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INSURANCE OBSERVER

The Future of Insurance Underwriting

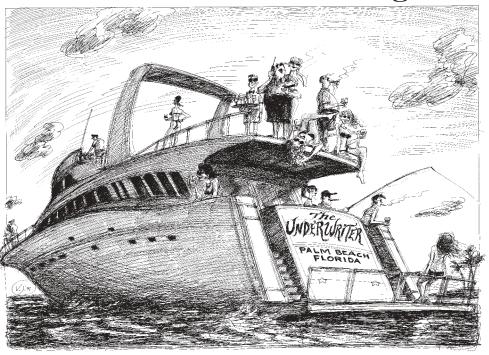
Baseball, Data Analysis

n theory, large auto-insurance companies should outperform small ones by a mile. Factors going in their favor include greater spread of risk, economies of scale, well-known brands, resources to attract the best employees, more money to spend on systems, and better data from which to derive more accurate pricing. Theory, of course, isn't reality. Despite their advantages, large insurers don't necessarily do better than their smaller, poorer competitors.

In Moneyball, Michael Lewis writes about baseball, money, and, in particular, the Oakland A's and its general manager, Billy Beane. The A's payroll is lower than all but four of the thirty major-league baseball teams, and less than one-third that of the New York Yankees. But, during the five years ending in 2003, the A's won-lost record was 479-330, roughly the same as the Yankees' 484-322. How, posited Lewis, was it possible to spend so little and do so well? Conversely, how come some teams spent so much yet did so poorly? "The answer begins with an obvious point," he writes. "In professional baseball it still matters less how much money you have than how well you spend it." (The same is true of the insurance business, which is why we're drawing a comparison between the two.)

Lewis's point is so obvious that it's easy to ignore. One might assume that in base-ball—a statistic-laden sport—it would be *obvious* how to spend money properly, and that, for example, the 2003 Mets' \$116 million payroll would *guarantee* better results than the A's \$56 million payroll. But it did-

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"Mr. Spitzer, I see no evidence of any wrongdoing."

n't. (The A's won ninety-six games in 2003 and the Mets won sixty-six.) Similarly, it would *seem* logical that the biggest auto-insurance companies would do much better than their smaller rivals.

One explanation for this phenomenon is that the subtleties of baseball and insurance cannot be seen by the naked eye; they are only visible through vigorous analyses of data and statistics. Certainly, it's impossible to see the difference between a .300 hitter and a .275 hitter (one hit every two weeks, as statistician Bill James has noted). Baseball and insurance have an unlimited number of statistics and possibilities, and how a team or company interprets these makes a significant difference over time. Probabilities, odds, and risk, must be assessed. For example, is it a better value for a team to pay \$5,000,000 per year for a .300 hitter or \$1,000,000 for a .275 hitter? How does one

value a walk versus a hit; a sacrifice bunt versus a possible hit; a good hitter who's a poor fielder versus an average hitter who's a good fielder?

The A's Billy Beane analyzed statistics and figures that others ignored, found value in "cheap" players who were overlooked by others, and produced a superior won-lost record on a shoestring budget. The A's won-lost record is not the result of chance. It's the result of a strategy that takes advantage of data and statistics.

"Everything that happens on a baseball field alters, often very subtly, a team's chances of scoring runs," writes Lewis. Small differences accumulate over time and make a large difference. *Moneyball* is about baseball analysts who deconstructed the game, viewed it quantitatively, and then put it back together in a better way.

Data analysis is even more important in personal auto insurance—the largest

single line of insurance, with about \$160 billion in premiums—than it is in baseball. Is it better, for example, to write an auto policy for a preferred-risk driver for a \$400 premium, or a high-risk driver for \$1,800? Should an insurer spend more to reduce its loss ratio or less to reduce its expense ratio? What mix of drivers and territories is most profitable? Will a high commission induce an agent or broker to "produce" more profitable business, or is it better to bypass agents and brokers and offer a lower premium with the money that's been saved on expenses? What effect does age, car, credit score, territory, and occupation have on drivers' premiums. Each of these questions lends itself to quantitative analysis.

uring the past century there have been several big trends in the auto-insurance business. (The first important trend was the widespread use of automobiles.) Initially, the business was dominated by insurance companies represented by independent agents. By the 1940s, rural mutuals using captive agents epitomized by State Farm—had become an important force. (State Farm became America's largest auto insurer in 1942.) If State Farm could be called a generalist (its target market is the average American), GEICO, USAA, and 20th Century are specialists. Their preferred-risk markets and low-cost structures (writing business directly, thereby eliminating agency costs), permitted them to offer lower prices and still earn excellent profit margins. They gained market share because they were delivering a commodity for less than others, and were low-cost producers.

Progressive was a different type of specialist: a counter-puncher. In 1956 it was one of the early players to enter the nonstandard auto-insurance market. The company's spectacular long-term success—it is, perhaps, the greatest insurance underwriter of the last forty years—isn't a matter of being in the right place at the right time. It simply understood the game and the numbers better than everyone else, and played better, as well. (Progressive has grown extremely rapidly while managing to achieve a remarkably low loss ratio.)

Underwriting is the heart of the autoinsurance business. While the importance of distribution, brand, expenses, claims handling, and agent relationships shouldn't be minimized, there's no sub-



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stitute for having the most accurate price for a risk, or class of risk.

The following essay, *Pricing Sophistication and Auto Insurance:* Survival of the Fittest, is by Brian Sullivan, whose ninety-minute speech electrified the audience at our 2003 conference. Brian knows more about the

auto-insurance market than anyone in the world, and he shares that knowledge weekly in the indispensable *Auto Insurance Report*, of which he is editor. (For more information about *Auto Insurance Report*, visit www.riskinformation.com.)

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Pricing Sophistication and Auto Insurance

Survival of the Fittest

by Brian Sullivan

Tarning: some people will think I'm overstating the argument that will follow. But even if it's only half right, it's reason enough for auto insurers to be deeply concerned. A small number of insurance companies have developed such superior skill at calculating accurate auto-insurance prices that they're able to outperform their competitors by a wide margin. Insurers that fail to match these companies' skills will find themselves faced with adverse selection, an inability to grow profitably or remain the same size profitably, and a poor ability to shrink their way to better profitability.

An excellent illustration of this market development was presented by Keith Toney, CEO of InsurQuote Inc., and Paul Mang, Associate Principal at McKinsey & Co., at Auto Insurance Report's national conference in Newport Beach, California in May. Toney and Mang's presentation was the result of a yearlong examination of auto-insurance pricing sophistication, and has established the framework around which pricing discussions will revolve for years to come. InsurQuote and McKinsey conducted a study of leading auto insurers in Illinois. They chose Illinois because it's a large state (population 12.6 million) with an open regulatory environment.

They found that for a sample risk, Nationwide generated one price, while Progressive—the company with the most sophisticated pricing—generated 131 different price points. Progressive's multiple prices were the result of a more expansive list of questions asked at the time of application and a more aggressive analysis of the relationships between rating characteristics.

This is merely one example of one risk in one state, and the 131:1 ratio is just an indicator. The ratio for other risks in other states could be 25:1 or 200:1. I'm not picking on Nationwide, and it's not alone; the narrow pricing models of many other insurers were exposed by the InsurQuote-McKinsey analysis (e.g., State Farm had one price point for the sample risk versus Progressive's seventy-six).

These statistics were generated from public information, and may fail to take into account unreported pricing-and-underwriting strategies, but even if the numbers are off by fifty percent—and they're

not—it wouldn't change my conclusions. Time and again in the Illinois study, across multiple risks and carriers, certain companies that have more sophisticated pricing models generated more specific price points than did their competitors with less sophisticated approaches.

My premise is simple: greater underwriting sophistication is a significant advantage. Progressive, the epitome of pricing sophistication, is growing much faster than other insurers, and is doing so with a much lower combined ratio than most companies. (From 1994 to 2003, Progressive's revenues grew at a 17% annual rate and its combined ratio averaged 93.7%.)

Other insurers that have greater sophistication are also performing well. Although InsurQuote and McKinsey have not formally concluded that pricing sophistication leads to increased profit, Auto Insurance Report's review of the evidence has convinced me of the high correlation between an insurer's level of pricing sophistication and its current growth and profitability.

There are leaders in the pricingsophistication game—and laggards. The pricing-sophistication gap isn't necessarily widening between the top and the bottom insurers. Instead, it's shifting among companies in the middle. Some insurers are moving towards increased sophistication while others are stalled by corporate culture, systems troubles, or because they deny that there's a need to change.

It's so difficult to build a sophisticated pricing system and takes so long to implement that today's leaders will have at least several years to profit from the laggards' weaknesses. Companies that are al-

tion still have opportunities, but aren't likely to profit to the extent that Progressive has.

Of course, price isn't everything. Brand and customer inertia are formidable factors, and both inure to the benefit of insurance companies that don't have sophisticated pricing skills. So does the lack of price transparency in the personal-auto market. (Few customers really know the lowest price available to them.)

ready moving towards greater sophistica-

uto-insurance buyers are "shopping" more than ever. When an insurance company with a quality brand offers lower prices, it now has a better chance of gaining new business than in the past. If the lower prices are the result of more accurate pricing skills, the new business is likely be profitable. (The companies on the losing end of this equation are losing particularly profitable business.) Ultimately, more accurate pricing is more important that a quality brand.

Progressive can grow rapidly and produce an excellent loss ratio even though its brand is only modestly useful. State Farm, the largest auto insurer, is clearly one of the pricing laggards. It recently lost billions of dollars when it tried to grow market share with a low price-even though it has one of the two best brands in the business. (Over time, companies with most accurate pricing may end up with the best brands.)

Allstate, the other big brand, has a much better pricing model than State Farm (but not as good as Progressive's). Allstate's pricing has produced excellent profits, but little growth. The company is now confident enough in its "standard" and "preferred" auto-pricing skills and will become more aggressive. (Allstate's nonstandard auto skills are not up to the same level, and the company continues to retreat there).

SAVE THIS DATE THE ANNUAL

INSURANCE CONFERENCE

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The Key to Pricing

After examining numerous pricing plans, InsurQuote's Toney and McKinsey's Mang identified four key pricing characteristics: granularity, dispersion, interactions, and variables. (These may sound complex, but aren't beyond the reach of anyone capable of understanding baseball statistics.) Let's look at each characteristic. continued

Granularity

Granularity is the number of pricing "cells" an insurer generates based on the data it gathers to underwrite a risk. Age, for example, would be four cells if drivers are placed in broad ranges such as 16-25, 26-40, 41-60, and 61 and up. But age would be seventy cells if each year from 16 to 85 is considered individually. If it can be calculated that each year has a distinct risk characteristic, then a pricing model that analyzes age by year—rather than range—would generate a price that's more closely correlated with risk than a model that analyzes age by range.

The same idea of granularity applies to how a pricing model slices up territories, vehicles, occupation, annual mileage driven, and education. The more variables



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an insurance company uses, the more pricing cells it will have. If it's able to find correlations among these variables, it will have even more cells. Greater granularity increases a company's ability to adjust and adapt pricing as it learns more about the relative importance of variables and their relationships to each other. If the correlation between age and credit is such that credit is more important for middle-aged drivers than young or old drivers, that would result in more cells than if credit is given the same weight for all age groups.

While InsurQuote and McKinsey were working on their study of pricing sophistication, they shared some of their findings with Auto Insurance Report. At first I assumed that greater granularity assured more sophisticated pricing. Toney and Mang explained why this is not necessarily correct. Their analysis found that even though some insurance companies have a large number of pricing cells, the cells tend to lead to similar price points. For example, a company may have thousands of cells, but only a handful of price points. Within a logical price range for a preferred risk of, say, \$250 to \$2,000, what is the need for tens of thousands of cells? After all, there are only a few hundred prices within that range that are different enough to matter. Here's the answer: the existence of a large number of cells indicates the potential effectiveness of a pricing model because it is the foundation of any insurance company's ability to develop accurate prices.

The InsurQuote-McKinsey study found that in Illinois the variations of insurance companies' granularity were huge. Progressive, which has more than one billion pricing cells, was the clear leader in granularity. The Hartford was in second place, with about one-hundred million cells. State Farm was at the other end of the spectrum, with about one-million cells. Most insurers in Illinois were closer to State Farm than to Hartford. (Progressive was off the charts.) Bear in mind that these results are from one state at one particular time. Also, some companies that fared poorly in Illinois may have more sophisticated pricing models in other states.

Dispersion

The second characteristic of sophisticated pricing is *dispersion*. Dispersion is the range of premium that an insurance com-

pany generates from its cells. A company with low dispersion may have auto-insurance premiums ranging from \$400 to \$600. A more sophisticated analysis of the same risks might result in a \$250-to-\$750 range.

A company may have high granularity, but if its dispersion is low it isn't bringing more accurate prices to the marketplace. At first I assumed that high granularity and low dispersion meant than an insurer wasn't too sharp. Why build a fancy model and then fail to use it? Toney and Mang explained that when a company transitions from a simple pricing model to a more sophisticated model, it would be risky to roll out the new prices immediately. It could disrupt an entire book of business, costing a company a significant number of customers and agents. The assumptions and premiums in a new pricing model must be tested before they can be relied on. (More than one business has been undone by overconfidence in numbers generated by computer programs.) It's a good bet that a new pricing model won't be accurate from the start. The companies with the most sophisticated pricing share a common characteristic: they're constantly changing as they learn from mistakes and think up new ideas to test. The least sophisticated companies are static. They fail to respond to changes in the market and changes made by competitors.

To illustrate some points about granularity and dispersion, let's look at a hypothetical example of insurance-company pricing:

iver A	Driver B
25	45
good	mediocre
good	speeding
single	married
ngerous	safe
\$500	\$500
	good good single ngerous

Driver A is twenty-five, has good credit, a good driving record, is single, and owns a dangerous vehicle. Weighing these factors, the insurer arrives at a price of \$500. Driver B is forty-five, has mediocre credit, one speeding ticket, is married, and owns a safe vehicle. Weighing these factors, the insurer arrives at a price of \$500.

The fact that an insurer may have the same price for disparate risks is less important than its ability to reach that price

skillfully. In the example above, it appears that the insurance company believes that Drivers A and B present the same risk. Over time, an insurance company that has considerable granularity should be able to fine tune its pricing. It may discover that age is more important than it thought it was and give a greater risk weighting to Driver A's youth and a lower risk weighting to Driver B's middle-age. Driver A's premium might rise to \$550 and Driver B's might decline to \$450. In this example, the granularity is essential for the dispersion to take place.

Although an insurance company's pricing model might calculate \$550 for Driver A and \$450 for Driver B, the company might keep both drivers' premiums at \$500 for a while. Market forces might dictate this behavior, or, perhaps, the company might decide to make a gradual transition to more accurate pricing for renewal business. (Essentially, the insurer would be betting that the \$50 mispricing on each risk would not be great enough to expose it to adverse selection from companies with equally sophisticated—or more sophisticated—pricing models.)

Before it focuses on risks like Drivers A and B, an insurer might decide to change the more extreme edges of its pricing. It might raise prices for high-risk customers who are "undercharged" and reduce prices for low-risk customers who are "overcharged."

A mature pricing model has high granularity. It often has wide dispersion. An insurance company can use its data and knowledge to offer lower prices to lure the lowest-risk drivers away from competitors, robbing them of their most profitable customers. The smart company also establishes prices that are high enough to encourage the highest-risk drivers to move (or stay with a competitor), thereby punishing competitors that lack the pricing sophistication.

As less sophisticated insurance companies retain more underpriced customers, their loss ratio rises. In order to survive, they may raise prices. This, however, creates a new class of customers who are paying too much, many of whom will be exposed to the lower prices of more sophisticated companies. Toney and Mang have called this "the mispricing cycle," and it will continue until the unsophisticated insurance companies improve or go out of business.

Interaction Among Variables

The third characteristic of sophisticated pricing is the analysis of the *interaction among variables*. Each variable has a certain importance. The interaction of variables, however, creates an exponential increase in granularity. Age, credit scores, and territory are all important variables. They are especially important when used with each other.

A vehicle's "symbol" (the relative risk of one vehicle versus another), is a measure of risk. While it may be useful to consider a vehicle's symbol in an entire state, it is far more powerful to consider the vehicle's symbol by territories within a state. A pickup truck, for example, is probably a work vehicle in downstate Illinois, but it may be more of a sports car in a wealthy suburb. Small imported sedans are less likely to be stolen in the suburbs than in the city.

Granularity and dispersion were difficult to quantify in the past. But InsurQuote was able to use its modeling capabilities and analytical software to generate a significant amount of new data for measurement. It entered all Illinois-filed rate plans and formulas into its system, then used a random risk generator to create 800,000 different "people" who fit the demographic and geographic profile of Illinois. It then ran these risks against the insurance companies' rating formulas to generate quotes.

Some data didn't lend itself to computer analysis. Interactions are difficult to quantify and require a human eye to look for differences in filed rate plans. It is possible to review two rating plans and see that one is more sophisticated than the other. (InsurQuote and McKinsey did that in their work in Illinois.)

New Variables

The fourth characteristic of sophisticated pricing is the implementation of *new variables*. To be at the leading edge of pricing sophistication, an insurance company cannot merely identify new interactions among established rating factors, it must also identify new variables. Although relatively rarely used, education and occupation are examples of leading-edge variables identified by InsurQuote and McKinsey.

Here are two more examples: 1) At least one company is asking applicants for bodily injury limits on their existing poli-

cies. If a customer is looking to move from minimum limits to much higher limits, that might say something interesting about that customer; and 2) Companies have always looked at the repair and theft-replacement cost of different vehicles. (These are known as "physical damage symbols.") Now, a handful of insurance companies are looking at the relationship between liability claims and the car an insured was driving. This "liability symbol" is proving to be predictive.

The search for new variables—and variations on old variables—is the insurance business's search for the Holy Grail. It would be rash to say that there will *never* be another variable as powerful as credit scoring, but there's nothing on the horizon that has a chance of having that kind of impact.

Winning at the insurance-pricing game requires constant revision and testing. Perhaps "occupation" and "education" will have limited use. Maybe they will be too difficult to group together and verify in an independent-agent environment. But insurance companies must find competitive advantages through more sophisticated analyses. Many of these advantages will be small. For example, suppose that most occupations are not predictive, but it turns out that bartenders are worse- than-average risks and engineers are better-than-average risks. Those data points are useful by themselves. But, depending upon interactions, they may be extremely useful. Perhaps young bartenders are average drivers, and older bartenders are poor drivers. Perhaps female engineers are fabulously analytical in their driving behavior, but male engineers overreact to their perceived nerd status and have a psychological compulsion that leads them to drive with a heavy foot. (I'm making this up for illustration, so please—no nasty notes from the engineers' defense society.)

The testing of assumptions and new ideas are critical components of the underwriting-sophistication process. Sadly, many insurance companies are illequipped for this. They are limited by their computer systems and, more importantly, by their corporate cultures. Someone who actually comes up with a new idea is rare indeed at most insurance companies. Carrying that idea to implementation is even rarer. The careers of those who generate and champion new

ideas are tied to the success or failure of these new ventures. As a result, those who propose change fight to the death to protect it, even when signs show that it is failing.

At the most innovative insurer, Progressive, things are different. It isn't a career-ender to have been the proponent of a failed idea as long as it was rational and executed with skill. "Smart" failures are considered learning experiences building blocks for future revisions and new ideas that may be successful. At Progressive, those who propose a new idea are often the first to speak up if it isn't working. This isn't unusual in business but it is unusual in the insurance business. In the pharmaceutical business, for example, failure is part of the discovery process. Direct-response marketers are constantly testing. Some tests succeed and some fail, but a company that's unwilling to experience failures is not likely to be successful. Learning from failures and responding to changing markets are essential for success.

Few Skilled Executives

It would be easier for insurance companies to build sophisticated personal-auto insurance-pricing models if they could hire experienced executives who knew how to do this. Alas, all of the experienced executives could probably fit into a minivan. Furthermore, they're employed by the small number of companies that have begun the task of building a sophisticated system. If these companies are wise, they'll make sure that these people are paid well.

Hiring one of these executives is difficult. For insurers with entrenched cultural and technical problems, it is, perhaps, impossible. Almost as difficult is identifying and hiring one of these executives' key associates—one who's ready to take on a project of his own. As a result, most insurers will have to do what the current pricing leaders have done: struggle, fail, and figure it out on their own, grabbing for whatever information and outside resources they can find.

aving a competitive pricing model has always been important, and McKinsey's research on consumer buying behavior has determined that it has become increasingly important in recent years. A study released at

the *Auto Insurance Report* national conference found that the percentage of consumers who shopped their insurance had grown from 36% in 1996 to 53% in 2003, putting about \$25 billion of premium in play each year. (Remember, personal auto is a \$160 billion market.)

Thus, there are two powerful forces at work in the market that will accelerate the risks of being on the wrong side of the price sophistication battle: 1) More consumers are shopping each year, which means that more consumers are likely to be exposed to insurers that have sophisticated pricing, and 2) more insurers are attempting to create sophisticated pricing models.

As more insurers move forward, the market will eventually reach a "tipping point" where there will be a critical mass of accurate prices. Despite the inefficiencies of the auto-insurance market, a large number of shoppers will find more accurate prices, thereby speeding up the mispricing cycle and increasing the pain for insurers that haven't caught up to the middle of the pricing-skill pack.

And so it has come to this: Progressive is all alone at the top, armed with the most potent pricing model. Due to this competitive advantage, the company is growing rapidly and profitably. Most insurers have made little progress at catching up to Progressive. They're struggling to find growth and profit, and clinging to market inertia and inefficiency. Among the largest insurers, State Farm, Farmers, Nationwide, and American Family fall into the category of insurers that don't have sophisticated pricing. They are joined by the vast majority of small insurers. There are a number of insurers in the middle that are rapidly achieving a significant advantage over those that have done little. These include Hartford, Allstate, Safeco. Travelers, MetLife, and 21st Century.

The big game is not catching Progressive. It has a competitive advantage that will last for many years. Instead, the game is to avoid being in the bottom tier of pricing sophistication. Companies in that position will lose their best risks and suffer from adverse selection in the mispricing death cycle.

Thanks to the power of brand, the inefficiency of the market, and the inertia of auto-insurance customers, this cycle will be somewhat slow and muted. But given the inevitability of the move to pricing sophistication, no auto insurer can afford to ignore this trend.

A final, important point: there are public policy issues related to underwriting sophistication. The public is *still* struggling to accept the use of territory in pricing. Credit scoring is an ongoing battle. Insurers may be bad at pricing sophistication, but they're even worse at explaining themselves to consumers. At every single step of this evolution, insurance companies must think about the public impact of pricing changes with the same vigor that they consider the virtues of competitive advantage.

The new tools are powerful, and they must be handled with great care.

