Session 1A Discussant Comments

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Discussion of Papers

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Introduction

Before reviewing and commenting on the three papers which were presented in this Session 1A called "Innovative Retirement Products," I would like start with some comments on the fact that the session combines three seemingly divergent topics and how these nevertheless belong together.

Longevity risk means different things to different people. For the individual person, the risk of outliving one's income is a question of one's personal income and expenditures in addition to one's own health and life expectancy. So, personal longevity risk management consists of the assessment of an individual's post-retirement needs and identifying which level of income will be required to cover them. This question is addressed in the paper by David Blanchett by applying actuarial methods to the financial planner's view.

Having identified a desirable stream of income, it is up to the retirement savings industry to provide products with the desired pay-out pattern, and with the appropriate amount of risk for the individual's risk appetite. Moshe Milevsky and his co-author propose a new version of an old product which gives the individual the option to take a flexible amount of longevity risk. So, within this session, we have shifted from the individual's perspective to the view of longevity risk from a product development point of view, which an insurance company might take. To complete this 360 degree review of longevity risk, Johnny Li and his co-authors provide a means for the insurance industry as a whole to measure and manage longevity risk, as it applies to different kinds of companies. Their proposal for a model-based mortality index intends to facilitate the creation of a financial market in which longevity and mortality risk are actively traded and which the insurance and pensions industry can access to manage their risk exposures.

We might see this session as an overview of the entire longevity risk pyramid, where the base is formed by the need of individuals for income post retirement, the midsection consists of the products which the industry provides to individuals as longevity risk solutions, and the peak is wholesale management of longevity risk using capital market instruments.

Estimating the True Cost of Retirement

The main contribution of David Blanchett's paper, "Estimating the True Cost of Retirement," is that it extends the toolkit of financial advisers and intermediaries and improves our understanding of required post-retirement income in relation to pre-retirement income.

According to Blanchett, current models for retirement expenditure typically assume a simple target replacement rate, i.e., required post-retirement income as a percentage of pre-retirement income. This simplistic assumption does not take into account the fact that pre-retirement income increases with age throughout a person's work life. Furthermore, the Department of Labor's Current Population Survey shows that there are pronounced differences in age-related income patterns depending on level of education. Households with different levels of income also, typically, have different

percentages of pre-retirement expenses dropping away after retirement. Blanchett therefore differentiates predicted post-retirement income by two factors, the level of income and pre-retirement spending behavior.

Based on the Consumer Expenditure Survey of the Bureau for Labor Statistics, post-retirement consumption profiles vary significantly by age, where the most pronounced shift is the relative increase in health care costs at older ages. As a consequence, retirees are also subject to a different inflation risk than the general population, because medical inflation has, historically, by far outpaced the Consumer Price Index. Bringing this information together with longitudinal data from the RAND Health and Retirement Study, the author is able to calculate the actual real change in consumption for retirees, by age, showing a pattern which he describes as the "retirement smile." Immediately after retirement, consumption net of inflation sharply declines. Between ages 70 and 75, the rate of decline slows down but on average consumption still continues to decrease with age.

Blanchett not only gives the reader a theoretical motivation to improve the retirement spending model but also a commercial incentive. He shows that assuming constant expenditure after retirement is too cautious. A more accurate model would show real post-retirement consumption going down. This implies that traditional models are likely to overstate the pre-retirement savings target. Blanchett's Monte Carlo simulation model predicts a target savings rate which is up to 25 percent lower than traditional models.

Further research in this area could extend the model to include dynamic policyholder behavior. Stochastic models are used to model different economic environments and different mortality scenarios. The individual is likely to respond dynamically to adverse economic environments by reducing the amount of spending, where possible. Such behavior would also likely dampen the overall impact of adverse scenarios and possibly show that the individual's personal longevity risk is smaller than currently estimated. An offsetting negative effect may come from health care expenses. These are already subject to a greater rate of inflation. Scenario-testing should also include adverse scenarios with respect to medical costs and expenses in general.

The paper itself mentions that the question of retirement saving needs is an international question. In my view, it would be very interesting to have similar analyses carried out for different countries as a comparison. Such an analysis would not only benefit the retirement savings industry, but may also help inform policy decisions of governments. To date, different countries have responded differently to emerging longevity risk and the stress it will likely cause on their finances. This paper shows clearly that it is important not to oversimplify the projected post-retirement expenses.

Optimal Retirement Tontines for the 21st Century

[Moshe] Milevsky and [Thomas] Salisbury give a historical overview of the tontine, which at the beginning of the 20th century was a highly popular retirement savings product. They apply economic theory to compare the utility of tontines with conventional fixed annuities from the policyholder's perspective. Their findings show that an ordinary tontine is less valuable to a policyholder than a fixed annuity. The authors further go on to propose a tontine pay-out structure which is front-loaded. This has the effect of improving its maximum utility. The main difference between a conventional fixed

annuity and the tontine is that the tontine allows the policyholder to participate in the longevity risk. Therefore, a true comparison between the two product types must allow for the cost of the guarantee which is provided by the annuity. Milevsky and Salisbury show that depending on a policyholder's risk aversion, a modern tontine may actually be a better choice than a fixed annuity.

Milevsky and Salisbury argue that tontines with appropriate pay-out structures should once more be allowed as a complementary retirement savings product alongside annuities. While the issuer of a life annuity provides the policyholder protection against longevity risk, the issuer of a tontine provides only the infrastructure for policyholders to pool their individual longevity risks, without guarantees. These two products could be seen as two ends of a continuous spectrum, along which there are products for every flavor of risk appetite.

In my view, this paper makes a valuable contribution to product development. Not only is their proposal for a new product idea (or rather the renaissance of an old product) thought-provoking, they also provide a theoretical framework in economic theory which actuaries in product development should consider when creating product proposals. This paper is a useful and illustrative example of applying modern economic theory to insurance product design, especially because the authors introduce the concept of subjective survivorship, the influence of an insured's self-assessment of personal health (or information advantage) on the optimal product structure.

For future research, I would be interested to see the concept of subjective survivorship applied within the framework of an enhanced or underwritten annuity. As an industry, we typically consider the underwriting process as gate-keeping to prevent the applicant's superior knowledge of their own health to cause the insurance company systematic losses. However, the risk categorization performed as part of the underwriting process and the information which an insurance company derives from this process is potentially also valuable to the individual policyholder. Likewise, an insurance product must effectively address the particular risk which the individual faces. The more value policyholders derive from an insurance product, the more viable it becomes in the long term, which should be an insurance company's strategic aim.

In addition, the analysis may usefully be extended to more general assumptions for the utility function. Milevsky and Salisbury's assumptions imply a constant lifetime pay-out would be optimal, while we have seen in David Blanchett's article that actual expenditures are age-dependent. Furthermore, the comparison of products should include participating annuities and other forms of retirement savings which allow for a certain amount of risk-participation by the individual.

Finally, a case for re-launching a product like the new tontine—or Hamiltonian as the authors suggest it now be called—should allow for uncertainty with respect to the baseline mortality assumptions, not just stochastic uncertainty. This is mainly because different socio-economic groups have strongly varying mortality and because even within a reasonably homogenous group of risks there is a considerable amount of misestimation risk associated with the best-estimate mortality assumption. Since the authors' new product lets the policyholders retain the longevity risk, it is important from a regulatory and a consumer-protection point of view to have a very good understanding of all risks associated with longevity to make it as transparent as possible.

THE CBD MORTALITY INDICES: MODELING AND APPLICATIONS

Addressing wholesale longevity risk is an important issue for life insurance companies and pension funds. For years, the feasibility of hedging longevity risk with standardized financial instruments has been discussed through various initiatives, at a number of industry conferences and in numerous academic papers. Longevity risk is only slowly emerging as an asset class in the capital markets, because there is, still, a lack of transparency for investors and hedgers alike. [Wai Sum-Chan], Johnny Li and [Jackie Li] make an important contribution to this discussion with their paper on "The CBD mortality indices: Modeling and applications."

The authors propose a model-based mortality index framework, akin to the VIX implied volatility indices on the Chicago Board of Options Exchange, and identify criteria which the underlying mortality model would need to meet. One of the key criteria is invariance with respect to new data, which is met by the original Cairns-Blake-Dowd (CBD) model. This model, which has been studied widely in actuarial literature, also has the advantages of being both simple and intuitive.

The intuition behind the CBD model derives from its simple linear structure. Modeling logistic period mortality as a linear function of the average age gives rise to two parameters for each time period, the intercept and the slope. These two parameters can be directly associated with the overall level of mortality and the slope of the mortality curve at any given point in time. Treating the two parameters as a bivariate time series, participants in a longevity or mortality risk market can naturally identify changes in the overall level of mortality and changes in the degree to which mortality improvements affect younger or older ages. The authors propose a visualization of longevity risk with the means of two-dimensional joint-prediction regions, which are derived performing a stochastic simulation of the future mortality using the CBD model and for a given calendar year plotting the two parameters for each scenario as a point in two-dimensional space.

The paper makes several valuable contributions to the discussion of longevity risk management. The proposal of a model-based index as opposed to the existing nonparametric indices has the potential to enhance the transparency and intuitiveness of mortality to investors and other market participants outside the actuarial community. The proposal is supported by objective selection criteria for the model. With regard to the CBD model itself, the authors propose using the class of VARIMA (vector autoregressive integrated moving average) time series as a more general framework for treating multivariate mortality indices, which takes into account serial- and cross-correlations of the time series. This is a valuable technique which can and should be applied to any mortality projection model which includes more than one time series. The advantage of using a more general time series process is that the resulting projections are more likely to accurately reflect the correlations between the two indices. Finally, the proposal of joint prediction regions as a visualization of longevity risk again serves the purpose of greater transparency and the ability for market participants to communicate about mortality in an effective manner.

Following on from the paper presented here, the authors have already compared the hedge effectiveness of financial instruments based on the CBD mortality indices with that of existing instruments based on nonparametric indices, showing that the CBD mortality indices may likely allow hedgers to structure the same level of protection with fewer instruments. A complementary piece of

work may also include the performance of instruments based on the CBD indices concerning longevity basis risk, which has also been cited as one of the thresholds to the creation of a mortality risk market.

Extending the range of models considered as candidates for the model-based indices was another suggestion for further study. This has already been addressed by including an extension of the original CBD model, which includes a second-order curvature term. Additional candidates like the Makeham-Perks or the Makeham-Beard model might be considered.

In summary, the three papers have contributed to the management of longevity risk at three different levels. Blanchett gives us the individual's perspective on longevity risk and suggests that an important part of the equation is to understand what a retired person will spend during retirement, and how that depends on the individual's age, socio-economic status and their pre-retirement spending. Milevsky and Salisbury put forward a potential solution for the longevity risk management of an insurance company, which is to offer products in which the policyholders retain and pool the risk, without providing any guarantees. For institutions which have substantial exposure to longevity risk already, a much discussed option is to hedge the risk using financial instruments. Creating a market for these instruments may be facilitated by the introduction of model-based mortality indices which are more transparent and intuitive than existing nonparametric indices. This is proposed in the paper by Chan, Li and Li. Indeed, longevity risk is a challenge at various different levels and addressing this risk will require measurement and management of the risk at each of the different levels. Working together across various disciplines and finding innovative solutions to the longevity risk challenge at all levels is the theme of the triennial Living to 100 Symposium. Consider joining us again in 2017 for Living to 100 VI.