Valuation of Insurance Contract Liabilities
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CIA Practice Education Course –
Finance/Investment and Individual Life and Annuities
Goals

- CALM... and what you need to know
- Assets... and the modeling thereof
- Liabilities... and the modeling thereof
- ASB NOI and Scenarios... and what has changed
- Modeling and Output ... and bringing it all together
- IFRS Phase 2 ... and what to expect in the future
Canadian Asset Liability Method (CALM)

- Prescribed method used to determine the value of insurance contract liabilities.
- Uses projections of both **assets** and **liabilities** under various scenarios (deterministic or stochastic).
- Projections go to end of **last liability** cash flow.
- Iterative process
  - Goal: determine adjusted initial assets that have zero surplus after last liability cash flow.
- Value of insurance contract liabilities = IFRS statement value of the adjusted initial assets.
How does CALM work?
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Overlaying one asset over liability cash flows
How does CALM work?

Combining Asset and Liability Cash Flows
How does CALM work? (Example)

- Asset
  - Zero coupon bond with maturity in 5 years.
  - Current market value of $1,000.
  - Current statement value of $900.
- Liability
  - $1,280 guaranteed payment payable in 5 years.
  - Flat interest rates of 5% (BEY)
  - Asset in 5 years will be worth...... $1,280.
  - At t=5, can pay liability payment, without any surplus/deficit.
    - Actuarial Reserve at t = 0 is statement value of asset, therefore $900.
CALM Modeling

- Key components:
Assets

- **Cash Flows**
  - Need asset information.
  - Result from maturities, interest payments, dividends, etc.
  - May be scenario dependent (e.g., floating bonds).

- **Assumptions**
  - Asset defaults.
  - Non-fixed income assets.
  - Investment expenses.
  - Other.
Assets

- **Asset Defaults**
  - Asset can no longer make payments.
  - Vary significantly by asset class.
  - May vary by term.

- **Investment expenses**
  - Administration costs.
  - Investment management costs.
  - Other costs.
Assets

- Non-fixed Income (NFI) Assets
  - Examples: equity, real estate, some derivatives.
  - Growth rate and income rate assumptions.
    - Cannot be better than historical benchmarks.
Liabilities

- **Insurance contracts**
  - Policy obligations; for example: actuarial liabilities, amounts on deposit, provision for experience rating refunds.
  - Other balance sheet amounts; for example: dividends on deposit, portions of FTL/FTA.
  - **Does not include future new business.**

- **Liability cash flows**
  - For example: premiums, claims, benefits, expenses, taxes, policyholder dividends, experience rating refunds, reinsurance related cash flows...
  - Certain cash flows will be scenario dependent.
Liability Assumptions

Assumptions to consider

- Term of the liability;
- Policyholder reasonable expectations;
- Mortality;
- Morbidity;
- Lapse;
- Expense.
Liability Assumptions

- Term of the liability
  - Modeled term may not be contractual term.
    - Can policyholder alter the term?
    - Are there constraints on insurer’s ability to adjust term?
  - Impact of changing term
    - Increase or decrease liabilities?
    - Testing usually required.
  - Other considerations
    - Could extend term to recover acquisition costs.
Liability Assumptions

- **Policyholder Reasonable Expectations (PRE)**
  - Used as guidance for determining cash flows that are subject to insurer’s discretion.
    - For example: participating policy dividends, adjustable premiums.

- **Mortality**
  - **Insurance considerations:**
    - Age, gender, duration since policy issue, smoking habits, health, lifestyle of insured.
    - Underwriting practices, anti-selective lapse, future mortality improvements.
  - **Annuity considerations:**
    - Age, gender, health, group or individual, size of premium, benefit choice.
    - Are funds deposited within a registered vehicle?
    - Underwriting class (structured settlements, back-to-back contracts).
    - Future mortality improvements.
Liability Assumptions

- Morbidity considerations:
  - Age, gender, smoking habits, occupation, cause of disability, industry;
  - Duration since issue;
  - Definition of disability, as well as administration, claim adjudication practices;
  - Environmental factors (unemployment rates, levels and integration of government benefits), economic factors;
  - Future morbidity improvement.
Liability Assumptions

- Lapse considerations:
  - Issue age, attained age, duration, policy size, plan benefits, premium paying status, client sophistication.
  - Lapse supported vs. lapse sensitive.
  - Experience can develop quickly; use your own company experience when feasible.
  - May vary with economic scenario.
    - For example, a scenario where minimum interest rate guarantees are triggered may call for a lower lapse assumption than under higher-rate scenarios.
Liability Assumptions

- Expense considerations:
  - Include all expenses related to insurance obligations, including overhead.
  - Expenses for premium paying policies should include premium taxes and premium-based agent compensation.
  - Exercise caution in projecting unit expense improvements.
  - Include income taxes where appropriate.
    - Investment Income Taxes (“IIT”).
    - Capital taxes if incurred on assets backing liabilities.
    - Premium taxes.
  - Expense inflation should vary with the scenario.
Asset and Liability Margins

- Margins for Adverse Deviations (MfAD)
  - MfAD reflect the degree of uncertainty of the expected assumptions.
  - Larger MfAD used for assumptions that are based on less credible data.
  - Prescribed ranges in SOP for each assumption.
  - MfAD can be increased above high range point for unusually high uncertainty or if necessary to produce adequate provision for adverse deviations (PfAD).
  - Testing may be required to establish proper size and direction (margin always increases the liability value).
  - Margins appropriate for one scenario may not be appropriate for another.
ASB Notice of Intent

- The Actuarial Standards Board announced its intention to revise the economic reinvestment assumptions in late 2012.
- Exposure draft published in December 2013.
- Standards became effective in October 2014.
What Changed

- Revised calibration criteria for stochastic interest rate model to become more stringent.
- Revised deterministic scenarios to produce results comparable to those provided by stochastic methodology.
- Removal of the constraint on investment in risk-free fixed income assets after 20 years
- Establishing limits on Alternative Long Duration Assets (ALDA) usage.
1) Changes to Deterministic Risk-Free Rates

- Old standard has 10 prescribed interest rate scenarios (Base, P1 to P9) of varying forms.
- Eliminated P9 and re-designed all other scenarios.
- Canada URRs will be prescribed and reviewed every 4~5 years.
- For companies with international businesses, URRs have to be developed.
2) Changes to Credit Spread Assumptions

- Old Fixed Income (FI) reinvestment strategy assumes that the future purchase of FI will grade from the current reinvestment mix to Treasury over 20 years.
- New standards eliminate this grading to Treasury and maintain current FI reinvestment mix forever.
2) Changes to Credit Spread Assumptions

- Old Standards:
  - Grade from current spread to historical average over 5 years.
  - Years 5+ uses same historical average spread as year 5.

- New Standards:
  - Years 0 – 5:
    - Grade from current spread to historical average over 5 years.
    - 10% MfAD at year 5.

- Years 6 – 30:
  - Grade to 80 bps plus default (if lower than 5-year point).

- Years 30+:
  - Use same credit spreads as year 30.
2) Changes to Credit Spread Assumptions

- New standards added two margins on historical average credit spread:
  - 10% MfAD on credit spreads – Grading from 0% to 10% over 5 years.
  - 80 bps + padded default cap on credit spreads at year 30.

![Graph showing 20-Year Corp BBB Credit Spreads with MfADs and Cap](image)
3) Changes to ALDA Return Assumptions

- ALDA market value correction range is increased from 25% - 40% to 20% - 50%.

- Minor change to the gross up of ALDA income assumptions after market value correction.
4) Changes to ALDA Constraints

- **X/Y/Z Methodology**

Cash flows supported by ALDA t = 0

X=20%, Y= year 20, Z=75%

The following year in the projection (t = 1), the 20 year horizon resets and the 20th year cash flow is now supported by 20% ALDA. The amount of ALDA allowed in year 1 is the PV of red bars.
5) Stochastic Risk-Free Rate Scenarios

- Stochastic scenarios replace prescribed scenarios 1 to 8 only.
- Book reserve between CTE60 and CTE80 range.
More on Stochastic Risk-Free Rates

- Stochastic reserve is determined by modeling thousands of different interest rate scenarios in CALM.
  - Interest rate scenarios are generated using a calibrated scenario generator.
  - ASB does not promulgate an interest rate model to be used for stochastic risk-free modeling.
  - The requirement is to have the interest rate model generate scenarios that fully satisfy the promulgated ASB calibration criteria.
  - Generator defines how interest rates move from one period to the next based on a prescribed set of calibration criteria.
- Padded stochastic CALM reserve is set as the average of the xx% of the highest resulting liabilities (i.e., 30% for CTE70).
- The best estimate reserve is still deterministic and calculated using the prescribed base scenario.
Deterministic Scenarios

- Deterministic scenarios include
  - Risk-free yield curves
    - Deterministic scenarios to produce results comparable to those provided by stochastic methodology.
  - Curve contains at least short-term, medium-term, and long-term rates.
    - Promulgation of high, low and median ultimate reinvestment rates targeted to be consistent with promulgated stochastic calibration criteria.
  - One base scenario (CIA Base/PS 0).
  - Eight prescribed scenarios (CIA 1 to 8/PS 1 to 8).
  - All prescribed by SOP.
Deterministic Scenarios

- CIA base scenario
  - Projection year 1:
    - Yield curve as of the valuation date.
  - Projection years 2 – 20:
    - Calculate forward rates implied by valuation date curve.
  - Projection years 40:
    - Equal 30% of 20 year rates + 70% of URR Median.
  - Projection years 60+:
    - Use prescribed ultimate reinvestment rates – Median.
  - Projection years 21 – 40 and 41 – 60
    - Linear transition.
Deterministic Scenarios – CIA Base

CIA Base Scenario - Short and Long Term Risk-free Yields
(March 31, 2015)
Deterministic Scenarios

CIA P1 & P2 Scenarios - 30-Year Term Risk-free Yields
(March 31, 2015)
Deterministic Scenarios

CIA P3 & P4 Scenarios - 30-Year Term Risk-free Yields
(March 31, 2015)
Deterministic Scenarios

CIA P5 & P6 Scenarios - 30-Year Term Risk-free Yields
(March 31, 2015)
Deterministic Scenarios

CIA P7 & P8 Scenarios - 30-Year Term Risk-free Yields
(March 31, 2015)

Risk-Free Yield (in %)

Projection Year

0 10 20 30 40 50 60 70

0.00% 2.00% 4.00% 6.00% 8.00% 10.00% 12.00%
Deterministic Scenarios – Rates and Spreads

- **Interest Rates**
  - SOP prescribes how to calculate short-term and long-term rate for each scenario.
  - Interpolate for terms between short and long based on average historical curve shape.

- **Risk Premiums (Credit Spreads)**
  - CIA Base spreads grade to historical averages over 5 years.
  - CIA 1-8 must move to 90% of historical averages over 5 years, and then grade to historical cap (80 bps).
Reinvestment Strategy

- Need to follow insurer’s current investment policy.
  - Could be segment specific.
  - Could be a mix of non-fixed income and fixed income assets.

- Considerations:
  - Are changes to investment policies being considered?
  - How are cash flow shortfalls handled?
    - By selling assets? If so, what is the order?
    - By short-term borrowing?
  - Degree of asset-liability mismatch will impact earnings and reserve sensitivity.
Modeling – CALM Valuation

- Provide for economic risk through the scenario testing of cash flows.
- Project asset and liability cash flows under various economic scenarios, including the base and eight prescribed scenarios.
- Roll cash flows forward to end of projection period using economic scenario assumptions.
- Adjust starting assets so that ending surplus is zero.
- Scenario liability = Value of starting assets.
Modeling – CALM Valuation

- Liability not less than highest scenario liability under all prescribed scenarios.
  - Liability not limited to highest scenario – could be higher.

- Stochastic Modeling
  - Scope of scenarios must cover prescribed scenarios.
  - Selected scenario should have policy liabilities in the $\text{CTE}(60)$ to $\text{CTE}(80)$ range.
    - Model and parameter uncertainty would support a larger margin.
Modeling - Reinsurance Asset

- CALM calculation based on contract liability net of reinsurance cash flows.
  - Under IFRS need to report gross contract liability and a reinsurance asset instead of net contract liability that was reported under CGAAP.

- Requires use of approximation to CALM, as assets backing full gross liability usually not available.
  - Reinsurance cash flows based on same assumptions and margins as net CALM liability.
  - Use PPM interest rate vector that reproduces net liability (apply to gross and ceded cash flows).
Modeling – Currency Risk

- Applies where liabilities and supporting assets denominated in different currencies.
  - Includes situation where expenses incurred in different currency.

- Base scenario: use currency forwards (derive from interest rate differentials if necessary).

- MfAD: apply one standard deviation of changes to the exchange rate.
  - Minimum MfAD of 5% currency movement.
Modeling – Interest Rate Risk

- **Interest Rate Risk**
  - Modeled through multiple scenarios of changing interest rates.

- **C3 Margin**
  - Calculated from the scenario liability values derived from the economic scenarios.
  - **Equals:**
    - Most adverse scenario liability minus base scenario liability.
    - If use stochastic CALM, then base ≠ CTE(0).
  - Must be at least as great as that resulting from the most adverse of the eight prescribed scenarios.
Choose worst scenario for each block?
- Only one future scenario applied
  - Unless foreign block, in which case a different scenario can be selected.
- Reserves should be “sufficient without being excessive”.

Participating should not generally mingle non-participating.
- Due to restrictions on flows between par and non-par.

Are “synergies” permanent?
IFRS Phase 2

- Why are the accounting standards being updated?
  - Global standard for insurance contract liabilities.
  - Improve transparency of financial statements for users.
  - Improve comparability between insurers and other fields.
  - Intents of the changes are not to increase/decrease reserves.

- Actuaries are mainly preparers, not users.

- Known impacts
  - New modeling methodologies.
  - Significant presentation changes.
  - Considerable effort at transition.

- Potential effective date of January 1, 2019... or later.
IFRS Phase 2

- Main changes relate to discounting of liabilities.
  - Other impacts are collateral impacts from the discount rate.
- Discount rate curve (biggest change from CALM).
  - Reflects characteristics of the liability (not the assets).
  - At inception, set
    \[ PV \text{ of future inflows} = PV \text{ of future outflows} + \text{risk adjustment} + \text{contractual service margin (CSM)} \]
  - Risk adjustment reflects the compensation an insurer requires for bearing the uncertainty in the cash flows.
  - CSM eliminates any accounting gains at inception of the contracts.