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ERM Symposium

Securitization Issues

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Overview of Presentation

- This presentation focuses on three specific issues as each relates to insurance securitizations:
  - Mortality Volatility Analysis for Life Insurance Securitizations
  - GAAP Accounting for Reg XXX Term Securitizations
  - Catastrophe Risk Financing Alternatives for P&C Insurance Securitizations

Agenda

Mortality Volatility Analysis

GAAP Accounting for Reg XXX Securitization

Catastrophe Risk Financing Alternatives

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Mortality Volatility Analysis

GAAP Accounting for Reg XXX Securitization

Catastrophe Risk Financing Alternatives

Mortality has traditionally been viewed as a deterministic process

- Mortality assumptions have been defined by a table of death rates. This approach is simple and allows for risks to be easily replicated and compared
  - Either industry tables (e.g., SOA 1975-80) or company-specific tables are utilized
  - Factors are often applied to the table to represent variations in mortality (e.g., by risk class or by duration)
- The deterministic approach, while sufficient for most analyses, ignores two important aspects of mortality:
  - Mortality volatility risk
  - Mis-estimation risk

Stochastic mortality techniques can provide enhanced insights into financial performance

- Increased focus on quarterly earnings leads to focus on volatility in mortality results
  - How much volatility is reasonable in one quarter?
- Stochastic mortality can also provide guidance in setting economic capital levels
- Stochastic mortality can be especially useful when:
  - There are a limited number of lives at risk
  - The economic consequences of death have a high severity but low probability of occurrence, such as the case of stop loss reinsurance

When properly applied, stochastic mortality modeling techniques can provide useful insights into the variability in financial performance of a life insurance vehicle or transaction

Sources of variance can be broken down as follows

Sources of Mortality Variance

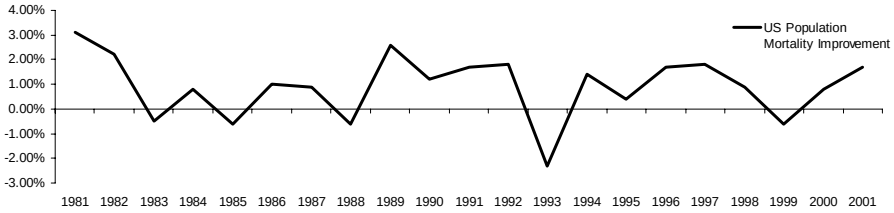
Mortality Volatility Risk	Mis-estimation risk
■ Standard random fluctuation in mortality ■ Fluctuation in population mortality due to various environmental factors ■ Fluctuation due to catastrophic events	■ Mis-estimation due to sampling ■ Mis-estimation of mortality slope

Standard random fluctuations in mortality

- Given there is a finite number of lives in any population, the number of deaths is random
- Many assume that variance in mortality due to random fluctuations is immaterial due to the law of large numbers
  - However, even in a portfolio of 1,000,000 lives, actual to expected ratios in a single year can have a standard deviation of 3%
  - Depends on mix of business
- There is general agreement that this can be approximated using a binomial function

Fluctuation in population mortality due to various environmental factors

- External environmental factors can have a measurable effect on general mortality levels, and in turn insured mortality levels
- U.S. population mortality improvement over the last 20 years has varied from (2.3%) to 3.1%



Time series models can be used to incorporate this fluctuation into stochastic mortality models

Fluctuation due to catastrophic events

- A large-scale catastrophic event can have a material impact on mortality
- The 1918 influenza epidemic is most often cited as a catastrophic mortality event in the U.S.
  - The epidemic resulted in an extra five deaths per 1,000 in the U.S. over a single year
- Can be modeled as a one-time shock to mortality

Mis-estimation due to sampling

- Typically, a mortality assumption is based on, or at least influenced by, the mortality experience of a finite number of lives
  - For example, the results of a five-year mortality study
- There can never be certain of the “true” mortality rate
- Mis-estimation due to sampling may be estimated in Monte Carlo analysis using standard deviations from the underlying mortality studies used to set the mortality assumption(s)
  - There are advantages in using a single variable (or single set of variables) that is applied to each scenario (as opposed to a vector by duration)

Mis-estimation of mortality slope

- A current issue in mortality is slope of the underlying mortality table
- Most companies have priced using SOA 1975-80, but SOA 1985-90 and VBT have steeper slopes
  - The last industry mortality table based on homogenous risk selection techniques throughout the select and ultimate periods is the SOA 1975-80 table
  - Introduction of smoker distinct rates, lower blood testing limits and preferred rates has influenced the slope of later industry tables
- Could be incorporated into an overall stochastic modeling framework
  - Requires assumption regarding probability of different mis-estimation
  - Boot-strapping method could be used to extrapolate point estimates to an overall distribution function

Monte Carlo simulation and parameterization techniques are the primary method used in stochastic mortality modeling

Stochastic Mortality Modeling Techniques

Source of Mortality Variance	Stochastic Modeling Technique
Standard random fluctuation in mortality	■ Monte Carlo simulation ■ Parameterization techniques
Fluctuation in population mortality due to various environmental factors	■ Time series analysis
Fluctuations due to catastrophic events	■ Parameterization techniques
Mis-estimation due to sampling	■ Parameterization techniques
Mis-estimation of mortality slope	■ Assumptions required to parameterize using boot-strapping

For securitizations, to date the focus has been on standard random fluctuation in mortality and deterministic tests have been used to assess environmental and mis-estimation risks

Securitization of redundant reserves on life insurance (e.g., term, universal life) rely heavily on the use of mortality stress tests

- Mortality stress tests are used in life insurance securitization transactions to assess the level of redundancy in the statutory reserves
  - Business included in transaction was either recently issued term insurance and a limited amount of future new term business
- Bond insurers use the stress tests to ensure that the initial equity paid into the special purpose reinsurer is sufficient
  - Bond insurers concerned with both having to pay interest payments during the transaction (typically due to temporary cashflow shortages) and to pay principal at the end of the transaction
- Rating agencies use the stress tests in determining a shadow rating for the special purpose reinsurer
- For a securitization of term insurance statutory reserves the primary risk to the transaction is mortality

The mortality stress tests presented in main securitization report typically include a variety of deterministic stress tests

- Level of mortality
  - Permanent increase of 5%, 10% and 25% in mortality
    - — Certain transactions have used a maximum shock of 15% or 20%
  - On the largest shock, X factors under Regulation XXX also increased
- Mortality trend
  - 1% per annum deterioration in mortality for 30 years (the transaction period)
  - Amount of mortality deterioration after end of level term period increased to reflect increased mortality anti-selection
    - — Increase effectiveness factor
- One-time shock to mortality
  - 250% increase in mortality in year 2 of projection
  - Shock approximates impact of 1918 Influenza event

In addition, stochastic mortality analysis is typically conducted

- Stochastic mortality using a Monte Carlo process can be run both for both in-force and new business (if applicable)
  - 1000 scenarios
  - Persistency incorporated into the stochastic mortality process
- Stochastic process to date have only incorporated the fluctuation due to finite number of lives in transaction
  - Have not incorporate one-time shocks or trend changes
- Used by Moody's in its evaluation of the transaction
  - Evaluated by Moody's similarly to credit risk

Observations regarding the assessment of mortality volatility in securitizations

- The stress test that would have the greatest impact on the likelihood of a bond insurer making a principal payment was the 25% shock to mortality
- However, the one-time shock typically had a greater impact on bond insurer payment of interest
- There was a desire to attach a confidence interval to the deterministic shocks – however, none were provided
  - Concerns over attaching a confidence interval to mis-estimation risk
- The level of mortality shocks for transactions with greater diversification (e.g., a reinsurer) were lower than for a direct writer
  - Shocks that did not benefit from diversification are not typically modified

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Mortality Volatility Analysis

GAAP Accounting for Reg XXX Securitization

Catastrophe Risk Financing Alternatives

The following example describes the impact of a term securitization on GAAP accounting

- Surplus notes are raised and cash is dividended to parent or utilized efficiently elsewhere in the organization
- Other key assumptions in this scenario are as follows:
  - Economic reserve assumed equal to GAAP benefit reserve less GAAP DAC
  - Surplus notes raised equivalent to redundant statutory reserves, which equal statutory reserves less economic reserves
  - No change to GAAP benefit reserve, GAAP DAC or GAAP deferred tax liability (DTL) due to transaction
  - Interest on assets backing notes equal to cost to service debt on notes
  - Statutory capital and surplus held after the securitization equivalent to that held prior to the securitization
    - Results in negative unassigned surplus
  - No other equity buffer is required for the transaction
    - Simplifying assumption

We analyzed the U.S. GAAP impact for a typical company pursuing this type of transaction

Company XYZ — Before any Securitization ($ Billions)

Statutory Balance Sheet								
Assets			Total Assets	Stat Res			Total Liab	Surplus
1.8			1.8	1.3			1.3	0.5
GAAP Balance Sheet								
Assets	DAC	Other	Total Assets	Ben Res	DTL	Other	Total Liab	Equity
1.8	0.7	0.1	2.6	0.9	0.3	0.1	1.3	1.3
GAAP Income and ROE								
No expense impact								
Income	ROE							
0.09	7.0%							

The following example shows the impact of a term securitization on a typical company's U.S. GAAP ROE

Company XYZ — After Securitization ($ Billions)

Statutory Balance Sheet											
Assets			Total Assets	Stat Res				Total Liab	Surplus Notes	Unassigned Surplus	Total Surplus
1.8			1.8	1.3				1.3	1.0	(0.5)	0.5
GAAP Balance Sheet											
Assets	DAC	Other	Total Assets	Ben Res	DTL	Other	Notes	Total Liab			Equity
1.8	0.7	0.1	2.6	0.9	0.3	0.1	1.0	2.3			0.3
GAAP Income and ROE											
No expense impact — investment income reduced											
Income	ROE										
0.06	17.9%										
With expense impact of 1% cost on notes and $2mm											
Income	ROE										
0.05	14.4%										

Securitization results in reduced GAAP income but significantly higher ROE. Size of transaction plays a significant role regarding the feasibility of these transactions

Some of the key factors regarding securitization transactions include the following

- Definition of redundant reserves
- Amount of equity buffer required for the transaction
- Tax sharing agreements
  - Ability to transfer tax benefit is key to making transaction a success
- Cost of transaction
  - Variable costs (e.g., wrapper and investment bank)
  - Fixed costs (e.g., advisors and ongoing captive expenses)

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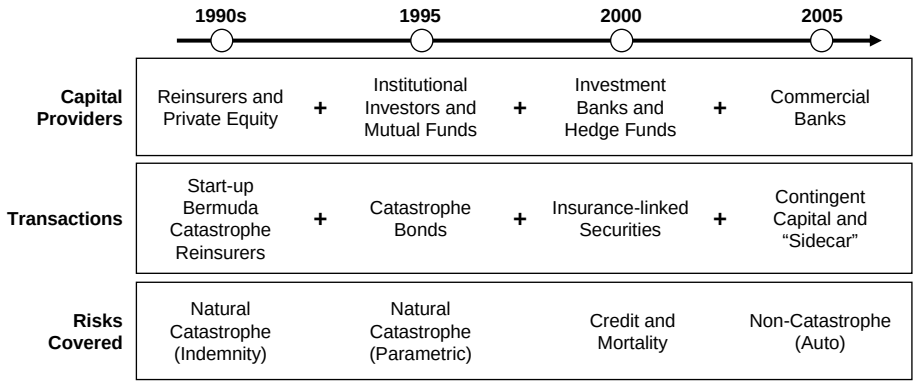
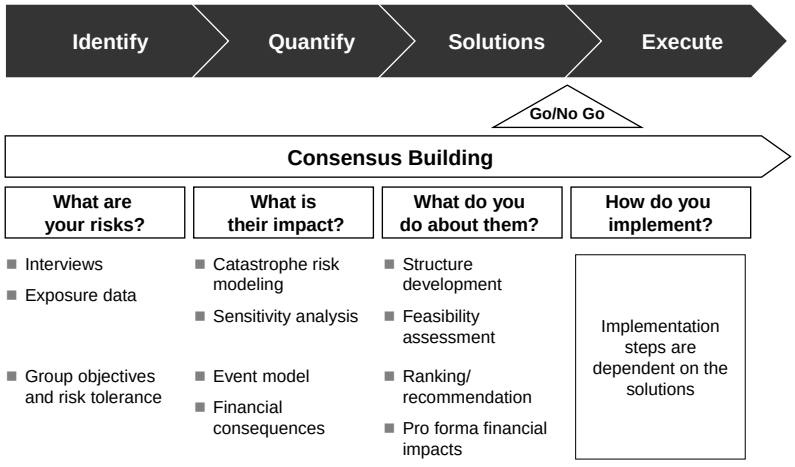
Catastrophe Risk Financing Alternatives

Expanding use of capital markets for P&C risk financing capacity

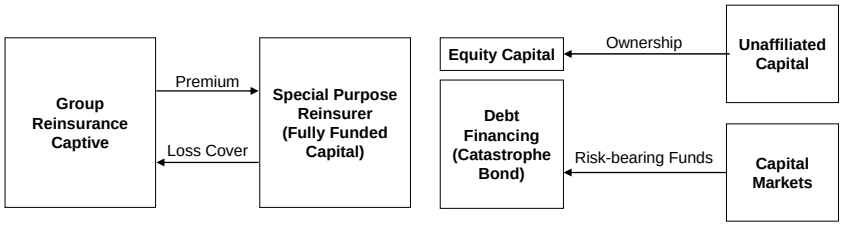
- In the last two decades, new transactions have emerged to bring a wider group of capital providers to cover a broadening array of insurable risks



A number of key steps should be considered regarding solution development as well as execution

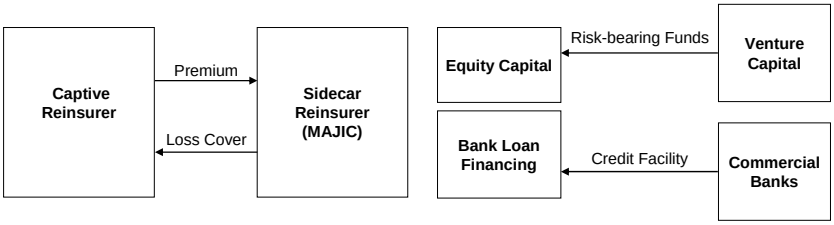


Risk transfer via catastrophe bond



- Special purpose reinsurer financed with risk-bearing debt to cover losses
- Losses can be on an indemnity or parametric basis
- Debt capital raised equals full limit of losses (equity capital is minimal)
- Single-use, pre-funded debt capital eliminates captive's credit exposure
- Investors attracted to well-priced risks not correlated with financial markets
- In case of loss event, investors lose some or all of principal and interest
- Debt is rated in a manner consistent with credit risk exposure

Risk financing via MAJIC* sidecar



- Special purpose reinsurer financed with risk-bearing equity and bank debt
- Flexible risk capacity that is adjustable with coverage needs and cost of capital
- Total capital raised is enough for rating but need not equal full limit of losses
- Bank debt provides additional cash to cover losses but it is traditional credit facility
- Cash invested in investment grade securities and available to pay covered losses
- Indemnity coverage feasible since dealing with small group of investors
- MAJIC sidecar rating can affect capital charges for reinsurance recoverable

*MAJIC = multi-year adjustable just-in-time insurance capital