

**APRIL 2012 - GLOBAL FINANCIAL STABILITY REPORT
CHAPTER OUTLINE**

THE FINANCIAL SECTOR IMPACT OF LONGEVITY¹

I. INTRODUCTION

This chapter will analyze the impact of demographic changes, a low interest rate environment and longevity risk on institutions, markets, the economy, and on financial stability. It will add to the literature in at least two ways: (i) it will go beyond the much-debated effects of population aging and focus on the issue of longevity risk, i.e., the risk that the population will live even longer than now expected; and (ii) it will look at the issue of longevity and longevity risk in the context of the current low interest environment. The chapter will attempt to quantify the exposure of certain sectors to longevity risk, identify agents that could benefit from buying longevity risk, and assess whether transferring this risk using appropriate instruments and markets could benefit financial stability. The analysis is expected to yield specific policy implications, including an assessment of whether adjustments to the structure of collective and individual retirement schemes can play a role in coping with the challenges of longevity risks.

II. DEMOGRAPHIC CHANGE, AGEING AND ITS ECONOMIC IMPACT

Section II will describe demographic trends of developed and developing economies and explain its impact on the economy and financial markets. Specifically, it will address the following questions:

- a. What are the global and regional trends of population ageing?
- b. What are the channels through which population ageing affects the global economy and financial markets?

To answer these questions and motivate the topic, the section could rely on studies undertaken by the OECD, the G10, the United Nations and others.^{2,3,4,5} Question (a) could involve showing a “heat map” of areas with different demographics; question (b) should mention the potential impact of ageing on equity, bond, and real-estate prices and on cross-border flows.

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² OECD (2011), *Pensions at a Glance 2011: Retirement-Income Systems in OECD and G20 Countries*.

³ See Visco, “Ageing and Pension System Reform: implications for financial markets and economic policies”, G10(2005).

⁴ See Lutz, Sanderson and Scherbov, “The coming acceleration of global population ageing”, *Nature* (2008).

⁵ United Nations, *World Population Ageing: 1950-2050*, Department of Economic and Social Affairs, Population Division, 2001.

Apart from providing a literature review, the separate discussion of demographic change should help to clarify the contribution of this chapter. Specifically, it will indicate how the research in this chapter is different from earlier work; the main contributions are: (i) a focus not only on the impact of longevity (the baseline effects of aging), but also of longevity risk (the impact of unexpected innovations in longevity); and (ii) a focus on the effects of the low interest rate environment on the liabilities of institutional investors.

III. LONGEVITY: THE BASELINE

Section III will introduce the concept of life expectancy and its effects on the liabilities of institutional investors. Specifically, it will address the following questions:

- a. What is the standard way of forecasting longevity and what are the issues for institutional investors resulting from this forecasting framework? This question could be answered by giving a literature review of the most important mortality forecast models, with a focus on the Lee-Carter (1992) Model.
- b. How has life expectancy evolved across different regions over the past decades and what are the expected trends in longevity going forward?⁶
- c. How is the increase in longevity affecting the liabilities of institutional investors? How does this interact with the low interest rate environment? This can be illustrated with a numerical example. The potential fiscal implications could also be discussed.

IV. LONGEVITY RISK

Section IV will introduce the concept of longevity risk. Specifically, it will address the following questions:

- a. What is longevity risk, who is exposed to it, and how can it affect the economy and financial markets?⁷ This section will explain that longevity risk consists of several components that include: (i) past projections have continuously underestimated realized life expectancy, (ii) there is a significant tail risk associated with longevity, for example as a result of a sudden break-through in the treatment of severe illnesses or other medical advances that increase longevity; and (iii) when a longevity event materializes, agents are slow to react to it. At a fundamental level, the effects of a longevity event on the economy and financial markets are similar to the effects of aging, i.e., they propagate through the labor force composition and participation rate, the public finances, private saving and investment, and potential growth. However, realization of risk may act as a

⁶ As appropriate, the chapter will use information from the upcoming Executive Board paper on “The Challenge of Pension Reform in Advanced and Emerging Economies” produced in FAD.

⁷ See CRO Forum, “Longevity CRO Briefing,” Emerging Risks Initiative - Position Paper.

shock to the economy and markets as they adjust to the new economic reality. This shock may be mitigated to the extent that economic agents have taken risk mitigation measures that may include hedging or limitation of exposures. To the extent that agents or markets are not fully aware of the risks associated with longevity and have not mitigated the risk appropriately, the shock to the economy and markets may be exacerbated, presenting a possible risk to financial stability.

- b. What is the potential magnitude of longevity risk?^{8,9,10} This question could be answered by first providing some rough “back-on-the-envelope” calculations to infer the potential global magnitude of longevity risk inherent in private DB pension promises and compare it to the magnitude of aging more generally. This could be done by (i) assessing the global magnitude of private DB pension promises and (ii) relying on previous research papers that have delivered estimates how much an increase in life expectancy adds to the present value of DB pension obligations. An advantage of this approach is that it would discuss different scenarios and relate them to existing findings in the literature.

The issue could then be analyzed in more detail with an appropriate dataset, for example using U.S. data on corporate pensions plans from Form 5500 compiled by the U.S. Department of Labor. This dataset includes detailed information on the balance sheet of corporate pension plans and on the main assumptions underlying the calculations of its pension liabilities (including the mortality table used in the projections). The study will attempt to assess the impact of using increased longevity assumptions (i.e., updated mortality tables) on the value of the pension liabilities, perhaps using a simple regression that relates the change in liabilities to a longevity event (updates in longevity tables, represented by a dummy or another longevity measure), controlling for changes in interest rates and other control variables. The database appears to have sufficient longevity events (i.e. updates in mortality tables): 5 percent of full sample, 10 percent since 2003, 15 percent since 2004. Given the richness of the data, the analysis can be done for various subsamples (i.e. small versus large plans, past switches versus current switches, etc.) and should therefore add value as a new and alternative estimate of the impact of longevity risk. Finally, robustness checks could rely on previous studies to deliver alternative estimates. To the extent appropriate datasets from other countries can be found, similar exercises could be employed to estimate the sensitivity of pension schemes to longevity risks there.

⁸ See Loeys, Panigirtzoglou and Ribeiro, “Longevity: a market in the making,” J.P. Morgan Global Market Strategy (2007).

⁹ See Antolin, “Longevity Risk and Private Pensions,” OECD Working Papers on Insurance and Private Pensions, No. 3, OECD Publishing.

¹⁰ The average funding deficit is based on a sample of 2100 publicly traded global companies. Further information can be found in: OECD (2011), Pensions at a Glance 2011: Retirement-Income Systems in OECD and G20 Countries.

- c. What is the effect of the current low interest rate environment on longevity risk? ¹¹ Similarly to section III.c, this section could address the fact that the magnitude of longevity *risk* is negatively related to the level of the interest rates. That is, the lower the interest rate the more severe the realization of a longevity shock due to its higher expected present value. This could again be demonstrated with a numerical example (possibly using data from the Form 5500 database or other publicly available information). The section would also assess the extent to which longevity risk exacerbates the financial distress of already under-water pension plans.

Possible Box: A case study of the effects of a realization of longevity risk: the advent of HIV drugs in the 1990s.

Possible Box: What Is Longevity Risk, Really? This box would give further elaboration on the difference between the longevity baseline and the risk to the baseline, with examples of such risks; for example, a cure for cancer, a medical advance that increases the maximum life span of humans, etc.

V. LONGEVITY RISK TRANSFER

Section V will discuss the tradeoffs involved in the transfer of longevity risk. Specifically, it will address the following issues:

- a. To what extent is there a need for longevity risk transfer? Or are those exposed to longevity risk also the optimal holders? This would recognize the fact that the risk transfer might involve a substantial amount of basis risk, with recent experiences from the financial crisis as well as the potential criticism that from an aggregate perspective longevity risk transfer might be a zero-sum game. For example, if it is mostly governments holding the risk, and a longevity risk event would lead liabilities ultimately to end up on the public balance sheet (through bailouts), it would not make sense to transfer the risk to the private sector in the first place.
- b. Who would be a natural buyer of longevity risk? This would discuss the characteristics of an optimal buyer of longevity risk. Potential candidates include industries benefiting from an increase in longevity (i.e., healthcare, pharmaceuticals), countries with different demographics (i.e., Middle East) or sectors with a comparative advantage in valuing longevity risk (i.e., financial sector?). The section may attempt to quantify the extent to which some of these agents are “short” longevity risk. This may perhaps be done by combining existing estimates of longevity risk and the costs of ageing. For example, how much would the health care sector benefit from an increase in longevity of x years?

¹¹ Specifically, low expected market returns depress pension asset values, whereas low current (and future) risk-free rates increase the present value of future DB pension obligations. See Box 2.3 in September 2011 GFSR.

- c. What is the current situation with regard to longevity risk transfer?
- i. Transfer of longevity risk to the household sector, as opposed to other financial market participants, can occur with closures or freezes of DB plans, which are frequently taking place now. Can households effectively hedge with annuities or reverse mortgages? Are there other means by which households could assume, incrementally, the risks associated with their own longevity?
 - ii. Which instruments are currently available to trade and hedge longevity risk in a market context?¹² These include longevity bonds and swaps, as well as pension plan buyouts and transfers to other financial institutions.
 - iii. How efficiently do these new instruments transfer longevity risk?
 - iv. What share of total longevity risk do these instruments and markets cover?
 - v. Are there market failures?
- d. What types of instruments or markets would we need to efficiently transfer longevity risk? Who should create these markets and instruments—the private sector or the public sector?¹³ The section will explain different ways of trading longevity risk and their pros and cons, but it will not advocate the choice of a single ideal product or market infrastructure.
- e. What is the effect on financial stability of developing a new market, or not developing a market? Does the underlying uncertainty make this market more volatile than others? Does the maturity of the instruments make counterparty credit risk more problematic? This section will tie the discussion to lessons learned from the crisis such as, for example, the associated moral hazard issues if pension funds hedge their longevity exposure.

Possible Box: Presentation of the five latest transactions involving the transfer of longevity risk.

Possible Box: Why did the first longevity bond offer fail?

VI. POTENTIAL POLICY IMPLICATIONS

The potential policy implications of the chapter fall in the following broad categories:

- Promoting awareness of the existence and magnitude of longevity risk for institutions, sectors, markets, and financial stability in general.
- Assessment of longevity risk for governments and implications for sovereign balance sheets (including from contingent liabilities), as well as need for structural changes in the public sector of most countries to address longevity risks. A conclusion may be that the

¹² See Biffis and Blake, “Mortality-Linked Securities and Derivatives”, Working Paper (2009).

¹³ See Thomsen and Andersen, “Longevity Bonds - a Financial Market Instrument to Manage Longevity Risk”, Monetary Review (4th Quarter 2007).

amount of longevity exposure the public sector can additionally take on is limited, given their considerable exposure through public pension and healthcare obligations.

- Assessment of which systems are most conducive to containing longevity risks, perhaps by sharing the impact or by allowing for a gradual and predictable shift in the risk to the households (e.g., by increased retirement age alongside an increase in longevity risk).
- Indicating potential need for and benefits of longevity risk transfer and possible current market failures (potentially as a result of current policies). A conclusion may be that the non-bank financial sector (e.g., reinsurers, hedge funds, and other natural tail risk-takers) has the potential to invest in longevity risks.
- If there appear to exist some type of market failure in the development of a market to transfer longevity risk, the chapter may opine about whether governments (the public sector) can improve the situation. In this regard, the chapter will analyze role of the government in: (i) removing potential current government obstacles (taxation, regulation, etc.) that prevent effective longevity risk transfer; or (ii) promoting the development of instruments and markets for longevity risk transfer.
- Suggesting potential needs for prudential regulation in the area of longevity risk awareness and mitigation with a focus on maintaining financial stability.