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Decoding the predictive analytics black box

While the insurance industry endures occasional criticism for being slow to innovate, analytical techniques have been a foundational element of insurers' business models. Historically, the bulk of this analysis has focused on actuarial and risk assessment; in this, the property-casualty segment of the industry is ahead of the life/annuity and health care segments.

Why now?

The cost of data and computing power continues to plummet, with ever larger data sets gathered and analyzed in more efficient ways. At the same time, the analytics field is developing rapidly with applications that extend across the enterprise.

Innovation from outside the industry has been hindered somewhat by limited availability of clean, reliable, and relevant data, as well as a desire on the part of insurers to shield strategic functions and capabilities from external visibility. However, the persistently soft market in property-casualty insurance, a growth trend toward lower face amount term products in life insurance, and regulatory pricing pressure on health care insurance are driving insurance companies to reduce their cost of acquisition and service. As a result, insurers are expanding the use of analytics products to help drive business decisions and improve their overall customer experience.

We had the chance to spend some time

with Spinnaker Analytics, a Boston-based firm offering predictive models and analytical products to tackle a variety of business problems in the financial services industry. For more than 20 years, Spinnaker has worked in various functions spanning distribution, marketing, underwriting, operations, IT, and finance to address customer segmentation and proclivity for transactions and cross-sell, volume and sales forecasting, work flow prioritization, staffing and resource allocation, and other business priorities. These are areas where the application of analytics traditionally has been overlooked, and insurers are looking to address this across property-casualty, life, and health.

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Life-annuity insurer asset outliers The results of not following the crowd

In analyzing life-annuity insurer investment trends, Conning tends to look at the overall industry trends. This necessarily means that we are looking at average behavior, albeit an average that is heavily influenced by the largest insurers. In general, asset allocations and investment results for the industry change slowly year to year. This is influenced by the predominant asset class used by life-annuity insurers, long-term bonds. More than 80% of

life-annuity insurer investable assets are in long-term bonds, and many insurers will hold bonds until maturity.

The industry average portfolio consists of approximately 3% cash and short-term bonds, 81% long-term bonds, 12% mortgages, 3% Schedule BA assets, and 2% other (including equities, real estate, and options/derivatives used for non-hedging purposes).

However, individual insurers' portfolios are very different from this average. As seen in the Conning Strategic Study, *Life Insurance Industry Investments—Where Are the Return Levers?*, below a threshold of about \$1 billion in General Account investable assets, insurers are much more bond-dependent. The smallest insurers (less than \$100 million in assets) tend to hold only Treasuries, cash, and common stock. In general, smaller insurers do not have the scale or expertise to take advan-

tage of more complicated asset classes.

Some larger insurers, those with more than \$1 billion in investable assets, have portfolios that are far from the industry average. How extreme are some of these deviations? What are the drivers behind these choices? Are returns from these allocations higher or lower than the average?

Looking for outliers

Smaller insurers are more constrained regarding asset allocations, yet many have extreme allocations related to their size. As a result, we excluded insurers with less than \$1 billion in General Account net admitted assets from the following analysis. In addition, to help with investigating the results of these choices over time, insurers that did not report business for the complete period of 2011 to 2015 were excluded. After these exclusions, 126 life-annuity insurers remained.

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Return to profitability for crop insurers

The 2016 crop year is shaping up to be another solid profit for the public/private MPCCI (multiperil crop insurance) program. Yields for the major crops look strong, and commodity prices are hanging on so far. This profitability is good news for the 17 AIPs (Approved Insurance Providers) and their reinsurers who write this unique corner of the insurance market.

This two-year streak will be a stark, but welcome change from the preceding three. Those included 2012, which was the largest underwriting loss in the history of the program—driven by widespread drought. The subsequent two years were also weak in comparison, mainly due to commodity price declines. The underwriting gains were only 7% and 13%, respectively, a far cry from the ~18% average for the industry. These gains are before deducting unreimbursed operating expenses, LAE, and reinsurance costs. We estimate that, at a 13% net underwriting gain, the MPCCI industry is approximately breaking even.

A key question: Is the MPCCI industry reverting to normal profitability? or might we expect to see more of what the industry experienced over the past five years?

This stretch of losses/weak profitability was unprecedented, having not happened before in the past 35 years of the MPCCI program. This period caused many par-

ticipants to question the attractiveness of this business, and certainly played a role in several of the six sale transactions that have occurred since 2014.

2012-2014: What Happened?

The experience in 2012-2014 was a result of three factors, some of which are related.

- ◆ Old-fashioned bad luck with the weather (2012)
- ◆ the continued decline in commodity prices
- ◆ shifting buyer behavior changing risk profiles

First, weather patterns are volatile and one should not read too much into weather volatility and the resulting losses for any single year.

Second, commodity prices are a major driver of volatility and profitability for crop insurers. About 80% of MPCCI premium has exposure to prices through revenue policies (which protect farmers from a decline in crop revenues resulting from price, yield, or both). Corn and wheat account for 63% of insured values, and corn alone declined in value by 22% in 2013 and 25% in 2014 (measured from spring reference price to harvest price—the relevant period to determine potential loss).

Third, buyer behavior has shifted toward

higher coverage levels and more revenue products. Over the past ten years, the weighted-average deductible has decreased, moving from ~32% in 2006 to around 26% in 2015. During this period, the number of high coverage level policies (80% to 90% coverage) doubled. Insurers incur liability only when deductible thresholds are pierced; as deductible levels have decreased, smaller price changes can lead to losses for insurers. If we couple that shift with the policy mix whereby revenue policies are now ~80% of the premiums, up from 53% ten years ago, there is greater loss exposure for insurers.

Are low commodity prices bad?

Yes and no. They are not great for scale reasons, with fewer premiums available to cover fixed costs. However, for underwriting loss exposure, low prices can be good. At lower absolute price levels, the risk of further declines that can trigger losses on revenue policies is lessened. Perhaps insurers should be happy to trade a slightly higher expense ratio for greater stability in the loss ratio.

Rising commodity prices are generally good for crop insurers. If prices rise from the spring through to harvest, this negates the potential for revenue-related losses. Insurers should be careful of what to wish for—rising prices, especially rapidly rising prices, eventually unwind, creating loss exposure for MPCCI insurers. That is what insurers experienced in 2013 and 2014.

There has been a several-year deflation in commodity prices, affecting everything from farm values to MPCCI premiums. Corn is currently 41% below its five-year high, and soybeans are 23% off their high. As a result, crop industry premiums have fallen each of the past five years.

Risk sharing

The current risk sharing arrangement between the FCIC (Federal Crop Insurance Corp.) and the AIPs has been in place since 2011 with the then “new SRA” (Standard Reinsurance Agreement). The 2011 SRA has been around for five years; however, the industry is still digesting the results under this new arrangement, and every year has more data to work with.

Simply put, in five of the historically

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Percentage Change in Harvest Prices vs. Spring Reference Prices

| | 2012 | 2013 | 2014 | 2015 | 2016* |
|----------|---------|---------|---------|---------|---------|
| Corn | 32.0% | (22.3%) | (24.5%) | (7.7%) | (8.2%) |
| Soybeans | 22.6% | 0.0% | (15.1%) | (8.4%) | 8.8% |
| Wheat | (21.7%) | (17.8%) | 2.1% | (15.7%) | (19.0%) |
| Cotton | (22.3%) | 2.5% | (17.9%) | 0.0% | 13.8% |

*Through 10/14/2016

Gross Loss Ratios

| Group 1 States | 1998-2011 Average | 2012 | 2013 | 2014 | 2015 |
|----------------|-------------------|------|------|------|------|
| Iowa | 45% | 223% | 216% | 191% | 20% |
| Illinois | 45% | 449% | 81% | 40% | 67% |
| Indiana | 59% | 336% | 39% | 39% | 39% |
| Minnesota | 54% | 30% | 161% | 213% | 14% |
| Nebraska | 60% | 231% | 74% | 88% | 34% |
| Total Group 1 | 52% | 242% | 125% | 123% | 45% |

Prepared by Conning, Inc. Source: Risk Management Agency, U.S. Department of Agriculture

most profitable states (known as Group 1 states), gains that AIPs can achieve are lower and losses they can assume are greater. In exchange, the government now assumes a greater share of any losses in all the other states (Group 2 and 3 states). The reduction in gain potential is quite large. For example, at a 40% gross loss ratio in a Group 1 state (not uncommon), the AIP is able to “keep” 33 points of that gross 60% gain. Under the prior SRA, AIPs were keeping 45 points. The difference is a reduction of 12 points of gain.

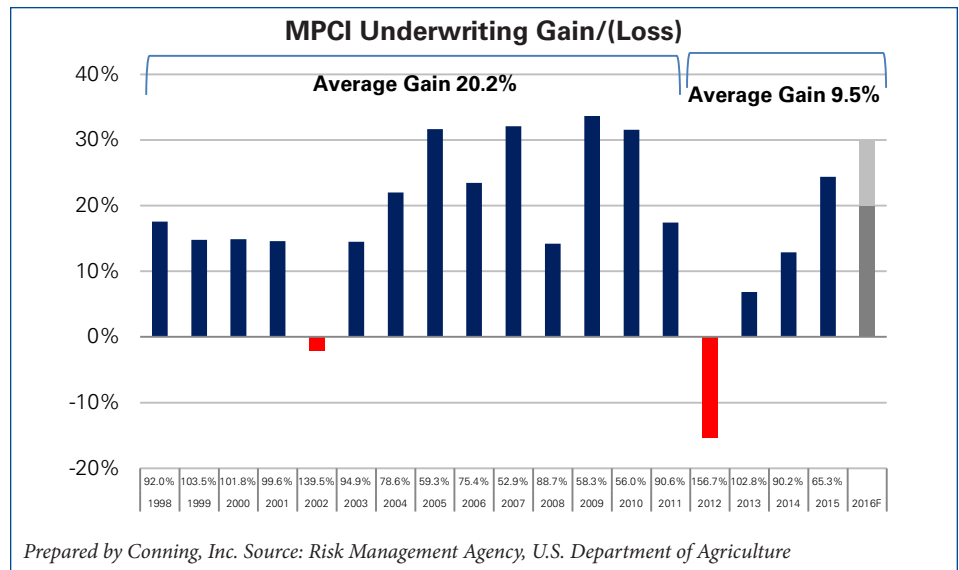
As a result, we estimate that, in “good” years, when the overall gross ratio is below 65%, AIPs have lost about 6 points of gain. While a good year pre-2011 generated a low-30% gain, it currently will generate a mid-to-high 20% gain.

Likewise, downside risk is also greater. At the top of the first loss corridor (loss ratios between 100% and 160%), the current SRA generates a 39% retained loss, whereas under the old SRA the loss retention was 30%. At the top of the second loss corridor (220%), the increase in loss retention is 12 points higher to 66%—which is a net retained loss ratio of 166%.

The only actual experience we have in results under new and old SRAs in “bad” years is the comparison of 2002 to 2012. The 2002 gross loss ratio of 139% translated into a net retained loss ratio of 102%. The 157% gross loss ratio in 2012 generated a retained loss ratio of 115%. This increase in retained loss ratio was driven by extraordinary loss ratios in the Group 1 states, with Illinois at 449%, Indiana at 336%, and both Iowa and Nebraska over 200%. These compare to long-term gross loss ratio averages for these states in the 45% to 60% range.

Is crop insurance still a good risk/reward tradeoff?

A good place to start in addressing this question is to look at the current ownership profile of the AIPs. Major insurers and reinsurers are the ultimate owners of AIPs, which account for nearly 80% of the premiums within this \$9 to \$10 billion segment. It is a substantial shift from the makeup of this market in 2004, where large re/insurer ownership accounted for less than 15% of the total premium.



Prepared by Conning, Inc. Source: Risk Management Agency, U.S. Department of Agriculture

Over this time, the market has grown from \$4 billion to nearly \$10 billion today. Arguably, it requires a larger balance sheet to operate as a major insurer in the MPCI market and to be able to retain a meaningful share of the risk. The market is large enough to attract attention of big companies that can absorb the premium volumes without being overwhelmed (e.g., Chubb).

Also there is general recognition that crop risk may be one of, if not the best, diversifiers. It is especially true for reinsurers that have property cat risk, with which crop generally does not correlate. If we add to these features the relatively low capital consumption for crop risk in a diversified portfolio, it is easy to see why reinsurers are in this business.

One of the big risks in MPCI is the government risk—a major change in the program to the detriment of the AIPs. The MPCI program has been around, more or less in its current form since about 1980. There are many reasons to believe that it will continue, more or less in its current form, but that discussion is beyond this article’s scope. The “chipping away” risk is perhaps more relevant, and we have seen this over the tenure of the program, most recently with the changes in the 2011 SRA. These changes have affected both gain and loss sharing as well as the expense component.

What about another loss year? It will definitely happen; the industry averages one about every ten years. With prices where they are, that risk is more likely to come

from a widespread drought or other event that affects crop yields. MPCI is a more volatile line than most, with exposure to both weather and commodity markets. Under the current SRA, the risk/reward profile has insurers subject to lower gains and higher losses. Comparisons to the old SRA are certainly interesting, but they are also not relevant. What is relevant is to understand buyer behavior and other attendant risks, and to use the various levers available to the AIPs to optimize the results and mitigate the exposures.

*Rebekkah Humphrey
Steve Webersen*

What are the new tools?

Predictive modeling is a significant leap in sophistication of analysis. It generally uses advanced statistical techniques to identify material indicators. Insurers gather and analyze information that covers behavioral aspects of the insured, specific characteristics of the policyholder and the property being insured, as well as broader geographic and socioeconomic characteristics of the environment for in-force policyholders. Hundreds of data elements can be evaluated simultaneously to identify those variables and weights that produce the greatest differentiation of future behaviors. In personal lines, some models now yield billions of potential variables. This creates unprecedented opportunities for mass customization in product design, feature, and pricing.

Modeling represents a leap in another regard. Under traditional risk classification, the factors almost always made intuitive sense. The coal miner class obviously faces more dangers than the store clerk class. Predictive modeling can identify additional factors that are technical or mysterious in nature that may have strong predictive value (identifying correlations with risk), but may not be easily explainable, and may even have been previously undetectable. Thus, instead of merely automating what statistical analysts were doing on paper 15-20 years ago, advancements in processing power and applications enable computers to do what people could not do. For example, store clerks in specific neighborhoods may face greater criminal violence, while others may face long-term health risks due to a sedentary lifestyle.

The property-casualty segment has generally been ahead of the life-annuity segment in this type of risk analysis. Part of this divide is the facility property-casualty insurers have in gathering risk data, something that is not as readily and abundantly available to life insurers. In addition, the loop length for the data differs by segment. All predictive techniques have error/noise built in and can have bias; feedback allows for correction, but if the feedback loop is too long, it creates a hurdle for model development. Property-casualty and health have fairly a short period—more or less a year—in evaluating actual

loss/claims experience versus expected, whereas life (particularly long-term care) needs a much longer window for a similar comparison. As a result, it can be difficult to get a sign-off for implementing risk assessment models from the risk management departments at life insurers.

Borrowing techniques already prevalent in other industries (e.g., retail, defense, aerospace, and biotech) and academia (e.g., physics, biological sciences, and econometrics), leaders in predictive analytics are expanding their reach. New tools being applied include the following:

- ◆ **Spectral analysis.** Spectral analysis is used to identify dominant periods (or frequencies) in a time series and is useful in highlighting cyclical patterns in data
- ◆ **Neural networks and genetic programming.** Artificial neural networks try to simulate how the human brain processes information. There is a layer of hidden units between the input and the output. In traditional models like regression, there is a linear relationship between the inputs and the output. In a neural net, the input variables interact with the hidden units using complex multi-layered functions via a process called weighting. The hidden units combine the input interactions in a complex matrix and then pass the result to the output units. Genetic programming uses the trial-and-error mechanism typically observed in biological organisms. Advances in machine learning now allow a similar approach in optimizing the selection of predictive algorithms.
- ◆ **Simulation.** Traditional statistical techniques do not work for questions such as cancer incidence and other rare event modeling. Simulations such as Monte Carlo present the decision-maker with a range of probabilistic outcomes based on a given set of decisions. They allow the user to develop scenarios that result in extreme outcomes (highly risky scenario) or very conservative outcomes and everything in between.
- ◆ **Pattern recognition.** Pattern recognition identifies regularities and

irregularities in observed data using advanced statistical techniques. For example, facial recognition algorithms rely on a variety of clustering and dimensionality reduction techniques to identify prominent characteristics such as eyes, nose, chin, etc. as the starting points and then fill in the remaining image using pixel matching. This type of analysis is finding application in both property-casualty claims fraud analysis and in life underwriting disease detection.

- ◆ **Machine learning and deep learning.** This is a broad area encompassing supervised and unsupervised learning. In supervised learning, a model is explicitly created and then data are used to train the model. In unsupervised learning, computers do not have to be explicitly programmed to conduct analyses. The algorithms execute a variety of analyses and then sift through the results, dropping/modifying the analyses autonomously.

What is the real impact of the new tools?

The critical question in all of this is, “what is the value of these new tools?” It is important to always ask—not, “what data can we get?”, but “what’s the problem we are trying to solve?” “What data do you need to answer the questions that you have?” Organizations seem to focus on the new tools too soon and forget the useful applications of traditional statistical tools/theories. Therefore, they tend to overcomplicate issues and spend the bulk of their time and resources on gathering too much data and building models before they can experience any meaningful return. Having more data does not necessarily mean better insights. With big data, analysts tend to try to over-fit their models and misinterpret coincidence, correlation, and causation.

Instead, insurers should be looking to do more with less and deploy what Spinnaker calls “Rapid Prototyping” techniques to quickly establish a model and iteratively improve its performance as more relevant data become available. This would maximize the return on investment, while giving the executives the much-needed volume control knob or spigot to increase

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the flow of funding into various analytics initiatives at their discretion with a clear line of sight on the results.

Organizations need to be mindful not to overspend on building out a data and analytics infrastructure as the industry did with information technology in the 1970s and 1980s. Today, startups do not have an in-house IT infrastructure; instead they leverage the cloud and outsource services with a “pay-for-usage” model, while retaining the flexibility to adopt the next standard and services providers as and when each emerges.

Interestingly, one of the principal benefits of these new tools that is often overlooked is the shift it causes in the corporate culture becoming more fact-based and data-driven. This move away from old school intuitive decision-making to a fact-based approach can be seen in asset management. Hedge funds, like Two Sigma, are applying technology and data science to assess investment opportunities. Brian Duperreault recently cited the innovative approaches being taken by Two Sigma as one of the reasons he came out of retirement to start Hamilton Insurance Group, applying a similar approach to the insurance business.

Putting these new techniques into practice (case study)

Spinnaker was able to walk us through an example of how the use of evolving analytics techniques can be put into practice. Its client, a top ten U.S. diversified insurer, approached the analytics firm with a staffing question: “With a strategic plan to increase sales by 30%, we need a sophisticated staffing model to estimating underwriting staff augmentation requirements to accommodate the new business flow.”

As part of the analysis phase of the project, Spinnaker met with distribution management and discovered that they did not think they were going to be able to get enough new RFPs to generate a 30% increase in submissions; they were already seeing the bulk of the RFPs in the market. Pursuing this issue further, the team discovered that the more relevant question was, “What’s the likelihood of submitted business being placed with us?”

With a clearer view to the underlying busi-

ness problem, Spinnaker developed a Case Score using its Case Prioritizer™ product to analyze the firm’s historical client performance/behavior to create a quantified indicator of predictive quoting outcome. Using logistic regression analysis on key RFP variables such as case size, industry, geography, and demographics, the Case Score provided a probability score of the business being placed with the company. Therefore, the client could evaluate an RFP as it came in and allocate resources appropriately.

Without adding an underwriter, the client improved sales 32% within the first quarter of implementation by using the score for triage. Spinnaker was able to replace an environment where RFPs were considered on a FIFO or a “squeaky wheel” basis with a method that allocated resources to high-scoring cases. As a result, distribution and marketing started working together rather than at odds with one another.

Where do the insurers go from here?

We asked Nirav Dagli, CEO of Spinnaker Analytics, where do the insurers go from here?

“Start-ups don’t have large IT departments with large server rooms today. Instead, they create organizations of tech-savvy business users. Carriers need to create analytically savvy organizations while leveraging the deep domain knowledge built up over decades. Instead, most have been investing immense resources in building data storage infrastructure, and many are content to check the box of analytics by hiring a few data scientists who know nothing about the insurance business. We are dealing with a world of multiple certainties where wearable computing, mobile phones, virtual reality, autonomous vehicles, nano technology, robots are all claimed as definites. In such an environment, we all need to be adaptive and not bet the farm on any one thing.”

Conning believes insurers need to ask themselves the following five questions:

- (1) Where can I apply analytics within my organization to execute strategies and improve performance?
- (2) How can I use the data I already have to start answering critical business ques-

tions?

(3) How do I build an organization culture that is adaptive to “multiple certainties”? How can I invest scarce funds to build capabilities I need today while maintaining the flexibility to adapt to future disruptions as they emerge?

(4) What problems do I need to solve today? What other problems exist, but will likely be solved by others in the near future?

(5) How can I improve the analytical savvy of my organization and combine it with deep domain knowledge in the face of a shallow talent pool of analytic engineers?

In a challenging environment for insurers, with constraints on many of the traditional profit levers, Spinnaker’s experience highlights the growing opportunities for predictive analytics to unlock value for insurers across segments.

Alan Dobbins
Mary Pat Campbell, FSA, MAAA

For the highest-level analysis, we focus on the major asset classes of short-term bonds and cash, long-term bonds, mortgages, preferred stock, common stock, real estate, Schedule BA assets, and derivatives/options. Obviously, having a higher-than-average allocation to one of these classes will lead to lower-than-average allocations in other classes. In addition, because bonds are the most-used asset class, we will not examine high allocations in long-term bonds.

Mortgages: slight advantage to higher allocations

Mortgages are the second-most used asset class and have been gaining in use from 10.6% of investable assets in 2011 to 11.9% in 2015. Of the 126 insurers examined, only 30 had higher allocations than the industry average; this shows the predominance of the largest insurers with high mortgage holdings. Indeed, 16 of those 20 insurers held more than \$20 billion in General Account investable assets in 2015, and five of the seven largest insurers measured by General Account assets are part of this group.

As can be seen in the top graph on page 7, mortgages have provided higher book yields than bonds for more than a decade, though their advantage has waned. Likewise, these top ten insurers do seem to have had some excess yield due to mortgages, though perhaps not to the extent they would wish. In 2015, these ten insurers averaged 5.05% in book yield for their entire portfolio, compared to the industry average of 4.81%.

This 24 bps advantage may mean a lot in a low interest rate world. The overall industry saw net premium decrease by 2% between 2014 and 2015, and statutory operating margins have been at single-digit percentages for five years. A boost in investment income can help in such a low-margin environment. These top ten mortgage-holding insurers did have better results for 2015 compared to the whole industry—investment income made up 22% of their revenue (versus 20% for the industry), and the group as a whole showed 9.6% operating margin compared to the industry's 6.9% margin for 2015.

Short-term bonds and cash: liquid and

low-yielding

The overall industry holdings of short-term bonds and cash were about 3% of investable assets in 2015, much reduced from a prior high of 5% in 2008. Given the very low interest rate environment in recent years, there were only six insurers with allocations to cash and short-term bonds exceeding 10% in 2015, and four of those six insurers are reinsurers. The other two insurers were an A&H company and an annuity-focused company.

One commonality among most of these insurers is the need for liquidity to pay claims. For example, in the case of the A&H insurer, the total benefits paid in 2015 were almost 200% of net admitted assets for the insurer—indicating a lot of cash flows. While the benefit ratios for the other insurers are not quite so high, whether compared against assets or net premium, reinsurers often need to make relatively large single-claim payments due to the nature of their business, so the high holdings of cash would not surprise.

These high holdings lead to low yields. The whole group averaged 3.65% gross book yield for their entire portfolio over 2011 to 2015, well below the industry average of 5.08% over the same period. Similarly, their average book yield for 2015 was 3.39%, while that of the industry for 2015 was 4.81%.

Schedule BA assets: balanced out by high cash positions?

Schedule BA assets—long-term invested assets that do not fit in the traditional categories of bonds, real estate, mortgages, and equities—are far from being a “core” asset class for insurers. BA assets also include joint ventures and holdings in hedge funds. The industry has had holdings of about 2% to 3% of investable assets in this category for many years.

As seen in the second graph on page 7, in most years, Schedule BA assets have provided higher yield than bonds. However, the variability of results, the illiquidity of the assets, and the higher risk charges work together to make high allocations to this class not quite as attractive as one may wish.

The top ten holders of Schedule BA assets, by percentage allocation, did have

Top Ten Holders by Percentage Allocation—Mortgages

| Insurer | Allocation (% of Investable Assets) |
|-----------------------------|-------------------------------------|
| Meiji Yasuda Life | 40.6% |
| American National Financial | 22.3% |
| Mass Mutual | 20.9% |
| Principal Financial | 20.1% |
| Banner Life (L&G) | 20.0% |
| Prudential of America | 19.4% |
| Metropolitan | 19.3% |
| Michigan Farm Bureau | 19.2% |
| Woodmen of World Life | 18.8% |
| Pacific Life | 18.7% |

BBB-rated Bonds

| Insurer | Allocation (% of Investable Assets) |
|---------------------------|-------------------------------------|
| Greek Catholic Union | 58.9% |
| Erie Insurance | 52.0% |
| Primerica | 49.7% |
| Harris Insurance Holdings | 47.9% |
| Torchmark | 47.4% |
| Cincinnati Financial | 47.0% |
| Sagicor Financial | 45.1% |
| Mutual of America Life | 44.9% |
| Modern Woodmen | 43.8% |
| GBU Financial Life | 43.2% |

Below-Investment Grade Bonds

| Insurer | Allocation (% of Investable Assets) |
|----------------------|-------------------------------------|
| Heritage Life | 15.2% |
| CIGNA | 12.7% |
| Tennessee Farmers | 11.3% |
| Allstate | 9.9% |
| UNUM | 9.4% |
| Banner Life (L&G) | 9.4% |
| UNITRIN (Kemper) | 9.2% |
| RGA | 8.5% |
| Cincinnati Financial | 8.2% |
| HCSC | 8.2% |

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a higher average overall book yield for 2011-2015 than the industry, but not much higher: 5.25% versus 5.08%. Similarly, the one-year result of 2015 was higher: 4.93%

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versus 4.81%.

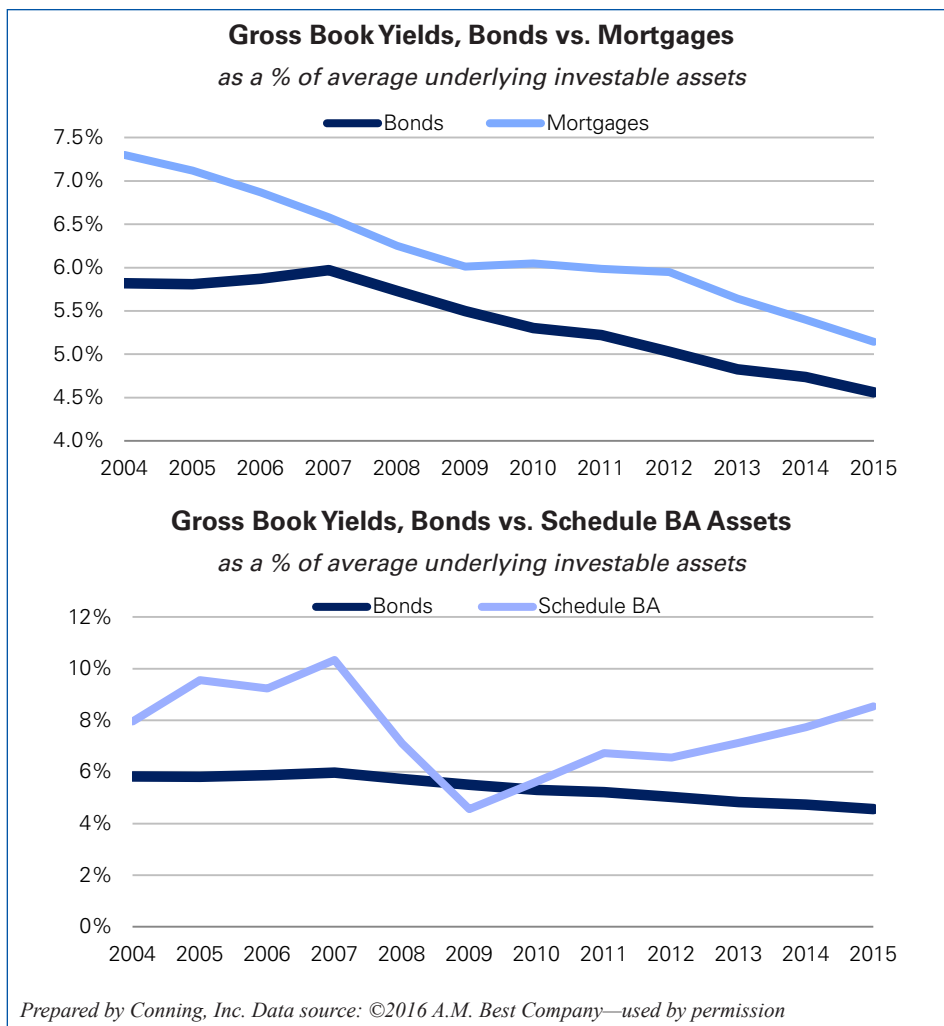
The relatively small part Schedule BA assets play in the portfolio limits the upside they can provide. In addition, it seems that those holding high levels of Schedule BA assets temper the volatility and illiquidity from these assets by holding higher-than-average levels of cash and short-term bonds. The top ten insurers for Schedule BA allocations had an average of 6% allocations to cash and short-term bonds, twice the level of the overall industry. In addition, this group tends to have lower-than-average allocations to mortgages, 4% versus the industry average of 12%.

Taking on credit risk in the bond portfolio: paying off for now

So far, we've avoided the major component of the industry portfolio: bonds overall. As noted in our investigations of investment trends over the years, since the end of the financial crisis, the industry as a whole has seen a migration of its portfolio into BBB-rated bonds. Holdings in BIG (below-investment-grade) bonds have remained somewhat low, however. The 83.5% of the portfolio in 2015 breaks out to about 52.1% in bonds rated A to AAA (this includes cash), 26.5% in BBB-rated bonds, and the remaining 4.9% in BIG bonds.

If we look at the top holders in BBB-rated bonds, we find:

- ♦ 70 of the 126 insurers being investigated have higher-than-average allocations to BBB-rated bonds.
- ♦ Of these top 70, eleven hold more BBB-rated bonds than they do A-AAA-rated bonds.
- ♦ The top ten insurers for BBB-rated bond allocations averaged a 5.36% book yield on their entire portfolios from 2011 to 2015 and a 5.01% book yield for 2015 alone.
- ♦ Two insurers have over half their entire investable assets in BBB-rated bonds, both of which are in our smallest size category being investigated: \$1 to \$5 billion.
- ♦ Those two insurers averaged a portfolio book yield of 5.74% for 2011-2015 and 5.47% for 2015 alone.



If we look at BIG bonds, the allocations are less severe. The highest allocation to BIG bonds seen is 15% of the overall portfolio, about three times the industry average. As the top holders of BIG bonds are not allocating a very large portion of their portfolios to these bonds, there is less of a relationship between these high allocations and high yields as was seen with BBB-rated bonds. The top ten BIG bond holders averaged 5.22% in book yield over 2011 to 2015, compared to the top BBB-rated bond holders with a 5.36% average yield.

Balancing risk and reward

In some of these cases, the particular asset class or category affects the overall portfolio yield by only a few basis points. In a world of low interest rates and low margins, this can help.

However, as noted in the June 2016 *Conning Commentary* article, 'A "tail" of two capital models: Changes in RBC and BCAR,' bond credit risk charges are likely

to be changed by both U.S. regulators and credit rating agencies. Part of the shift of bond portfolios into BBB-rated bonds has been influenced not only by bond spread activity and bond issuance in different credit tiers, but also by the return on required risk capital for these assets.

Beyond the liquidity issues of alternative assets such as Schedule BA assets, the inherent volatility and high risk charges have deterred insurers from seeking too much yield from those areas. Instead, we have seen a credit migration of the industry's bond portfolio in the search for yield. In 2015, impairments on bonds increased compared to prior years, indicating credit losses have begun to rise in the bond portfolio. Some allocation outliers have been able to eke out extra yield through adding risks of various dimensions, but it seems that advantage may be waning.

Mary Pat Campbell, FSA, MAAA

Conning's New and Upcoming Releases

ANNUAL—Individual Life-Annuity Growth and Profit Leaders— Leading for the Long Term

Conning's study of successful life companies provides a high-level analysis of the three basic competitor segments making up the industry: large national competitors, mid-market companies, and small insurers. The study provides detail on the successful competitors within each of the size segments, analyzing performance metrics of the companies making up each group (size, growth, leverage, and profitability). The study concludes with a review of the characteristics of the successful insurers. *Released October 2016*

ANNUAL—Life Settlements, Secondary Annuities, and Structured Settlements— Rate Increases Squeeze Returns

This study provides Conning's market review of the life settlements and secondary annuity markets industry and associated transactions in 2015 and our forecast of the markets' development through 2025. It explores the key issues facing investors and participants in the life settlement market that emerged during the prior year. *Released October 2016*

ANNUAL—Life Insurance Industry Investments— Where Are the Return Levers?

Conning's annual in-depth analysis of life insurer assets and capital will look at how insurers are weathering the low interest rate environment and the strengthening economy. The study develops separate analyses of the portfolios of small and midsized insurers, with a detailed review of their bond portfolios, as that investment class is dominant, to look for insights into current strategy. *Released October 2016*

Record Profitability in Workers' Compensation— Strategies for Continued Success

In this study, Conning presents an overview of the current state of the workers' compensation market, which in 2015 delivered its most favorable underwriting results in decades. Informed by a survey of industry executives and peer analyses of workers' compensation insurer performance, the study separately reviews national multiline insurers, specialist workers' compensation insurers, regional insurers, and state funds. Further, the study identifies key success factors and future challenges for workers' compensation insurers. *Released August 2016*

Managing General Agents— Continued Growth, but at What Cost?

The managing general agent (MGA) market is one of the fastest growing segments, and MGAs underwrite a significant amount of insurance premium spread over a large number of participants. While they are known for writing an estimated \$40 billion in insurance program

Property-Casualty Forecast & Analysis by Line of Insurance— Third Quarter 2016

Available now, the third Quarter 2016 edition of Conning's widely utilized *Property-Casualty Forecast & Analysis by Line of Insurance* includes Conning's updated forecast of 2016 through 2018 performance with commentary by line of business. This edition of the *Forecast* includes updated analysis of data derived from insurer reports, government data, and the economic outlook. Investment yields and capital gains estimates incorporate projections from Conning's proprietary dynamic financial analysis of the industry. The *Forecast* includes an industry-wide analysis, as well as separate forecasts for and analysis of personal auto, homeowners, farmowners, crop, commercial auto, workers' compensation, commercial multiperil, general liability, medical professional liability, fire & allied lines, inland marine, nonproportional reinsurance, and all other lines. Key industry metrics are reported and forecast through 2018, along with analysis and explanation of assumptions.

Conning's *Property-Casualty Forecast & Analysis by Line of Insurance* is an indispensable tool for planning and budgeting.

business, they also write an array of specialty business that may be difficult for most insurance agents to reach. Conning's proprietary survey results also provide input from market participants. Conning looks at the changing role of MGAs over time and their influence in today's insurance market. *Released July 2016*

ANNUAL—Life-Annuity Distribution & Marketing Annual

Life-annuity insurers are operating in a dynamic, and often confusing, sales and marketing environment. To succeed, they need to benchmark their progress, not only against other insurers, but also against other financial industry sectors. In this study, Conning analyzes and presents best practices both in and out of the life insurance industry relative to consumer advertising, marketing, social media, and sales activities. All distribution channels are considered, along with multi-channel approaches. *Released July 2016*

ANNUAL—Personal Lines Consumer Markets Annual

Conning's annual review of key consumer and product segments in personal lines insurance is designed to keep insurers abreast of trends, activities, and growth opportunities. Conning analyzes consumer trends and their impact on insurer products and distribution activities. Demographic segments are analyzed over time to bring into focus the shifts in population and consumer preferences. Conning will also review how these changing consumer dynamics are impacting market segments such as high net worth, nonstandard auto, senior, young adult, Hispanic, and other ethnic segments. *Released June 2016*

Property-Casualty Reinsurance

Conning's study on the reinsurance market focuses on the changing buying patterns and use of reinsurance by cedants over the past decade. The analysis explores the changing reinsurer panel size of the top 50 cedants, as well as the changes in the proportion of ceded premium to gross premium. We also review the mix of authorized and unauthorized reinsurers and the types and levels of collateral. *Forthcoming*

Property-Casualty Small Business Insurance

The small business market is an area of intense interest to insurers due to the complex market dynamics and accelerating use of analytics and direct distribution. Every few years, Conning analyzes industry and NAICS data and surveys industry participants to develop its well-known study of the small business insurance market. Conning's study will size the market, industry segments, and participants. Trends in distribution and industry segments will be analyzed and presented, along with a discussion of the future of the market. *Forthcoming*



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