



Annuity Policyholder Behavior Case Studies and Trends

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TOWERS WATSON 

Agenda

- Introduction
- Brief update on annuity policyholder (PH) behavior
- Case studies
 - Fixed annuity (Ken Lombardo)
 - Variable annuity (Stephen Turer and Katie Minor)
 - Application of predictive modeling to VA lapses (Guillaume Briere-Giroux)

Update on Annuity Policyholder Behavior

Recent PH Behavior Trends for Variable Annuities

- Variable annuity (VA) lapses dropped from pre-crisis level
- Expected by VA writers from “universal” use of dynamic assumptions
- But... the extent of the drop was typically larger than expected
 - Withdrawals benefits (GMWB)
 - Death benefits
- Many carriers have revised or are in process of revising their dynamic assumptions
 - New approaches
- Percent of maximum GMWB withdrawal emerging lower than 100%
- Early utilization remains more limited than expected

Did policyholders become “shell-shocked” during the financial crisis?

Recent PH Behavior Trends for Fixed Annuities

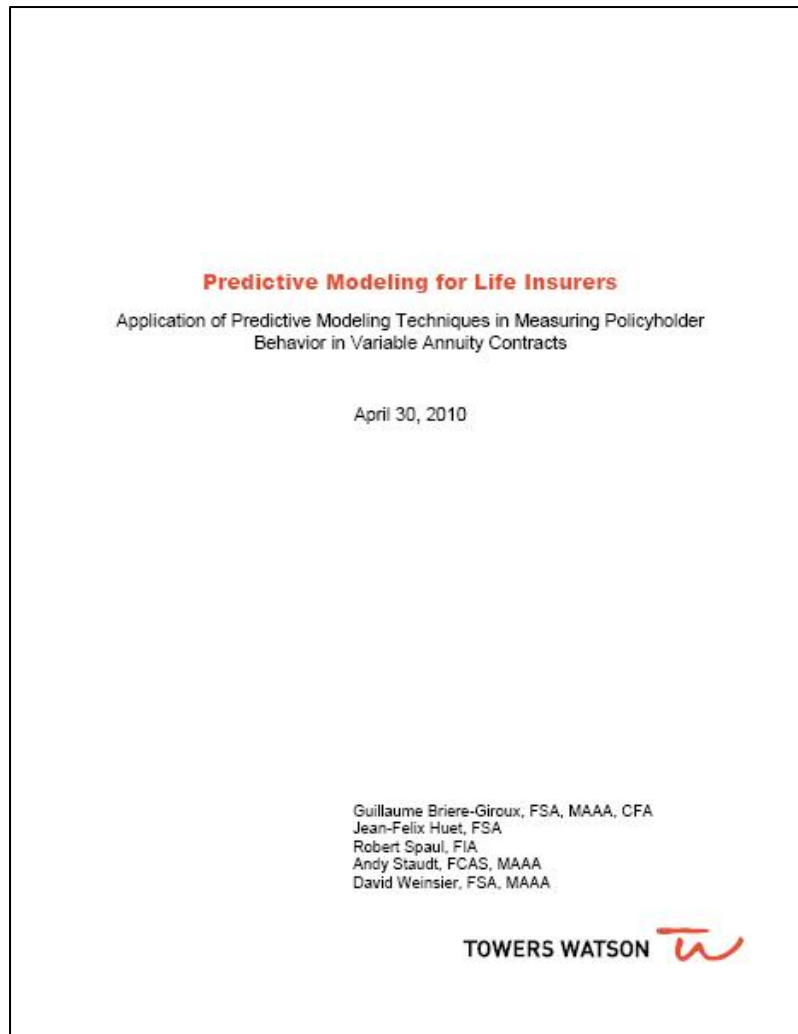
- Dominating theme is the low interest rate environment
- Carriers reported seeing low lapse rates out of the surrender charge period on book value annuities
 - Renewal rates more attractive than new money and have higher guarantees
 - Interest rates could rise, but yield curve is steep
 - This is causing an investment dilemma
- At height of financial crisis, wide credit spreads caused opposite phenomenon (higher lapse rates)
- Market value adjustments linked to treasury rates magnified the problem

Predictive Modeling Case Study on VA Lapses

Introduction to Predictive Modeling

- Predictive modeling (PM)
 - Use of advanced statistical algorithms to predict a chosen target variable using a set of independent variables
 - Commonly used in property and casualty industry for pricing and underwriting
 - Also used for marketing, customer retention and fraud detection
- Use of PM by life insurers is limited but growing
 - Mortality underwriting and pricing
 - Marketing and retention programs

Applying Predictive Modeling to VA Lapse Rates



- In the fall of 2009, the Society of Actuaries (SOA) launched a call for papers on Predictive Modeling for Life Insurers
- Towers Watson submitted an abstract proposing the application of predictive modeling to VA lapse rates
- We developed the case study and wrote the paper in early 2010
- The paper was approved for publication and released by the SOA in August 2010

Approach

- The case study used hypothetical but representative seriatim data
- Two models were calibrated to the data
 - A “Traditional Model” following typical experience study approaches and typical variables included to analyze VA lapses
 - A “Predictive Model” using a Generalized Linear Model (GLM) and the variables detected to be the most significant
 - The variables captured by the two models are presented on the next slide
- After model fitting, the models were compared and evaluated for performance
 - Fitting to 70% of the data
 - Testing against remaining 30%

Variables Used in the Traditional Model and the Predictive Model

- Traditional Model

- Policy duration
- Surrender charge length and strength
- End of the surrender charge period
- Commission structure
- Presence and nature of living benefits
- ITM of living benefits, defined as $[1 - (\text{Account Value} / \text{Benefit Base})]$

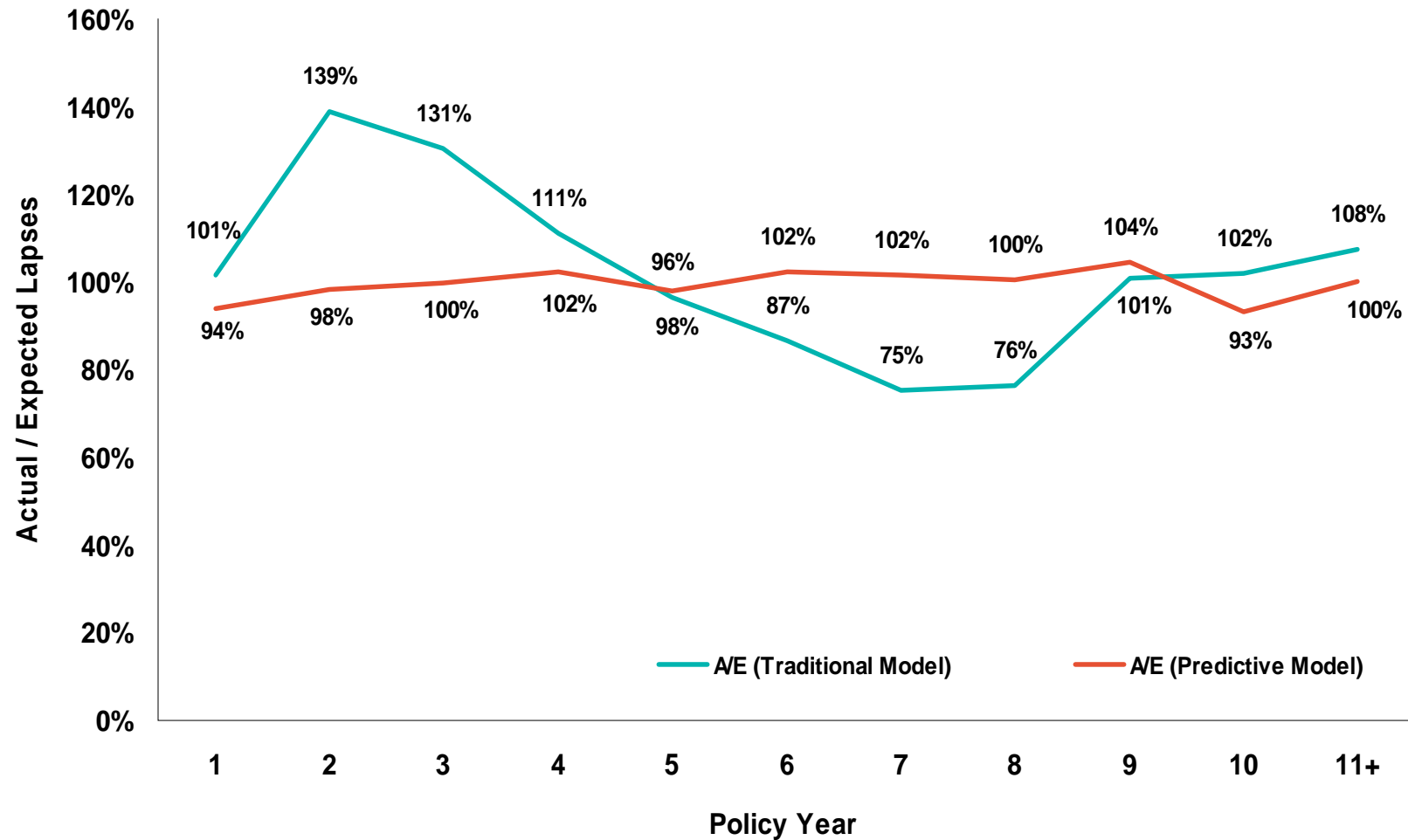
- Predictive Model

- Policy duration
- Surrender charge length and strength
- Proximity to end of surrender charge
- Commission structure
- Presence and nature of living benefits
- ITM of living benefits defined as $[1 - (\text{Account Value} / \text{Benefit Base})]$

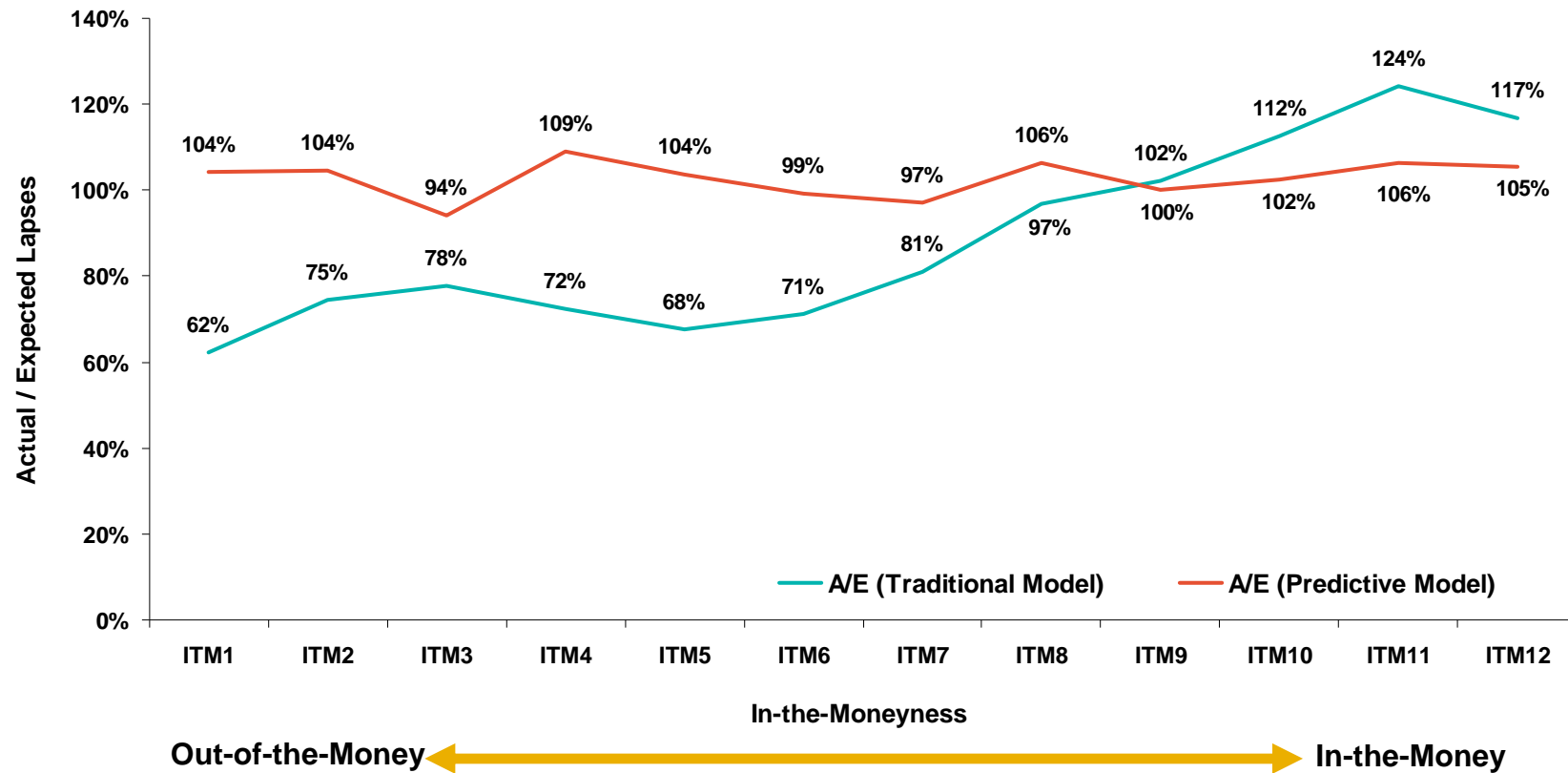
AND

- Premium (i.e., policy size)
- Fund value
- Portfolio mix (aggressive, balanced, conservative, cash)
- Attained age

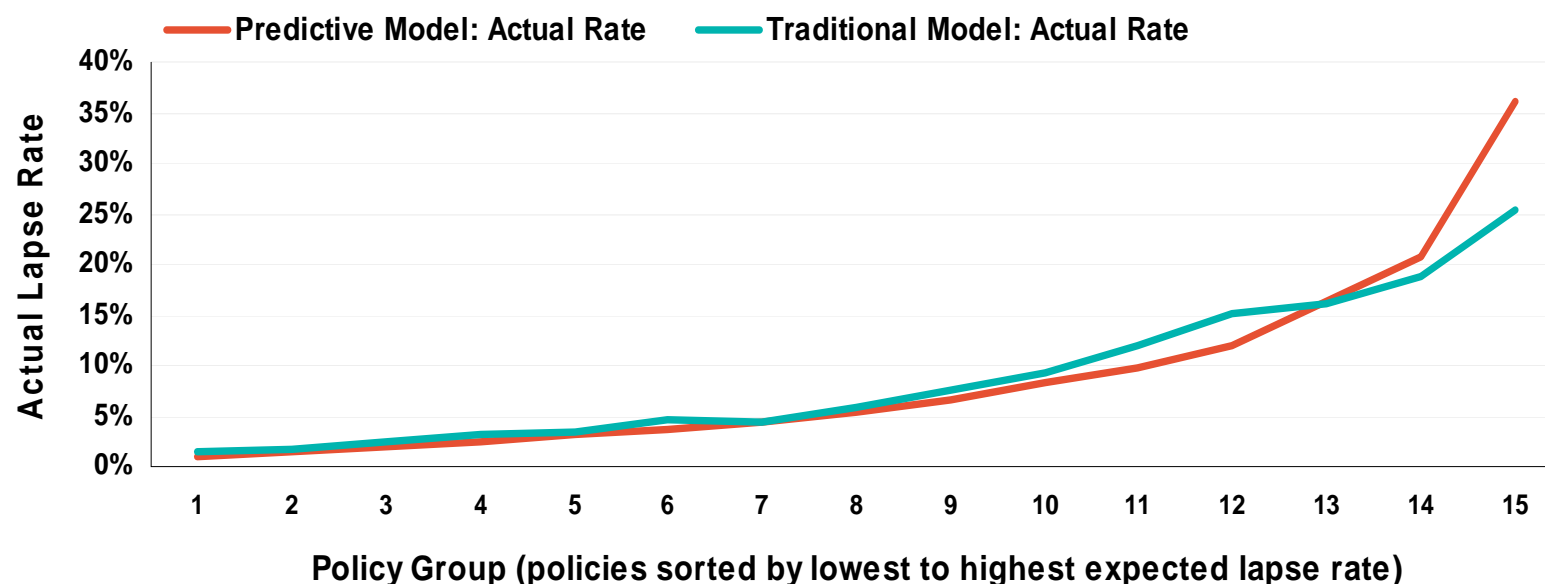
The Predictive Model Gave Better Actual to Expected Ratios by Policy Year



The Predictive Model Gave Better Actual to Expected Ratios by In-The-Money Bands

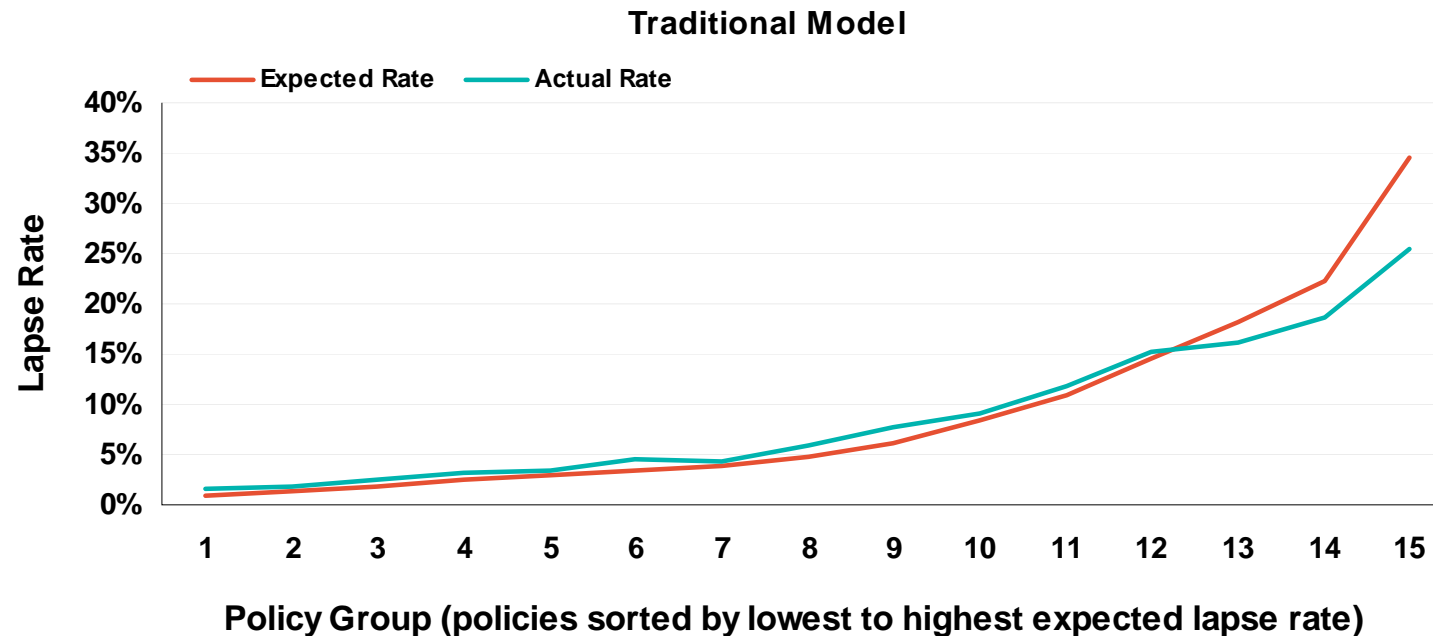


Comparing the Models Using a Lift Chart



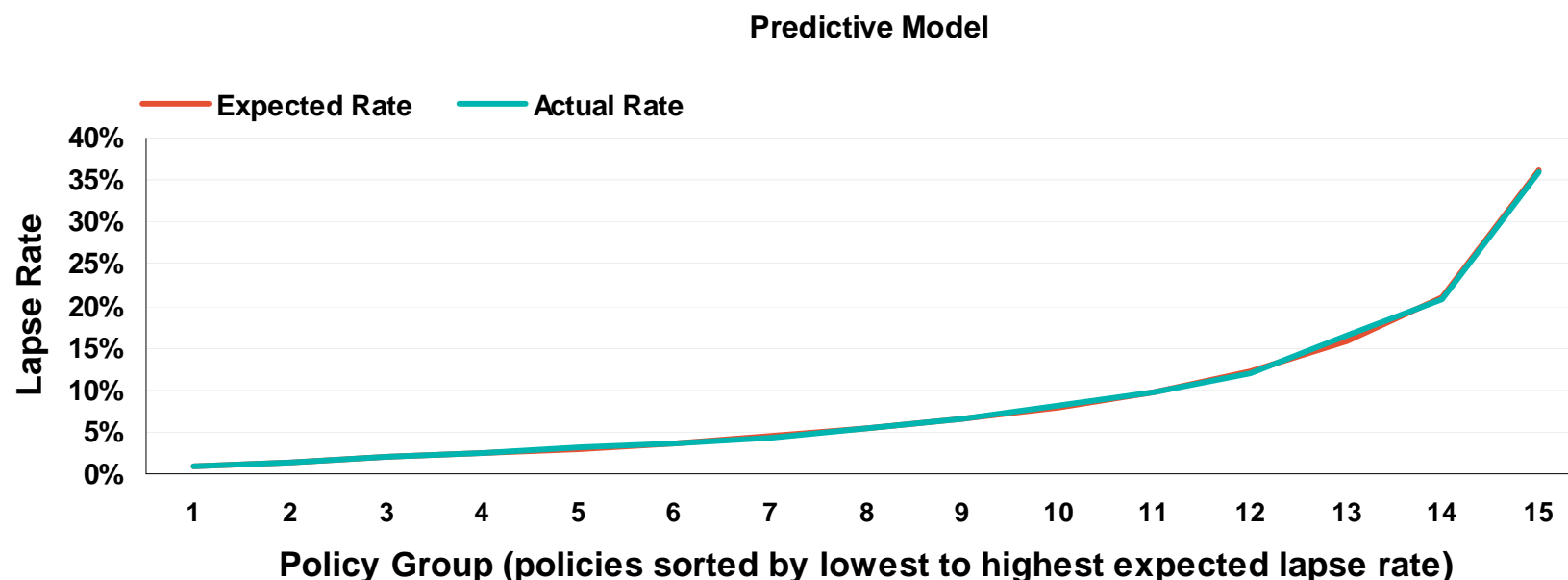
- Policies are sorted by **expected** lapse rates for **each** model. Once the policies are sorted, they are placed into buckets of equal size on the X axis (low risk of lapsing on left, high risk on the right). The **actual** lapse rate by bucket is plotted on the Y axis.
- The greater the difference in actual lapse rates between the high risk bucket (bucket 15) and the low risk bucket (bucket 1), the better the underlying model
- The actual / expected fit by bucket is shown on next two slides

Lift Chart Comparing Actual to Expected for the Traditional Model



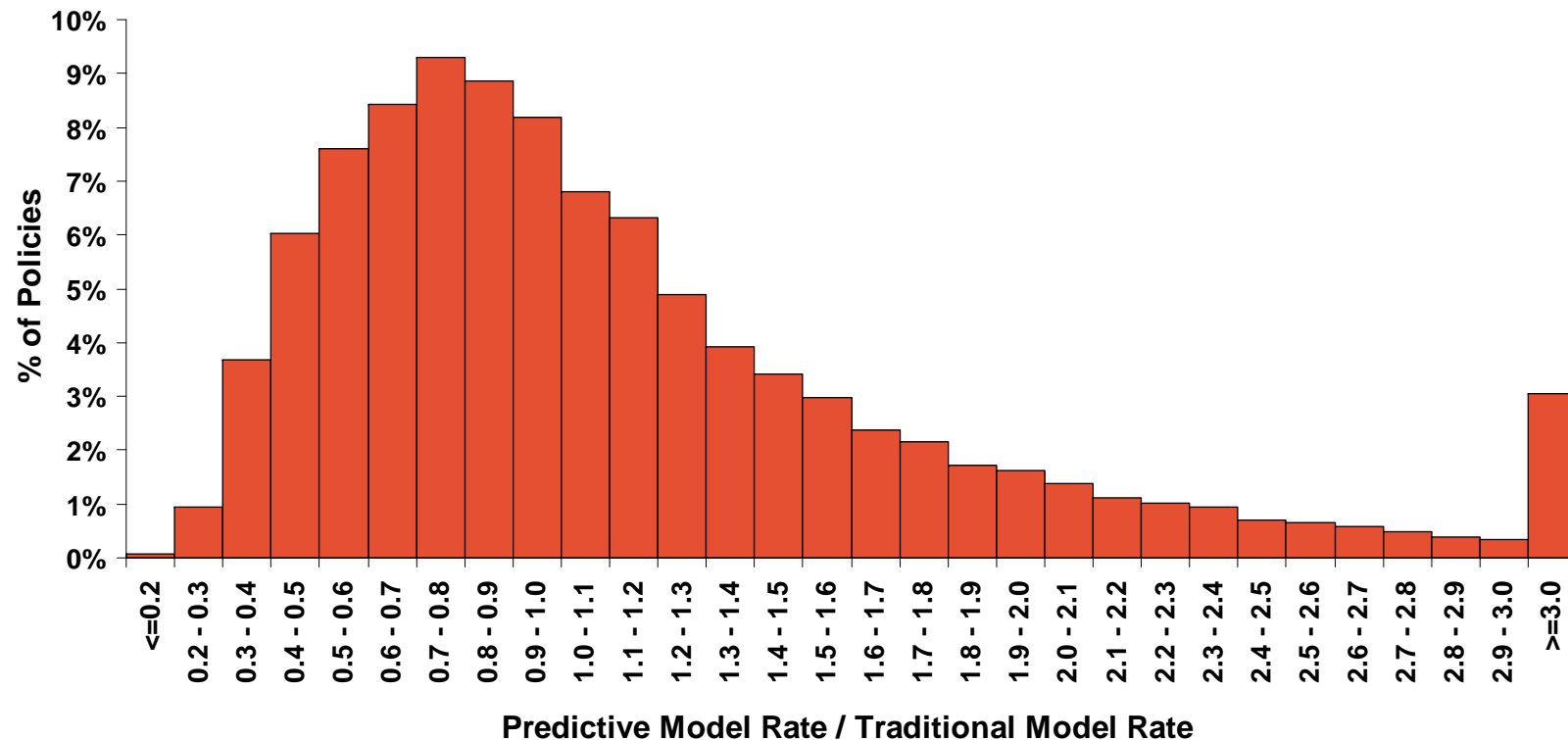
- Again, policies are sorted by **expected** lapse rates. Once the policies are sorted, they are placed into buckets of equal size on the X axis. The **actual** lapse rate by bucket as well as the **expected** lapse rate by bucket are plotted on the Y axis.
- The traditional model actual and expected lines track reasonably well, but there are important differences. The same graph for the predictive model is shown on the next slide.

Lift Chart Comparing Actual to Expected for the Predictive Model



- The actual rates and expected rates by bucket track much more closely with the predictive model
- To understand why that is the case, we compared expected lapse rates between the models using an histogram (next slide)

Comparison of Expected Lapses Rates at the Policy Level



- For approximately 65% of the policies, the predicted lapse rate was different by a factor of more than 20% (higher or lower)
- As shown previously, the predictive model has a better fit; this indicates that the traditional model may have limitations in explaining tail behavior

Why is the Predictive Model Better?

- Can more easily isolate contribution of “base lapses” and “dynamic lapses”
- Less data is needed to extract significant relationships
- More easily allow for additional variables (e.g., age, policy size)
- Correlations between variables are captured
- Interactions between variables are captured

Conclusion

- Policyholder behavior assumptions are a key annuity industry topic
- New approaches like predictive modeling are emerging
- Better assumptions can help
 - Extrapolate assumptions to new products / markets with more confidence
 - Improve risk management
 - Reduce margins for uncertainty
 - Refine design to better match specific cost/benefit with expected utilization
 - Identifying most profitable segments or target markets

Improved assumptions ⇒ smarter risk management and products