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**International Financial Reporting for Insurers: IFRS  
and U.S. GAAP  
September 2009**

**Session 15: Risk Margins – Theoretical Basis**

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# Risk Margins Concepts

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## Risk Margins

- IAA Risk Margin Working Group
  - Formed 2005
  - Originated during discussions with IAIS
  - Final Report April 2009
  - Disbanded May 2009



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# RISK MARGIN LIABILITIES



## Liability calculated using Risk Margins

- Measurement of Insurance Liability
- Discounted cash flow model
- Uses 3 “Building Blocks”
  1. Current Estimate
  2. Risk Margin
  3. Discount Rate



## Current Estimate

- Unbiased probability weighted estimate of cash flows
  - Mean – not Median (Central)
- Discounted for the time value of money



## Risk Margin

- Depends upon Reporting Purpose
  - Regulators: Solvency Margin
    - ◆ Additional amount to reduce the probability of insolvency
  - Investors: Profit Margin
    - ◆ Compensation for assuming risk



## Risk Margin Methodologies

- Quantile
- Cost of Capital
- Decrease Discount Rate
- Explicit Assumptions



## Discount Rate

- Recognizes that 1 today is worth more than 1 paid in the future
- Discount rate composed of one or more of the following components:
  - Risk free return
  - Liquidity premium
  - Credit default premium
  - Uncertainty premium



## CURRENT ESTIMATE

- May be thought of as “Best Estimate”



## Current Estimate

- Include all relevant cash flows
- Probability weighted
- Assumptions
  - Market Inputs
  - Non Market Inputs
- Discounted for Interest



## All Relevant Cash Flows

- Premiums
- Benefits
- Expenses
- Risk Reinsurance
- Etc.



## Probability Weighted

- All possible scenarios included
  - Include catastrophes
  - Include all financial market possibilities
- Practicality
  - Stochastic upon stochastic issue
  - Assumption interdependence



## Probability Weighted Example

- 3 possible outcomes
  - 1 with 33% probability
  - 2 with 33% probability
  - 5 with 33% probability
- Probability Weighted outcome
  - $1 * .33 + 2 * .33 + 5 * .33 = 2.67$



## Market Inputs

- Markets
  - Financial Markets – currently
  - New Markets – ?Mortality Bonds?
- Apply if Market input is both
  - “Relevant”
  - “Reliable”



## Non Market Inputs

- Examples
  - Mortality
  - Persistency
  - Expenses



## Non Market Inputs

- Explicit assumptions
- Portfolio – More relevant
- Consistency among assumptions
- Future focused



## Practical Issues

- Data Quality
  - Credibility of sample sizes
  - Accuracy of available data
- Limitations
  - No long term risk free investments
  - No industry actuarial experience



## Discount Rate

- Components (Possible)
  - Risk free rate
  - Liquidity premium
  - Default premium
  - Other premium (or credit)



# RISK MARGINS



## Risk Margin (RM)

- Purpose
  - Investor: Profit Margin
  - Regulator: Solvency Margin
  
- $RM = \text{Total Reserve} - \text{Current Estimate}$



## Risk Margins

- Approaches
  - Quantile
  - Cost of Capital
  - Increase Discount
  - Explicit Assumptions



## Risk Margin - Approaches

- Regional Preferences
  - North America: Explicit Assumption & Quantile
  - Europe: Cost of Capital



## Quantile Approaches

- Confidence Levels (Value at Risk, VaR)
- Conditional Tail Expectation (CTE)



## Confidence Level

- Estimate is adequate X% of time
- Example: Net Value at Risk (VaR)
  - Estimate is adequate 99% of the time over a 1 year time frame
  - $RM = VaR \text{ Estimate} - \text{Current Estimate}$



## Conditional Tail Expectation (CTE)

1. Select the X% of scenarios with highest estimates = sample
2. Calculate average estimate of sample
3. CTE Estimate = average
4. RM = CTE Estimate – Current Estimate



## CTE Example

- US Principal Based Reserves for Variable Annuities (VA)
- Stochastic projections
  - Multiple years (30+)
  - Up to 10,000 prescribed economic scenarios



## CTE Example

1. Start with Original Reserve (OR)
2. Stochastically determine present value of deficiencies (PVD)
3. Select 30% largest PVD = Sample
4. Additional Reserve = Absolute value of Sample Average
5.  $R_x = OR + \text{Additional Reserve}$
6.  $RM = \text{Additional Reserve if } OR = \text{Current Est}$



## Cost of Capital

- Negative Cash Flow Component
  - $CoC = \text{Capital} * \text{Cost Rate}$
- Cost Rate
  - Expected Investment Return on Insurance Assets – Target Return
  - Tax effected
  - 6% to be used in EU for Solvency II



## Cost of Capital

- Capital Alternatives
  - Economic Capital
    - ◆ Internal Model Based
  - Regulatory “Floor” Capital
    - ◆ Example: 200% of Regulatory Action Level
  - Ratings “Target” Capital
    - ◆ Example: A Rating



## Cost of Capital Example

- Facts
  - Term Life
  - “A” Bond Investments
  - S&P “A” Rating Target



## CoC Example: Capital

- Risk Based Capital (S&P A Rating)
  - Asset: X%
  - Liability: Y%



## CoC Example: Cost

- WACC
  - Bond 5% (After Tax)
  - Stock 10%
  - Weight 1/2 Bond, 1/2 Stock
  - WACC = 7.5%



## CoC Example: Cost

- Asset Portfolio Yield
  - 6% Pre Tax
  - 33% Tax Rate
  - 4% After Tax
- Cost of Capital
  - $7.5\% - 4\% = 2.5\%$



## CoC Example: CoC Year 1

- Capital = 1,000
- Cost = 2.5%
- Cost of Capital =  $2.5\% * 1,000 = 25$



## Decrease Discount Rate

- Historically used with Net Level Premium Valuations
  - LDRE = Low Discount Rate Estimate
  - $RM = LDRE - \text{Current Estimate}$
- Simplistic
  - Easy but crude



## Explicit Assumptions

- Mortality & Expenses
  - Increase assumption to include RM
- Persistency
  - Increase or decrease based upon product features to include RM
- $RM = \text{Conservative Rx} - \text{Current Estimate}$



# DISCOUNT RATES



## Discount Rates

### ■ Issues

- Risk Free Rate
- Liquidity Premium
- Path Dependent vs. Independent Rates
- Asset Linked Liabilities




## Discount Rate: Background

- Reserve =  $PV(\text{Benefits}) - PV(\text{ Premiums } )$
- Reserve = Assets
- Asset Portfolio Irrelevant
  - Existing assets can be sold and reinvested



## Discount Rate: Background

- Replicating Portfolio
  - Asset Cash Flow = Liability Cash Flow



  - Liability Value = Asset Value
- Challenge
  - Replicating Portfolio may not exist

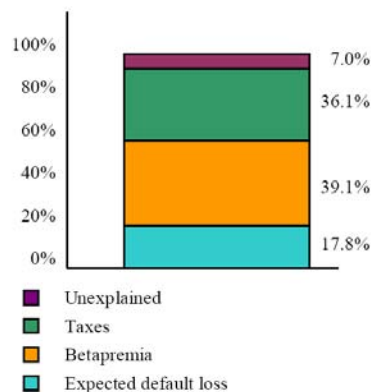


## Discount Rates

- Components
  - Risk Free Rate
  - Liquidity Premium
  - Default Premium
  - Taxes & Other



## Estimated relative contribution of different elements of the spread between A rated bonds and U.S. Treasuries



**Estimated relative contribution of different elements of the spread between A rated bonds and U.S. Treasuries**

- 39.1% Beta Premia – Liquidity Premium
- 36.1% Taxes
- 17.8% Default Premium (Expected)
- 7.0% Unexplained

*Source: Credit Derivatives, Derivatives working party (2005)*

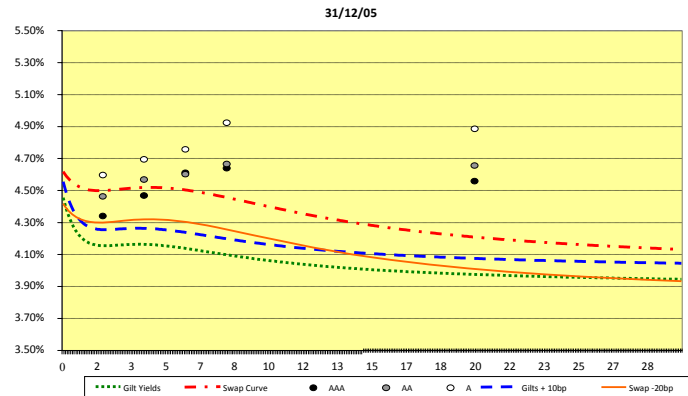


**Discount Rates  
in Market Consistent Framework**

- Possible Continuum & Policyholder Behaviour
- Risk Free
  - Policyholders are traders
- Risk Free + Liquidity Premium
  - Policyholders 100% predictable



## Possible Rates for Discounting



## Risk Free Rate

### ■ Possible Basis

- Government Bond (+ adjustment?)
- Swap Rates (- adjustment?)
- Corporate Bond - Adjustment



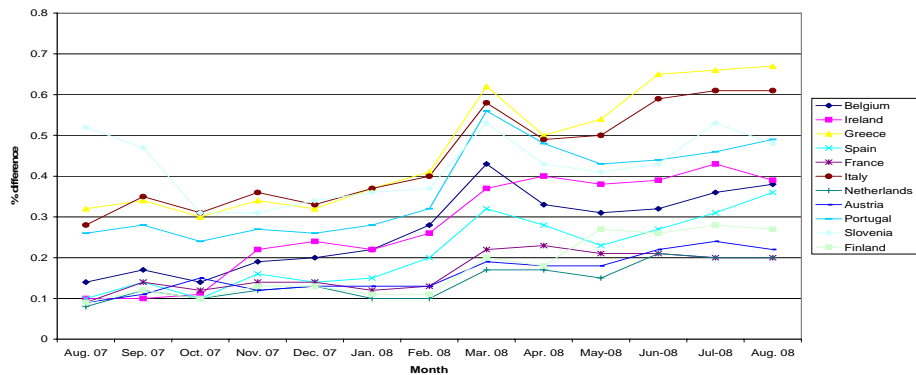
# Risk Free Rate Components

- Government Bond =
  - +“Real” Interest Rate
  - + Inflation
  - + Sovereign Risk
  - +/- Other



# European Bonds

Government bond yield spreads relative to Germany



## Government Bond Limitations

- Sovereign Risk
- Call Risk
- Market Distortions
- Limited Terms



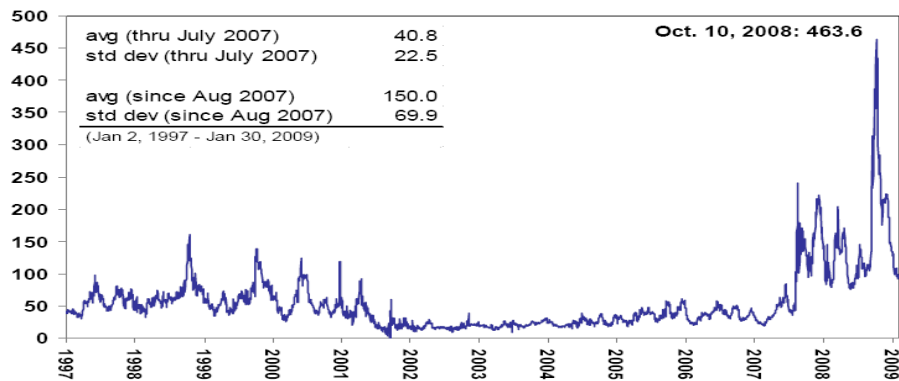
## Government Bond Adjustment

- General Collateral (GC) Repo
  - Borrow cash
  - Government bond collateral
  - Cost 5-10 bp over Government yield
- Adjusted Rate
  - Government Rate + .0005



## Swaps (TED = LIBOR – Treasury)

3M TED Spread  
Jan 2, 1997 - Feb 6, 2009



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## Swaps

- Over the counter (OTC)
  - Fixed versus Floating Legs (LIBOR)
  - Financial Institution counterparties
  - Credit risk
- CRO Forum
  - Risk Free = Swap - Adjustment



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## Corporate Bonds

- Corporate Bond Interest Rate =
  - + Risk Free Rate
  - + Default Cost
  - + Liquidity Premium
  - + Taxation
  - + Contract features (e.g. calls)
  - + Uncertainty on above



## Liquidity Premium

- Bond Rate (Corporate?)
  - - Expected Default Cost
  - - Uncertainty Premium
  - - Expenses



## Discounting Scenarios

- Path Dependent Discount Rates weighted
  - Versus
- Single Discount Rate applied to probability weighted cash flows



## Asset Linked Products

- Policyholders assume some investment risk (e.g. bonus)
- Company retains some investment risk (e.g. minimum interest guarantee)



# Risk Mitigation



# Risk Mitigation

- Pooling – reduces variance
- Diversification – offsets variances
- Reinsurance – transfers risk/variance
- Contract features – transfers risk to PH
- Discretionary benefits – transfer to PH
- Concentration – increases risk

