BEST'S REVIEW
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Taming The Cat

Securitizing pandemic losses offers life insurers a guaranteed way to fund potential claims.

by Ghalid Bagus

INFECTION PROTECTION: Andrew Speaker, who was misdiagnosed as having a deadly strain of tuberculosis, stares out of his Denver hospital room window after being placed in quarantine in May 2007.

AP Photo/The Rocky Mountain News/George Kochaniec Jr.

Recently, a man with a multidrug-resistant strain of tuberculosis was placed in quarantine by the U.S. government after he allegedly exposed several hundred passengers and crew to the disease on two trans-Atlantic flights. This marks the first time since 1963 that the government has issued a quarantine order.

This quarantine underscores the fact that neither modern health care nor cutting-edge technology guarantees immunity from an outbreak of disease that may not be so easily contained. Moreover, the catastrophic mortality that might ensue—whether from TB, bird flu, or some other, yet-undiscovered disease or virus—could stress conventional insurers and reinsurers to the breaking point.

As a new risk-management tool, catastrophic-mortality risk securitization enhances the capacity of the life insurance industry by transferring catastrophic mortality losses to the capital markets. Reinsurers are recognizing that, despite pooling their exposure to risk, they may not be able to handle the capital obligation brought about by a large-scale terrorist attack or, more likely, a pandemic. In turn, they are looking for alternative risk-transfer mechanisms

- Catastrophic-mortality risk securitization transfers losses from a pandemic influenza or a terrorist attack to the capital markets.
- Because attachment points are high, events must be large in scale—causing hundreds of thousands of deaths—to cause a loss on

Mortality Bond Structure

As with other bonds, a mortality catastophe bond may be structured with different tranches. Tranches are parts of a security that can be broken apart and sold in pieces. For example:

First $100 million tranche
covers an increase in mortality by 10% to 20%
- Bonds are rated and priced according to risk.
- Lower tranches are rated higher and have a lower rate of return.

Second $100 million tranche
covers mortality increases of 20% to 30%
- The more deaths there are from an event the lower the probability that it will occur and the more secure the investment.

in capital markets. For an increasing number of reinsurers (as well as primary insurers), mortality catastrophe bonds provide the answer.

Clear and Present Danger

Securities with mortality risk as a component have been around a long time. The innovation in financial markets is securitization of pure mortality risk. As with a property-linked catastrophe bond based on earthquake or hurricane losses, payment of a mortality security is subject only to losses from a well-defined risk. In the case of a mortality catastrophe bond, the event might be a sudden spike in death rates, whether caused by a flu epidemic or a nondisease-related incident such as a large-scale terrorist attack.

As the events of Sept. 11, 2001, grimly illustrate, terrorism is a real threat. However, it would require a much larger event than Sept. 11 to produce the kind of mortality spike that would trigger these bonds, since the bonds attach at a high level. Pandemic influenza is more likely than a terrorist event to trigger the bond, since a pandemic potentially could affect mortality more severely.

According to the World Health Organization, at least 30 new diseases have emerged over the past 20 years and for many, there is no treatment, vaccine, or possibility of effective prevention or control. While the influenza virus has been around for a long period of time, the H5N1 version of the virus, often referred to as "avian flu" or "bird flu," is of great concern. Scientists say H5N1 exhibits all but one of the features required to start a pandemic—as of now, it can't transmit itself efficiently enough among people to infect us on a widespread scale.

As history has shown, fatalities from influenza pandemics can reach into the millions. The following are numbers from the World Health Organization:

- 1889 pandemic: 1 million dead
- 1918 Spanish flu: 40 million dead
- 1957 Asian flu: 2 million dead
- 1968 Hong Kong flu: 1 million dead

However, numerous difficulties prohibit mortality catastrophe bonds from being pandemic-specific, the largest being the difficulty of identifying the exact number of deaths due to a pandemic. For instance, although a death certificate might state the cause of death as influenza, there is no way to know whether the death was caused by the virus itself or by an underlying precondition, such as a weakened immune system. As a result, most mortality catastrophe bonds reference population mortality rates that include deaths from all possible causes.

The Model

Mortality-securitization modeling is critical in determining the probability of loss as well as expected loss to the investor. In 2003, Milliman developed a parametric model using historic data to project future possible outcomes. It relies on hundreds of thousands of stochastic scenarios to project future events.

Milliman's model does not have an upper limit on the severity of a projected disease epidemic. The model also projects terrorist events that are more severe than those historically observed.

Because the attachment points are high, events must be large in scale—sometimes predicting hundreds of thousands of deaths—to cause a loss on the bonds. These bonds could

They're Back

Swiss Re pioneered the mortality catastrophe bond, followed by Scottish Re and AXA. The bond durations vary between three and five years. Newer bonds can include multiple tranches, including some transactions where the most senior tranch, is guaranteed by a financial guarantor.

Insurance-linked securities feature little correlation with financial markets, providing the diversification craved by many investors (including hedge funds). That said, many companies have deemed this approach to risk transfer too expensive, and have opted not to pursue mortality catastrophe bonds.

Company	Bond Notional	Countries Covered
Swiss Re (VITAI)	$400 million	France, Italy, Switzerland, U.K., U.S.
Swiss Re (VITAII)	$362 million	Canada, Germany, Japan, U.K., U.S.
Swiss Re (VITAIII)	$705 million	Canada, Germany, Japan, U.K., U.S.
Scottish Re	$155 million	U.S.
Axa	$442 million	France, Japan, U.S.

Anatomy of a Mortality Catastrophe Bond

Let's say a fictitious company, ABC Re, wants to manage the risk of a catastrophe, such as the 1918 Spanish flu pandemic. ABC Re is concerned about its financial obligation should the mortality rate increase between 10% and 20%.

Here are the steps ABC Re can take to mitigate its risks:

1. ABC Re calculates its underlying mortality exposure by considering the distribution of its business by country, as well as age and gender weightings within those countries.

2. ABC Re then issues a $100 million notional of a mortality catastrophe bond to investors, tied to the mortality index.

3. A special-purpose vehicle issues the bond, invests the $100 million principal in high-quality bonds, and swaps the bond coupons for a London Interbank Offered Rate-linked cash flow.

4. Investors receive quarterly coupons set at the LIBOR rate plus a spread. At maturity, if no event has occurred, the $100 million is distributed by the special-purpose vehicle to investors. However, if the independent agent confirms that an event has occurred, the principal is distributed to ABC Re per the terms of the agreement.

5. For purposes of the example, the mortality index has a weighted average mortality rate of approximately three deaths per thousand, so investors begin losing money when the weighted average population mortality rate hits 3.3 per thousand. They lose all their money when the mortality rate hits 3.6 per thousand.

6. ABC Re has an independent agent calculate the increase in mortality at the end of each year, based on government statistics. If there is a pandemic and the index turns out to be 3.5 per thousand, investors lose roughly 66% of their capital investment. ABC Re keeps $67 million, and the investors get back only $33 million.

7. If the mortality rate increases to four per thousand, the investors would lose all their money—by our example, $100 million.

8. The bond gives ABC Re some protection against extreme mortality risk, acting as a form of collateralized stop-loss reinsurance. It does so without having the company acquire any credit-risk exposure to reinsurance or retrocession providers. Investors in the bond take the opposite position and receive an enhanced return if an extreme mortality event does not occur.

cover smaller events if the attachment points were set lower, but that would defeat the purpose; the attachment points have been set higher in order to cover the tail risk. Even an event such as Sept. 11 would need to be about a hundred times larger in scale before the mortality rate would result in a loss in our ABC Re example (see "Anatomy of a Mortality Catastrophe Bond" above). Historic events that would have caused losses in the ABC Re example include World Wars I and II and some of the larger influenza pandemics. Moreover, a nuclear bomb may kill many people instantly, but the significant number of people who get sick due to radiation exposure and don't die until 10 years later doesn't get counted in the mortality statistics upon which the bond is based. Why? Because the bond would have matured already—current mortality catastrophe bonds have a three- to five-year duration.

A pandemic causing at least several hundred thousand deaths is a more likely mortality catastrophe bond trigger. Given the increased risk of bird flu, Milliman's disease model severity curve has been changed to reflect the possibility that the virus may cause a pandemic that is the most lethal ever known. Specifically, the model assumes that there is no theoretical upper limit on the increase in mortality for extreme disease events.

In these models, the time of infection has no impact upon the bond; it's the time of death that is relevant. Once the bond matures, the investor and the issuer sever ties. (There is an extension period at the end of the bond because there are delays between the period to which mortality statistics relate and when the governments release the mortality statistics; however, this is a waiting period only and not a period of exposure for the investor.)

Investors choose catastrophe bonds for diversification—their return is largely uncorrelated with the return on other investments, such as fixed income or in equities. In turn, many reinsurers and insurers alike may transfer catastrophic losses to financial markets, especially with a potential pandemic in the wings and quarantines not far behind. BR

Mortality Cat Bond Scenarios

The reinsurance market has a large amount of mortality risk on its books and an accumulation of exposures. Furthermore, a reinsurer's credit risk can increase in scenarios with severe mortality increases. This leaves reinsurers and primary insurers looking for alternative risk transfer options. One is to issue mortality catastrophe bonds.

Reasons to issue a mortality catastrophe bond include:

- Having an additional tool in the group's risk-management strategy
- Diversifying from reinsurance markets, where capacity is currently lower than demand for such protection—and where such protection takes a form that lasts no longer than one year
- Accessing capital markets as an alternative source of protection
- Using a collateralized structure that removes credit exposure to the protection seller, which may be impaired under highly distressed mortality scenarios
- Using a shelf program with the flexibility to tap capital markets as required, taking advantage of market conditions when they are favorable. For example, the insurer could set the bond notional at $100 million, but issue $50 million now and the rest later.