Proposal to present a paper called

Hedging Longevity Risk in Life Settlements Using Biomedical RBOs

at the Tenth International Longevity Risk and Capital Markets Solutions Conference

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April 2014

Extended Abstract

Within a life settlement, both the liability of future contingent premiums and the death benefit of the insurance contract are transferred from the insured to a life settlement company in a secondary insurance market transaction. The life settlement market evolves from so-called "viatical settlement" market popular in the late 1980s, and differs itself by generally attracting senior insureds with below average health states (usually with some chronic diseases), whereas its predecessor mainly targeted the early victims of AIDS. Naturally, the profitability and healthy development of such business heavily depend on the capability of market participants (life settlement companies) to obtain accurate projections of the underlying insureds' future life expectancies, and failure to do so can result in unexpected loss/reduced yield rate to the life settlement companies (Zhu and Bauer, 2013).

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While the life settlement companies can improve the mortality projections by employing state-of-the-art stochastic mortality forecasting models (Hunt and Blake, 2014) and by further considering possible adverse selection from the insureds (Zhu and Bauer, 2013), one key factor that is usually dismissed or at least difficult to model when furnishing the estimations is the potential of medical advancements in the future: In particular, the collapse of the viatical settlement market can be greatly attributed to the medical breakthrough of the new drug/therapy in effectively treating AIDS patients, resulting in considerable loss to viatical settlement companies (Stone and Zissu, 2006). Similarly, successful development of new drugs/treatments on other (chronic) diseases will also likely to increase the life expectancies of the affected patients, and thus acts as an (adverse) *longevity shock* to the life settlement companies.[1] In a recent contribution, Brockett et al. (2013) illustrate how to price life settlements using a mortality table that reflects the underwriter's medical information, under a double exponential jump diffusion mortality model framework. In this research, we start from a different angle: How can a life settlement company hedge such longevity risk by seeking answers from the capital market?

The market solutions for longevity risk has steadily developed over the years (we refer to Blake et al. 2014 for a recent update). While the forms of existing longevity-linked derivatives deviate, they are all generally designed to be dependent on the survival prospect of some underlying population (or at least a large demographic group). While this reduces asymmetric information and promotes such securities in the capital market, we argue that they might not be as effective as hedging tools that can be used by the life settlement companies, due to the non-negligible basis risk materializing between the general population and the settled insureds. In particular, it is unlikely that the longevity risk we specifically look at—the potential medical breakthrough in a certain disease—will be systematically picked up in a population longevity index.

In a recent contribution, Fagnan et al. (2013) design a new business model to finance the research in the biotechnology and pharmaceutical industries. More precisely, they propose to solve the current problem of under-funding in biomedical research by combining a large number of drug-development projects into a single portfolio—so-called "megafund", and further securitize the portfolio with different structured tranches (research-backed obligations or RBOs). While the core advantage of such single portfolio lies in effective diversification and the reduction of risk, the authors also argue that with successful securitization, the senior tranche may be rated by rating agencies, and thus can be accessed by institutional investors. However, one issue left to be discussed is the attractiveness of the riskiest equity tranche.

In this research, we connect the two strands of literature, and show that such biomedical RBOs

[1]Due to the limited number of policies within one life settlement company and the limited types of common diseases it usually deals with, the life settlement company cannot fully utilize the law of large number to diversify such risk.

can be used by the life settlement companies as an effective tool of longevity risk management. In particular, the patterns of the returns of such RBOs, especially of the equity tranche, provide as a natural hedge of above-described longevity shock due to medical advancement, with much narrower basis risk compared with conventional longevity-linked securities. Therefore, the life settlement companies fill up the vacancy and serve as instinctive buyers of the equity tranche, which will in turn promote the healthy development of the mega fund and RBOs as a whole.

The analysis in the research will be conducted in two stages. In the first stage, we use a rather stylized three-period model to illustrate the potential benefit of using biomedical RBOs as a hedging tool by the life settlement company, and compare the outcome with cases of no hedging, or with conventional longevity-linked securities. In the second stage, we plan to conduct in-depth numerical analyses with simulations on various medical breakthroughs, using cancer as an example. Our goal is to not only provide quantitative implications to the life settlement industry, but also give recommendation on the optimal structural of the biomedical securitization.

References

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