# Actuarial Modeling of LTC Insurance Products:

## *The current and future states from a typical carrier's point of view*

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# Closed Block Long-Term Care Insurance (LTCI) Business:

## Key Actuarial Functions, Goals, and Challenges

### Experience Studies

**Monitor experiences and set up actuarial assumptions:**

- *Limitations of company data.*
- *Limitations of industry data.*
- *Balance of precision and simplification.*
- *Sound actuarial judgments.*

### Pricing/Re-rating

**Achieve timely state approval of adequate rating increases, and implement them promptly:**

- *Complex regulatory requirements and resistance.*
- *Lack of resources for managing state filing.*
- *Limitation of admin system and operation support .*

### Financial Reporting & Management

#### Valuation

**Calculate, report and analyze reserves accurately and sufficiently in a timely manner**

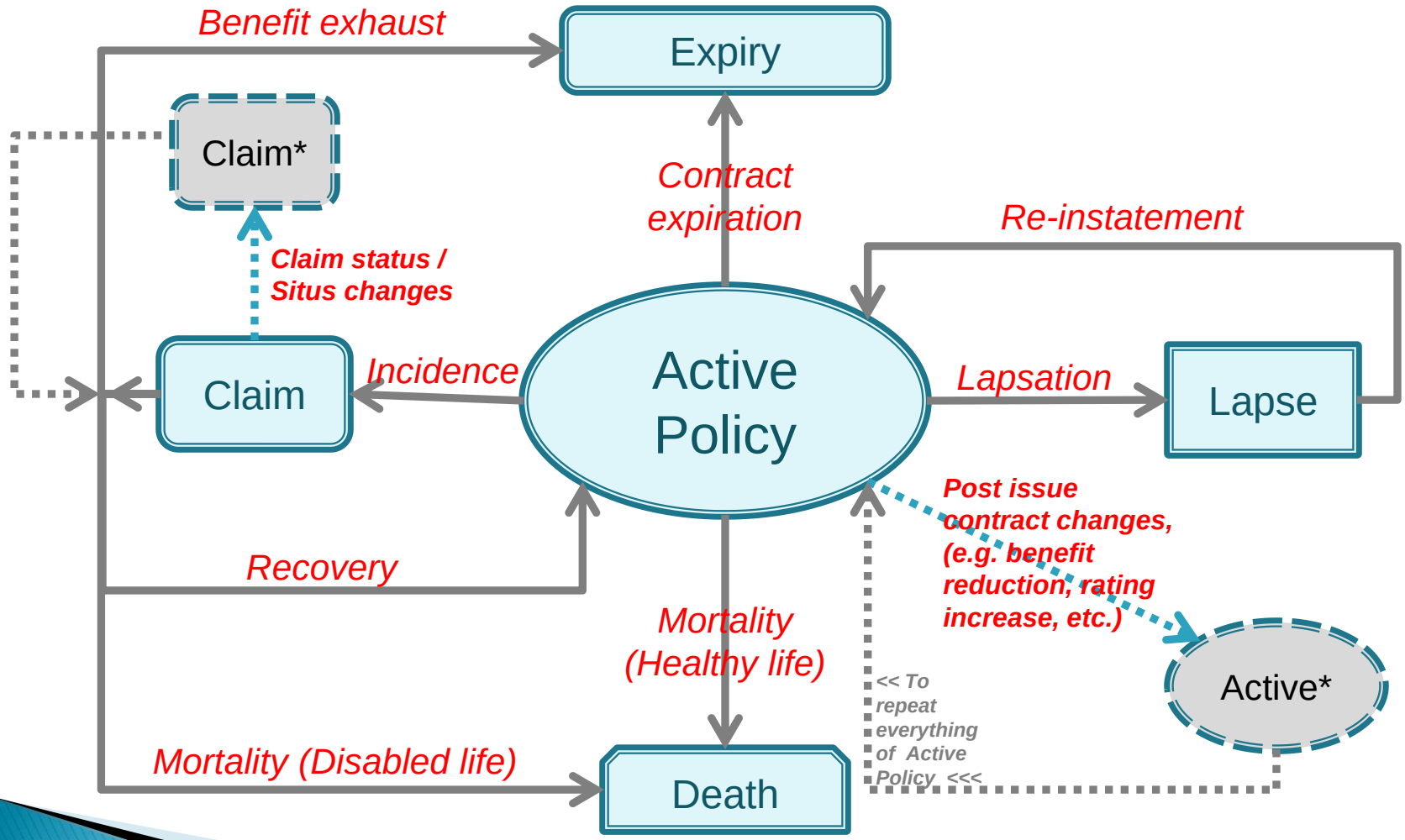
- *Data issues and manual processes.*
- *Limited analytical tools.*
- *Additional management scrutiny.*
- *Limitation of underlying assumptions.*

#### Projection

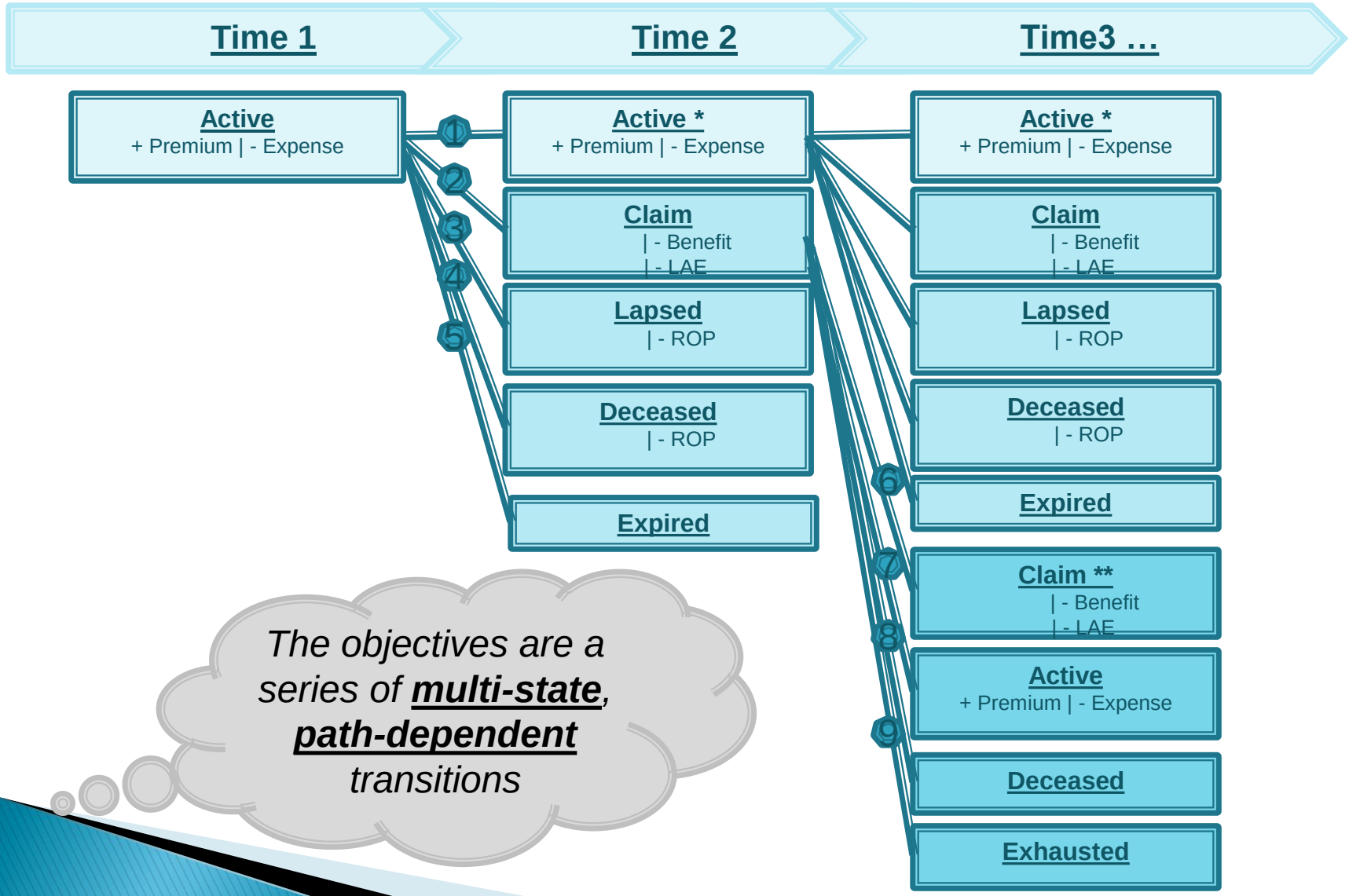
**Perform GAAP and statutory reserve adequacy testing, financial forecasting and capital stress assessment; All accurately and sufficiently in a timely manner:**

- *Limitations of system function and capacity.*
- *Limitation of underlying assumptions.*
- *Dynamic regulatory and management requirements*

# Actuarial Modeling: The evolution of a LTCI policy



# Actuarial Modeling: Chronicled quantifications



# Actuarial Modeling: Data, assumption, methodology, and output

**Policy Inforce**
**Claim Inforce**
**All census data**

**Policyholder / Claimant behavior:**
- Controlled: lapse, utilization, etc.
- Uncontrolled: mortality, morbidity etc.

**Contract Terms**
- Coverage period
- Benefit period / pool

**Economic Factors**
- Inflation
- Cost of care increase

**Inherent Relationships**
**Accounting Rules**

- ✓ ***Inventory***
  *Premium inforce; Policy/claim counts; Lapse/death decrements; Etc.*
- ✓ ***Cash Flow***
  *Premium; Claim payment; Expense; Etc.*
- ✓ ***Balance Sheet & Income Statement***
  *Reserves; DAC; Capitals (RBC, Required Capital, RAC, etc)? Revenue; Expense; Benefit; Earnings; Etc.*
- ✓ ***Profit Measures***
  *Premium margin; Loss ratio; IRR; ROE; RAROC; Etc.*
- ✓ ***Other Metrics***
  *E.g. Liability duration*

*How are the **systems** doing??*

# Actuarial Modeling: Options & decisions, morbidity as an example

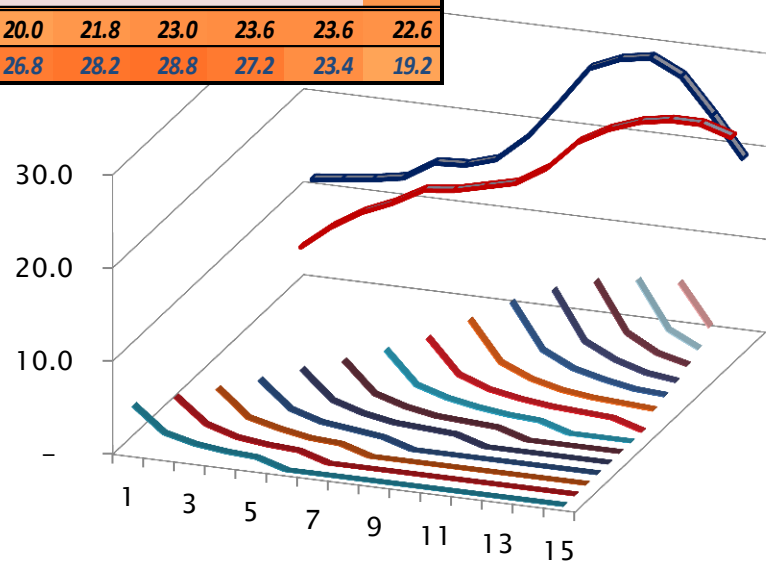
| Realistic | alistic | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 11.2 | 5.0 | 2.4 | 1.6 | 1.2 | 1.0 | | | | | | | | | | |
| 2 | 11.6 | | 5.2 | 2.6 | 1.6 | 1.2 | 1.0 | | | | | | | | | |
| 3 | 12.0 | | | 5.4 | 2.6 | 1.8 | 1.2 | 1.0 | | | | | | | | |
| 4 | 12.6 | | | | 5.6 | 2.8 | 1.8 | 1.4 | 1.0 | | | | | | | |
| 5 | 14.6 | | | | | 6.0 | 3.0 | 2.0 | 1.4 | 1.2 | 1.0 | | | | | |
| 6 | 14.8 | | | | | | 6.2 | 3.0 | 2.0 | 1.4 | 1.2 | 1.0 | | | | |
| 7 | 15.8 | | | | | | | 6.6 | 3.2 | 2.2 | 1.6 | 1.2 | 1.0 | | | |
| 8 | 18.6 | | | | | | | | 7.2 | 3.6 | 2.4 | 1.8 | 1.4 | 1.2 | 1.0 | |
| 9 | 22.6 | | | | | | | | | 8.4 | 4.2 | 2.8 | 2.0 | 1.6 | 1.4 | 1.2 |
| 10 | 26.8 | | | | | | | | | | 9.6 | 4.8 | 3.2 | 2.4 | 1.8 | 1.6 |
| 11 | 28.2 | | | | | | | | | | | 10.2 | 5.0 | 3.4 | 2.4 | 2.0 |
| 12 | 28.8 | | | | | | | | | | | | 10.4 | 5.2 | 3.4 | 2.6 |
| 13 | 27.2 | | | | | | | | | | | | | 9.8 | 4.8 | 3.2 |
| 14 | 23.4 | | | | | | | | | | | | | | 8.8 | 4.4 |
| 15 | 19.2 | | | | | | | | | | | | | | | 7.6 |
| **Claim Payments:** | | **5.0** | **7.6** | **9.6** | **11.0** | **12.8** | **13.2** | **14.0** | **14.8** | **16.8** | **20.0** | **21.8** | **23.0** | **23.6** | **23.6** | **22.6** |
| **Claim Costs:** | | **11.2** | **11.6** | **12.0** | **12.6** | **14.6** | **14.8** | **15.8** | **18.6** | **22.6** | **26.8** | **28.2** | **28.8** | **27.2** | **23.4** | **19.2** |

*There is a probablity for a claim to incurr at any policy duration; There is a likelyhood for a claim to continue to any period once incurred ...*

*Therefore, in any projection period, the claim payment is a mixture of the likely new claim and the possible continuous payments from all probable claims incurred in the past ... ...*

*Assumptions to consider in modeling such future payments will include claim incident, claim termination, benefit utilization, benefit expiration, inflation, claim transition, etc. Any manipulation of the payments (e.g. to calculate claim costs) will also need additional assumptions ... ...*

***Claim Cost***
*vs.*
***1st Principle***
*approaches*



# Actuarial Modeling: Options & decisions for level of details

How accurate for estimate of paid claim and future claim reserve?

*Move incidence and continuance directly into projection models??*

Need to capture transfer activities and utilize more accurate claim continuance assumptions?

*Incorporate care setting transfer into projection models??*

Want to improve accuracy of policy expiration (& accordingly assumptions get simplified too!)?

*Incorporate benefit expiration / exhaustion??*

How important to track lives, test / validate assumptions, and use those results?

*Separate disabled mortality from active mortality??*

What level of consistency required for matching contract terms?

*Model all features and riders, e.g. benefit restoration, shared care, etc.??*

# Reality Check for A Typical Carrier: Where we are?

## Models

- Claim cost approach is still the norm.
  - Only incurred claims can be projected rather than paid claim.
  - Can't distinguish between healthy lives and disabled lives, and can't capture recoveries.
  - Can't capture expiration of benefit.
  - Variance between actual and modeled results can't be analyzed without further manipulation.
  - Assumptions are manipulated from other elements therefore lack transparency and are static.
  - Assumption tables can be overwhelming to capture each characteristics.
- Many simplifications, sometime ignorance, to certain detailed product features (e.g. factors are commonly used).

## Infrastructure

- Multiple Systems for different functions, e.g.
  - PolySystems' HealthMaster for valuation,
  - PolySystems' HealthDelphi for projection,
  - GGY-Axis for cash flow testing,
  - MG-ALFA for pricing,
  - Plus various of manual tools in Excel, Access and even APL.
- Multiple sources of data
  - Different output from different admin systems.
  - No sharing among different functions.

## Capacity

- Financial Projection
  - Cash payments not projected;
  - Cost of care inflation not explicit;
  - Many restrictions for liability testing, including: *Lapse rate updates; Lapse/mortality/utilization shocks; Calendar year adjustments; etc.*
  - Lack of user friendly functions, such as: *Output reports; Audit reports; MS Office interaction; etc.*
  - System errors and issues.
- Valuation and Reporting
  - Reserving requirements deviated from those when assumptions was developed.
  - Numerous patches and manual topside.
  - Reserve increases can't be precisely quantified.
  - Lack of flexibility for updates.
- Pricing / Re-rating
- Experience Studies

# Reality Check: Where we want to go

## Business Need

- Uncompromised compliance for regulatory requirements
- Transparency and reliability of modeling results for financial analysis. At the minimum, claim payments and inforce should be accurately projected to serve as the key financial reporting, forecasting, capital testing and product management information.
- Responsive to on-going business activities; Dynamic to reflect new experience and information.
- Capacity and flexibility for future regulatory and management demands.
- Improved efficiency and reliability for reporting and analysis, and ultimately lead to more effective management decisions.

## Models

- Monitor and track key behaviors and risk drivers in a more disciplined manner, and implement corresponding assumptions to fix root causes of many issues associated with the current claim cost approach.
- Ensure internal consistency of assumptions, e.g. disabled and healthy mortality vs. total mortality; mortality and recovery vs. claim continuance rates.
- Streamline valuation and projections.
- The 1st Principal Approach is the key:
  - Claim payments can be projected precisely for both timing and magnitude; Populations, both active policies and claims, can be projected explicitly; Future claim reserves can be projected consistently.
  - The projected cash flows will ensure accuracy of AAT, ALM, RAC and financial forecast.
  - Assumptions will follow and reflect policy behaviors directly, therefore are transparent, measureable, and dynamic.
  - Assumptions will be easy to update for basis changes and for sensitivity or shock testing.
  - Assumptions will allow comparison of actual to expected, crucial for both experience studies and financial analysis.

## Infrastructure

- Modernized and Integrated System Platform(s):
  - Same platform for valuation, projection and pricing.
  - Multiple concurrent financial projections (e.g. locked in vs. best estimate).
  - Integrated asses/liability projections.
  - Build-in analytics and more robust management information (e.g. Roll forward, SOE).
  - Reduced cycle time for production, analysis and ad hoc research.
  - Incorporate governance processes for future changes, both routine data/assumption/methodology updates and enhancement for e.g. stochastic capabilities.

# Reality Check: How to get there

## Raise the bar

- Actuarial assumptions and model calculations have to match policy & claim behaviors, contract features and economic and regulatory factors more closely.
- Systems must have the power and capacity consistent with the modeling and reporting requirements.

## Models

- Revise assumptions and re-engineer model calculation with the 1st principle logics.
  - Experience studies & assumption setup: Monitor claim incidence, claim continuance and benefit utilization rate directly.
  - Calculation engine: Move claim incidence, claim continuance and benefit utilization rates into projection; Apply benefit cap into projection.

## Infrastructure

- System evaluation for improvements and/or conversion.
- Enhance the current systems, if capable, to optimize the existing functions.
- Over-haul the current systems.

# Reality Check: More ahead

## Ongoing Challenges

- Management may disapprove financial analysis.
- GAAP targeted improvements mandate new methods for reserves and financial reporting.
- PBR sets up new stage for higher modeling expectations, e.g. stochastic modeling?
- Enhanced federal supervision posts complex tests and strict controls, e.g. SIFI to certain companies with Prudential included.
- Sustainability of the business itself: revenue, earning and capital.

## Opportunities

- Data and experience accumulation and utilization.
- More disciplined and principle-based modeling approach.
- Modernized infrastructure, functional and optimal.
- Reactions and pro-actions.
- Right business decisions based on solid data and reliable information.

*It's a continuously evolving and improving working progress.*

# Lessons learnt for managing the change

- Management support and engagement.
- Budget and planning: Never underestimate the cost.
- Realistically assessing resources and expertise: Internal vs. outsourcing
- System conversion: Setting up a dedicated team vs. adding more people to the existing function teams.
- Knowledgeable and reliable project manager sometimes is a key too.
- Accountability, communication, collaboration.
- Documentation, approval