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Investment Guarantees in Equity Linked Insurance
- The Canadian Approach -

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A New Millennium. A New Challenge for Actuaries

Overview

- Description of product & markets
- A brief history of Canadian regulations
- Canadian Institute of Actuaries Task Force on Segregated Fund Investment Guarantees
- Valuation practices and standards
- Balance sheet integration
- Risk management

Introduction: Product

- Segregated Funds: variable annuities with investment guarantees on death and maturity
- Minimum guarantee: 75% ROP on death and at maturity (at least 10 years from policy issue)
- Many variations: automatic ratchet (lookback), rollover option, elective resets (shout)
- Guarantees can operate across investments ("family-of-funds") or "fund-by-fund", by deposit, etc.

Introduction: Market

- Extremely popular alternative to mutual funds due to guarantees & other insurance attributes
- About CAD $50 billion in AUM (June 2001)
- Largest source of new premium income
- Convergence: reinforces image as full-service "financial institutions", not "insurance companies"
- Insurance wrappers: many funds are externally managed by brand-name mutual fund companies

A Brief History

- In 1997, segregated funds began to receive significant attention in Canada:
  - no industry standards re: policy liabilities
  - no prescribed minimum capital requirements
  - wide variety of practices
  - unsophisticated modelling (if any)
  - inappropriate or inadequate pricing
  - little or no risk management

Industry Developments

- Research paper by CIA Joint Working Group 1998:
  - broad articulation of the risks in financial mgmt
  - recommended direction for CIA/regulators
- CIA valuation guidance in 1998:
  - deterministic “drop/recovery” scenarios to set floor liability
  - stochastic modelling recommended to test adequacy
- Key conclusions:
  - deterministic methods (e.g. retrospective accumulation of risk charges, single-scenario drop/recovery) are flawed
  - stochastic methods needed to value/price risk

CIA Task Force

- Formed in Fall 1999 in response to concerns by industry and regulators (OSFI). Scope/Mandate:
  - develop and recommend approaches for the use of stochastic techniques to measure the policy obligations created by investment guarantees
  - negotiate implementation of standards of practice
- Broad representation: insurers, consulting firms, regulators, academic, software provider
- Dec 2001 report available in English & French at CIA website - www.actuaries.ca

CIA Task Force: Development

- Scope expanded to address minimum required capital & capital adequacy
  - response to regulators re: proposed deterministic "drop/recovery" scenarios for setting required capital
  - recognition of the low frequency / high severity risks
- Working Principles:
  - stochastic analysis superior to other techniques
  - consistency in practice & ease of implementation
  - integrated approach to total balance sheet requirement ("TBSR" = liabilities + minimum required capital)

CIA Task Force: Recommendations

- Establish liabilities using the stochastic techniques and “best practices” as outlined in the report
- No single model is mandated:
  - companies must “calibrate” stochastic investment return models to specific criteria
- Immediately discontinue use of deterministic scenarios to set policy liabilities:
  - maintain for capital resiliency testing (“DCAT”)

CIA Task Force: Report

- Regulators introduce an interim factor-driven approach for setting the TBSR:
  - minimum required capital = [TBSR] – [policy liabilities]
  - transition to “stochastic capital” over next few years
- Report addresses many areas, including:
  - stochastic investment return models
  - product features, policyholder behaviour, model risks
  - liabilities, incl. margins/provisions for adverse deviations
  - extensive appendices (references, regulatory guidelines)

Policy Liabilities: General

- Canadian Asset/Liability Method ("CALM"):
  - prospective, realistic, cashflow-based valuation
  - consider all revenues, expenses & material contingencies
  - determine the basket of assets necessary and sufficient to mature the policy liabilities at some confidence level
  - assumptions are "best estimate" based on emerging and expected future experience
  - liabilities include provisions for adverse deviation ("PfADs")
  - recognize risk management (reinsurance, hedging)
  - Appointed Actuary: ensure compliance, opine on liabilities

Policy Liabilities: PfADs

- Provisions for Adverse Deviations:
  - related to degree of uncertainty in projecting future contingent events
  - often accommodated by explicit margins applied to the assumptions (e.g. ±5–20% adjustment to lapse rates)
  - emphasis is on “plausible adverse experience” (not intended to cover catastrophic losses)
  - consistency with Canadian GAAP (not solvency based)
  - single reporting framework (STAT ≡ GAAP)

Policy Liabilities: Segregated Funds

- Typically, a bifurcated approach:
  - host contract, including expenses & DAC recoverability, valued using deterministic methods
  - provision for guaranteed benefits set via stochastic analysis using realistic (not risk-neutral) projections
- Holistic “whole contract” valuation is permitted
- Interaction with minimum required capital:
  - integrated approach to required capital should have no bearing on the valuation assumptions

Valuation of Segregated Funds

- Select appropriate investment return models
- Calibrate equity models to return criteria
- Generate distribution of realistic scenarios
- Incorporate explicit MfADs for non-scenario tested assumptions
- Start with current policy values and project all relevant cashflows/contingencies along each path/scenario
- Discount cashflows to the valuation date
- Establish provisions (PfADs) for investment/market risk using appropriate coverage level from aggregate loss distribution

Equity Model Calibration

- To ensure appropriate sampling of adverse market performance, companies are required to calibrate their equity return models to prescribed criteria:
  - based on historical monthly TSE300 TR 1956-1999
  - focus on “left-tail” of return distribution (2.5th, 5th & 10th percentiles over 1-, 5- and 10-year holding periods)
  - multiple calibration points are sufficiently flexible to permit a wide range of models (no specific exclusions)
  - ranges for mean & stdev to preserve drift & dispersion

Calibration Criteria

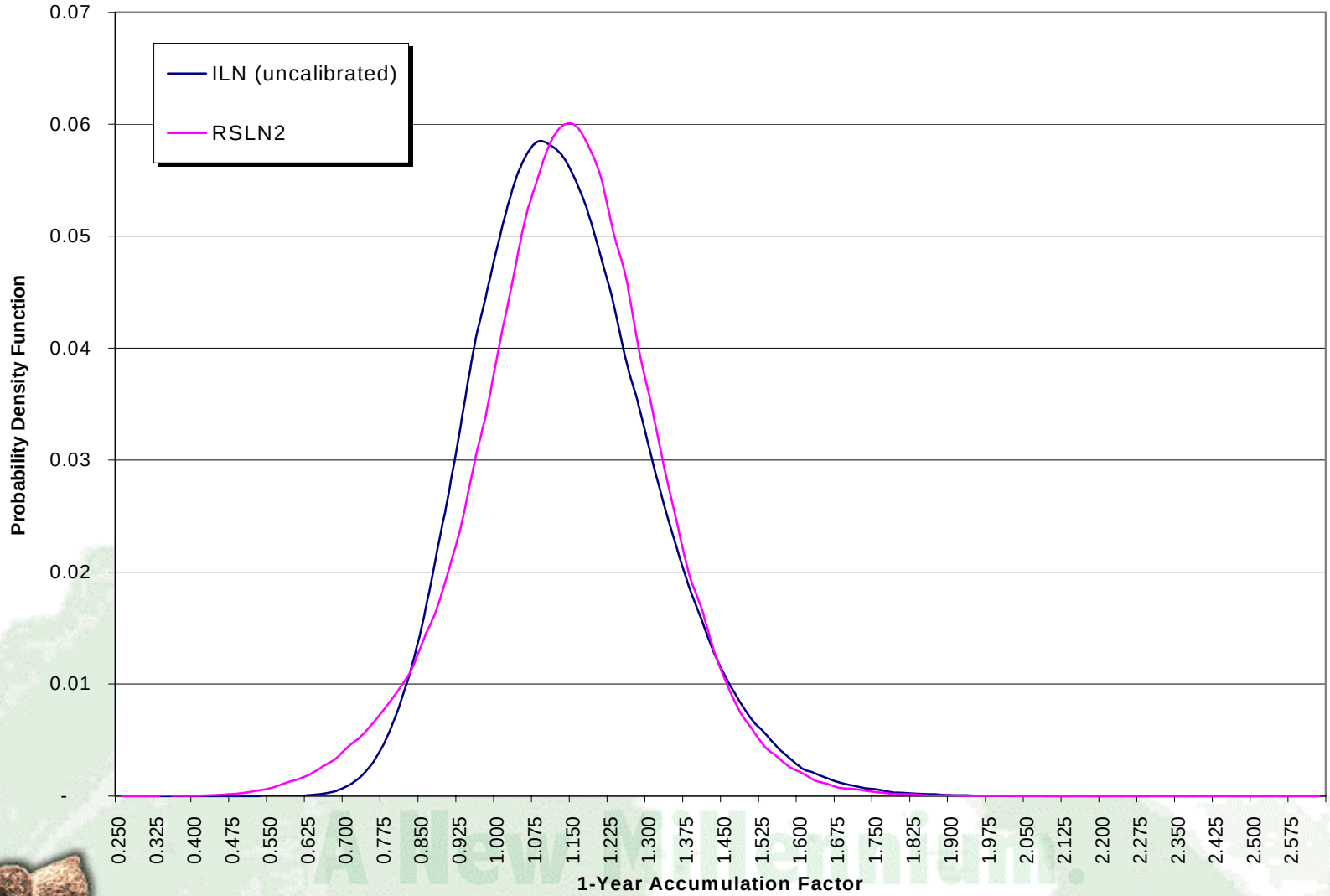
- Developed from 3 equity return models using MLEs:
  - lognormal with mean-reverting stochastic volatility (SAV)
  - regime-switching lognormal with 2 regimes (RSLN2)
  - stable distribution (STABLE)
- Consistent with empirical evidence

Accumulation period	2.5%	5%	10%
1 year	0.76	0.82	0.90
5 years	0.75	0.85	1.05
10 years	0.85	1.05	1.35

Calibration Guidance

- Technical appendices on calibration process
- No specific guidance on projecting bond fund returns
- Calibration process does not establish a PfAD:
  - introduces consistency in practice
  - ensures minimum “fatness” in left tail of return distribution
- Calibration adjustments to the model parameters s/b carried forward to the simulation models:
  - may use different historic period(s) and/or data (e.g. other markets) for fund projections

Independent Lognormal



Investment Risk PfAD

- Determine liability to cover a range of plausible investment scenarios: incorporates a PfAD for investment risk
- The investment risk PfAD is based on coverage of a range of scenarios using a conditional tail expectation ("CTE") measure rather than the result of applying MfADs to the investment model assumptions
  - permits the same stochastic scenarios to be used for other testing (e.g. pricing, embedded value, corporate planning)

Investment Risk Measure: CTE

- $\text{CTE}^{+}(x)$ = right-tail conditional expectation
  = weighted-average of highest (100-x)% losses
- $\text{CTE}^{+}(x) \approx$ ½(100+x)$^{\text{th}}$ percentile
- Most appropriate measure for setting the policy liabilities under a realistic (P-measure) valuation:
  - more robust than “percentiles” or “mean + deviation” measures w.r.t. sampling error
  - less sensitive to small changes in initial conditions (MV/GV)
  - always reflects downside risk (tail events)
  - easy to calculate and readily interpretable

Policy Liabilities: CTEs

- Three primary components to investment/market risk:
  - investment performance,
  - parameter mis-estimation
  - model risk
- Accepted range is $CTE^{+}(60\%)$ to $CTE^{+}(80\%)$
- Consider:
  - amount / credibility of data
  - approximations
  - number of scenarios

Total Balance Sheet Requirement

- TBSR is currently formula driven based on prescribed factors at a $CTE^{+}(95\%)$ confidence level
- Regulators moving towards an environment whereby companies could use internal models to determine capital requirements:
  - must obtain prior approval
  - frequent stress-testing & audit trails required
  - models must be closely integrated into pricing,valuation & risk management processes (“risk management culture”)

Balance Sheet Management

- Minimum required capital ("MRC") = $TBSR - V$
- Actual B/S provision = $[V] + [MRC] \times [Capital\ Ratio]$
- A $1 of provision in capital is much more "expensive" than a $1 of provision in the liabilities since:
  - capital is "after-tax"
  - required capital operating ratio generally 150 – 200%
- Strong motivation for companies to hold higher liabilities if they can withstand the impact on earnings

Risk Management

- Dynamic Capital Adequacy Testing ("DCAT"):
  - deterministic scenarios useful to understand exposure & management action in prolonged/adverse markets
- Valuation framework introduces considerable volatility in earnings and capital if company is "running naked":
  - reinsurance has largely disappeared; expensive
  - withdrawal from market
  - product re-design and retail price increases
  - dynamic hedging & contingent risk management strategies