Insurance Rating Variables: What They Are and Why They Matter

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It sounds simple: an insurance premium is how much it costs to provide insurance coverage. But figuring out what that cost should be is actually quite complicated — so complicated that insurance companies employ entire actuarial departments to do just that.

A lot goes into how actuaries determine the cost of risk, and **rating variables** are a crucial component in that process. Rating variables are basically the characteristics of individual policyholders that can help approximate the cost of their risks. Insurance companies have been using rating variables to help set rates (and thereby price their policies) for decades. However, the use of some rating variables has recently generated discussion within the United States. Some states have even passed legislation controlling the use of certain variables, such as gender.

This report is being produced as an educative statement jointly by the Casualty Actuarial Society (CAS) and the Insurance Information Institute (I.I.I.) to help legislators, policymakers, the media and the public to understand:

- How rating variables work;
- How they are regulated; and
- Why they are indispensable to keeping insurance prices fair and affordable.

Why rating variables?

When we say that an insurance premium is the price of an insurance policy, what we really mean is that the premium is the estimated *cost of a risk*.

In insurance-speak, this cost is called a **rate** and is the amount of money needed to cover expected losses and the insurance company's expenses, as well as to provide the insurer with a reasonable profit. Rates are developed in close cooperation with regulators.

Calculating expenses and profit is fairly straightforward. Where things get complicated is measuring the money needed to cover losses. This is complex because each policyholder is unique — and therefore has a unique potential for accidents. Theoretically, an insurance company would have to calculate the individual risk of each policyholder to determine how much their rate should be. Unfortunately, this is infeasible when companies are evaluating the risks of thousands of policyholders.

That's why actuaries will use rating variables, which are characteristics that have been shown through rigorous analysis to correlate with the likelihood of making a claim. For example, in auto insurance typical rating variables include driver age, gender, and accident history as well as the model year of the vehicle being driven. These variables have been proven to correlate with how likely a person is to be involved in an accident and the expected costs and can therefore be used to help price that person's risk.

In other words, even though an actuary may not know the *exact* risk profile of an individual, rating variables create a very good picture of what that person's risk *probably* looks like. All of these variables combined allow actuaries to group policyholders with similar risks together to help determine the most accurate premium.

Using rating variables has enabled insurance companies to charge premiums more accurately, and, in turn, to become better able to offer insurance to more consumers.

The increased use of rating variables (and more accurate grouping of policyholders) has led to a large reduction in the number of consumers being forced to buy insurance through an "assigned risk pool." Often state-supported, these funds offer insurance to people who are considered too high-risk to buy insurance in the voluntary market. Premiums are often high in these pools, and the actual coverages can be less generous. Using rating variables has enabled insurance companies to charge premiums more accurately, and, in turn, insurance companies have become better able to offer insurance to more consumers, including high-risk ones. In 2002, assigned risk pools insured 827,000 consumers in the 45 states that provided data to assigned-risk manager AIPSO. According to AIPSO, by 2017 that number decreased to only 88,000 consumers — a reduction of almost 90 percent.[i]

Statistical criteria for effective rating variables[ii]

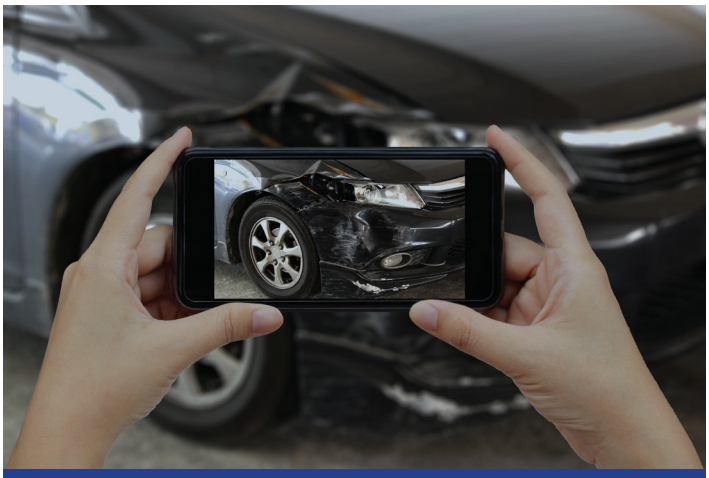
Not every potential variable will be effective at determining how much policyholders should pay for their insurance. Actuaries are very careful to make sure that each variable is effective and meets a wide range of criteria.

Most important, a variable should be **statistically significant**, which means that the variable needs to indicate a substantial difference in what it will cost to insure various groups of people. For instance, actuaries have determined that drivers with a history of prior collisions or driving violations demonstrate a higher probability of being involved in future accidents. This higher probability is statistically significant and the reason why a driver with a poor record will usually pay a higher auto insurance premium.

Data should be as **homogeneous** as possible, meaning that the members of a certain group have very similar characteristics. It does not make sense to group people with poor driving records who drive Mustangs together with people with excellent driving records who drive compact cars. Those two groups are very different and would be kept separate.

This data should also be **credible**, meaning that a particular group needs to be large and stable enough so that an accurate cost estimate can be developed. For example, until more people start driving it, a new compact car model will have very little data on it. To make up for this data deficit, an actuary will often use the data from a similar vehicle from the same manufacturer (say, last year's model) to help set the rate for the new model.

An effective rating variable will be **objective and verifiable, as well as inexpensive to administer**. If a variable is prohibitively expensive to administer and verify, then its costs may outweigh the benefits it offers for better pricing. As an example, knowing the exact skill level of a driver would be a very useful rating variable in auto insurance. However, exactly determining one person's driving skills is difficult and subjective — and far too costly when pricing risks for many thousands of people. Instead, actuaries will use proxies for skill level that *are* objective, such as age or years of driving experience, which have been shown to substitute well for someone's actual driving skill. And because age and experience are also easy and relatively inexpensive to determine, they make for effective rating variables for auto insurance.



Actuaries have determined that drivers with a history of prior accidents or driving violations demonstrate a higher probability of being involved in future accidents.

It is worth noting here, though, that this is changing with widespread adoption of telematics. Telematics data is collected from devices in cars that relay information about how, when and where a car is being driven. This data make it feasible to objectively determine someone's driving skills. As the cost of collecting telematics data continues to decline, actuaries are moving away from proxies for these kinds of variables. A rating variable's shelf-life is only as long as its effectiveness for pricing risks.

Regulator and consumer criteria for rating variables

When actuaries consider using a rating variable, they also take into account what regulators and insurance consumers want.

Regulators and consumers want insurance to be **affordable**. This is especially true when insurance is required by law ("proof of financial responsibility" for vehicle owners) or by third parties (homeowners insurance required by mortgage lenders). Unfortunately, some groups of insureds can have very high risks. Using certain rating variables (mileage in auto insurance) and discounts for hazard reducers (smoke detectors in homeowners insurance) can help insureds manage the affordability of the insurance coverage.

Regulators and consumers also often want to see a rating variable exhibit **clear relationships**, that is, they want rating variables to have an obvious impact on expected losses. For example, taking a certified driver's education course will likely result in better driving behavior and fewer accidents. So, using driver's education courses as a rating variable makes intuitive sense to regulators and consumers — especially if the variable results in a discounted premium.

On a related note, many regulators and consumers tend to prefer variables that are within the **control** of the policyholder. For example, drivers can control their driving behaviors. Safe behaviors can help drivers reduce their auto premiums by making themselves a better risk. There is an intuitive sense of fairness in rating drivers based on things they can improve. Of course, insureds cannot control for other variables, like age

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— using these variables may be perceived as undesirable to regulators and consumers. But as noted earlier, better data could eliminate the need for possibly undesirable proxies. Better data means a greater ability to determine a person's *exact* risk profile. Telematics data, for example, could provide actuaries with a driver's actual driving history, which would eliminate the need to rely on other proxies that may not be in the control of the insured.

How rating variables are regulated

Actuaries cannot just use whatever rating variables they want. Variables first need to be developed using thorough statistical analysis, but they are also subject to regulation. Within the U.S., insurance products are regulated at the state level, but certain federal regulations also apply.

Many states have regulations specifically governing rates. Rates cannot be too high or too low, and **they can't unfairly differentiate between two policyholders**. Some states require them to be actuarially sound, which means that an actuary must certify that the rates are in compliance with state laws. Rating variables need to be filed with individual state insurance regulators and reviewed. State and federal laws prohibit using rating variables that directly or indirectly impact groups based on characteristics such as race, nationality, religion, or income. Almost every state in the U.S. has the regulatory authority to reject a rating variable that it determines does not meet state requirements.

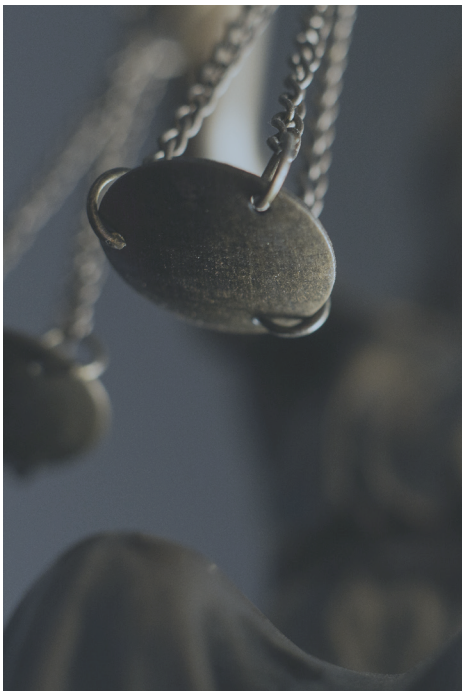
Restrictions on rating variables

Recently, regulators in a few states have begun restricting some rating variables. These restrictions could have unintended consequences, in particular for rating variables that can accurately reflect expected cost differences among policyholders.

If one rating variable is restricted, **the use of other rating variables as proxies could increase or decrease**. For example, if gender is restricted and is statistically applicable, other rating variables that can serve as proxies for gender may become more common. Consider this scenario: Imagine that male drivers have higher accident costs and are more likely to drive pickup trucks. If gender is restricted, then the proxy rating variable for gender could become pickup trucks. In this situation, rates for pickup trucks may increase, while rates for other types of vehicles may decrease. It is important to note that rate regulations still apply to the use of proxies. That means that proxies cannot directly or indirectly impact groups based on certain characteristics, such as race.

Using other rating variables may also result in **lower-risk policyholders effectively subsidizing higher-risk policyholders**. Male drivers might cost more to insure than female drivers, but if gender as a rating variable is restricted, then female drivers will overpay for insurance and male drivers will underpay, relative to their expected costs. **Restricting rating variables therefore impacts the insurance consumer much more than it does insurance companies.** The companies will still set overall premium levels that meet corporate objectives, regardless of rating variable restrictions. To meet these levels, low-risk policyholders will need to subsidize high-risk policyholders to compensate for the inaccurate premium. The premium will be paid to the insurance company regardless – but who pays how much will change.

Even worse, insurance companies may decide to be much more restrictive about accepting insurance applications from policyholders who might cause them to lose money. Say that gender is restricted as a variable. Because they will have to undercharge male drivers relative to their cost, insurance companies would know that they are likely to lose money on male drivers. This could cause the companies to restrict outright the number of male drivers that they will cover. Higher-risk drivers could be pushed back into the assigned risk pools, where these drivers will face higher premiums than they otherwise might have – and might have less coverage. Overall insurance availability could then actually decrease.



Conclusion

Insurance companies use rating variables to develop insurance premiums that can better reflect the risks that policyholders pose. Actuaries rigorously study rating variables for their effectiveness and impact on the societal goal of keeping insurance available and affordable. The widespread use of rating variables has given consumers more choice and more fairness in the insurance marketplace. This ability to set accurate prices is a cornerstone to setting actuarially sound premiums that are not excessive or inadequate or unfairly discriminatory.

Endnotes

i Exposure data supplied by Tim Messier (AIPSO), e-mail message to Ken Williams (Casualty Actuarial Society), June 2019. States excluded: Hawaii, Maryland, Massachusetts, North Carolina and Texas.

ii Geoff Werner and Claudine Modlin, Basic Ratemaking (Arlington, Virginia: Casualty Actuarial Society, fifth edition, May 2016), Chapter 9.

About the Casualty Actuarial Society

The Casualty Actuarial Society (CAS) is a leading international organization for credentialing and professional education. Founded in 1914, the CAS is the world's only actuarial organization focused exclusively on property and casualty risks and serves over 8,500 members worldwide. Professionals educated by the CAS empower business and government to make well-informed strategic, financial and operational decisions. Learn more at casact.org.

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