Notes on Risk Classification – Cost vs. Efficiency. Practical considerations for the U.S. P&C Market.

Abstract:

Traditional rating factors such as age, gender, and marital status are by and large free information. New rating criteria being introduced are, and will likely continue to be more similar to the industry's use of credit scoring – that is, large amounts of data being aggregated and sold to insurance companies for their consumption. Competitive pressures will compel insurers to utilize costly data at inefficient levels that will increase overall consumer costs, and given the explosion of data in the marketplace we must carefully re-evaluate traditional efficiency based arguments for risk classification.

1. Summary

Traditional rating factors such as age, gender, and marital status are by and large free information. New rating criteria being introduced are, and will likely continue to be more similar to the industry's use of credit scoring – that is, large amounts of data being aggregated and sold to insurance companies for their consumption. Competitive pressures will compel insurers to utilize costly data at levels that will increase overall consumer costs, and given the explosion of costly data in the marketplace we must carefully re-evaluate traditional efficiency based arguments for risk classification.

The most obvious example of this, the use of credit-based rating in auto insurance, can be laid out as follows:

1) Its use has become nearly universal in ratemaking, suggesting that while it is a competitive necessity, it no longer offers companies adopting it any particular advantage.
2) Its use adds a material cost to insurance companies, both in terms of purchasing data from credit-bureaus and from complying with regulations around the handling of consumer credit information.
3) Few would argue that its use has any impact on consumers driving behavior or insurance purchasing decisions (i.e. a ban on its use would have no impact on the frequency or severity of auto claims in the U.S. market as a whole)

Taking these three points together, the conclusion is that the use of credit-based insurance adds cost to insurance companies **and** consumers and adds no efficiency to the market. The only net-winners in this scenario are the credit-rating agencies aggregating and selling consumer credit data.

2. Background

Over the past 50 years much research has been done on the interplay between risk classification and adverse selection. The vast majority of this work is built off of the influential work of Rosthchild and Stiglitz (1976) which laid the groundwork for the understanding of how risk classification promotes the efficient utilization of insurance. Since the mid 90's much focus has turned to the effort of demonstrating the effect of adverse selection in actual markets, and to date the results have been quite mixed. Particularly, in the area of auto insurance, which will be part of the focus of this paper, there has been little evidence of adverse selection. Cohen (Cohen 2001) did provide evidence of adverse selection in an Israeli insurance market. However, his results are not readily generalized as they arose from mechanisms particular to that market at the time of the paper. Indeed, Cohen's work is useful, because when laid beside other's work where adverse selection cannot be shown[1] it demonstrates empirically that the ways in which consumer behaviors interact with risk classification systems is particular to those systems and cannot be generalized.

A key assumption in Rosthchild's finding that limits on risk classification lead to sub-optimal market efficiency is that of information asymmetry – that the consumer has information about their own riskiness that the insurer does not have access to and which they can use to their advantage. In practice, where this type of information asymmetry might arise is situationally dependent and is much more plausible in some types of insurance than others. The characteristics of environments in which one can expect to find evidence of adverse selection are straightforward:

1) Insureds must know more about their own risk of loss than insurance companies do. And,
2) There must exist low enough friction such that insured's are able and willing to alter purchasing decisions based on their information advantage.

3. Market distinctions – Life & Heath vs. Property & Casualty

In the case of health insurance a consumer is constantly receiving objective feedback about their own health status that an insurer is not privy to. This information can range from the results of an MRI, a positive pregnancy test, or an achy feeling in the consumers back. Similar types of feedback are, arguably, relevant to life insurance as well, given the strong link between health and mortality. Consider, however, what type of regular feedback an auto insurance consumer receives about their own riskiness. One might presume that feedback comes in the form of actual driving experience. However, they psychology of thinking oneself a good or bad driver is fairly complicated: if the only real feedback one is receiving is whether or not they crash, then by driving fast in a blizzard and not crashing, a driver might reasonably characterize themselves as a better than average driver. McCormick, Walkey and Green (1986) demonstrate empirically that the vast majority of people consider themselves better than average drivers. Even in the case of drivers with a poor driving record, because actual events are so infrequent, they are easily ascribed to chance and the degree to which drivers ascribe accidents to their own driving ability may be quite limited. The complex and

[1] See Chiappori and Salanié (2000).

fortuitous nature of automobile accidents (and indeed P&C claims, in general) makes it such that an average consumer likely has little information about their own or others riskiness, and what perceptions they do have are biased. While it may not have been the case in 1976, in the United States today even in states with the most restrictive rules on risk classification, it would be hard to find anyone in the insurance industry that would suggest information asymmetry falls in favor of the consumer[2].

4. Adverse Selection: Consumer vs. Company or Company vs. Company?

The term 'adverse selection' as it is commonly used within the P&C insurance industry rarely describes a situation of information asymmetry between consumer and company. Rather, it is almost always used to describe information asymmetry being exploited by some insurance companies to gain advantage over other insurance companies. And this characterizes what actually motivates the vast majority of risk classification pricing plans. This may be explained by the structural safeguards that exist guarding against consumer advantaged information asymmetry – information sharing between insurers about prior losses, coverages designed to motivate insured's to "reveal" their risk type[3], and restrictions on coverage where no pricing segmentation is available. Further, market friction arises in the form of the time and effort required to acquire insurance and the fact that agents are intermediating purchasing decisions. In practice, most auto or home insurance customers are dictated by an agent or website what their coverage should be. Very few are making informed or judicious decisions on the matter. Finally, mandatory purchase requirements as well as requirements imposed by lenders severely reduce any elasticity in demand that 'informed' customers might otherwise exercise.

While research has indicated that the presence of adverse selection is particular to the characteristics of a given market (see Cohen 2009), this is not particularly useful to a regulator who is tasked with making actual decisions about restrictions or lack thereof on risk classification. After all, a U.S. regulator is never tasked with deciding cart-blanche whether risk-classification is benefiting their constituents. Rather, they are normally assessing the use of a particular rating variable and trying to discern its impact on the market. With this in mind, we are better served exploring how unique rating factors impact the market in terms of efficiency and cost.

5. Rating Variable Interactivity

Let us define a working definition – that of an **interactive rating variable**.

Definition: Interactive Rating Variable (IRV) – A rating variable which interacts with aspects of the insurance system beyond pricing and market efficiency.

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[2] See Villeneuve (2005) for an analysis of markets in which this is the case.

[3] An example of when this might be used would be in the context of a particular coverage likely to attract a riskier subset of insureds. For example, sump-pump failure coverage will disproportionately attract insureds that are likely to have water problems in their basements.

In order to clarify this definition, consider the use of prior accidents as a rating variable in auto insurance. In addition to influencing pricing, the use of this rating variable interacts directly with the insured by incentivizing better driving. Quantifying the precise extent of this interaction is no trivial task, but the relationship is clear: if the insured drives carefully, they will pay less for insurance. Thus, this variable is said to have a loss cost interaction. In general, the introduction of a **loss cost IRV** will reduce the overall societal cost of risk by reducing the overall frequency or severity of claims. UBI is perhaps the most recent example of a new loss cost IRV that has impacted the market. While rating variables that have an interaction with moral hazard[4] certainly fall into this category, the definition is more general. Take, for example, a discount given for the installation of a fire alarm. In this instance the insured has the same amount of 'skin in the game' whether they install an alarm or not. However, the rating is structured in a way that incentivizes the insured to take on risk reducing behaviors. It is possible that an insured had foregone the installation of a fire alarm because they carry insurance, and the introduction of the rating variable reduces this moral hazard, but whether or not this is the case, we define it as a **loss cost IRV**.

While possibly not all inclusive, three primary classes of IRV's will be discussed:

1) Loss Cost
2) Expense
3) Market Friction

An **expense IRV** is a variable whose use in some way makes an insurance company more cost effective. An example of this might be the introduction of a multivariate rating plan in place of a legacy tiering system that requires heavy UW involvement.

A **market friction IRV** is a variable whose utilization increases the availability of insurance and decreases the societal burden of un-insured losses. The most obvious example of this is territorial pricing. The availability issues associated with restrictions in territorial pricing have been well documented in actuarial literature. While some discussion on this topic has been in the context of introducing an information asymmetry between customer and insurance company (i.e. urban risks will purchase more insurance and rural risks less insurance than is efficient.), the observable problems caused by these types of restrictions have nothing to do with this phenomenon. Rather, they are caused by how insurance companies compete with one another. Because geography is always observable to an insurance company, even when its use in rating is restricted, firms have strong incentive to use this information to produce marketing and distribution plans that will ensure they write fewer policies in high risk areas. While regulators can require a firm to "take all comers", it is much more difficult to require them to advertise and appoint agencies in particular areas. Thus, when unable to compete on price, companies compete by making their product scarce in high risk areas. This distinction is important – traditional efficiency based arguments would have it that territorial restrictions cause sub-optimal outcomes because of customer purchasing decisions. The reality, though, is that the friction is caused almost entirely by company behavior. Because of the outsize impact that insurance company advertising and distribution plans can have on the availability of insurance, a market friction IRV can be thought of as any variable that a company can

[4] A deductible factor, for example.

easily observe in a population and use to alter its marketing strategy[5]. Territorial rating is, seemingly, the most problematic as insurance companies rationally address limitations by reducing or eliminating distribution in high cost areas. Changes in advertising strategy likely have a less significant impact on availability.

6. Regulatory Concerns: Efficiency, Equity, and Cost

When examining the economic impact of any particular rating factor, the policy concerns have been well laid out:

1) **Efficiency Impact:** In the line of Rosthchild & Stiglitz, does the use of a particular rating factor reduce information asymmetry in a way such that companies/customers respond by offering/accepting more optimal pricing and coverage.
2) **Equity Impact:** What impact does the use of a particular rating variable have on inequality? In the classic RS model, which assumes ex-ante income equality, restrictions will cause high risk individuals to get a "good deal" in a pooling equilibrium and low risk individuals a "bad deal", thus reducing inequality. As a practical matter, the equity impact of restrictions are likely much more favorable than suggested by this simple model[6].
3) **Cost Impact:** What is the cost to acquire and utilize the data required for the rating factor? The implications of costly sorting have been explored by Crocker & Snow (1986) and Borenstein (1989). An insurer will have economic incentive to implement a new pricing variable as long as the cost of implementing the variable is less than the loss cost differences it is able to detect amongst insureds. This is because they can offer a more favorable price to a low risk group while not concerning themselves with the additional cost to the high risk group. 30 years ago, the notion of costly sorting was largely academic and used to create a framework around the idea of policies such as dis-allowing HIV testing for life insurance. Particularly in P&C insurance, it was not considered as a practical concern. However, advances in data acquisition and the ability of companies to monetize data require us to carefully understand the efficiency/cost trade-off present in a given rating structure.

The over-riding regulatory concerns with trends in P&C insurance pricing should be two-fold:

i) As new rating variables become more esoteric and less clearly linked to actual insured risk taking behavior, what efficiency is being added to the market? Given that to date no research has been able to demonstrate any widespread examples of adverse selection in the U.S. home and auto market, it is probable that additional risk classification is only increasing the information asymmetry that is already heavily in favor of insurance companies. Additionally, regulators must assess to what degree

[5] Consider geography, age, gender, etc. For example, in a scenario where restrictions based on gender are in place, one might envision a marketing strategy geared towards women to capture lower cost insureds.

[6] By considering the correlation between income, urban/suburban location, and credit score (the latter two of which are used almost universally in rating plans) the reason why this is so becomes obvious.

rating variables are interactive. How might they directly reduce the societal cost of risk?

ii) As returns on market efficiency have diminished, the amount of money and resources that insurance companies put into data acquisition and analysis is growing at an unprecedented pace. To the extent that this investment is in risk classification that has no efficiency or risk reduction benefits it is wasted from a societal standpoint. Regulators have historically been unconcerned with data acquisition costs and have incorrectly[7] assumed that insurance company investments are prima facie efficient. However, the most prudent concern of a regulator (aside from perhaps a 'social fairness' concern), should be exactly this trade-off between efficiency & 'cost of risk' reduction vs. implementation cost. Competitive pressure ensures a Nash equilibrium in which individual insurers will make sub-optimal decisions in this regard and it is a natural place where regulators are able to add real economic value to the insurance market.

7. Summary

Most policy-making discussions around new risk-classification variables focus on equity. Most actuarial discussions focus on "actuarial soundness" – if the variable is predictive it should be used. In reality, both mindsets fail to grasp what is likely the largest concern with the explosion of big data – that competitive pressure will compel insurance companies to adopt costly new rating data (much of it non-interactive), and in doing so increase company expense as well as the overall societal cost of insurance.

References

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[7] See Borenstein (1989). The literature lays out well why individual companies will make socially inefficient investments in an environment of costly sorting.