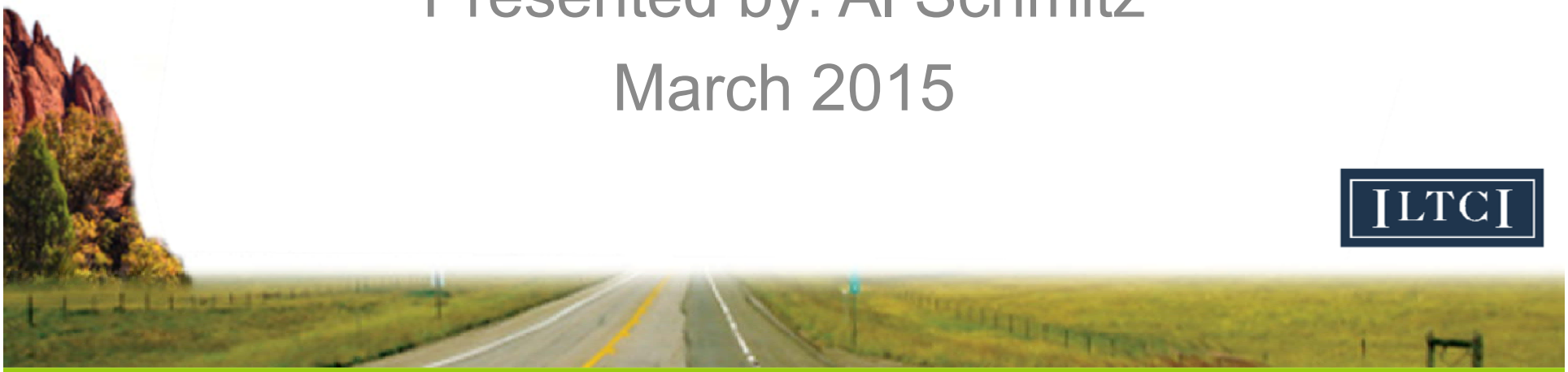
Actuarial

American Academy of Actuaries PBR Committee

Overview and Update

Presented by: Al Schmitz

March 2015



ILTCI

15th Annual Intercompany Long Term Care Insurance Conference

LTC Principle Based Reserves

- Agenda
  - Why Consider PBR for LTC?
  - Why Use a Stochastic Approach?
  - Objective of Project
  - History and Work to Date

LTC Principles Based Reserves

- Why Consider PBR for LTC?
  - NAIC Request
  - History of Academy Committee
  - Life Insurance
  - Health Insurance

LTC Principle Based Reserves

- Why a Stochastic Approach?
  - Better model / better measure of potential risk?
  - Better understanding of potential results
  - Hope that it will assist in measuring and managing the risk in LTC

Objective of Project

- Based on the initial request from the NAIC, the objective of the work group is to develop a prototype stochastic model to be used to help set the direction of PBR for LTC
  - Prototype Model
    - Conceptual Framework
    - Model Block of Inforce
    - Include Variability of Major Risks
    - Excel
    - Guide Only

History and Work To Date

I. Stochastic Modeling – key variables: morbidity, lapse, mortality, interest

II. Modeling Approach – morbidity, mortality, and lapse in Excel prototype using “Hazard Rate Approach”

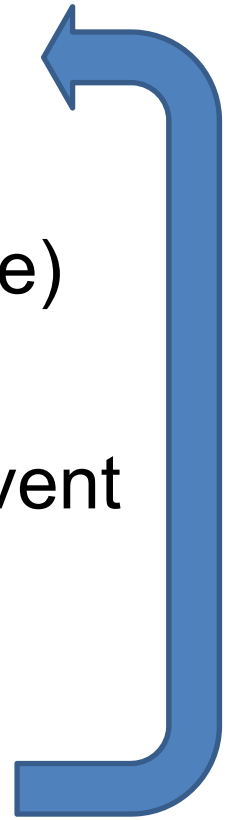
III. Modeling Considerations – premium rate changes, interest rate impact, morbidity / mortality changes, margins

IV. Assumptions and Data collection – sample assumptions developed by committee, two inforce files provided by two companies.

V. Stochastic and Deterministic Results

Model Description

- Excel Based Stochastic Model Using "Hazard Rate Approach"
  - When policyholder will have an event
  - What the event is (Lapse, Death, Incidence)
  - If event is an incidence – when will next event occur
  - What is the event (Recovery, Death)
    - if recovery

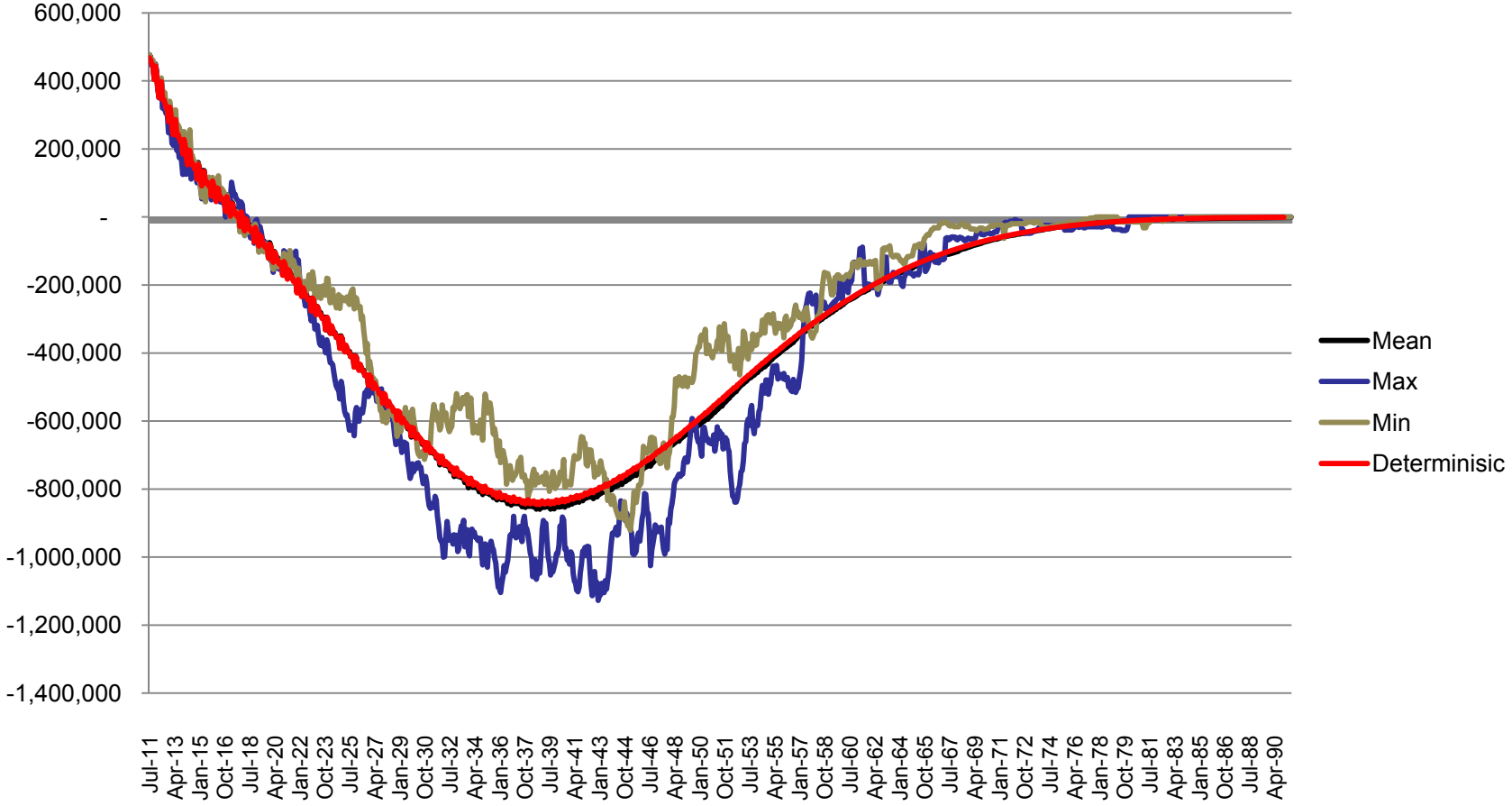


Assumptions

- Prototype Model Assumptions
  - "Reasonable" is important, but focus on the model and interactions
  - High Level Estimates from Committee
    - SOA Intercompany Data
    - No morbidity or mortality improvement in base run
    - No rate increases in base run

Calibration

Comparison to Deterministic – Inforce Block of LTC Insurance



Sample block of 6,000 policies

Initial Results

Distribution Characteristics of PV of Cash Flow @ 4%

- Mean 87 m
- Maximum 106 m
- Minimum 72 m
- Std Dev 5.261 m
- Skewness 0.138209
- Kurtosis 0.168010

Initial Results

- **Sample block of 6,000 LTC insurance policies, CTE calculations**

CTE 0 (GPV)	87m	100.0%
CTE 10	88m	101.2%
CTE 20	89m	102.1%
CTE 30	90m	102.9%
CTE 40	90m	103.8%
CTE 50	91m	104.8%
CTE 60	92m	105.8%
CTE 70	93m	107.1%
CTE 80	95m	108.6%
CTE 90	97m	110.8%
CTE 95	98m	112.8%
CTE 99	103m	117.8%

Note: CTE 90, for example, is equal to the average of the worst 10% of scenarios, each scenario cash flows discounted at 4%

Initial Results

Distribution Characteristics of PV of Cash Flow @ 4%

AAA PBR LTC Model Runs				
	Base	Incidence Plus 10%	Incidence Minus 10%	Active Mortality Minus 10%
Mean	87,130,339	99,228,164	74,036,463	94,746,011
Max	106,262,080	117,344,432	92,581,823	110,851,459
Min	72,487,960	80,432,369	59,192,117	80,400,667
Skewness	0.138	0.058	0.210	0.089
Kurtosis	0.168	-0.146	0.278	-0.050
Std Dev	5,261,055	5,638,591	4,949,694	5,292,701
Std Dev / Mean	6.0%	5.7%	6.7%	5.6%
CTE 0	100.0%	100.0%	100.0%	100.0%
CTE 10	101.2%	101.1%	101.3%	101.1%
CTE 20	102.1%	102.0%	102.3%	101.9%
CTE 30	102.9%	102.8%	103.2%	102.7%
CTE 40	103.8%	103.7%	104.2%	103.6%
CTE 50	104.8%	104.5%	105.3%	104.4%
CTE 60	105.8%	105.5%	106.4%	105.4%
CTE 70	107.1%	106.6%	107.8%	106.5%
CTE 80	108.6%	108.1%	109.5%	108.0%
CTE 90	110.8%	110.2%	112.3%	110.1%
CTE 95	112.8%	111.7%	115.0%	111.8%
CTE 99	117.8%	114.7%	119.9%	115.1%

Next Steps

- Summary Report
- Model Improvements
  - Stochastic Considerations
  - Management Actions
- Role in Reserve Calculations

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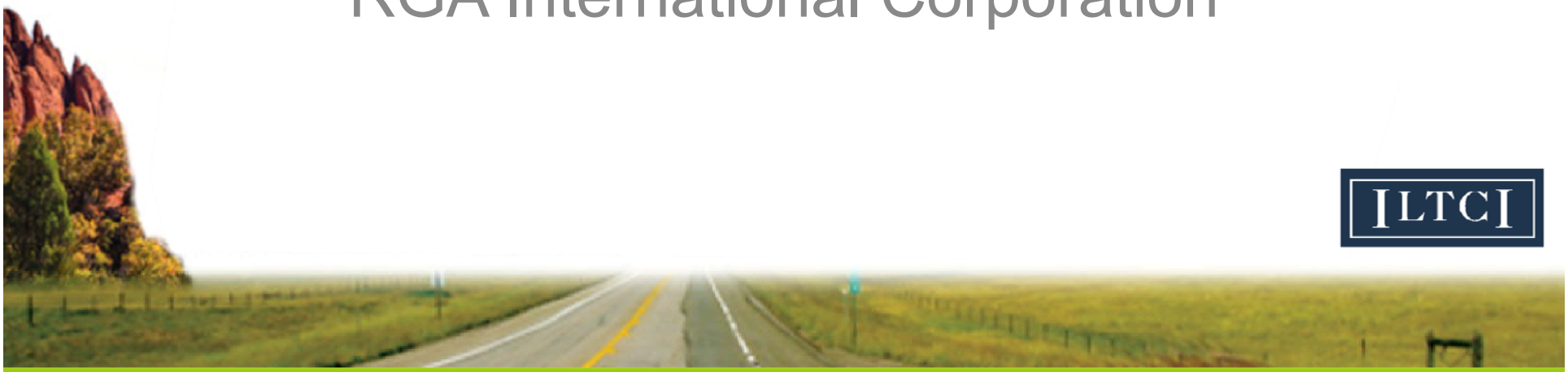
Stochastic Model Construction

Paul Morrison, ASA MAAA ACIA
RGA International Corporation



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Agenda

- Choices
- Construction
- Considerations

Choices

- What are the random events?
  - Claim
  - Lapse
  - Death
  - Salvage
  - Inflation
  - Interest
  - Any Others?

Choices – What are the random events?

- Claim
  - ADL by ADL?
  - Cognitive vs. ADL?
  - Probability Functions
    - Are these single decrement or multiple?
    - Are these independent?
    - Are the benefits different?

Choices – What are the random events?

- Lapse
  - Reasonable data sources today
  - Policy termination value (e.g. CSV, RoP)
  - Non-forfeiture
  - NAIC maximums
    - Is lapse no longer random?

Choices – What are the random events?

- Death
  - Life actuaries chose not to bother with death
    - Should we?
  - Active lives have different rates than impaired
    - Have we studied the difference?
  - NAIC tables
    - Is death no longer random?

Choices – What are the random events?

- Salvage
  - Must align with choice of random claim event
  - Affected by coverage level
  - Affected by region

Choices – What are the random events?

- Inflation
  - Benefit Impact
  - Interest Rate Impact
- Interest
  - Real vs. Nominal
  - Highly Intensive Theoretically and Computationally
  - Well Accepted Models (e.g. Hull – White)

Choices – What are the random events?

- Any others?
- What about non-random events?
  - Management Action
  - Regulatory Action

Construction

- Homegrown
  - Actuarial expertise
  - Programming expertise
  - Database expertise
  - Hardware expertise
- Packages
  - Vendors

Construction – Homegrown

- Actuarial expertise
  - Contingencies and their distributions
  - Contingent and non-contingent cash flow

Construction – Homegrown

- Programming expertise
  - Implementation of calculation formulae
  - Code libraries
  - Code reviews
  - Testing
  - Change management

Construction – Homegrown

- Database expertise
  - Usually a vendor supplied package
    - Internal limitations
  - Set up, maintenance and use require different sets of skills
    - What data is stored?
    - How is data stored?
    - Who will be extracting information from the database?
    - What query language(s)?
  - Input and/or Output

Construction – Homegrown

- Hardware expertise
  - Grid computing
  - LAN storage
  - Capacity planning

Construction - Packages

- Vendors
  - Numerous
  - Helpful
  - Not necessarily dedicated to LTC
  - Not necessarily dedicated to stochastic the way you might have chosen in earlier slides
  - Could be least expensive option
  - Just down the hall!

Considerations

- Difficulty of validation
- Set tolerances for data
- Run time issues
  - Programming shortcuts
  - Algorithm shortcuts
  - Modeling section

Considerations – Difficulty of validation

- Deterministic
  - The first thing to check
- Reconcile outliers
  - Is it a real possibility?
- Test boundaries
  - What is the most extreme?

Considerations – Set tolerances for data

- ETL Step
  - Blanks
  - Zero
  - 9999
- Calculation Step
  - Assumptions
  - Overflow/Underflow
  - Logical comparisons

Considerations – Set tolerances for data

- Storage Step
  - Trimming fields to save space
- Query Step
  - Timeout for any one query
  - Progress bar
  - Size of output record
  - Size of output table

Considerations – Run time issues

- Programming shortcuts
  - Each language has different shortcuts
  - Variants/Arrays
  - RAM vs. Disk

Considerations – Run time issues

- Algorithm shortcuts
  - Random walk step sizes/convergence
  - Mean reversion
  - Time/Type of event
  - Time epoch

Considerations – Run time issues

- Modeling section
  - Newest SoA section
  - Growing quickly
  - Many concurrent discussions
  - Actuaries don’t know everything

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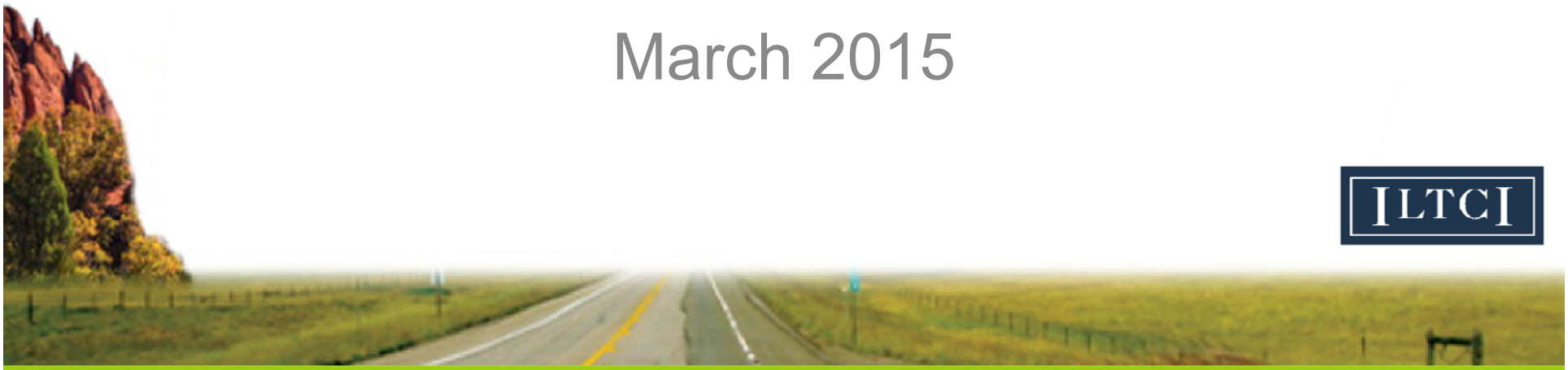
Volatility in Long-Term Care Insurance:
Implications for PBR

Presented by: Rachel Brewster

March 2015



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Volatility

- High volatility is driven by:
  - Future LTCi experience cannot be predicted with a great deal of confidence, especially over the distant future
  - Claim data is usually limited for many years after policy issue due to relatively low claims experience
- Effect of volatility should be reflected through a provision for risk and uncertainty (PR&U)

Components of Risk & Uncertainty

- Process Risk
  - Should PR&U reflect homogenous and independent risks since they can be eliminated by insuring sufficiently large numbers of insureds?
  - Issues with LTCi
    - Stability of Conditions
    - Efficiency of Insurance markets
    - Uncertainty of factors that impact experience

Components of Risk & Uncertainty

- Parameter Risk: Parameters are incorrect
  - Estimation Risk
  - Exposure Risk
  - Future uncertainty – Paradigm Shifts
- Model Risk
  - Over simplification
  - Under specification

Desirable Characteristics of PR&U

1. Consistent with applicable regulatory framework;
2. Consistent with sound insurance pricing practices, regulatory solvency principles, and actuarial standards;
3. Practical, understandable, and straightforward;
4. Transparent, auditable and verifiable;
5. Not over-reliant on subjective inputs;
6. Use current estimates;
7. Consistent among insurers with similar business and between insurance coverages, if practical;
8. Consistent over entire lifetime of the policy and between generations of products.

Measurement Methods

- Quantile Methods
  - Confidence levels
  - Conditional tail expectation
  - Moment Methods
- Explicit Assumptions
  - Independent risks
  - Correlation of risks
  - Aggregate methods

Scenarios to Consider

- Sources of Risk / Assumptions
  - Lapse
  - Mortality (Before & After Claim)
  - Claim Incidence
  - Utilization
  - Interest

Scenarios to Consider

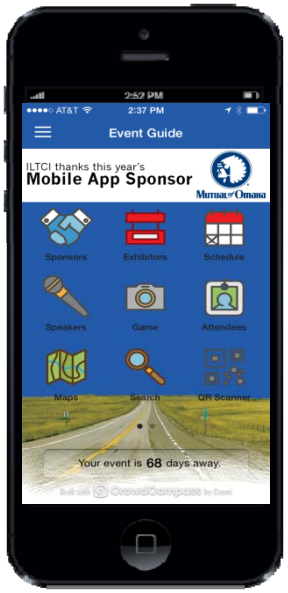
- How do these assumptions interact?
  - Expectations with mortality improvement
    - Prior to claim
    - Post claim
  - Changes in Alzheimers or Dementia
    - Impact of a cure
    - Impact of higher incidence

Future Considerations

- Risk Mitigation Impacts of Product Design
  - Higher Co-pays: More significant cost sharing
  - Longer Elimination Periods
  - Shorter Benefit Periods
  - Improvements to ‘Use it or Lose It’ design

Q & A

Don’t forget to fill out the survey



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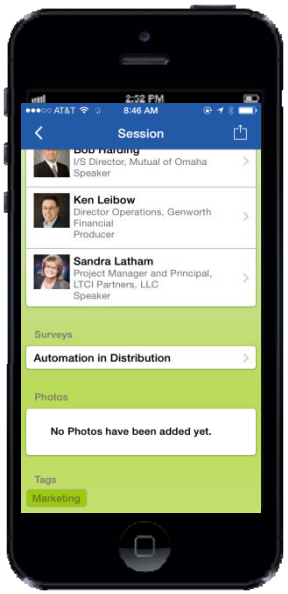
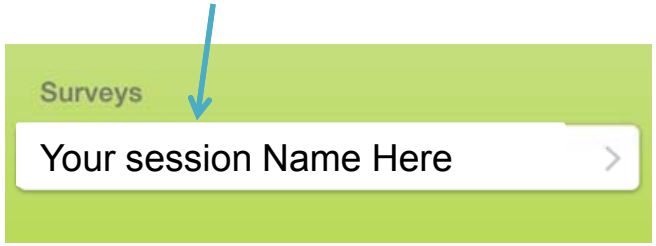
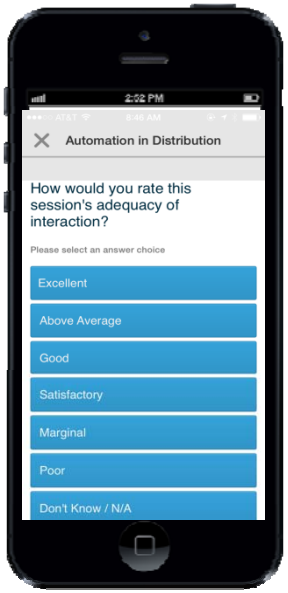
Available on the App Store

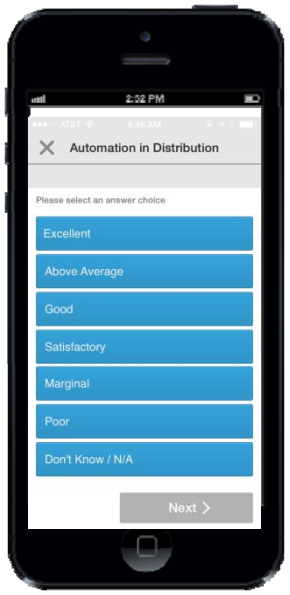
1. **Find the session**
2. **Scroll to the bottom**
3. **Tap on the session name below the survey**







Tap on the answer you wish to submit



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