

## **Overview**

Pandemics and catastrophic events, such as an outbreak of a disease and terrorist attacks with nuclear weapons, can cause a significant increase in mortality rates. Both traditional reinsurance and capital market solutions can mitigate potential losses resulting from excessive death claims.

This article is to summarize the research on the cost and benefit of issuing Mortality Indexed Bond in year 2008. The analysis is still valuable for the COVID 19 pandemic. The recommend was not to issue the bond under the current market environment, however monitoring closely should the market conditions change.

## **Probability of Pandemics**

There are more than ten pandemics and many catastrophic events occurred in the past 300 years. Most of these events only affect the population within a limited geographical region, and do not increase nationwide population mortality rate significantly. Only two of them are major disruptions to a nation or the world.

National Center for Health Statistics recorded 2.4 millions deaths in U.S. in year 2004. Only pandemics or catastrophic events that cause 0.48 millions extra deaths within the year would increase the general mortality rate by 20%. The probability of such pandemics or catastrophic events occurring is extremely remote. According to Milliman's study, the estimated probability of mortality index exceeding 120% of 2003 mortality index level is less than 0.02%.

## **Reinsurance**

Reinsurance is the traditional way to transfer mortality risk. However the cost of reinsurance that covers pandemics and catastrophic losses has skyrocketed since 9/11. The Company decided not to renew general catastrophe coverage because quoted premium in 2005 reached approximately fifty times of the premium we paid before 2002. In addition to its cost, reinsurance would expose the Company with counter-party credit risk as re-insurers' default risk increases when pandemics or catastrophic events happen.

## **Mortality Indexed Bond**

Mortality Indexed bond, first issued in December 2003, is designed to protect against adverse mortality experience as well. Mortality Indexed bond is gaining popularity from insurers since it provides diversification of protection sources to insurers. Investor's awareness on the Mortality Indexed bond is also increasing because investors are compensated for accepting low probability and highly diversified risk. The benefits of issuing Mortality indexed bond include both multi-year coverage with locked-in cost and no exposure to counter-party credit risk.

Mortality Indexed bond is structured similar to other asset backed securities, including transactions among the insurer, a special purpose vehicle (SPV), an asset trust and investors. The SPV issues Mortality Indexed Bond to the investors in the capital market. The proceeds of the issuance are placed into a trust account. The SPV receives the periodic returns based on a total return swap agreement from the trust, as well as recurring

premiums from the insurer, and pays coupons to the investors. At maturity, the investors are repaid with principals if specified mortality index<sup>1</sup> does not reach the pre-determined trigger level during the defined risk period. But if the mortality index reaches or exceeds the trigger level, a portion of the collateral or the full collateral in the trust account will be liquidated and a claim is paid to the insurer.

Mortality Indexed bond can be issued with several tranches/classes according to the insurer's risk appetite. Different trigger and exhaustion levels are assigned to different classes. For example, Class D trigger level is 110% of year 2003 index value, and Class B trigger level is 120% of year 2003 index value. Since the probability of mortality index reaching 120% of year 2003 index value is much smaller than the probability reaching 110% of index value, issuing bond with only Class B exposes the insurer more chance of paying excess claims than one with Class D. Thus the coupon spread for Class B investor is significantly lower than that for Class D investor<sup>2</sup>.

### **Recommendations**

Even though Mortality Indexed bond has some advantages over traditional reinsurance, including no counter-party credit risk, longer protection period, huge capacity and possible lower costs, there are several issues we need to consider.

#### Basis Risk

Mortality Index bond only pays the insurer when predefined trigger levels are reached. The Company will not have protection at lower layer of risk spectrum as the trigger levels are designed to be the severe events that are lethal and affect a large population.

The insurees may diverge from populations that are used in the mortality index calculation. As a result, possible basis risk could be significant if index does not match actual losses incurred.

In addition, governmental reporting of mortality rates usually lag behind for a couple of years. Delay in report would cause the contingent claims not being paid to insurers on time.

#### Cost

The investors demand higher spreads on Mortality-Indexed bonds due to the credit crunch and current economic condition. For example, Class B mortality bond, is rated Aa3 by Moody's, would cost you more than \$1.5 million<sup>3</sup> annually if you issue \$100 million protection with trigger level reaches or exceeds 120% of year 2003 index value.

Class A mortality bond, with trigger level reaches 125% of mortality index, is rated Aa2 by Moody's. It would cost you more than 135 bps under the current market environment instead of 60 bps as anticipated by Swiss Re presentation in November 2007.

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<sup>1</sup> The specified mortality index can be parametric and constructed using publicly available population data. It can be US-only index, and can be weighted by age and gender or weighted by states.

<sup>2</sup> For Osiris Transaction (2006), spread at issue for Class B is 1.20%, while spread for Class D is 5.00%.

<sup>3</sup> Based on 1.46% credit spread for an Aa3 rated bond matures in 5 years (data as of 1/8/08)

In addition to the annual cost, the issuing cost associated with modeling, issuing and administration is not negligible.

### Benefit

Each class of mortality bonds provides protection against mortality rate increase within a narrow interval. For instance, Class B mortality bond pays the insurer to absorb excess death claims when the mortality index reaches the trigger level (i.e. 120% of year 2003 index value), and it stops payment when the mortality index reaches the exhaustion level (i.e. 125% of year 2003 index value). While Class A bond pays only when mortality index reaches between 125% and 145% of year 2003 index value.

### Conclusion

The researchers believe that issuing Mortality Index bonds was not an optimal choice for managing extreme mortality risks due to its cost and the extremely remote probability of such events occurring.

Insurance companies' payout annuity products provide natural hedge against systemic increase in mortality. For life insurance, excess exposure above retention limits on individual lives and groups are reinsured. Therefore, the impact of potential losses from excessive death claims has already been moderated to a certain degree. Insurers should keep monitoring the market if the terms for Mortality Index bonds turn to be more favorable as a mean of transferring extreme mortality risks in the future.