First Announcement

The 8th Bowles Symposium, Georgia State University

Presents the

The Second International Longevity Risk and Capital Market Solutions Symposium

24 April 2006
Chicago, IL

Hosted by the American Risk and Insurance Association, the Pensions Institute, the Bowles Chair and the Edmonson-Miller Chair

Organized by: Professor Richard MacMinn (American Risk and Insurance Association) and Professor David Blake (Pensions Institute)

Sponsored by: The Actuarial Foundation, American Risk and Insurance Association, Society of Actuaries, Bowles Chair of Georgia State University, and Edmondson-Miller Chair of Illinois State University

Motivation

As populations in countries around the world age, governments, corporations and individuals face increasing risk. Pay-as-you-go state pensions and corporate pension plans are beginning to put severe financial pressures on governments and companies. Mortality improvements especially at older ages make it ever more likely that individuals with inadequate pension arrangements will end their lives in poverty.

Capital markets do provide governments, corporations and individuals a means of transferring risks and resources across time as well as across individuals. Similarly, individuals can transfer money forward via security purchases to fund the retirement years. However existing instruments do not allow agencies, corporations or individuals to effectively hedge the longevity risk that they face.

Instruments can be constructed to alleviate these problems. The mortality-linked securities issued by Swiss Re in April 2005 and EIB/BNP Paribas longevity bond announced in November 2004 to cover mortality surprises on the life and annuity contracts are two recent examples. The EIB/BNP Paribas bond will be the world's first example of a Longevity (or Survivor) Bond. A Longevity Bond pays a coupon that is proportional to the number of survivors in a selected birth cohort; letting the cohort be the number of individuals turning sixty-five in the year that the bond is issued, the coupon the following year would be proportional to the number in the cohort that survive to this year. Since this payoff approximately matches the liability of annuity providers, Longevity Bonds create an effective hedge against longevity risk.

Longevity risk in conjunction with interest rate risk has created problems for the annuity market. The immediate annuity market in the US is approximately two billion dollars per year while the UK immediate annuity market is approximately 10 billion dollars per year. As more and more baby boomers retire, annuity markets will grow as will the risk and consequences of underestimating mortality improvements. The whole private sector pension system in developed economies like the United States and United Kingdom are potentially at risk without hedging instruments such as Longevity Bonds. At the same time, the newly developing economies of Latin America, South East Asia, Eastern Europe and the former Soviet Union

states, which are attempting to establish private sector pension systems, often under World Bank guidance, are likely to find that these attempts are frustrated by the absence of annuities markets which cannot get off the ground without the existence of hedging instruments to help annuity providers hedge the longevity risk they face.

These issues will be discussed at the **8th Bowles Symposium** and **Second International Longevity Risk and Capital Market Solutions Symposium**. The conference fee will be $250 per person with a 50% discount for academics, and a wavier for students. There are a limited number of travel grants available to issue on the basis of need. Places will be allocated on a first-come-first-served basis.

Who should attend?

Representatives from pension funds, actuarial consultancies, the insurance industry, investment banks, and government departments, academics from the fields of actuarial science, pensions, financial economics, risk, insurance, and public policy

Conference Speakers

Demographics, Pensions and Capital Markets (working title)

Lord Adair Turner, Vice Chairman of Merrill Lynch Europe, a director of United Business Media plc, chair of the UK Low Pay Commission, chair of the UK Pensions Commission, Visiting Professor at the London School of Economics and CASS Business School, City of London and independent cross bench peer in the House of Lords.

Demographic Issues in Longevity Risk Analysis

Eric Stallard, Center for Demographic Studies, Duke University
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Longevity risk can be defined at individual and aggregate levels. At the individual level, longevity risk refers to the possibility of living longer than assumed in financial planning for the retirement of a single individual. At the aggregate level, longevity risk refers to the possibility of a higher average number of years of survival than assumed in designing a retirement security system for the aggregate. If the aggregate is a cohort of individuals who share a common year of birth, then the longevity risk can be hedged with Survivor Bonds having coupons proportional to the number of cohort survivors at each anniversary after the issue date.

Survivor Bonds represent a potentially important approach to the management of aggregate longevity risks. However, before such bonds and other similar instruments become practically feasible, a number of issues must be resolved.

This paper focuses on demographic issues in longevity risk analysis relating to the measurement and modeling of survival and mortality. Actuarial, economic, and financial issues are addressed in other conference papers.

Accurate measurements of the initial size and defining characteristics of each cohort, of decrements due to death, emigration, or other censoring events, and of increments due to immigration or other forms of cohort recruitment, all are necessary to ensure that the coupons accurately reflect the requirement that they be proportional to the number of survivors at each future date.

Accurate measurements of the inputs to the various models used for forecasting future survival

and mortality are necessary for ensuring the validity of the outputs of those models.

Several models based on generalizations of the basic life table are considered for use in forecasting future survival and mortality. Factors considered include the following:

- The impact of limits in the rate of increase in life expectancy and its absolute value
- The stochasticity of life table parameters and its representation in forecasts
- The changing nature of the mortality process as reflected in underlying- and multiple-cause of death data and death rates
- The impact of individual-level risk covariates and their change over age, calendar time, and cohort
- The impact of technological innovation

Stochastic life table models with or without risk covariates can be used to produce forecasts of the distribution of the proportion of survivors at each future date, allowing the capital markets to set appropriate rates of investment returns for Survivor Bonds and similar instruments. The accuracy of such forecasts depends on the impact of estimation errors in the model's parameters and the risk that the selected model is not representative of future survival and mortality processes.

Political Economy of Government Issued Survivor Bonds

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Peter Orszag, Brookings Institution

The Securitization of Longevity Risk

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Killing the Law Large Numbers: Is there a Mortality Risk Premium?

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The textbook assumption for pricing life insurance is that mortality risk is completely diversifiable and therefore not priced by markets in economic equilibrium. The law of large numbers is invoked to argue that a large enough portfolio effectively eliminates any idiosyncratic mortality risk. In this paper we challenge this paradigm by arguing that the uncertainty regarding the evolution of the instantaneous force of mortality will induce dependence than can not be diversified away by selling more claims. We then classify the equilibrium compensation for this risk in terms of the instantaneous Sharpe Ratio. Our paper discusses the theoretical conditions under which this risk premium exists and it provides some empirical estimates regarding its magnitude using a unique

database of life annuity quotes. Our results have implications for hedge funds and other institutional investors who are currently in the process of creating a secondary market for life insurance policies. As well, the existence of this mortality risk premium will affect individuals who are examining the optimal age at which to annuitize their pension.

Pricing Life Securitizations and their place in Optimal ILS portfolios

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There have been a half a dozen securitizations of life insurance risks in the past few years adding to the menu of insurance linked risks that have been securitized. There will be more. While these life securities, typically involving mortality risk, have been similar in form to well known Cat Bonds, they have their own unique characteristics. This paper looks at the pricing of these life bonds compared with conventional cat bonds. Essentially these novel bonds were issued at a discount to regular cat bonds and the intriguing questions is whether this discount emanates from their unique features or whether the discount is a temporary novelty premium.

At the same time "longevity" bonds ideas have been circulated which have not found success in the market. The question arises, what price would they have to garner in order to enjoy market success?

Finally, the inclusion of life risks, mortality or longevity, in a portfolio of insurance risk would appear to bring welcome diversification. The paper examines to question of much capital should be allocated to life in such a portfolio. The question is illustrated with a hypothetical portfolio using important advances in the application of optimization techniques. The answer is not always obvious, life risks are often necessarily bundled together with interest rate risks, and prices may or may not always be generous.

Exponential Tilting and Pricing Implications for Longevity Risk

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Samuel Cox, Georgia State University
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Shaun Wang and Sam Cox will present "Exponential Tilting and Pricing Implications for Longevity Risk." This paper applies the exponential tilting economic pricing framework to longevity risk. The implications include 1) the extreme event correlation matters, 2) the natural hedging of life insurance has an offset effect on the risk premium, and 3) large unexpected long-term medical care cost inflation has a positive effect on the risk premium. This exponential tilting pricing framework can be viewed as an extension of the Wang transform method

Creating synthetic survivor bonds

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This paper examines various ways in which survivor bonds can be created from conventional instruments. This is an important issue because survivor bonds are promising hedge instruments but governments have proved reluctant to issue them, since they are already long mortality risk, and there are arguments that natural private-sector issuers of such bonds are also in short supply. To circumvent these problems we propose two alternative means of creating synthetic survivor bonds: survivor bonds can be created by splitting the coupon payments on existing government bonds, or by combining positions in conventional bonds with survivor swaps. We consider the demand for such instruments, and suggest that capital markets institutions might find it profitable to create them.

A Two-Factor Model for Stochastic Mortality with Parameter Uncertainty

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This paper examines the evolution of the post-60 male mortality curve in the UK and the impact of associated longevity risk. We introduce a two-factor stochastic morality model, and calibrate it against UK male mortality data. The first factor affects mortality-rate dynamics at all ages in the same way, and the second affects mortality-rate dynamics at higher ages much more than at lower ages.

The paper then uses this model to price longevity bonds. It proposes a method to risk-adjust the market price of a longevity bond, and this method also takes account of uncertainty in the parameter values on which the model is calibrated. It also uses pricing data from the EIB/BNP longevity bond of November 2004 to make inferences about the market prices of the risks in the model. Based on these, it then investigates how future issues be priced to ensure absence of arbitrage between longevity bonds with different characteristics."

I would like to attend the 8th Bowles Symposium and Second International Longevity Risk and Capital Market Solutions Symposium on 24 April 2006. CLOSING DATE: 31 March 2006

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For latest details of the conference, see **journalofriskandinsurance.org** or **http://www.pensions-institute.org**