Session 5A: Longevity Risk Pricing
Discussant, Michael Kaster, MBA, FSA, MAAA

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**Papers Presented:**

***Longevity Risk Pricing***
Jiajia Cui, MPhil

***Insurance Industry Implications on Retirement Planning and the Secondary Market in Insurance***
Jay Vadiveloo, PhD, FSA, MAAA
Peng Zhou, PhD, FSA
Charles Vinsonhaler, PhD, ASA
Sudath Ranasinghe, PhD Candidate

First of all, I would like to thank and applaud the authors for their excellent work in the evolving area of mortality risk products. As insurance companies and the capital markets start to come together in the development of new products to address mortality and longevity risk, it will continue to be important for researchers to explore the application of new techniques to these markets and products.

My review of these papers was more from a practical application view. I am a consulting actuary who works with both insurance companies and the capital markets in the development of products like those discussed in these two papers. I know that my work in developing products, while ever struggling to be practical to end consumers, must account for the evolving risks associated with these products. Thus, the advancement of risk management and pricing techniques must continue to develop.

My review was based on the collective review of myself and two other actuaries from our practice. I will give briefly my comments on both papers with some suggestions for further development of these concepts.

**Longevity Risk Pricing**

I'll first discuss Jiajia Cui's paper on longevity risk pricing.

I have some general comments to start. This paper is a significant piece of research, and does a thorough job of developing the mathematical techniques to determine the appropriate price and risk margin for various types of longevity risk products.

The mathematics, at times, was a bit technical for the practitioner, and I would suggest that the author attempt to put a further simplified explanation of the technique into the paper. The validation of the mathematics of this paper is left to others who are interested in such analysis.

I found it difficult to ascertain the conclusion of this research and would suggest that the author attempt a more concise and poignant conclusion.

With respect to the use of the Lee-Carter method to estimate future mortality, I have one word of warning. Much of the "risk" from this projection method comes from the estimation error. As the risk pricing is the primary element accounted for in this paper, I would suggest that the author examine the application of other projection methods, like penalised spline regression (or P-Spline), and how these may cause the risk premium to vary. Jiajia did comment that this would be possible.

In addition, the use of L-C does not allow for parameter uncertainty, i.e., the uncertainty that is generated from the projection method itself. A major development in the United Kingdom and elsewhere has been to use a technique called bootstrapping that resimulates

and fits the data many times so that a distribution can be developed for each of the parameters—and hence stochastic mortality reflects not just the error item. This method can be understood better by examining the Continuous Mortality Investigation (CMI) Mortality Committee Working Paper 15.

With respect to the basis risk comments, I would suggest that the author look at basis risk by comparing the U.K. insured population data to the U.K. general population data. Again, this data is available through CMI.

## "…Implications on Retirement Planning…"

Next, I will discuss Dr. Vadiveloo, et al.'s paper. This really is two separate subjects and I will address each here.

The first section of Dr. Vadiveloo's paper is the beginning of a mathematical framework to justify an "optimal" investment portfolio for retirees. This concept is an outstanding idea, and one that would help many individuals manage their personal longevity risk.

I found the mathematical proof interesting and, most importantly, the concept that an optimal portfolio can be constructed for each individual to be a sound and profound statement. From a practical perspective, it should be noted that each individual will have his or her own preferences and goals, and the application of this theory would require sophisticated software to allow for these individual choices. For example, one underlying assumption in the paper is that "ruin" would occur if there was no inheritance left at death. This may be precisely someone's goal if they have no heirs.

One of the practical issues in the market for immediate annuities is that they are indeed underutilized today. Why? The answer is twofold: (1) lack of consumer/agent understanding of the benefits of immediate annuities in a balanced portfolio, that is the

mortality enhancement to return; and (2) lack of adequate compensation for the sales representative.

The paper does a nice job supporting the concept of a balanced investment portfolio with a place for the immediate life-annuity payout in combination with an ongoing investment vehicle. However, one of the problems is that there is not adequate disclosure to the consumer of the "return" aspect built in to the immediate annuity.

I believe that this paper, and other market forces, are espousing a call for an "immediate annuity revolution." As one of the panelists said yesterday, our profession is very good at providing "data" and "facts", and we need to get better at "marketing" our thoughts. We need to develop a case that this immediate annuity revolution is needed.

The "reinventing annuities" concept, as we call it, will require some core elements in order to overcome the current obstacles in the market:

1. Full disclosure/unbundling of the income annuity components. This is analogous to the product revolution that occurred in the 1980s with universal life.
2. Flexibility in contract design, which allows for the opportunities to benefit from returns in excess of guarantees, provide liquidity options and/or enhance payout alternatives, while still allowing for the balance of the accumulation and retirement income objectives of the retiree.
3. Finally, we must overcome the perceived lack of compensation for the advisor, and recognize the value of advisory services during management of the consumer's retirement portfolio.

The concept of reinventing annuities or this immediate annuity revolution leads to the need for product innovation, which will result in new and creative product designs. It should be noted that there is a process for the administrative mechanics of this unbundled concept that is patented, and if anyone would like to learn more about this, I would be happy to discuss it with you later.

## …The Secondary Market in Insurance

Finally, the second half of Dr. Vadiveloo's paper addresses the need for a pricing model for the secondary market of life insurance. This paper does a good job of describing the methods of pricing a secondary market product. It does identify the Key problem for such products or secondary market solutions, which is that there is no good mortality data applicable to this market. The paper clearly articulates the need to identify an appropriate slope for mortality for impaired lives, but does not describe a method to determine this.

One alternative could potentially be to look at the structured settlement mortality of insurance carriers, and specifically examine various mortality curves for particular ailments.

From our research in the United Kingdom, most impairments would likely be best handled through an initial constant factor that reduces over time.

It is clear that mortality is the most important risk for life settlements—and the most difficult to determine.

The paper does present one method of pricing for these secondary market products. I would suggest that a more complete dissertation would include other techniques. For example, we are aware of certain pricing techniques which include a Monte Carlo simulation of potential mortality outcomes based on an underlying life expectancy estimation and foundational mortality table.

The authors go on to state that one of the important elements in determining appropriate mortality curves is the use of underwriting assessments at time of settlement. It is stated in the paper that the underwriting misstatement risk is one of the risks associated with using underwriters and their estimates of life expectancy, and that this

risk is not diversifiable. We have seen some life settlement portfolios use more than one underwriting assessment to diversify against this risk.

It is also important to understand whether or not the underwriter has a built-in bias or predisposition toward mortality improvement when determining an LE. If not, an additional PAD should be built in to reflect future mortality improvement, for as Dr. Vadiveloo points out, a significant improvement in mortality could significantly reduce the investors' return, or even erode their return totally.

Again, I would like to thank the authors and acknowledge them for their dedication and considerable professional contribution in this area.

Thank you for your time.