

Equity-Based Insurance Guarantees Conference

Nov. 11-12, 2019

Chicago, IL

Policyholder Behavior Experience Data and Modeling

Timothy Paris

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SOA Equity-Based Insurance Guarantees Conference

Policyholder Behavior Experience Data and Modeling

Session 2B

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RUARK CONSULTING, LLC

November 11, 2019

1:30 - 3:00pm Central



**SOCIETY OF
ACTUARIES®**



SOA Antitrust Compliance Guidelines

Active participation in the Society of Actuaries is an important aspect of membership. While the positive contributions of professional societies and associations are well-recognized and encouraged, association activities are vulnerable to close antitrust scrutiny. By their very nature, associations bring together industry competitors and other market participants.

The United States antitrust laws aim to protect consumers by preserving the free economy and prohibiting anti-competitive business practices; they promote competition. There are both state and federal antitrust laws, although state antitrust laws closely follow federal law. The Sherman Act, is the primary U.S. antitrust law pertaining to association activities. The Sherman Act prohibits every contract, combination or conspiracy that places an unreasonable restraint on trade. There are, however, some activities that are illegal under all circumstances, such as price fixing, market allocation and collusive bidding.

There is no safe harbor under the antitrust law for professional association activities. Therefore, association meeting participants should refrain from discussing any activity that could potentially be construed as having an anti-competitive effect. Discussions relating to product or service pricing, market allocations, membership restrictions, product standardization or other conditions on trade could arguably be perceived as a restraint on trade and may expose the SOA and its members to antitrust enforcement procedures.

While participating in all SOA in person meetings, webinars, teleconferences or side discussions, you should avoid discussing competitively sensitive information with competitors and follow these guidelines:

- **-Do not** discuss prices for services or products or anything else that might affect prices
- **-Do not** discuss what you or other entities plan to do in a particular geographic or product markets or with particular customers.
- **-Do not** speak on behalf of the SOA or any of its committees unless specifically authorized to do so.
- **-Do** leave a meeting where any anticompetitive pricing or market allocation discussion occurs.
- **-Do** alert SOA staff and/or legal counsel to any concerning discussions
- **-Do** consult with legal counsel before raising any matter or making a statement that may involve competitively sensitive information.

Adherence to these guidelines involves not only avoidance of antitrust violations, but avoidance of behavior which might be so construed. These guidelines only provide an overview of prohibited activities. SOA legal counsel reviews meeting agenda and materials as deemed appropriate and any discussion that departs from the formal agenda should be scrutinized carefully. Antitrust compliance is everyone's responsibility; however, please seek legal counsel if you have any questions or concerns.

Presentations are intended for educational purposes only and do not replace independent professional judgment. Statements of fact and opinions expressed are those of the participants individually and, unless expressly stated to the contrary, are not the opinion or position of the Society of Actuaries, its cosponsors or its committees. The Society of Actuaries does not endorse or approve, and assumes no responsibility for, the content, accuracy or completeness of the information presented. Attendees should note that the sessions are audio-recorded and may be published in various media, including print, audio and video formats without further notice.

Background

Why is this important?

- Critical risk element for long-term EBIG-type products, and significant interactions with capital markets risks
- Complex and dynamic data
- Data sparsity, especially at the company level – a credibility problem
- Data is emerging in key areas
- Asset-side folks – demand that your liability-side colleagues demonstrate the robustness of models/assumptions that they provide you

Industry studies

Fixed-indexed annuity policyholder behavior

<https://ruark.co/ruark-releases-2019-fixed-indexed-annuity-study/>

<https://ruark.co/ruark-consulting-releases-2018-fixed-indexed-annuity-mortality-study/>

Variable annuity policyholder behavior

<https://ruark.co/ruark-releases-2019-variable-annuity-study-results/>

<https://ruark.co/ruark-consulting-releases-variable-annuity-mortality-study-results/>

VM-21 PBR for Variable Annuities

Public redline exposure draft as of April 30, 2019

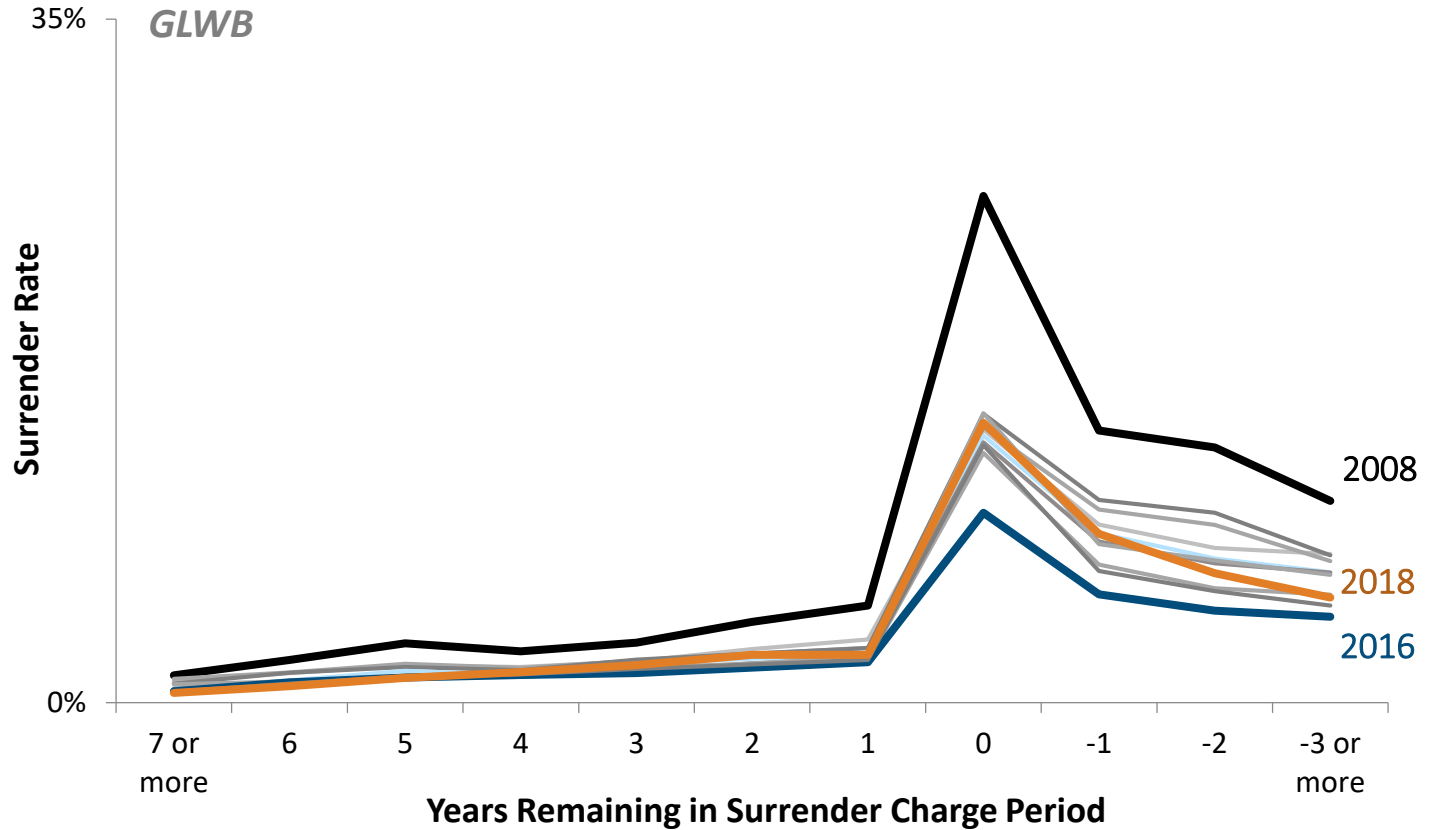
<https://naic-cms.org/exposure-drafts>

Section 10: Contract Holder Behavior Assumptions

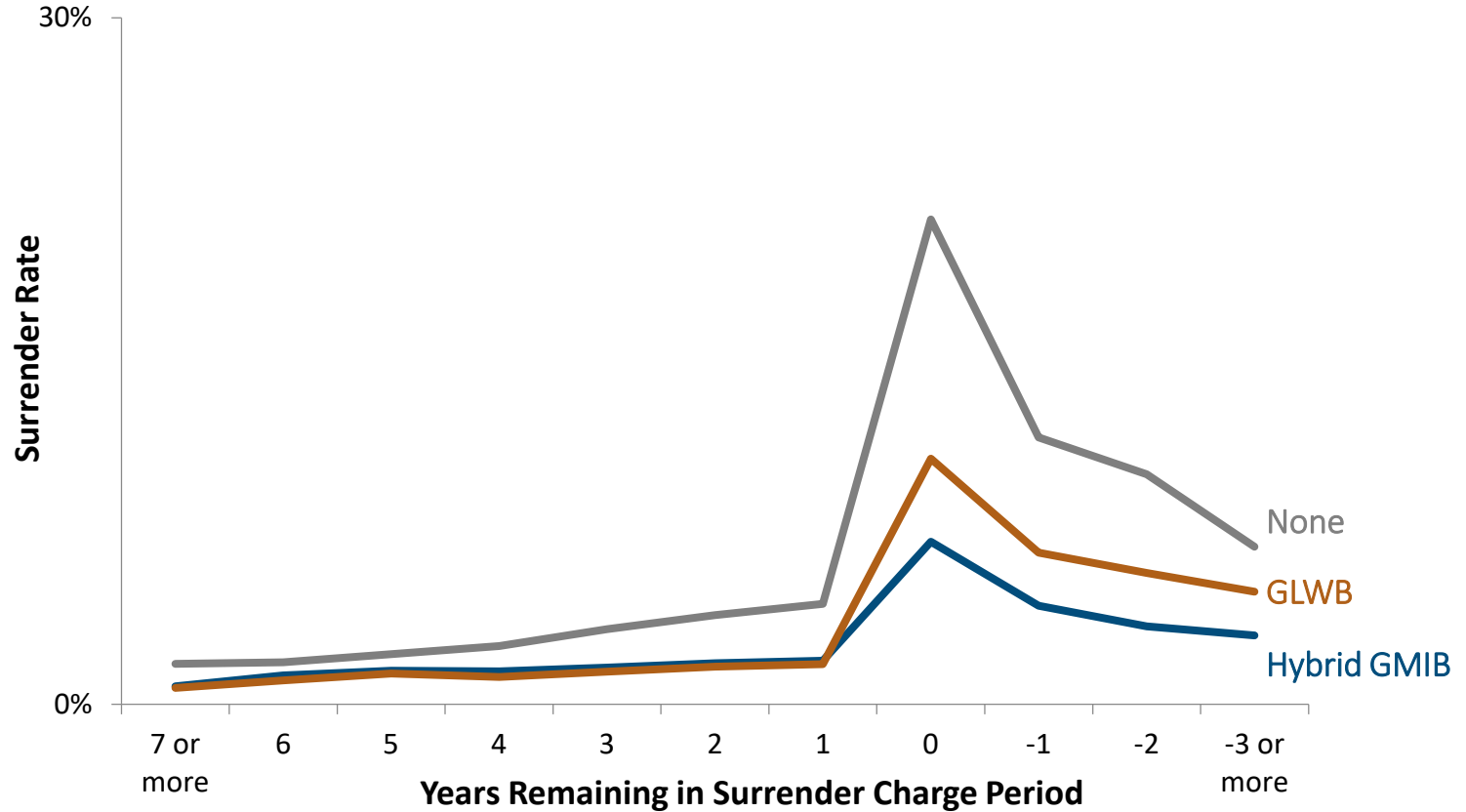
- 1 Should examine many factors including cohorts, product features, distribution channels, option values, rationality, static vs dynamic
- 2 Required sensitivity testing, with margins inversely related to data credibility
- 3 Unless there is clear evidence to the contrary, should be no less conservative than past experience and efficiency should increase over time
- 4 Where direct data is lacking, should look to similar data from other sources/companies

You and your data

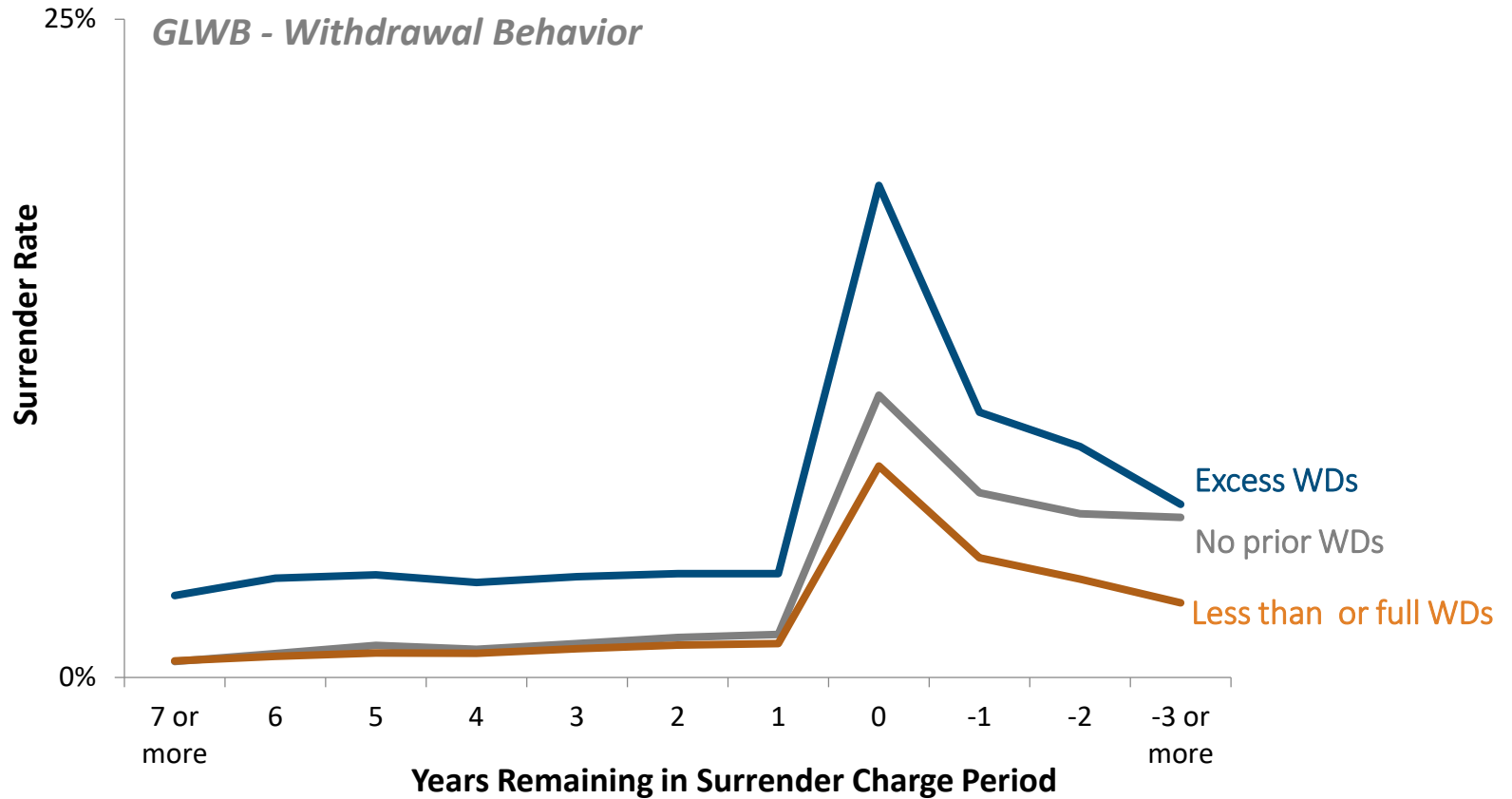
Your company-level data might indicate some key patterns in surrender behavior



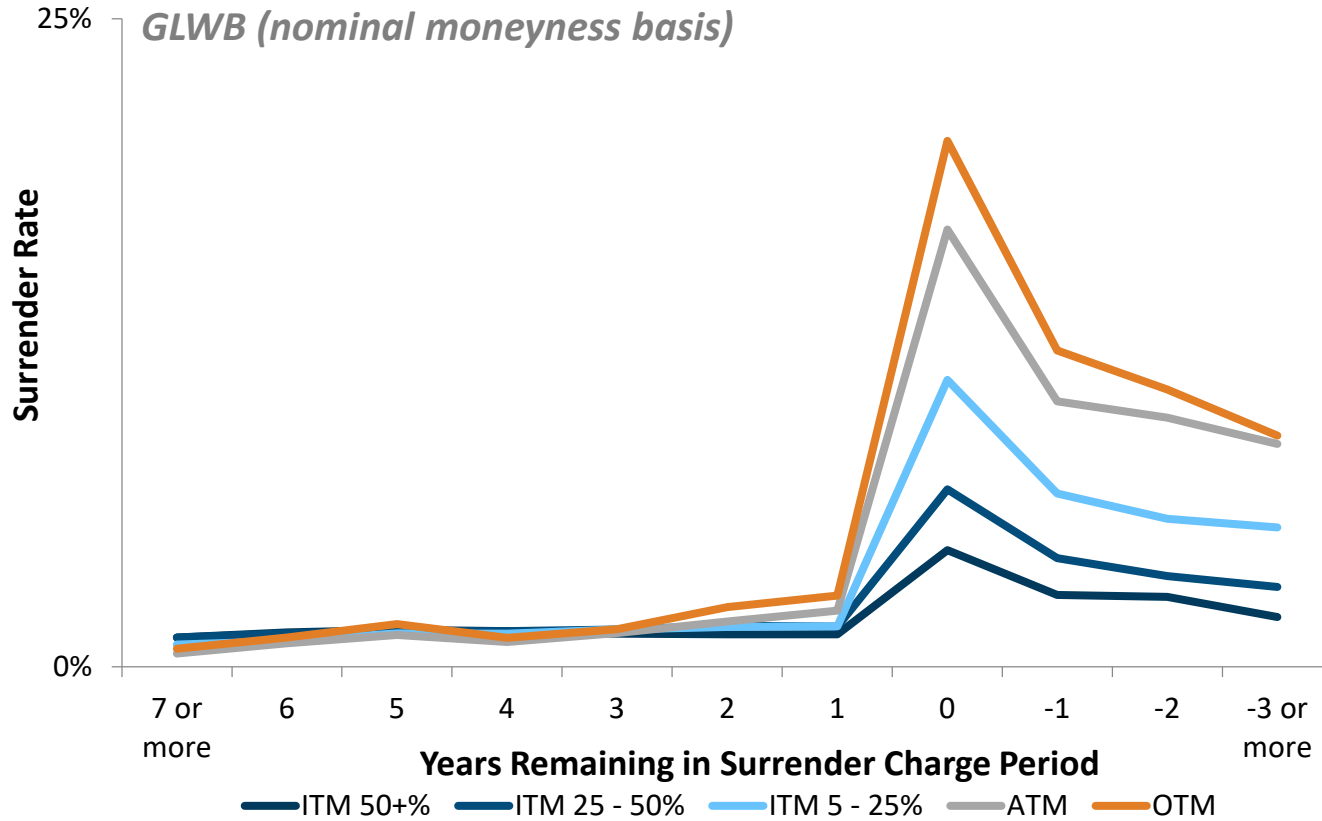
Surrender rates are lower with living benefits...



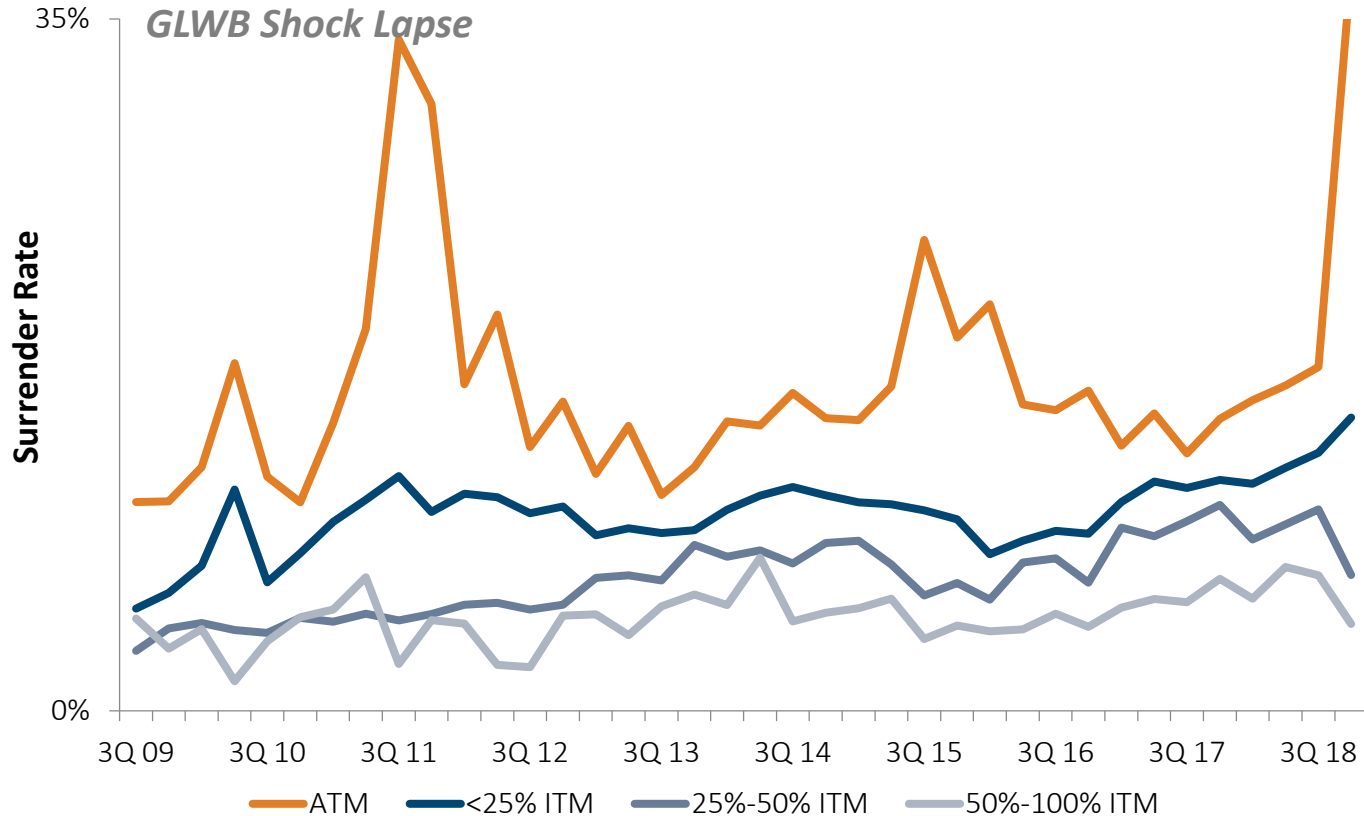
...and even lower with income utilization



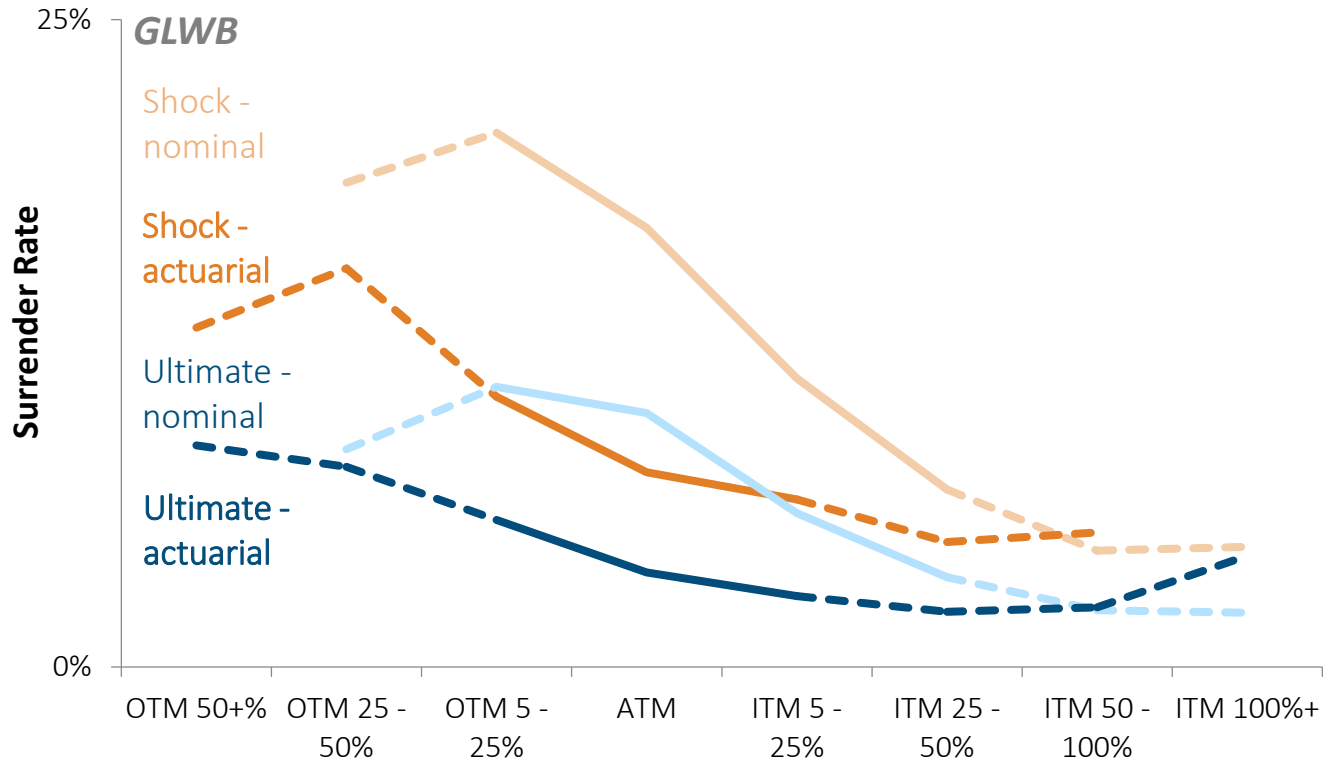
...and when guarantees are more valuable



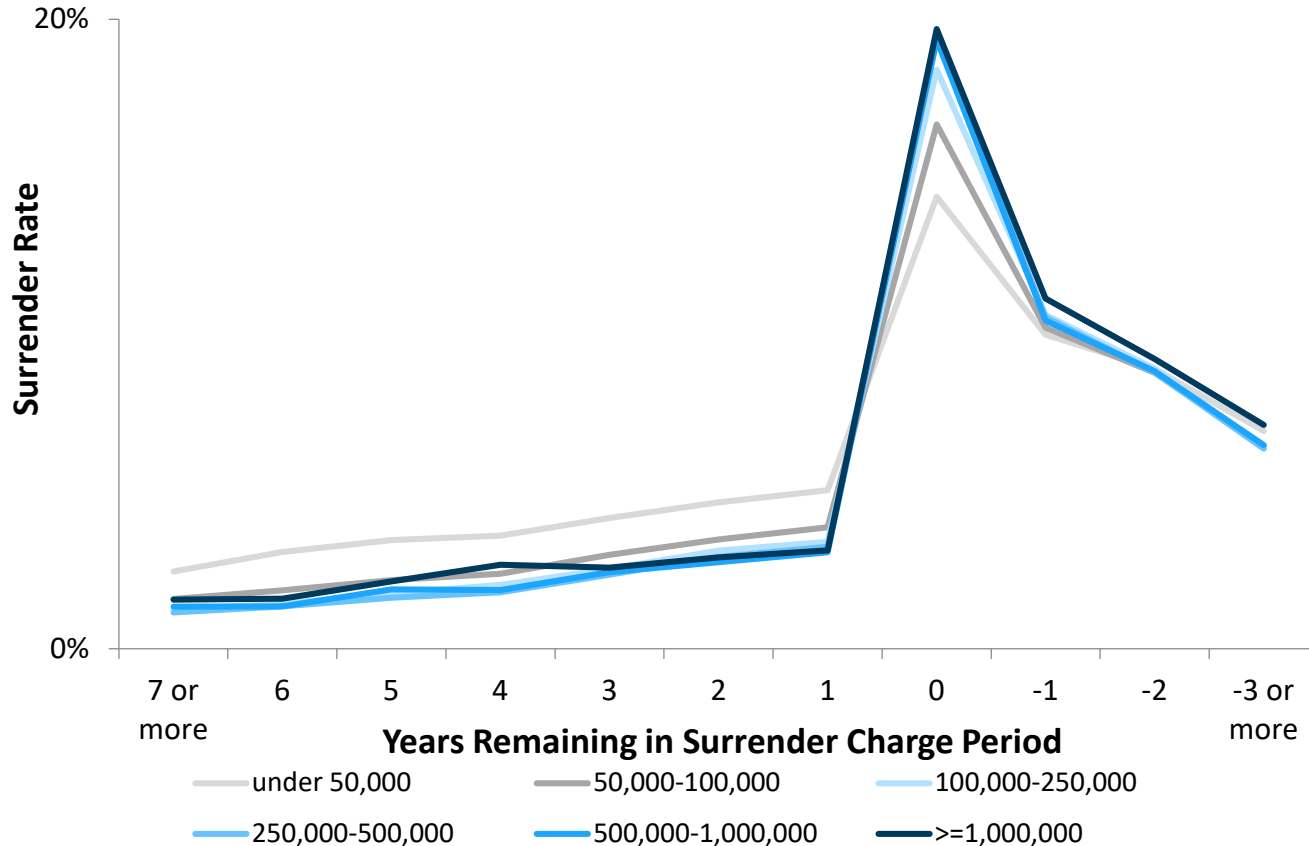
Dynamic sensitivity has also changed over the years



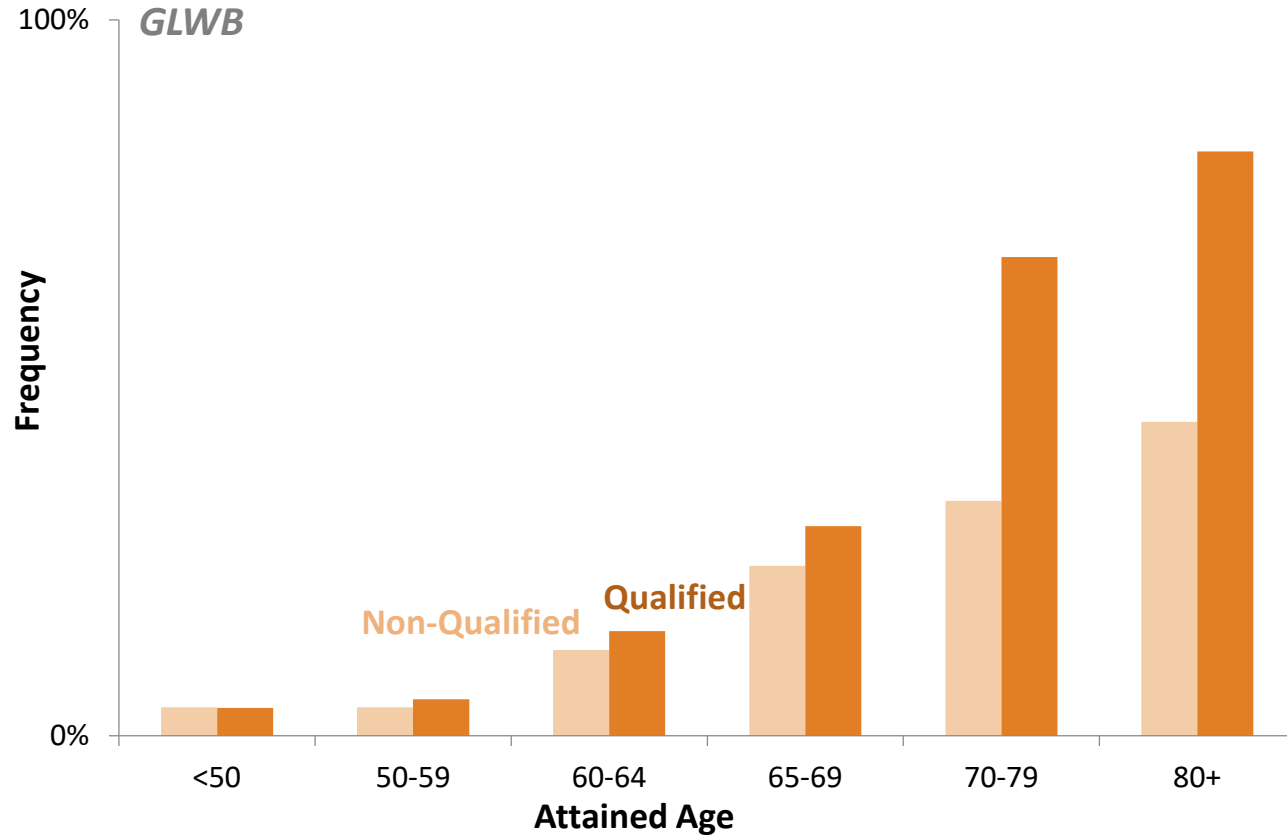
How you measure value matters, but company-level credibility is very limited



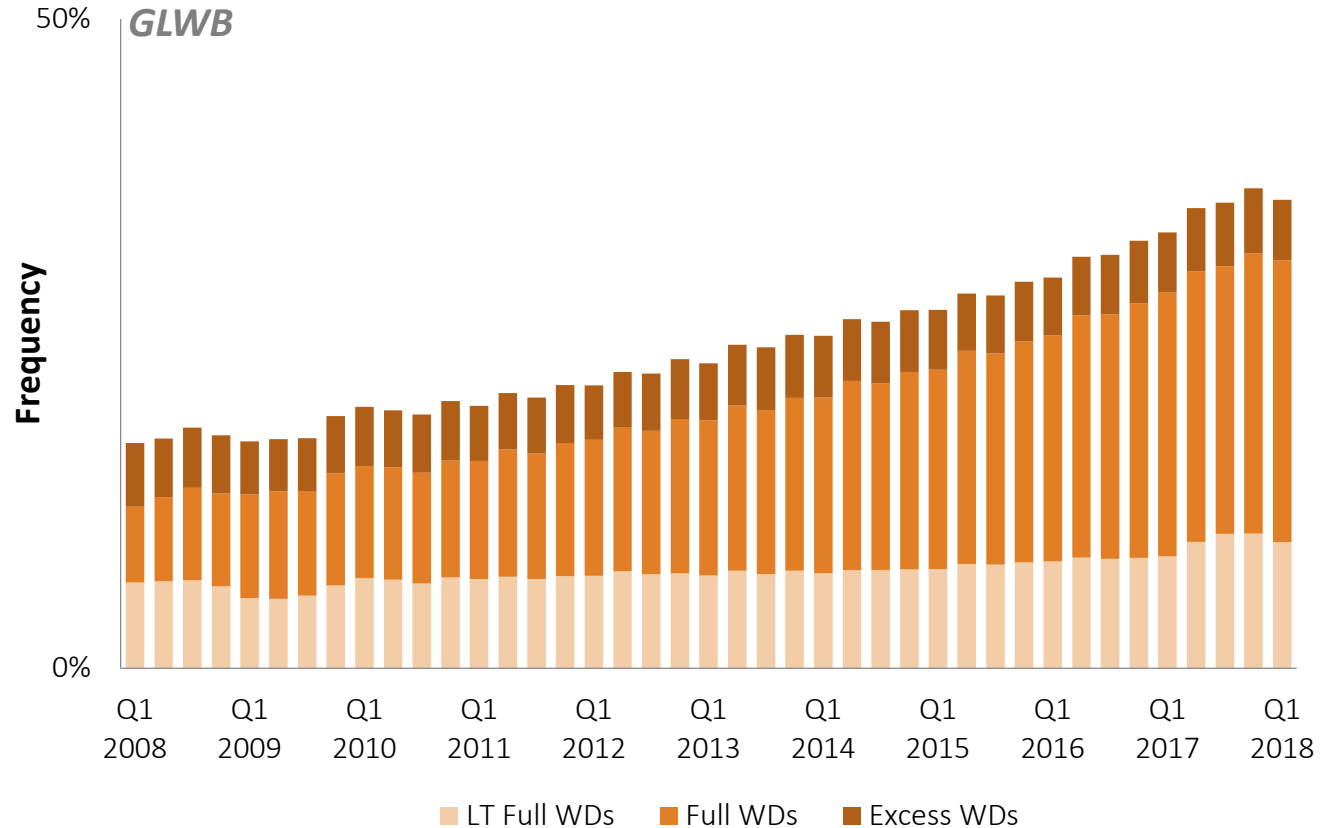
Largest and smallest contracts behave differently



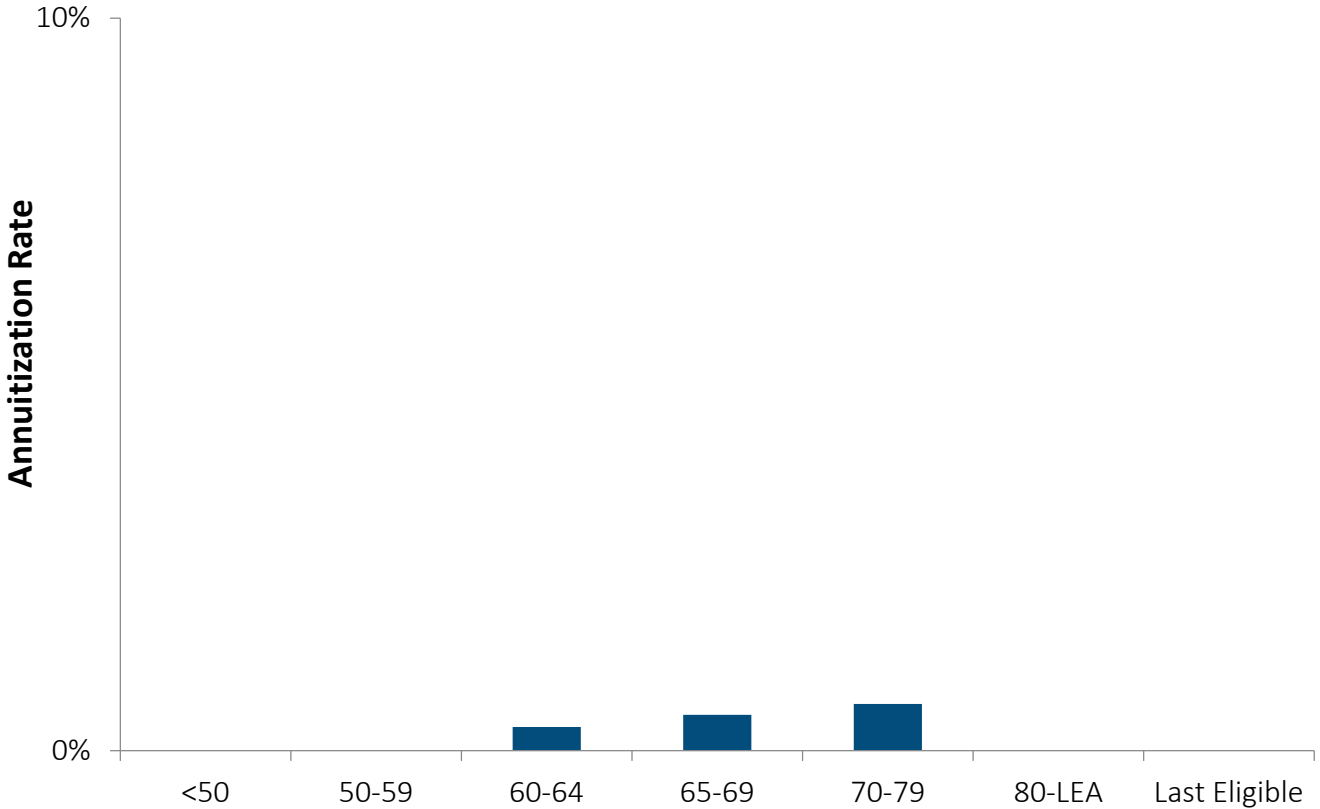
Withdrawals vary by age and tax status



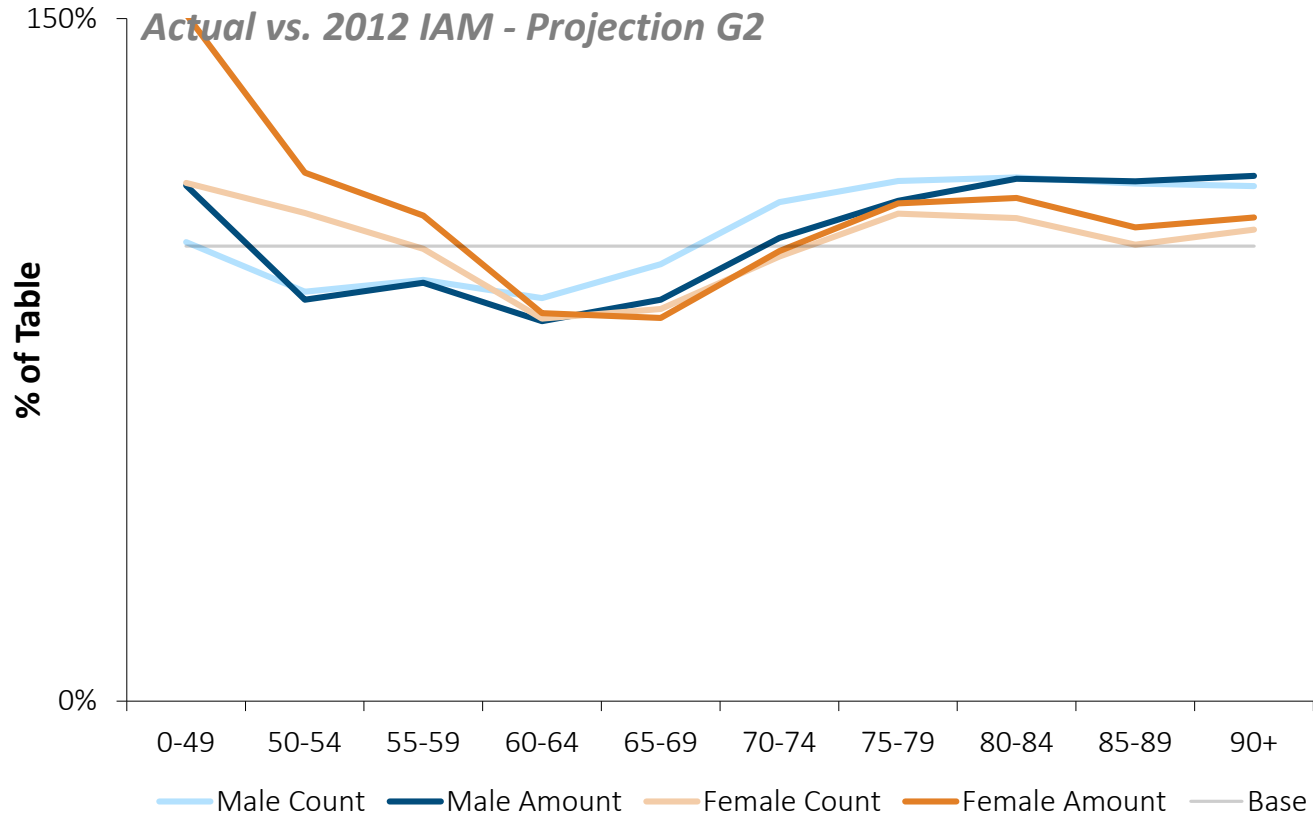
Withdrawal behavior is becoming more efficient



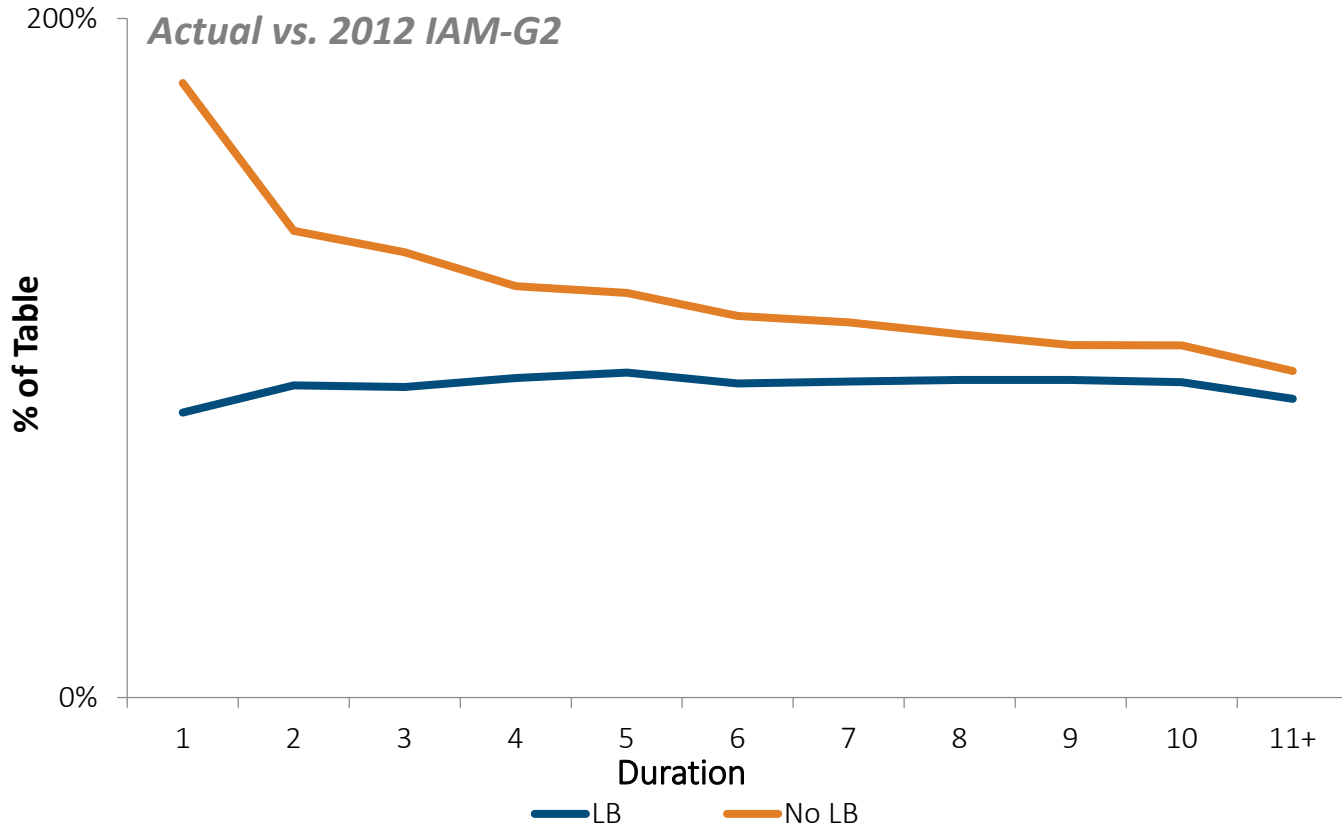
Hybrid GMIB annuitization rates are low, but company-level credibility is very limited



2012 IAM does not fit VA mortality experience very well



Evidence of anti-selection for death benefit guarantees



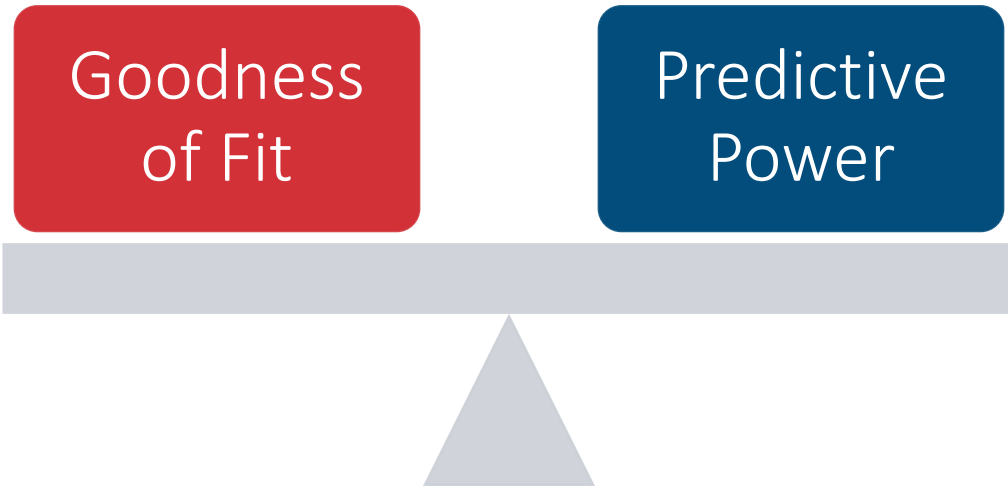
Results vary over time and between companies

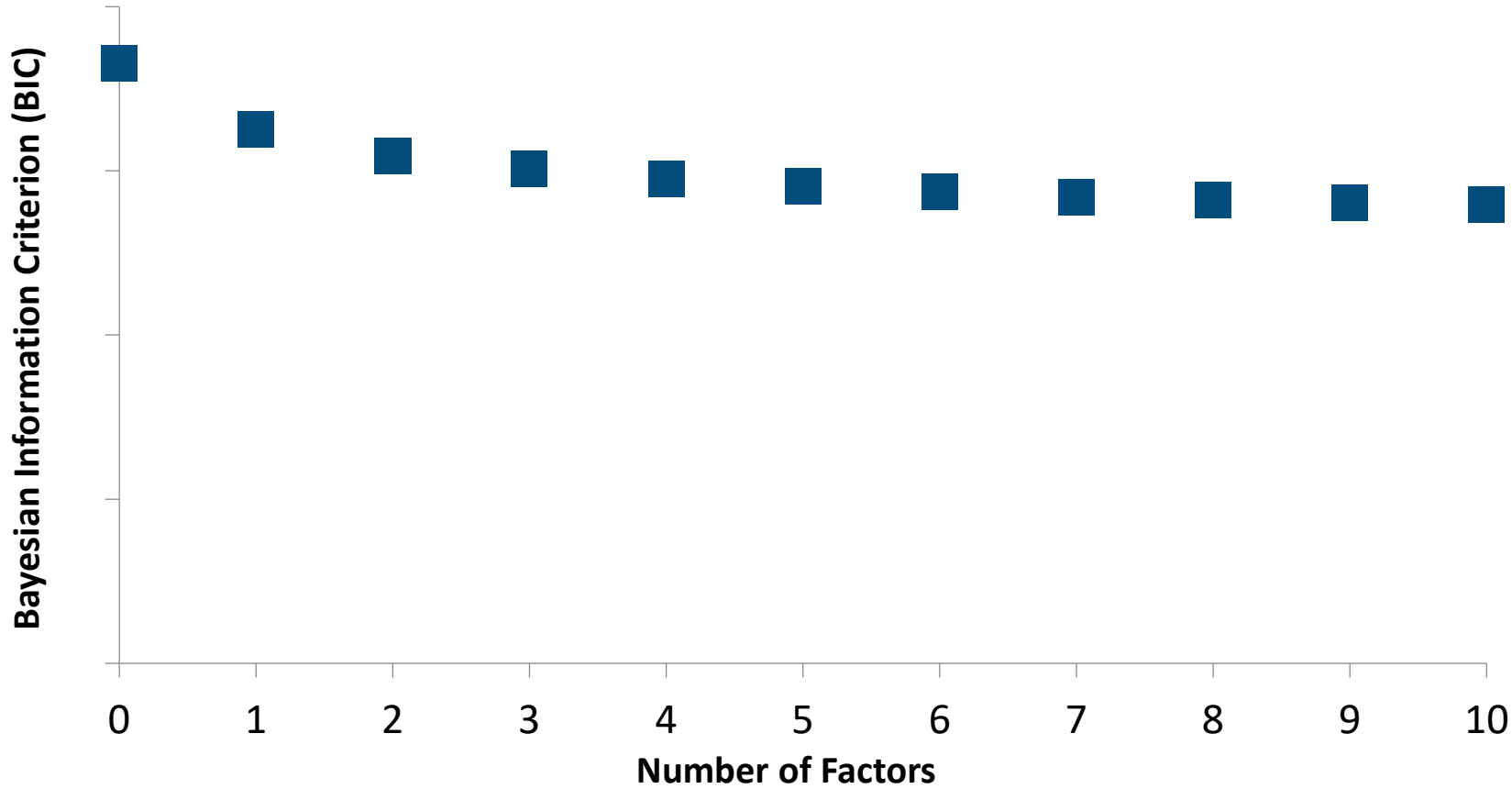
- Each company's size affects quality of analytical insights and volatility of their own results – a credibility problem
- Composition differences
- Idiosyncratic differences – product features, distribution, closed blocks, etc
- Using only your data, it is very difficult to identify the signal from the noise

Building models with your data

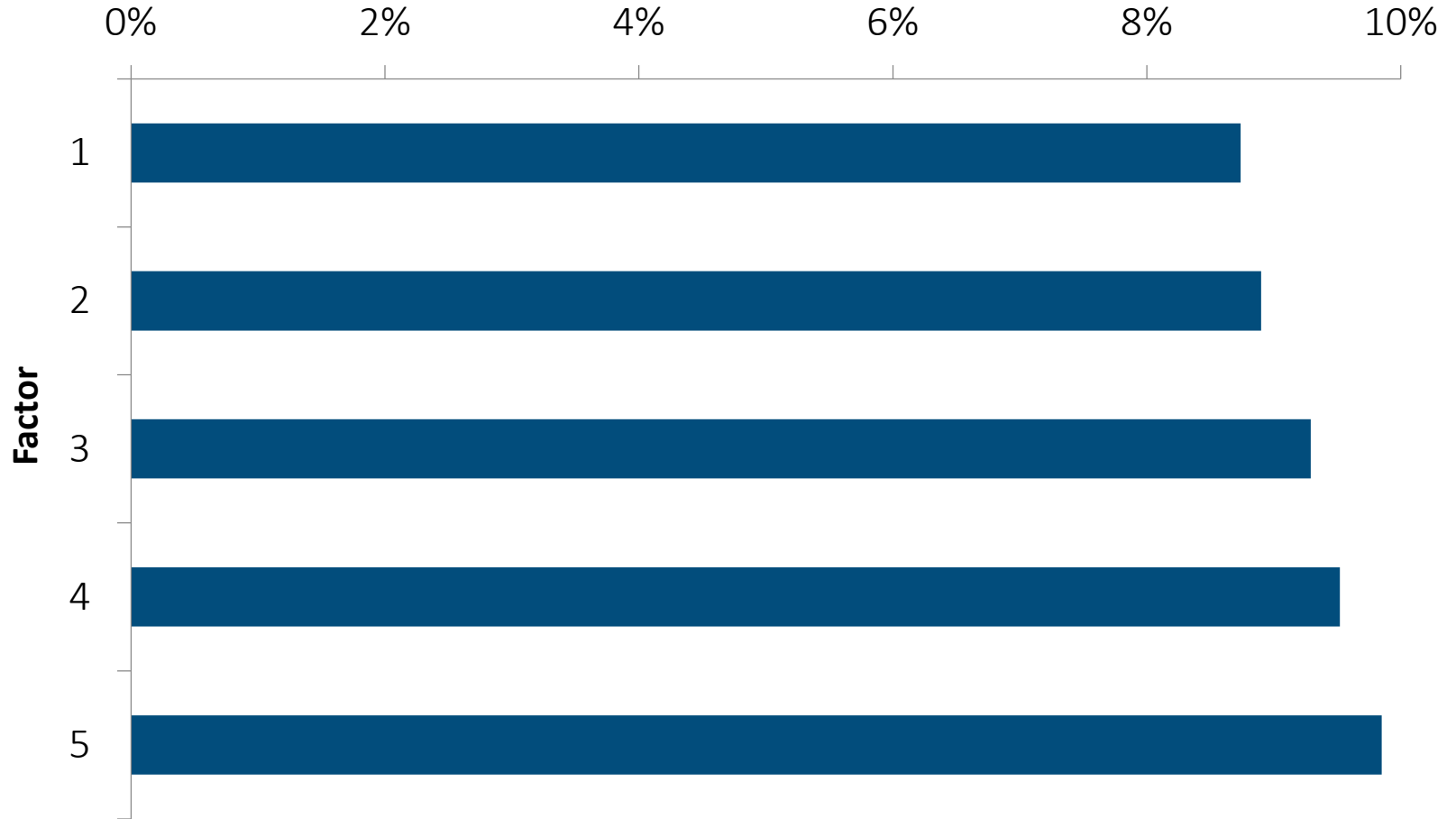
Modeling and assumptions

- Measuring goodness-of-fit for candidate models
- Testing predictive power on out-of-sample data
- Art + science: choosing, communicating, and ongoing recalibration



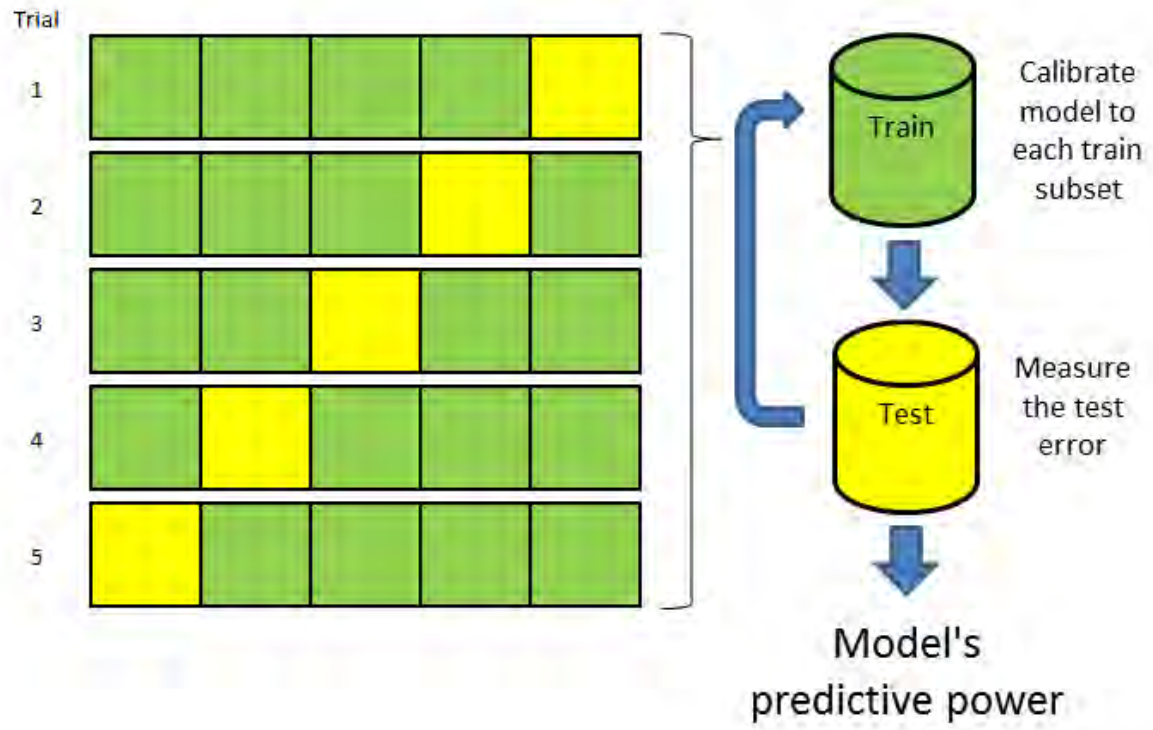


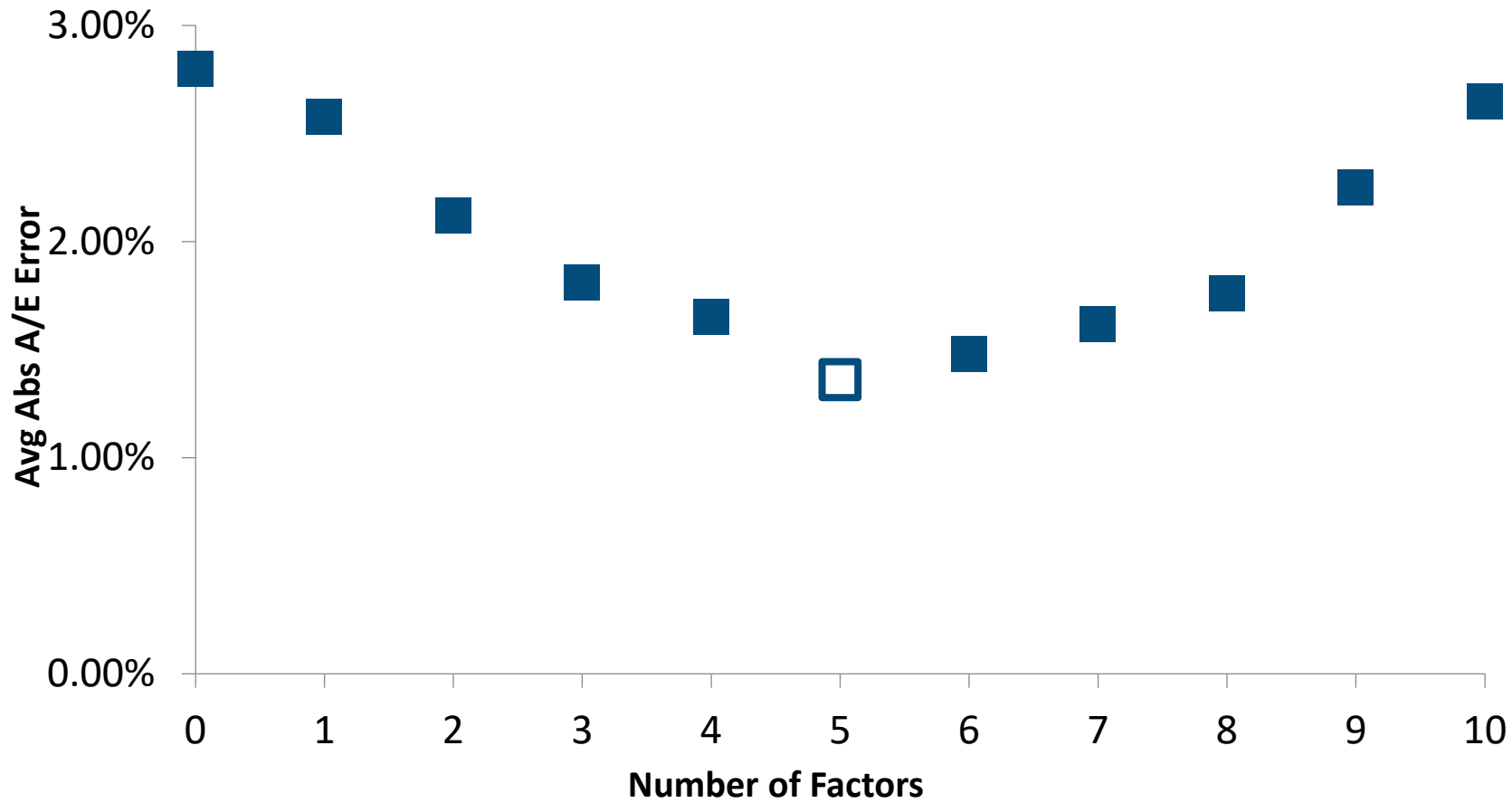
Coefficient Standard Error

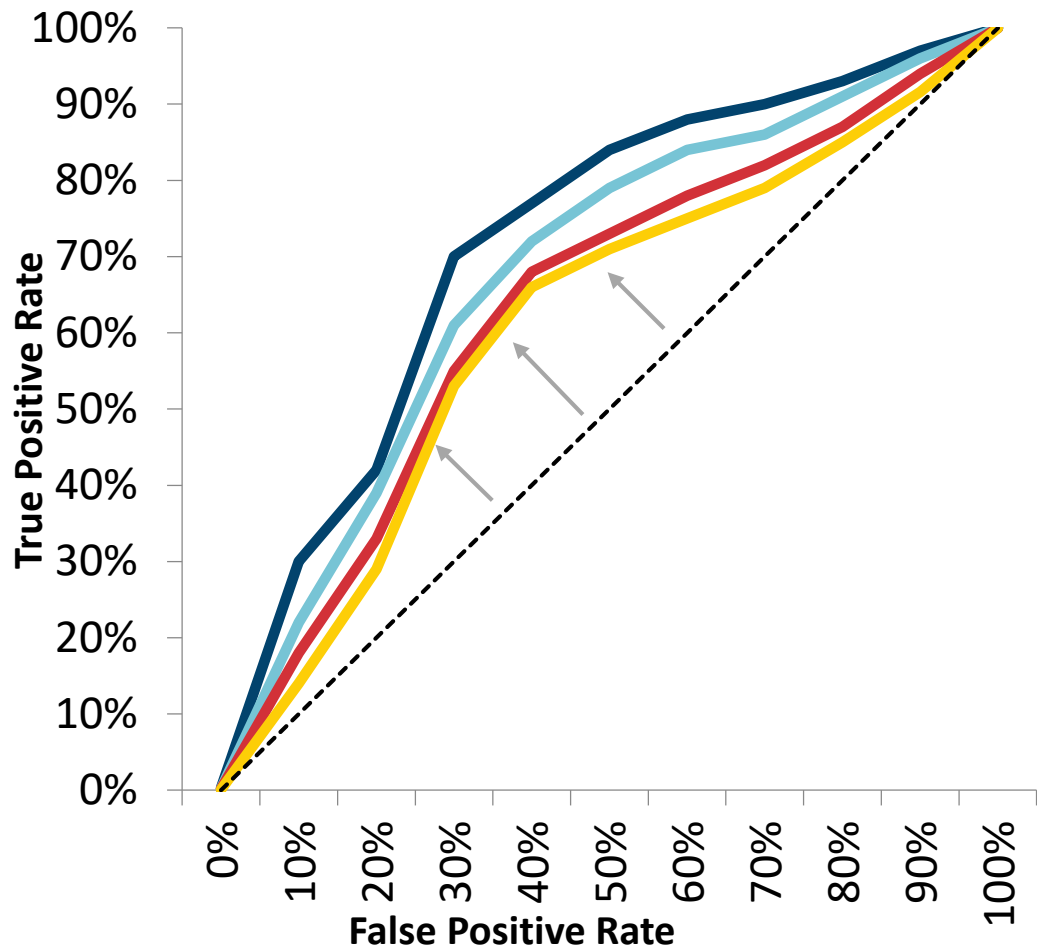


5-Fold Cross Validation

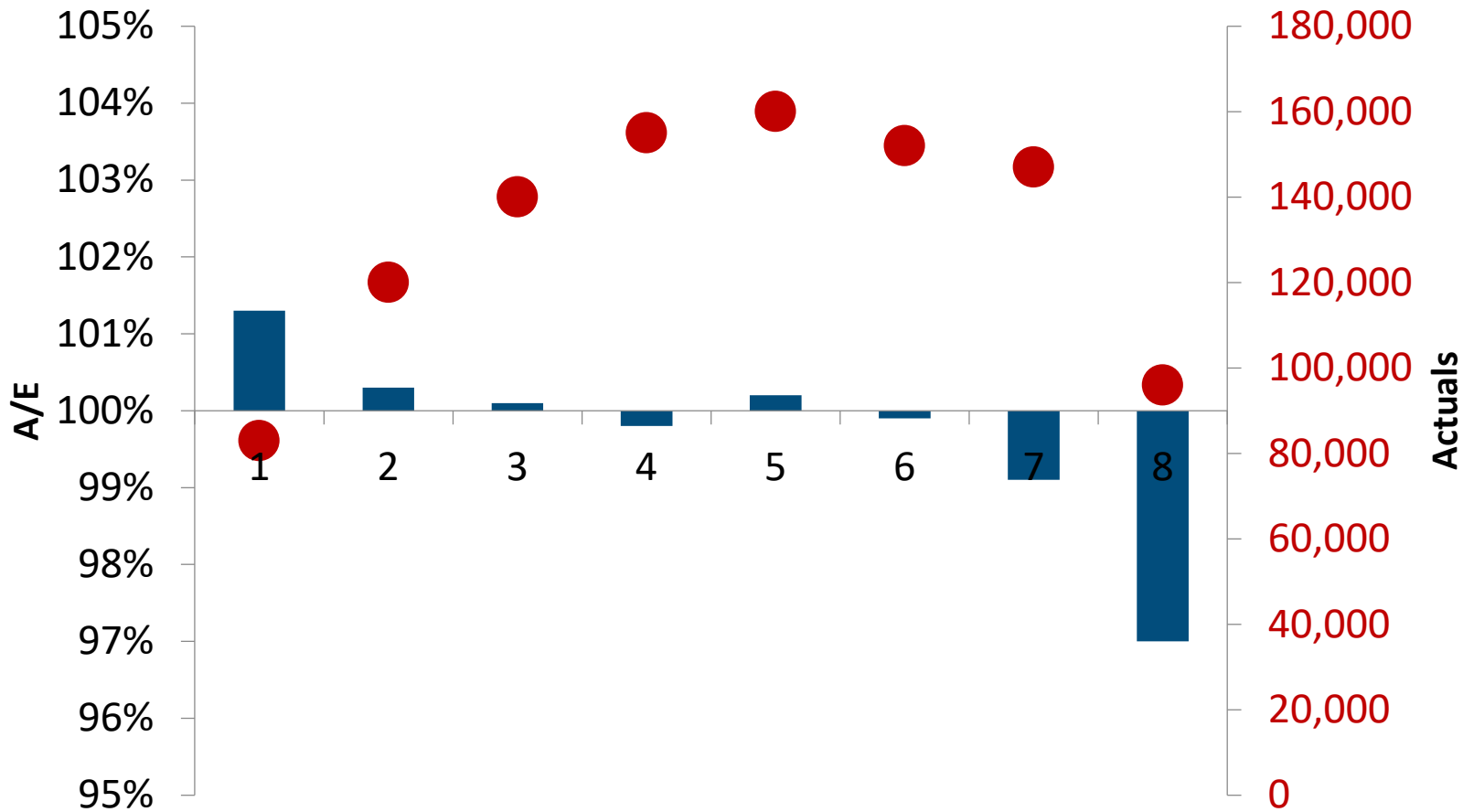
Measures the bias-variance trade-off

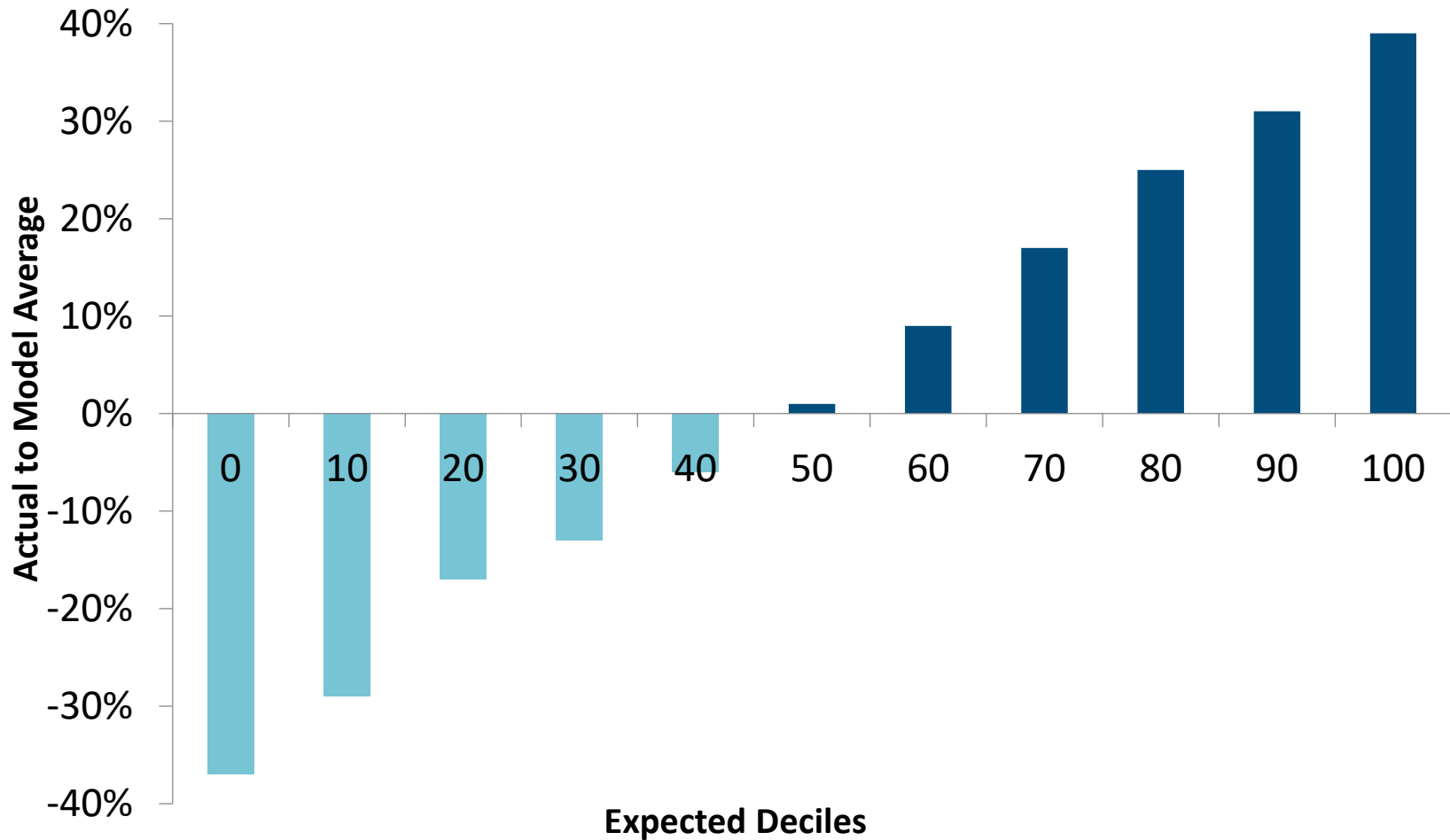






Factor Xi



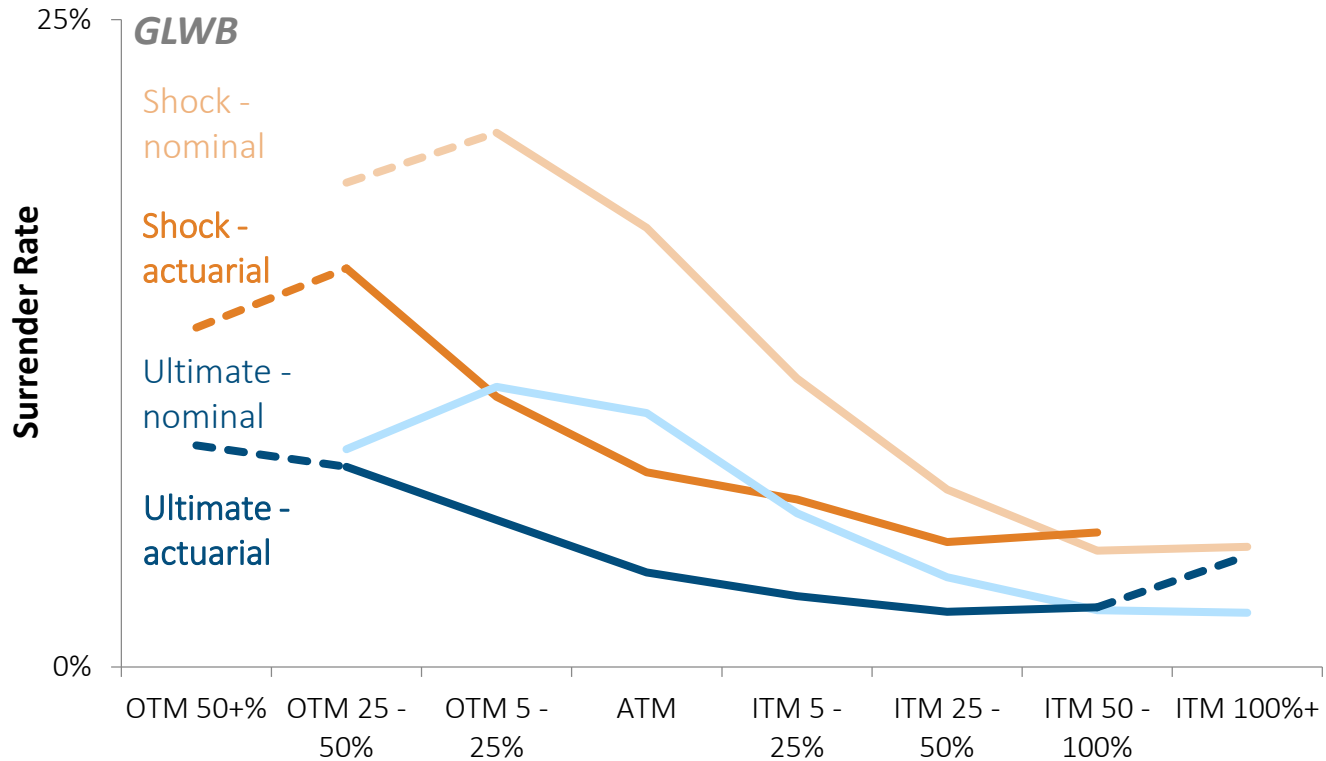


Cost-benefit of industry data

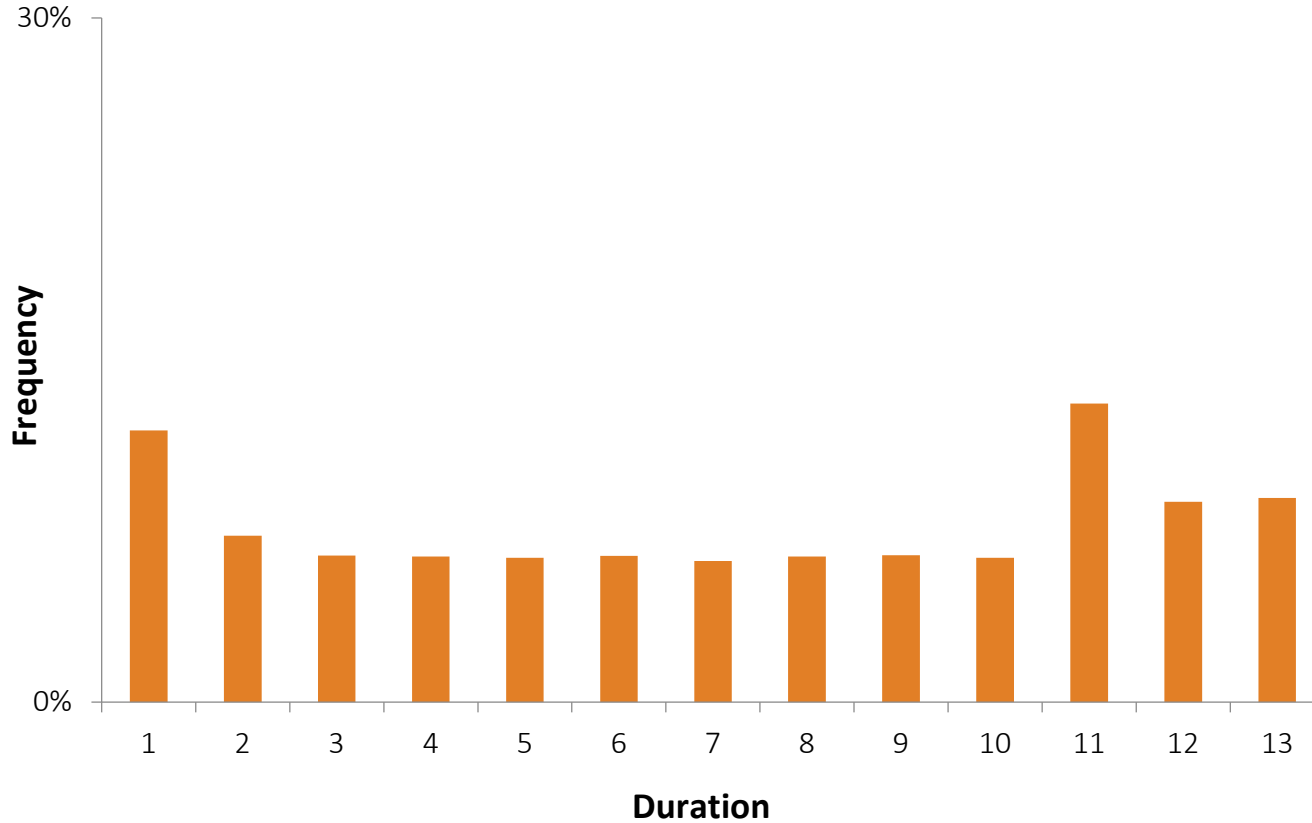
Example: variable annuity industry data

- 24 companies
- Seriatim monthly data for policyholder behavior and mortality
- January 2008 through December 2018
- \$795 billion ending account value

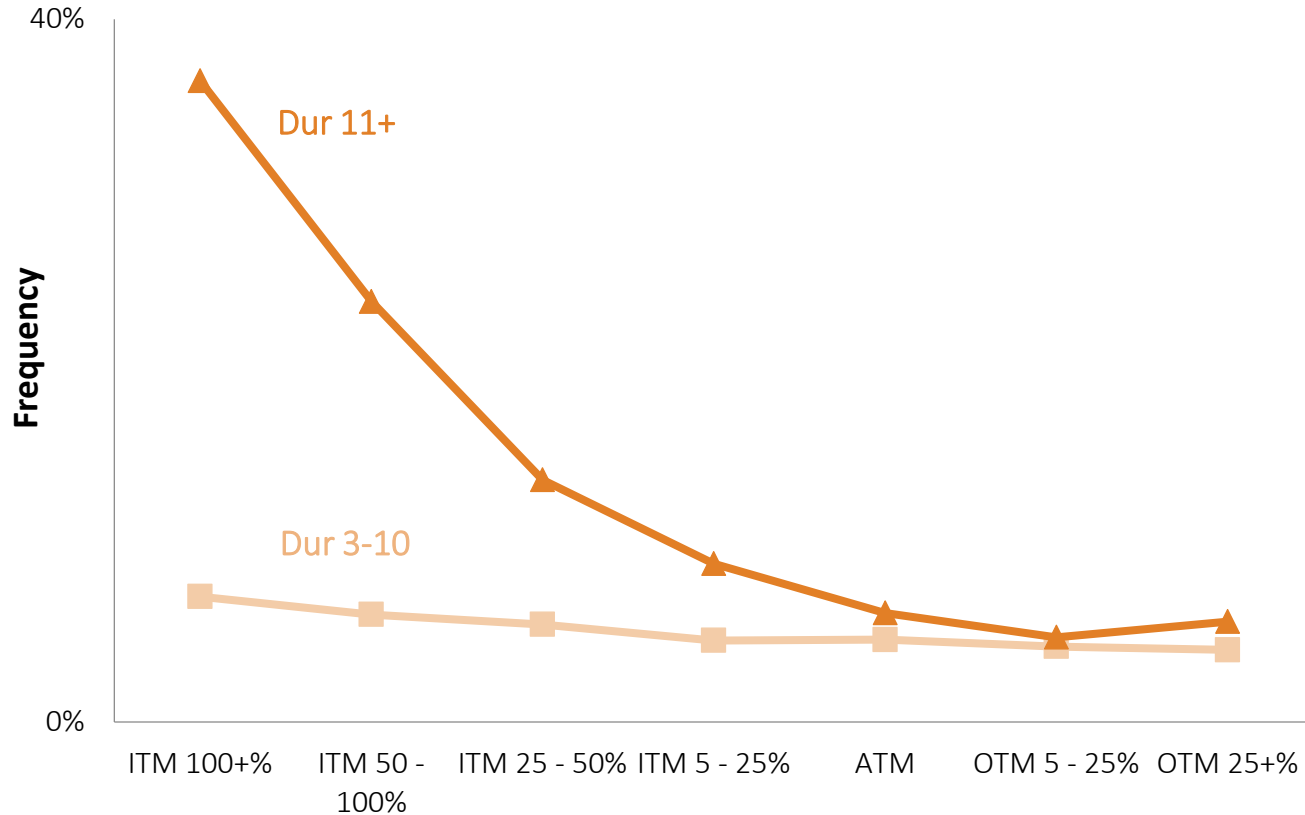
How you measure value matters, and credibility is vastly improved with industry data



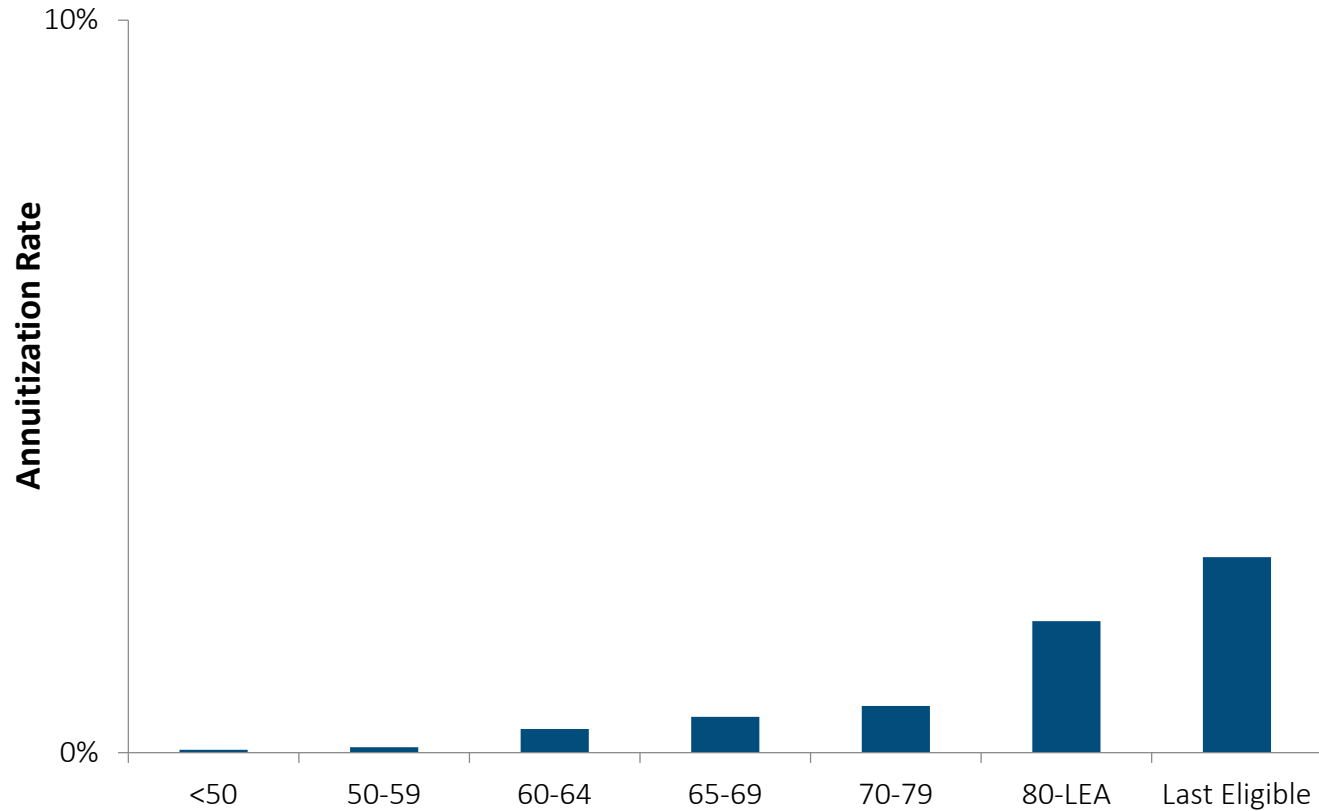
Industry data shows that GLWB income commencement is highest at issue and after bonuses expire...



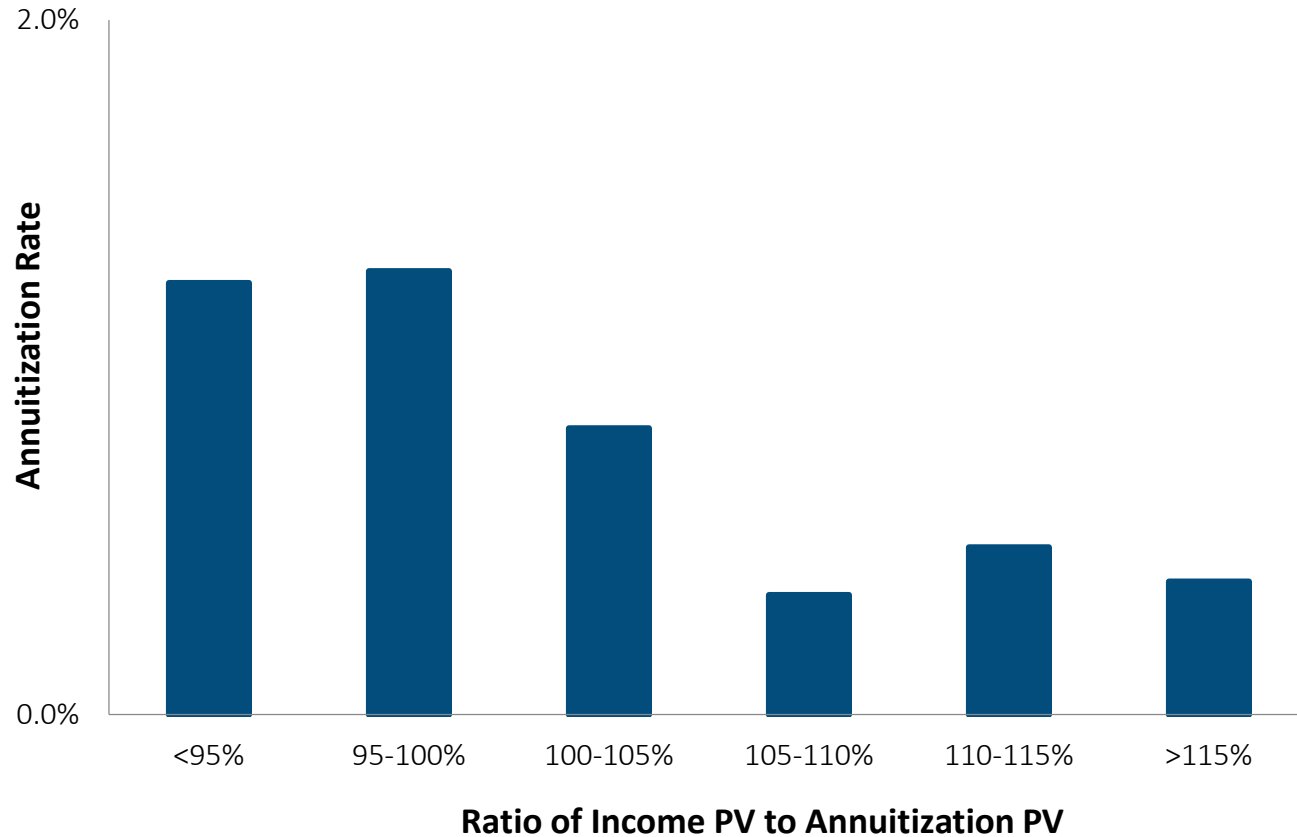
...and that ultimate income commencement is dynamic



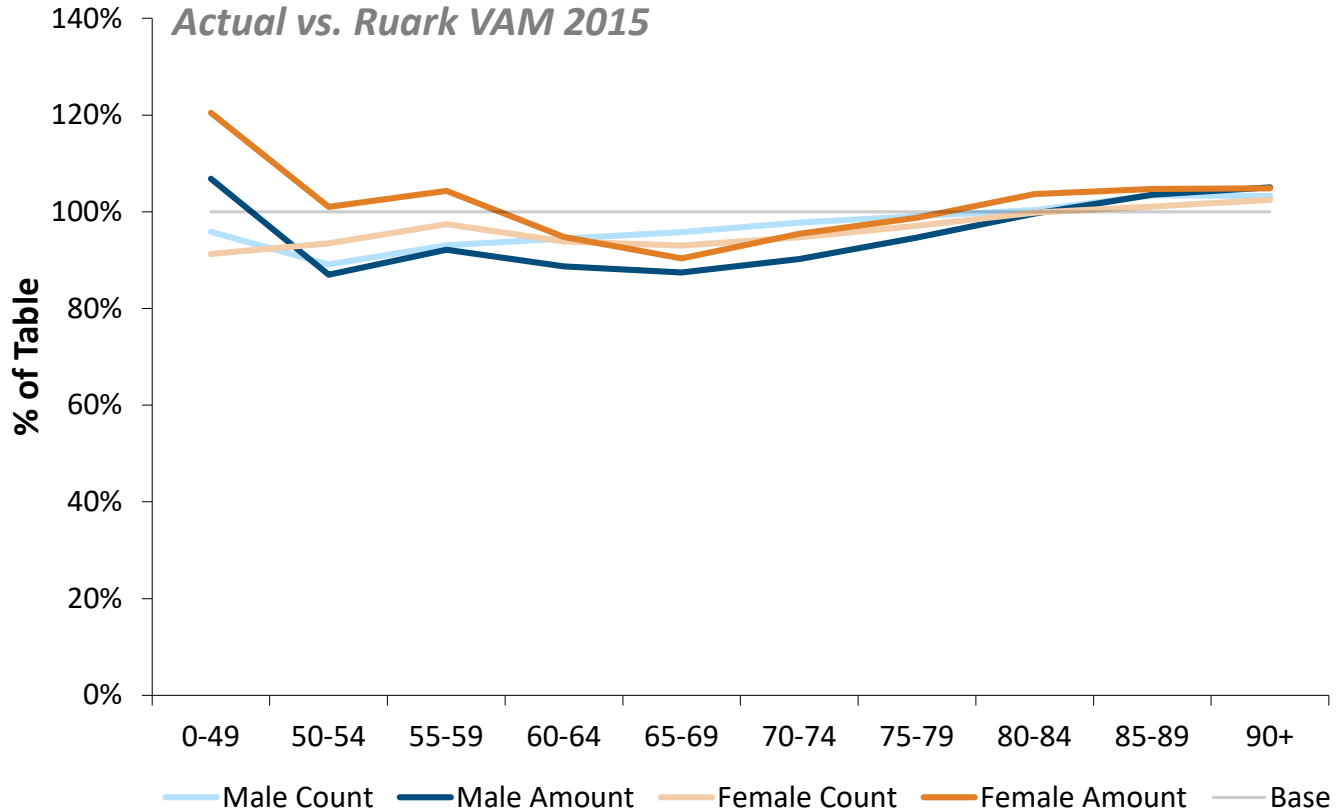
Industry data shows that hybrid GMIB annuitization rates are backloaded...



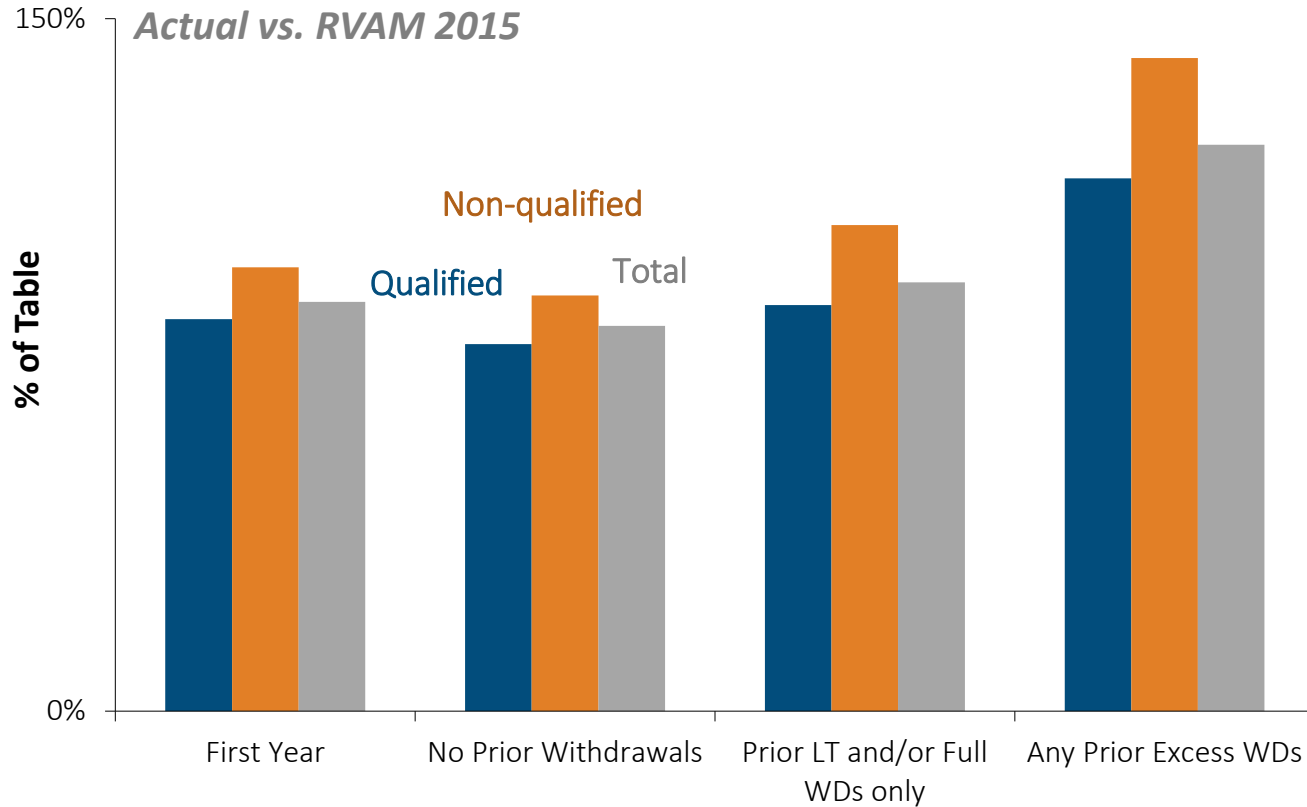
...and depend on economic value of other benefits, such as continued income utilization



Industry data also makes a better tabular mortality basis...

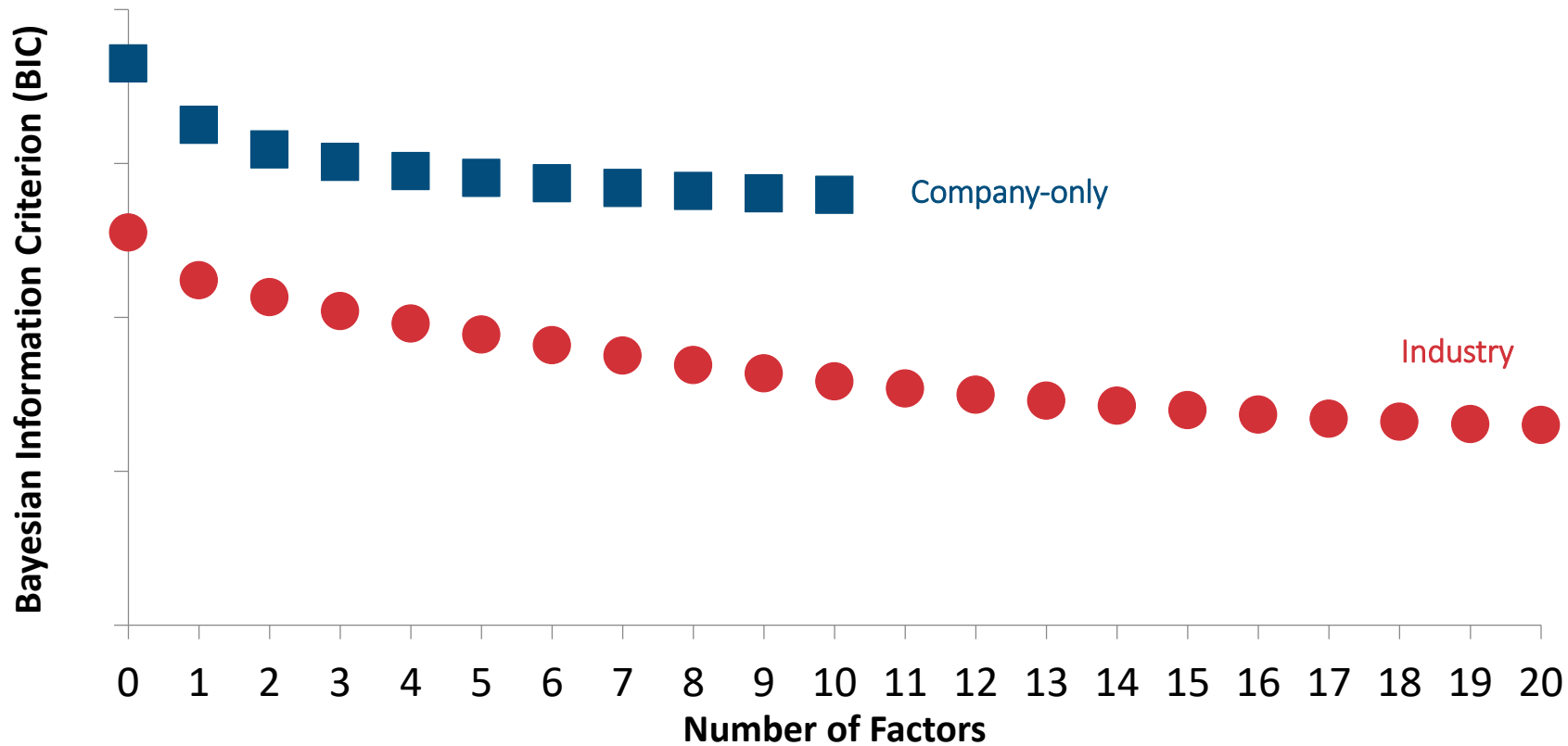


...and shows how income utilization affects mortality

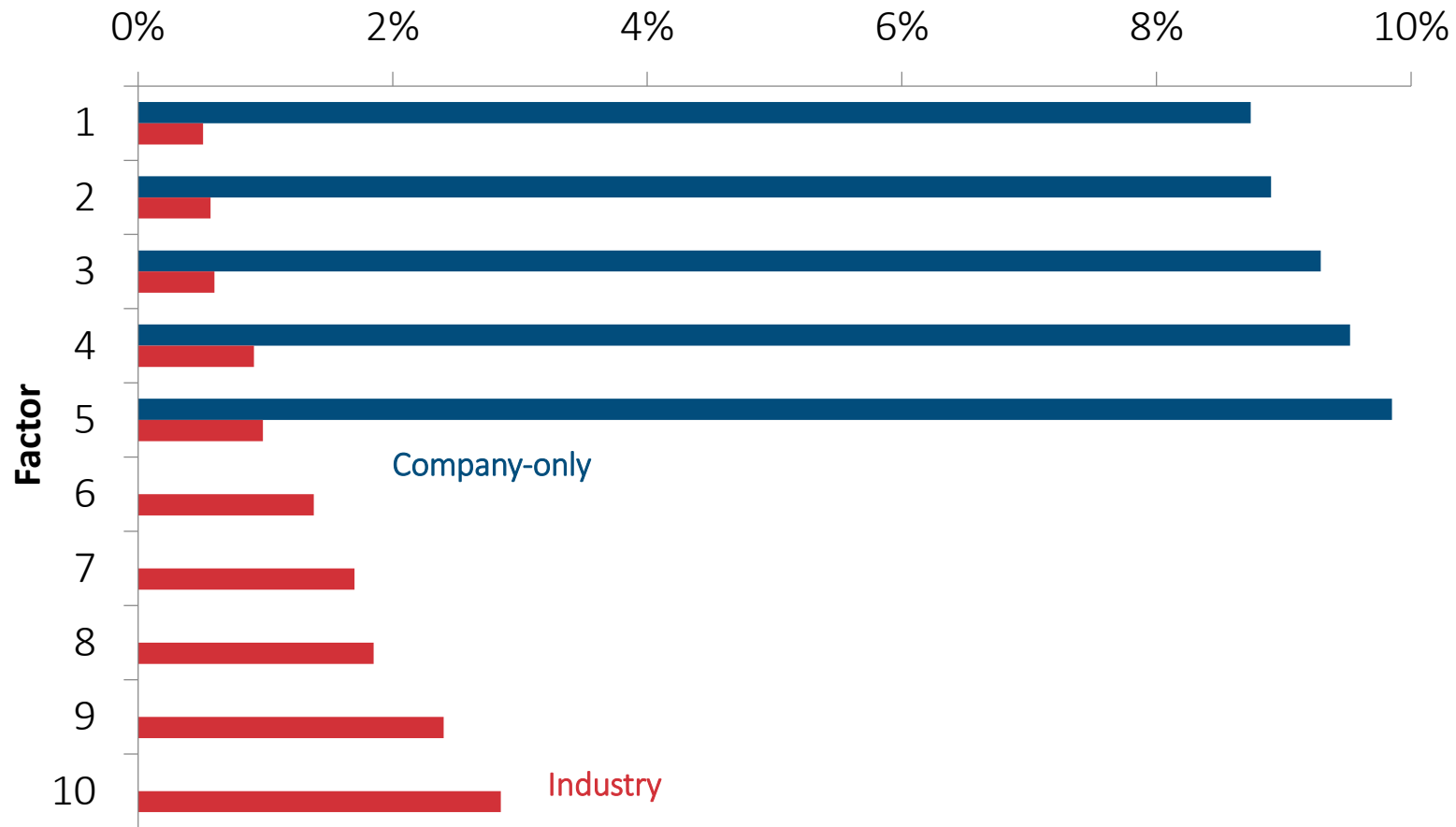


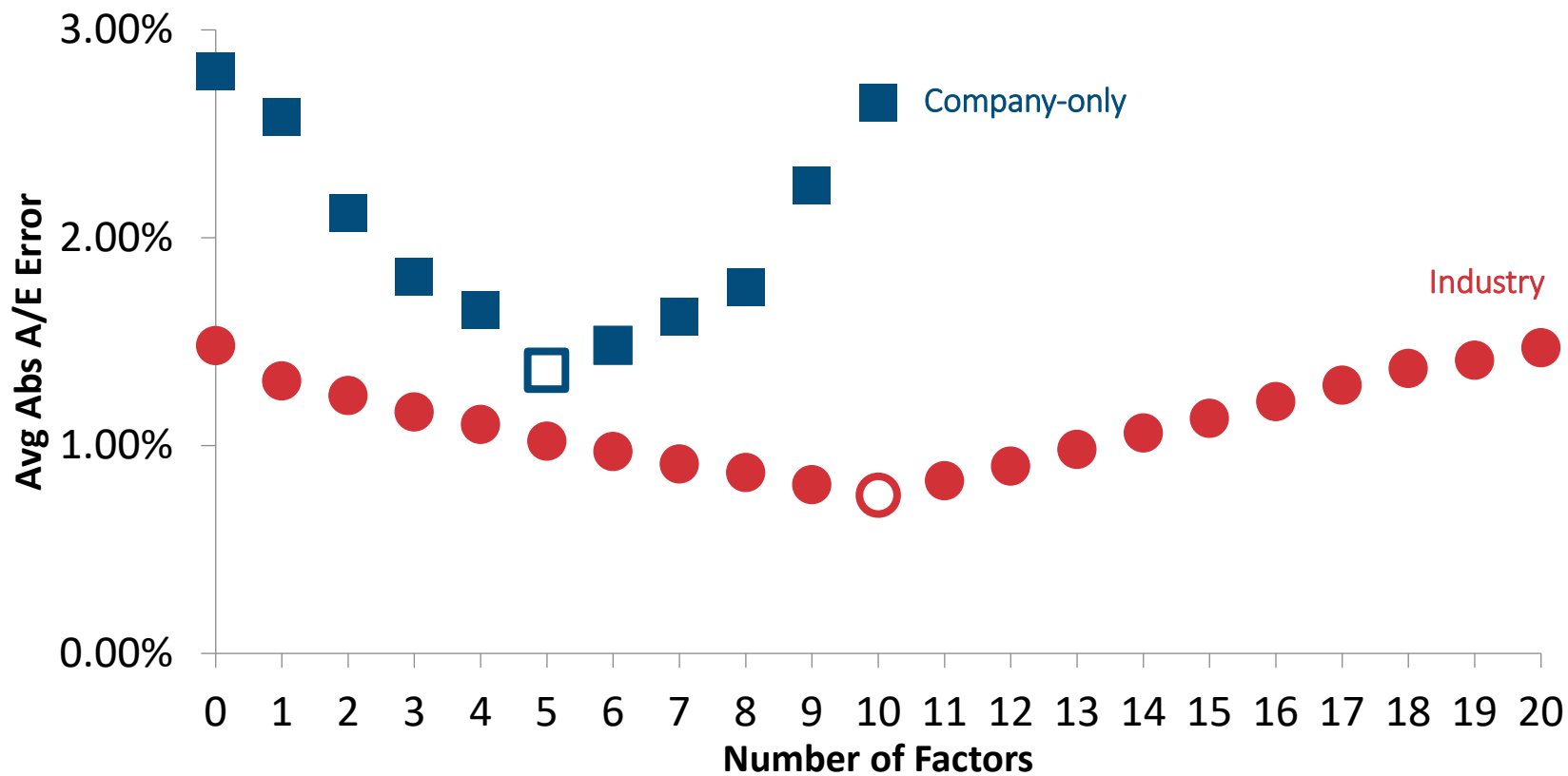
Modeling and assumptions

- Measuring goodness-of-fit for candidate models
- Testing predictive power on out-of-sample data
- **Using relevant industry data to improve candidate models**
- Art + science: choosing, communicating, and ongoing recalibration



Coefficient Standard Error

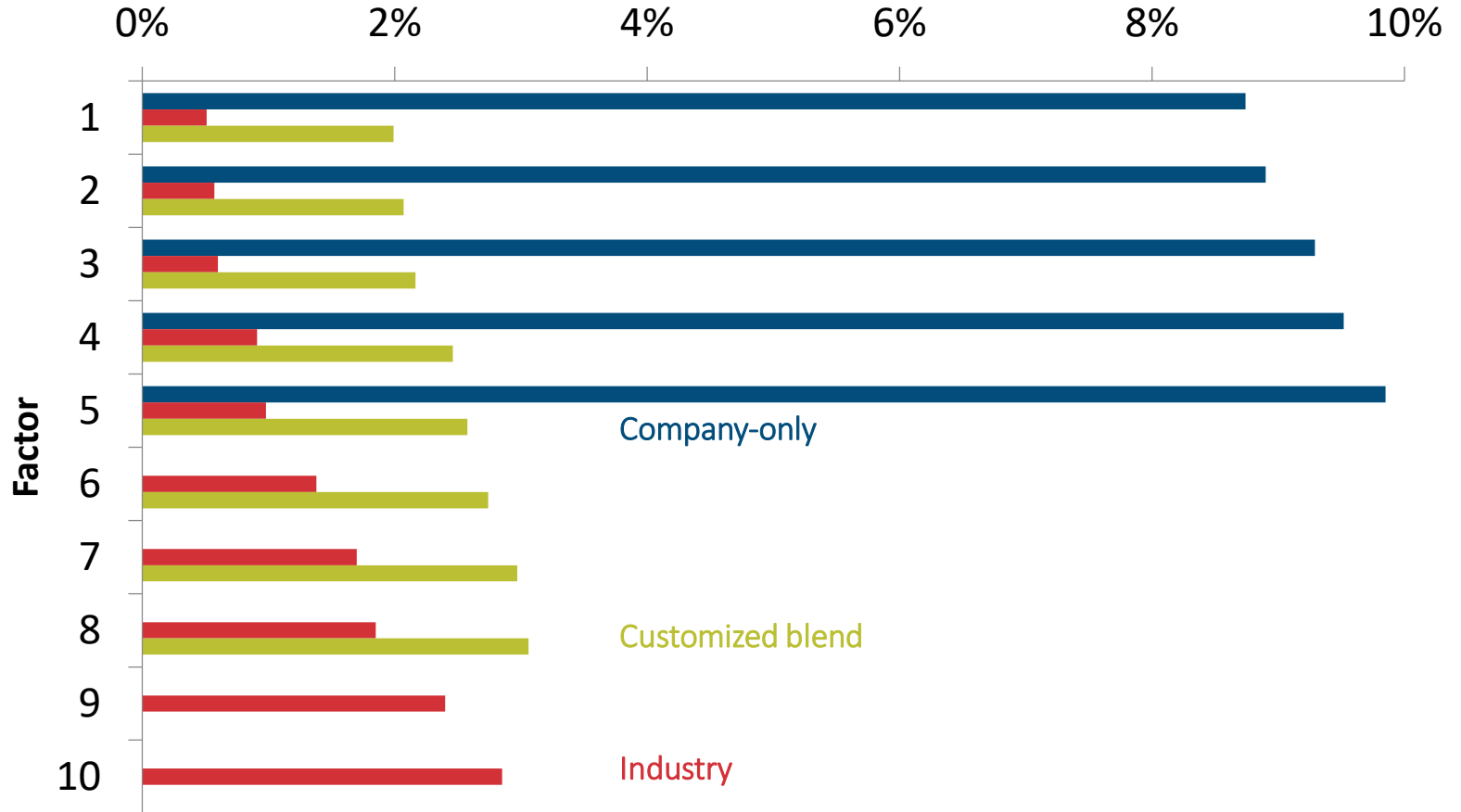


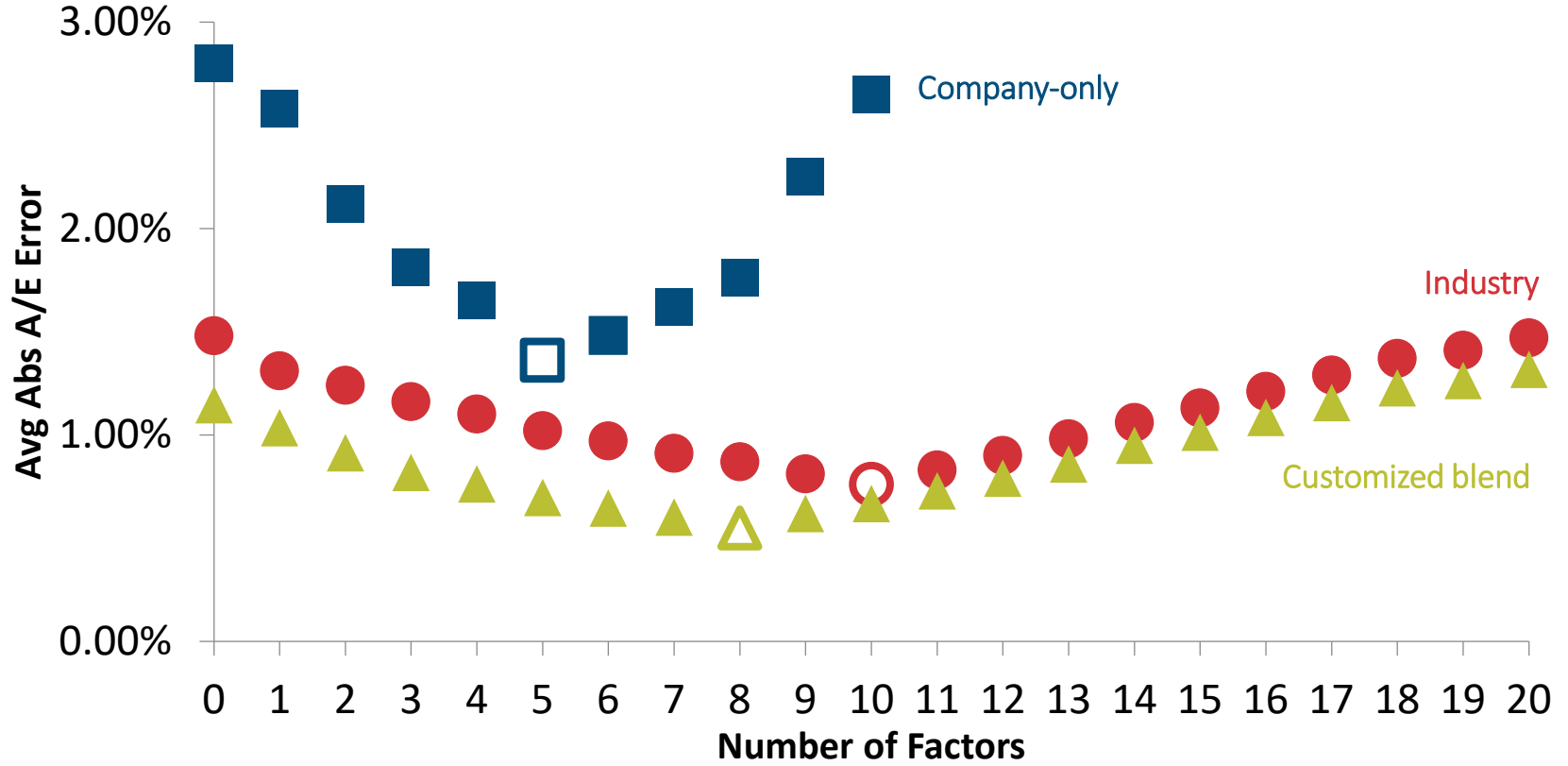


Customize your model in a credibility-based framework

- Subject matter expertise
- Actuarial judgment
- Quantify the benefits of using relevant industry data
- Ongoing recalibration, so focus on the framework and its sense of range

Coefficient Standard Error





How much is 1% A/E improvement worth to you?

Suppose 5.00% average annual surrender rates for your block

1% A/E improvement would be 0.05% annually and about 0.60% in present value terms

With 15% annualized market vol, hedge breakage (~2 s.d.) would be 0.18% of notionals

So what are your hedge notionals?


$$0.60\% * 15\% * 2$$

Hedge notionals	Annualized hedge breakage (~ 2 s.d.)
\$100 million	\$180,000
\$1 billion	\$1,800,000
\$10 billion	\$18,000,000

Cost-benefit of industry data

- Need to customize your model in a credibility-based framework
 - Quantify the improvement in goodness-of-fit and predictive power metrics
 - Quantify these improvements in financial terms – pricing margins, reserves, hedge breakage
 - Quantify the cost to access and use relevant industry data
 - Altogether, does this improve your financial risk profile?
- Contrast this approach with *unlocking ad nauseam*

More data
and/or
relevant
industry data



```
graph LR; A[More data and/or relevant industry data] --> B[Art + science, subject matter expertise and actuarial judgment]; B --> C[More statistically justifiable model factors and dramatically improved fit and predictive power]
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Art + science,
subject matter
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Discussion



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