Why Low Credit Scores Predict More Auto Liability Claims: Two Theories

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Abstract. This essay considers two explanations for the fact that liability claims vary inversely with credit scores. Theory 1 attributes the correlation to a connection between financial negligence and driving negligence, but the present article identifies difficulties for Theory 1 and offers an alternative explanation. Theory 2 proposes that people with low credit scores must economize and many do this by a reduction in car owning without a proportional reduction in driving. Such economizing raises the average miles per car and consequently the number of liability claims per 100 cars. Both theories are also critiqued with respect to explaining other predictors such as driver sex and accident record. At stake is choosing an effective regulatory response to the conflict between mandatory insurance and affordability problems for financially-pressed drivers. Theory 1 suggests a need for continued price regulation while Theory 2 works to create an informed, free market demand by consumers for an odometer mile exposure unit as an optional alternative to insurers' traditional car year unit.[1]

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Mandatory liability insurance has long been demanded by the public and, despite steadfast opposition by insurers, has been increasingly adopted over time by state

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[1] Note to Readers: This essay was first accepted by JIR for Fall 2007 publication but was then rejected based on an erroneous second review. The review in opening states that: "The author of the paper under review . . . argu[es] that *lower credit scores are related to lower income*." Later the review states that "a fundamental assumption of the [paper] is that *lower credit scores are associated with lower income*." These review statements (with emphasis added) about the paper are flat wrong but opportunity to refute them was denied.

Instead it is fact (and common sense) that drivers with lower credit scores are well represented at all income levels, which is why auto insurers find credit scores an effective discriminator in all markets. What the paper in fact argues is that lower credit scores are one way (of a number) to identify subgroups (whatever the main group's income level) with reasons to reduce fixed expenses. Far from being fundamental to the paper, the word "income" is not used until the latter part of the paper and is mainly confined to one paragraph in which credit scores are not mentioned. Readers can judge for themselves.

legislatures. But concern that insurance also be affordable leads to attempts to control some pricing variables. A recent example is legislative efforts to prohibit the use of credit scores in pricing. In response, insurers commissioned a study by Miller and Smith (2003) of a random sample comprising nearly 2.7 million car-year records from the files of national insurers. The sample shows that the cars owned by drivers with the lowest credit scores produced 2.5 times as many liability claims per 100 car-year exposure units as the cars owned by the highest score drivers. But this also means that credit score pricing charges more to those generally on tighter budgets, which contributes to pressure for regulating prices.

To help resolve the conflict between affordability and free-market pricing, this essay further examines *why* lower credit scores predict more liability claims. Two theories are brought to bear on this question. The prevailing explanation, Theory 1, is that a lower credit score predicts more driver negligence. The basis is that each liability claim requires a negligent act by the insured car's driver to cause the accident. Since the cars of low credit score drivers produce more liability claims than other cars in their insurance class, it is assumed that these drivers perform more negligent acts and therefore on average are more negligent drivers. In a 2002 report on credit-score pricing to the National Association of Insurance Commissioners (NAIC), the American Academy of Actuaries (AAA) likens the way credit scores work to the way driver records work in identifying subgroups within insurance classes:

> [H]istories of past accidents and violations do not *cause* drivers to have more accidents. The rating practice that does exist is based on the fact that, as a group, drivers who have been accident-prone in the past are likely to be accident-prone in the future. [Emphasis original.]

But the AAA report is also arguing here that the cause of a correlation need not be identified in order to gain approval for its use in pricing. Nevertheless, legislators, insurance commissioners, and consumer advocates continue to call for an explanation for the credit score correlation.

As the first academic response to these calls, Brockett et al. (2005, 2007) provide backing for Theory 1's driver negligence explanation. They review studies about how the "characteristics of individual risk taking . . . affect both financial decision making and risky driving habits." Brockett and Golden (2007) conclude that the research examined by their article

> suggests that the discussed individualized biological and psychobehavioral correlates provide a connection between credit scores and automobile insurance losses. Credit scores, like good student discounts and marital status, tap a dimension of responsibility and stability for the individual that can permeate multiple areas of behavior.

But this suggested connection entails unaddressed issues. One is that the studies reviewed by Brockett and Golden rely on accident data based on the *driver year*, whereas insurance claim data are based on the *car-year* exposure (statistical) unit and tied to the driver-type classification of the car rather than to the driver driving at the time the car was involved in an accident. Moreover the review takes no notice that according to periodic federal travel surveys (Hu and Reuscher, 2004) different categories of drivers and cars represent a wide range in average annual miles and, furthermore, that within the categories themselves drivers and household cars individually traveled from zero to 50,000 miles and more in the years surveyed. Differences in annual mile averages can readily match reported ranges in liability claims per 100 car years from the lowest to highest credit score categories. For instance, the 2.5 times difference in annual liability claims reported by Miller and Smith can be matched by the 2.5 times difference in annual miles from 6,000 miles to 15,000 miles. According to the 1995 travel survey, 30% of cars were driven less than 6,000 miles and 25% of cars were driven more than 15,000 miles.[2] Characterizing those with low credit-scores as "high risk drivers" on the basis of insurance records misleadingly implies that the high risk must be on the same statistical per-mile basis used in engineering studies[3] rather than as possible consequences of large annual-miles-per-car differences among categories of insured cars defined by classification and underwriting rules.

Theory 1 also entails generally unaddressed problems. One is that drivers subject to tighter budgets as indicated by lower credit scores should be more risk averse and should be, therefore, if anything, less negligent. Moreover, insurers report that lower credit scores also predict more uninsured motorist claims per 100 car years. These claims require as a condition of payment the non-negligence of the insured car's driver. The cars belonging to lower credit score drivers must therefore be both more negligently and more non-negligently involved in accidents.

As an alternative to the driver negligence explanation, Theory 2 proposes that low credit scores predict more miles per insured car. Significantly, the uninsured motorist claims problem for Theory 1 is actually a requirement for Theory 2: liability and uninsured motorist claims must correlate positively. The more miles an insurance category of cars averages, the more accident involvements and claims per 100 car years the category must produce, which will include both more negligent (liability) claims and

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[2] Because the distinction between *insured* and *uninsured* cars is not included in the federal travel surveys, the average mileages for categories of household cars reported by the surveys do not necessarily represent the averages for matching insurance categories, especially in places where the proportion of uninsured cars is large.

[3] For example, Williams (1999) shows how per-mile risk rates vary strongly with driver age. Age 17 drivers average about 30 state-reported accident involvements per million miles compared with adult driver involvements of 4-5 per million miles. Drivers over age 79 average about 18 involvements per million miles.

also more non-negligent (uninsured motorist) claims. This means that compared to an overall class average miles per car the sub-class of cars belonging to financially-constrained drivers must be averaging more miles per car.

The logical basis of Theory 2 is supported by several easily verified givens. First, accidents are a cost of operating cars. Parked cars rarely cause accidents, but each odometer mile driven entails a risk of accident and therefore must transfer a statistical but real cost to the car's insurer.[4] Statewide, liability claims historically vary directly with the amount of driving as negatively affected by sharp increases in gasoline prices and unemployment. Second, as demonstrated by consulting an agent's manual of rates and rules, premiums are charged not as a cost of operating cars but of owning them. As long as classification and coverage are unaffected, adding or subtracting cars from a policy results in a proportional change in premiums. Finally, premiums are paid in advance of coverage and are never readjusted at the end of the policy period regardless of how many, few, or no miles the car was actually driven.

According to Theory 2, traditional pay-per-car premiums must *cause* adverse selection under certain circumstances. Per-car prices allow only one certain way to economize on mandatory insurance: drive fewer cars more miles each. Inconvenience keeps most drivers from doing this—until the pressure to economize is great. When drivers remove marginal cars from insurance pools and start to share cars kept insured, average miles-per-car rises. The result is that insurers correlate more liability claims per 100 car years with lower credit scores and raise prices accordingly (if for no other reason than fear of being adversely selected against by a competitor that is pricing according to the credit score indications).

Theory 2 also explains other predictors of liability claims insurers use. Just as more liability claims correlate with lower credit scores, more claims are predicted for the cars of residents of lower-income zip codes, more claims for the cars of drivers with lower educational and occupational levels, more for installment plan premium payers, and more for cars newly insured after having been uninsured for a period—the so-called no-prior-insurance variable. Generalizing from these predictors, any marker of a need to economize predicts more liability claims per 100 car years. (See the top set of predictors in Table 1.)

[4] Measurement of the cents-per-mile class rates at which risk is transferred to insurers would require large numbers of cars in each class (for future statistical stability of the class per-mile rate determined) by risk-related categories such as car use, residence territory, and driver age. Under today's car-year exposure unit, the total cost of past claims for each class is divided by the insured car-years of exposure that produced the claims to obtain the dollars-per-car-year basis of the future price. Under the odometer-mile exposure unit the cents-per-mile cost basis of a class price would simply be the total cost of claims divided by the total insured odometer miles of exposure that produced the class's claims.

In accord with the Theory 1 explanation that low credit scores identify negligent drivers, Brockett and Golden (2007) cite the use of driver sex and the AAA report (2002) cites the use of driver records for the same purpose. However, the logic of Theory 2 provides an alternative explanation for both of these traditional predictors, as shown in Table 1. For example, men average more driving than women the same age and therefore are involved in more state-reported accidents annually on a per-100-licensed-drivers basis.

Table 1
Two explanations for why credit scores and other predictors work

Predictor variable (of liability claims per 100 car years)	Correl-ation	Theory 1 (Variable proxies for driver negligence)	Theory 2 (Variable proxies for avg. miles per car year)
Credit score	negative	"Lack of stability and impulsive behavior affect both driving and credit history."*	Variables are measures of need to economize on liability insurance, which can be done directly by giving up some cars and driving the insured cars remaining more miles each.
Zip code income	negative		
Education and occupation levels	negative		
Installment plan	positive		
No prior insurance	positive		
Driver sex – man (Controversial for adults. Used where allowed, mainly for cars accessible to young drivers)	positive	"[T]he psychobehavioral characteristics of risk-taking are related to impulsivity, sensation seeking, aggression, and sociability with men engaging in more overall risky behavior than women."**	At every age men average more miles than women, and presumably so do the cars they drive relative to the cars women drive.
At-fault accident (Use is often disallowed for small claims)	positive	"[D]rivers [who were] accident prone in past are likely to be accident prone in the future"***	As sub-classes, "accident-sampled" cars continue to average more miles per car than the main classes from which they are separated.
Not-at-fault accident (Controversial, but may or may not be used where allowed)	positive		
Car age (not disallowed but not used for liability prices)	negative		Annual mile averages decrease with car age

* Brockett and Golden, 2007
** Brockett et al., 2005
*** American Academy of Actuaries, 2002.

When it comes to Theory 2 explaining why past accidents are predictors of more claims per 100 car years, accidents may be realistically modeled as random sampling—not of car year records from company files as employed in the Miller and Smith (2003) study—but perforce of cars that are on the road. Although the low- and average-miles cars in an insurance class are sampled by accident involvement, this sampling obviously will be biased to those cars in the class that spend the most time on the road. This sampling process raises the average annual odometer miles of the sub-classes defined by accident involvement, as modeled by Butler and Butler (1989). Rather than identifying accident prone drivers in the future, accident records actually define sub-classes that average more miles per car year in the future than the cars will average in the large matching accident-free sub-classes.

In addition to the traditional predictors cited by AAA (2002) and by Brockett and Golden (2007) as validating Theory 1 explanations, however, are equally reliable predictors that if used would raise difficult questions for auto insurers. A noteworthy example is that car age is not used for liability pricing even though liability claims per 100 insured car years decrease with car age (McNamara, 1987). If this correlation were used in pricing, liability premiums would increase for a driver who trades an older for a newer car. But it would be difficult for Theory 1 to explain how buying a newer car causes a driver to become more negligent. However, Theory 2 explains that since annual mile averages decrease with car age, so must claims per 100 car years also decrease with car age. Trading an older for a newer car does not necessarily change the number of miles a driver drives whether many or few, but the car they drive definitely changes to a younger car age group that averages more miles per car.

In 1994 Harrington examined the case that mandatory auto insurance is "taxing low income households in pursuit of the public interest." But the case presented against such taxing is weakened by the implication that low income drivers pay the same insurance prices as higher income drivers. More recent work by Harrington and Niehaus (1998) confirms that the cars of lower income drivers produce more liability claims[5] and consequently are charged higher "taxes" per car year for mandatory liability insurance. Moreover, according to the present study's Theory 2, Harrington's case (1994) misidentifies the law-abiding choice as "pay or take the bus," i.e., pay the price of mandatory insurance or give up driving. Instead, the law-abiding choice that pay-per-car pricing actually offers is not giving up *driving* and taking the bus, but giving up *cars* and driving the remaining ones more. Hence more miles per car, more claims, and higher prices must follow in what insurers term "hard to serve markets." Theory 1 suggests that more driver negligence in these markets causes the higher prices. But this suggestion means that—other than to repeal mandatory insurance as auto insurers would have it—

[5] In the Missouri zip codes studied, liability claims per 100 car years exposure averaged 8.25 in the lower income zip codes which is 36% more than the 6.06 claims the other zip codes averaged.

there is no alternative to regulating prices to maintain affordability for the presumed negligent driver groups insurers identify.

Instead of these undesirable alternatives, however, the strong demand by the public for enforcing mandatory auto insurance could be accompanied by a strong demand informed by Theory 2 that automobile insurers provide the audited odometer mile exposure unit (Butler, 1993)—an option insurers offer to some fleet owners—as an option for private passenger car owners. At competitive cents-per-odometer-mile class prices this option would constitute a free-market remedy for the upward cost-price cycle that the traditional car-year exposure unit sets off for groups of economizing drivers. With this option drivers could car pool or take the bus to save on insurance while still keeping their own cars legally insured and available for use.

Critical to informing a public demand for a remedy to mandated car insurance which many cannot now afford is engagement by insurance commissioners and consumer advocates, as well as scholars, with the explanation offered by Brockett and Golden (2007) and the alternative explanation provided by this essay for why low credit scores and like correlations work to predict more liability claims per 100 insured car years.

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