Chile are available since 1992. (www.mortality.org)

Table 1
Non-parametric tests to identify similarities

Males / Austria	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Signs	1	1	1	0	0	1	1	1	1	1	1	1	1
Sequence	1	0	1	1	1	0	1	1	1	1	1	1	1
chi	1	1	1	1	1	1	1	1	1	1	1	1	1
Chile	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004

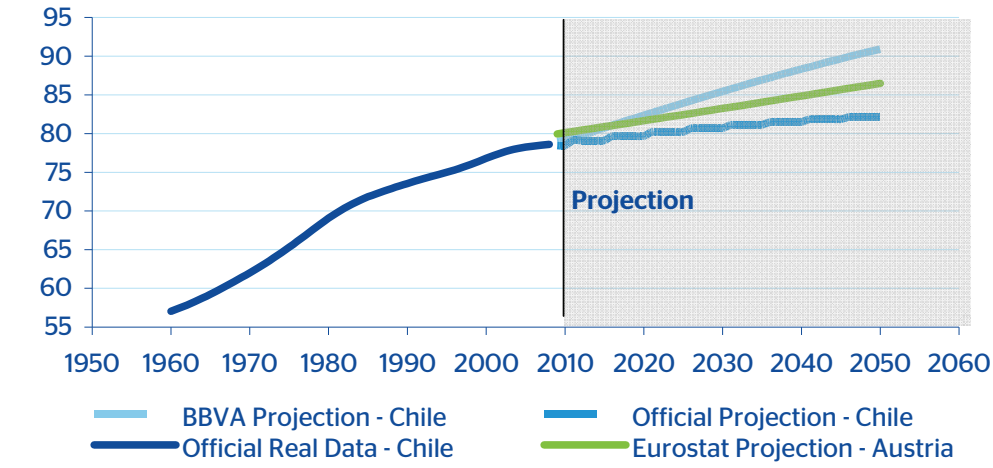
Females /New Zealand	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Signs	1	1	1	1	1	1	1	0	1	1	1	1	1	1
Sequence	1	1	1	1	1	1	0	1	1	1	0	1	1	1
chi	1	1	1	1	1	0	1	1	1	1	1	1	1	1
Chile	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007

1=Accept the nule hypothesis of the equal sample
0=Reject the nule hypothesis of the equal sample
Source: BBVA Research

The projections from the ARMAX model, offers us a life expectancy of 90.91 years in 2050, while the INE of Chile projected life expectancy from birth to be 82.14 years (see graph 3).

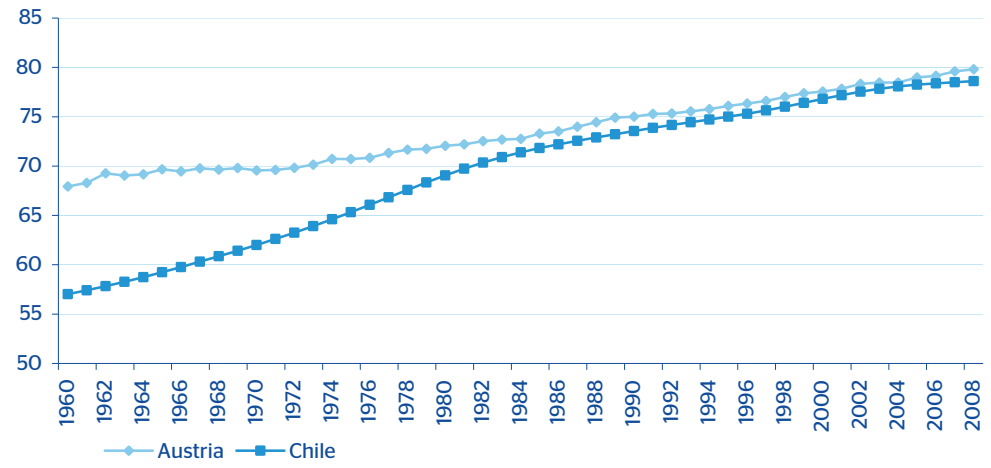
If we take the official estimates of the INE (82.14) and compare it to the estimations of Europop in the case of Austria (86.5) we notice that life expectancy of Chile and Austria diverge in approximately 4 years, contrary to what one would expect given the historical trends of these two countries (as of 1985, the spread has remained relatively constant at around 1.6 years on average – see graph 4).

Chart 3
Life Expectancy Projections



Source: BBVA research and information from the Chilean INE

Chart 4
Life expectancy convergence



Source: www.Mortality.org

Economic Impact of using inadequate mortality tables

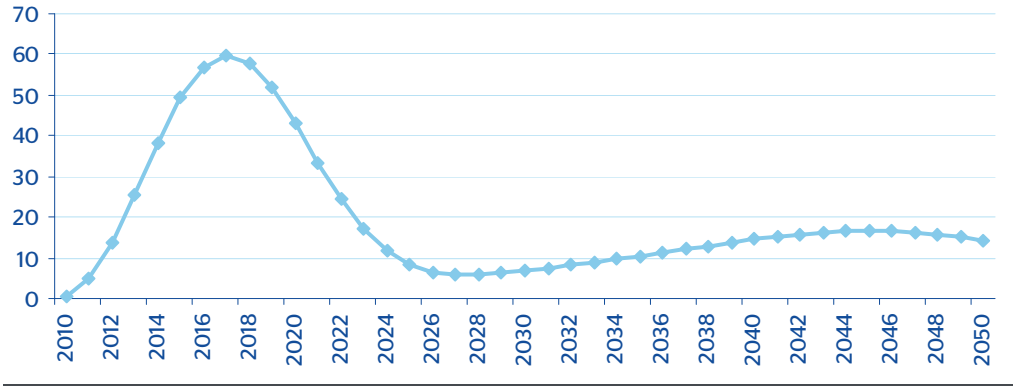
In the previous section, we observed that there exist discrepancies in the predictions made by the different institutions, and that in the case of specifically Austria and Chile it is surprising that that an almost sure convergence of life expectancies between the two countries could reverse in the next 40 years perhaps due to different estimation methodologies. Thus, we have to ask ourselves: Who is right? The risk to inappropriately answer this question is very relevant for the pensions industry.

A simulation exercise demonstrates that a deviation in 1% of the tables of mortality used for calculating annuities could translate into a loss for the industry amounting to 60 million dollars in 2017 (see graph 5).

These losses would mainly be due to two principle factors:

- Effect of a longer than expected lifespan of the affiliate
- Effect of using an inadequate rate

Chart 5
Simulation of systematic risk in the use of mortality tables has a 1% uncertainty in the Chilean mortality tables (in millions of dollars)

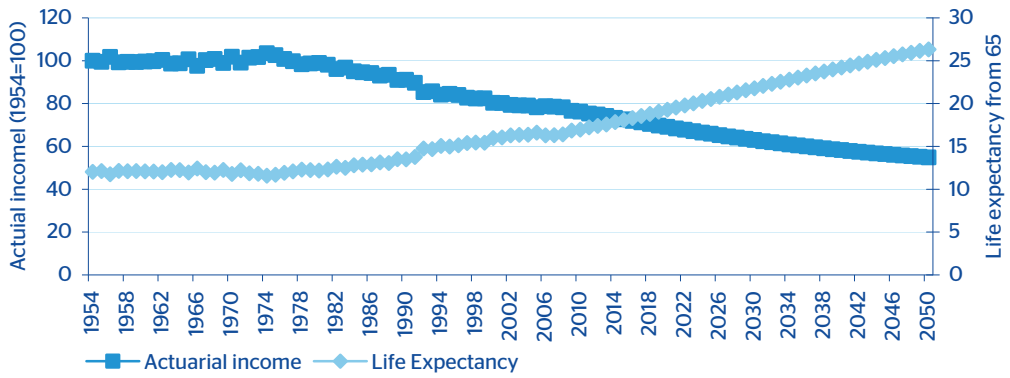


Source: BBVA Research

Additionally, the growth in life expectancy could indicate that the affiliates of many Latin American countries will not have sufficient benefits from their pension funds in old age. An estimation error in life expectancy could indicate that affiliates would have to allocate resources accumulated in an annuity over a longer period of life, with disposable income that would reduce the substitution rate and hence their standard of living.

In the case that supplementary contributions are not made, future generations could see their pensions reduced by almost 50% due to increased life expectancy (see graph 6).

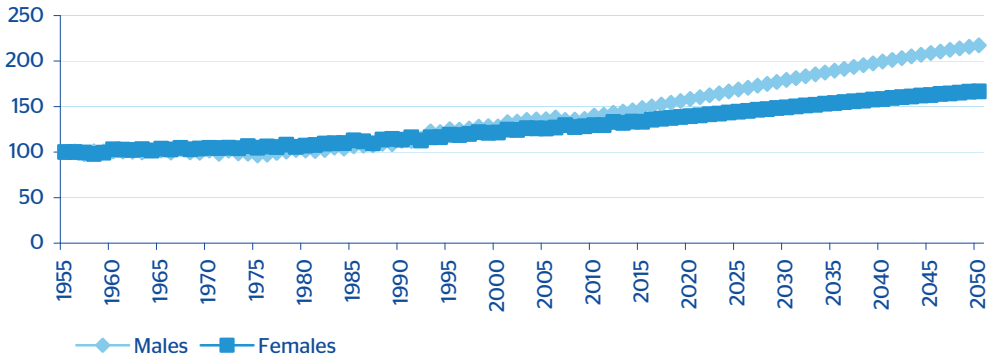
Chart 6
Evolution in life expectancy and male pensions



Source: BBVA Research

In another simulation exercise, we calculate would the contribution rate have to be in Chile in order to maintain the current substitution rate (see graph 7). Contribution rates would have to increase on average by 8 percentage points in the case of men and 4% for females from the current levels. The different evolution by sex is explained by the greater relative increase men would experience in life expectancy compared to women (sex-convergence is observed) and because men hold higher salaries and therefore should accumulate a higher balance in order to sustain their replacement rate.

Chart 7
Simulation of contribution rates necessary to maintain the current replacement rate



Source: BBVA Research

Conclusions and proposals for the industry

There exist considerable uncertainties about the evolution of life expectancy in Latam that poses a significant risk for the pensions and insurance industry, as well as the affiliates of the system.

Currently there is not sufficient information to create quality and regular mortality tables for the majority of countries in Latam.

It is a societal problem whose solution must begin with the authorities and the industry as a whole.

There should be specialized institutions created in the industry to optimize the calculations of the mortality tables in Latin America and to provide the statistical information necessary to do so..

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