



CARIBBEAN ACTUARIAL ASSOCIATION



Accredited as a Full Member  
of the International Actuarial Association

# "Crossing the Boundaries of Tradition"

19<sup>th</sup> Annual CAA Conference

Rose Hall Resort and Spa, a Hilton  
Resort in Montego Bay, Jamaica.

December 3-4, 2009



CARIBBEAN ACTUARIAL ASSOCIATION



Accredited as a Full Member  
of the International Actuarial Association

# Life Workshop and Experience Study

**Assumptions and Techniques in a prospective environment**

**David Congram**

**Friday December 4, 2009 – 1:30 pm**

# Agenda

- **Prospective Assumptions**
  - i. **Mortality**
  - ii. **Valuation interest rates**
- **Overview of the Stochastic Modeling Book**



# Review of Assumptions



# QIS 2

## Range of Mortality Assumptions

Line of Business	Mortality Table
Individual Life	2001 CSO Select & Ult  CIA86-92 (Male/Female) Below 100% 3 companies 100% - 115% 1 company Above 115% 1 company  A67/70
Universal Life	CIA86-92 (Male/Female)

Note: Various ratios of the above tables are used.



# QIS 2

## Range of Mortality Assumptions

Line of Business	Mortality Table
Immediate Annuities	<p><i>Individual:</i></p> <p>1983 IAM (Male/Female)            A67/70 ultimate            2000 SOA table</p> <p><i>Group:</i></p> <p>SOA 1983 GAM (Male)            SOA 1994 GAM table</p>
Deferred Annuities	<p>PA (90)            1983 IAM            CIA 82-88            SOA 1994 GAM table</p>



Note: Various ratios of the above tables are used.

# QIS 2

## Valuation Interest Rates - Individual Life

Initial Rate		Ultimate Rate	
Below 8.0%	2	Below 5.0%	2
8.0%-9.0%	6	5.0%-6.0%	7
Above 9.0%	1	Above 6.0%	0



# QIS 2

## Liability 1% parallel shift compared

Line of Business	Valn: Int PAD/ Net Liab	Capital: Component of Interest/ Net Liab
Group 1 & 2 – Individual Ins with immediate & deferred participation in profits	4%	12.0%
Group 3 – Individual Ins without participation in profits	29%	46.6%
Group 4 – Endowments	4%	4.9%
Group 5 – Annuities	6%	7.8%
Group 6 – Other Long Term business	3%	6.9%
<b>TOTAL</b>	<b>7.5%</b>	<b>10.6%</b>

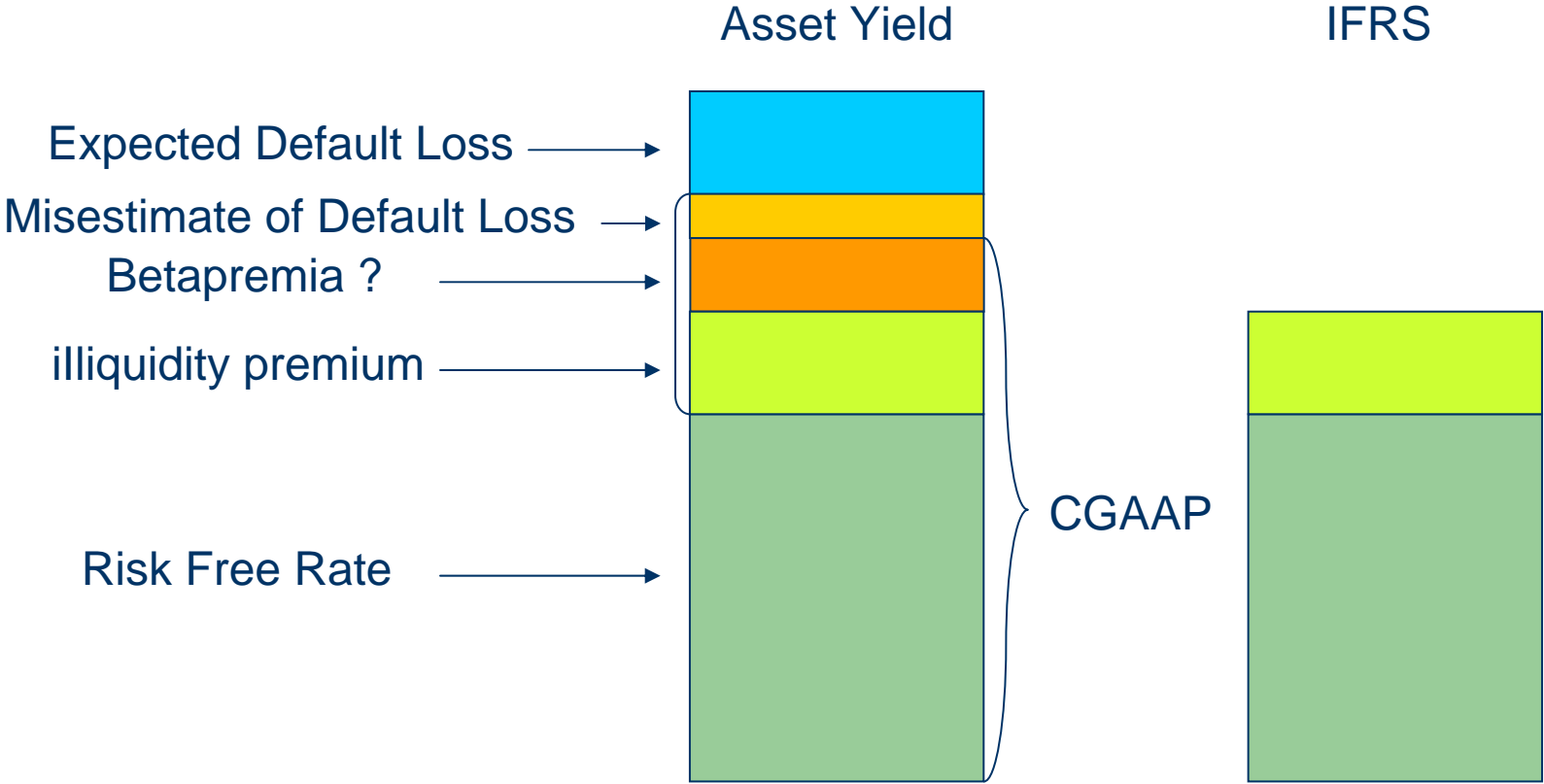
# From QIS 2

- **14 companies out of 24 participants have investment concentrations in excess of 10% of adjusted assets.**
- **17 companies out of 24 participants have open currency risk exposures**
  - i. **6 companies have in excess of 16% of total assets.**
  - ii. **47% of all exposures are in US dollar denominations**
- **Unrealized gains are significant. Real estate assets have unrealized gains of nearly 40% of that asset class**

# Segmentation

- **Minimum division**
  - a) **Surplus**
  - b) **Unit linked**
  - c) **Other product liabilities**
  
- **Valuation of the assets**
  - a) **Held to Maturity** - **Amortized Cost**
  - b) **Available for Sale** - **? Fair Value**
  - c) **Available for Trading** - **Fair Value**

# Views of the Discount Rate



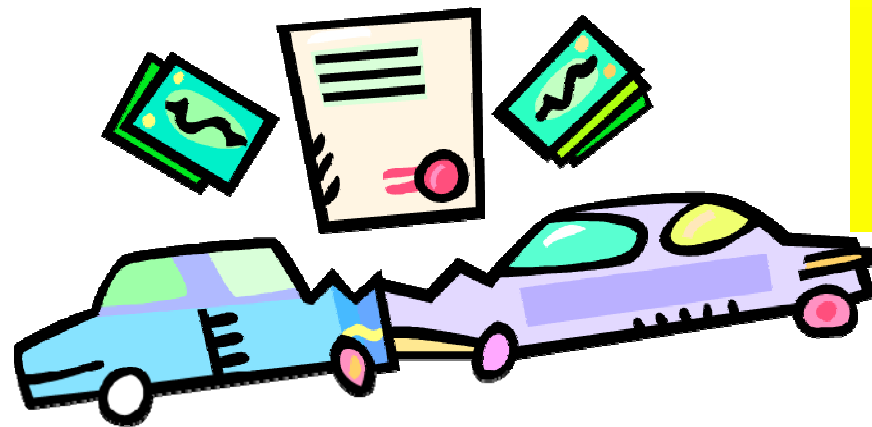
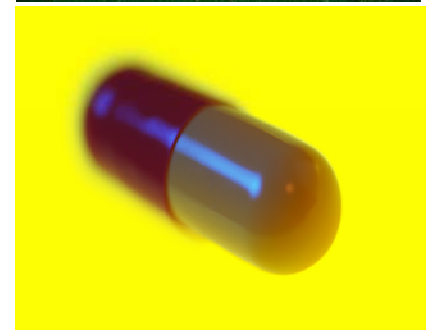
# Stochastic Modeling – Theory and Reality from an Actuarial Perspective

- **Sponsored by the International Actuarial Association (IAA)**
- **Funded by actuarial organizations and societies around the world:**
  - **The Actuarial Foundation**
  - **Canadian Institute of Actuaries**
  - **Casualty Actuarial Society**
  - **Financial Reporting Section of the Society of Actuaries**
  - **Het Actuarieel Genootschap**
  - **Institute of Actuaries of Australia**



# Overview of the Stochastic Modeling

- **Covers all insurance products**
  - **Contributing Milliman authors from**
    - **Life,**
    - **Health and**
    - **Property/Casualty**



# Motivation for Development

---

- **Provide technical background in stochastic modeling to actuaries around the world**
- **Serve as technical reference**
- **Demonstrate application of stochastic modeling techniques to insurance**
- **Illustrate, through cases studies, real world examples of stochastic modeling in insurance**

# Motivation for Development

---

- **Create stochastic modeling resource applicable to all countries**
- **Elevate awareness regarding importance of stochastic modeling in insurance**
- **Compare best practices across countries**

# Expected Uses

---

- **Actuarial education**
  - **Exam syllabus for actuarial organizations**
  - **On-the-job learning resource**
- **Technical resource**
  - **For stochastic modeling concepts/techniques**
  - **For insurance application of stochastic modeling**

# Expected Uses

---

- **By senior actuaries and senior management**
  - **Through case studies, to understand how stochastic modeling supports strategic and tactical decision making**
  - **To understand the ways in which stochastic modeling has been/is used around the world**

# Expected Uses

---

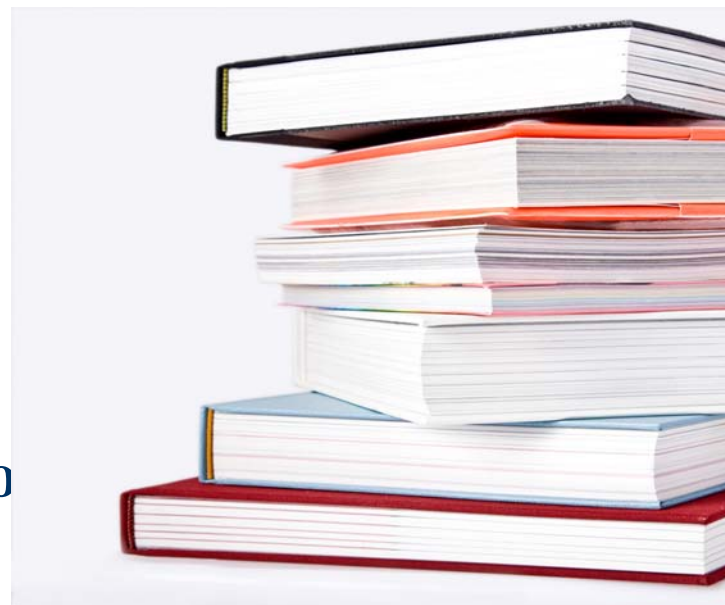
- **As a starting point for future editions**
  - **Regional actuarial organizations may tailor and/or add case studies to fit unique needs**
  - **Expect to add case studies as actuarial practice evolves and expands**

# Overview :

## General Outline

### Divided into Five Sections:

1. **General Methodology & Techniques**
2. **Applications of Stochastic Modeling**
3. **Evaluation and Communication of Stochastic Results**
4. **Case Studies**
5. **Technical Appendix & References**



# Overview : Structure

---

- **Each section builds on the previous one**
  - **Section I...**
    - **provides fundamental technical background material**
  - **Section II ...**
    - **applies the technical material developed in Section I to insurance models**

# Overview : Structure

---

- **Each section builds on the previous one**
  - **Section III ...**
    - **discusses practical considerations related to the models presented in Section II**
  - **Section IV...**
    - **Illustrates the real-world application of models developed in Sections I - III**

# Overview : Section I

---

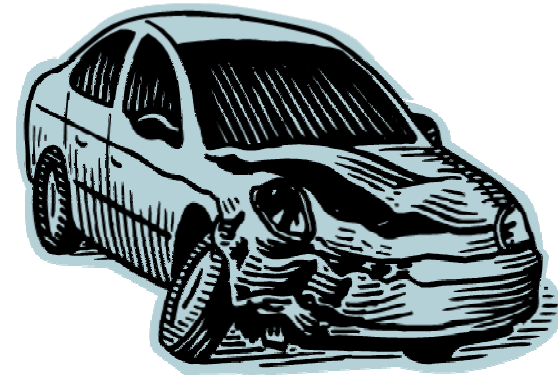
## Section I (General Methodology & Techniques):

- **Risk-Neutral vs. Real World Scenarios**
- **Modeling Techniques**
  - **Stochastic vs. Non-Stochastic Methods**
  - **Monte Carlo Simulation**
  - **Lattice Models**
  - **Regime Switching Models**
- **Distributions and Fitting**
- **Random Number Generation**
- **Risk Measures**

# Overview: Section II

## Section II (Applications):

- **Economic scenario generation**
- **Capital testing**
- **Deflators**
- **Life/Health models**
- **Casualty Claim/Financial models**
- **Country/Region Specific Issues**



# Overview : Section III

## Section III (Evaluation and Communication):

- Calibration
- Validation
- Auditing results
- Peer reviewing results
- Methods to communicate results



# Overview : Section IV

## Section IV (Case Studies):

- **Development and management of a variable-annuity product**
- **Economic capital for a multi-line life insurance company**
- **Development of Embedded Value for a multi-line life insurance company**
- **Unpaid claim variability for a multi-line non-life insurance company**
- **Economic Capital for a multi-line non-life insurance company**
- **Combining Economic Capital results for life and non-life companies**
- **Stochastic reserve and capital calculations**



# **Overview :**

## **The Case Studies**

---

- **Case studies presented in Section IV:**
  - **Touch on a wide variety of actuarial specialties**
  - **Address most of the risk factors discussed in Sections I-III**
  - **Illustrates use of the risk measures developed in Sections I-III**

**Let us take a look**



# Overview :

## Contributing Authors

---

**Contributing authors from Milliman have credentials from the following actuarial societies worldwide:**

- **Society of Actuaries (North America)**
- **Casualty Actuarial Society (North America)**
- **Institute of Actuaries (United Kingdom)**
- **Institute of Actuaries of Australia (Australia)**
- **Institute of Actuaries of Japan (Japan)**
- **Actuariel Genootschap (Dutch Society of Actuaries)**
- **Schweizerische Aktuarvereinigung (Swiss Association of Actuaries)**



# Overview :

## Contributing Authors

---

**Contributing authors hold the following advanced degrees or other professional credentials:**

- **PhD in Chemical Physics**
- **PhD in Financial Mathematics**
- **Master of Business Administration (MBA)**
- **Chartered Financial Analyst Charterholder (CFA)**
- **Global Association of Risk Professionals (FRM)**
- **Chartered Enterprise Risk Analyst (CERA)**

