

Using Odometer Readings to Predict Future Annual Mileage: How Accurate Are They?

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A report by Quality Planning – July 2010

Quality Planning 

Introduction

Annual mileage is an important rating factor for many auto insurers. Studies conducted by Quality Planning (QPC) and other researchers and actuaries show a direct correlation between miles driven and claims. The variance between insurance rates due to mileage differences varies considerably depending on the insurance carrier, the specific rating plan or book of business, and the rating territory or state. Some rating plans have only two rating bands for annual mileage — for example, fewer than 7,500 miles and equal to or more than 7,500 miles. Other carriers are experimenting with more granular mileage rating bands and mileage relativities. California is one of the few states that require annual mileage to be one of three mandatory rating factors, in addition to one's driving record and years of driving experience. Also, California has mandated updates to annual mileage data at least once every three years.

When asked, most people find it difficult to accurately predict future mileage for their vehicles, and insurers vary widely in their efforts to obtain those same annual mileage estimates for rating. Some ask for an estimate when writing a new policy and never update the information at subsequent policy renewals. Some companies ask their insureds to provide odometer data, or they collect odometer data from other sources to estimate annual miles driven. Others companies just ask their insureds for estimated annual miles both when writing new business and at renewal if there is a process to update the information. Insurers rely on insureds to accurately provide this information with little or no verification.

A California Department of Insurance (DOI) study in 2006 found that 11 percent of vehicles had understated annual miles of more than 10,000 miles; 15 percent had an understatement between 6,000 and 10,000 miles; and 30 percent had understated annual miles of less than 5,000. The study also found a correlation between the understated mileage and losses at the ZIP code level¹.

¹ Don McNeill, Policy Research Division, California Department of Insurance, (Sept. 21, 2006), *Errors in Self-reported Mileage for California Vehicles*.

Annual Miles Derived from Odometer Readings

Many carriers and regulators believe that annual miles based on current and prior odometer readings provide a good estimate for future estimates of annual miles. In California, this is one of the approved methods to update estimated annual miles.

At first glance, using odometer data to estimate annual miles appears to be a reasonable answer to a difficult problem. It is measurable, and therefore some people consider this to be an accurate estimate. A number of insurance companies collect odometer readings from the policyholder (self-reported) or use other sources, such as smog test data or service records, if available, to estimate annual miles.

But just because an odometer reading is based on measurable data, is it an accurate way to determine premium? Given the accepted use of the odometer-based methodology, we wanted to test its validity and accuracy. The fundamental research questions were:

- How accurate is the odometer-based estimate?
- Is it possible to quantify its accuracy?

Methodology

Addressing these questions required verified odometer readings. Self-reported odometer readings are prone to error because policyholders have an incentive to understate odometer readings (and hence mileage) to qualify for reduced premiums. The California Bureau of Automotive Repair keeps track of odometer readings required for smog checks. In California, a smog check is required every two years for vehicles six or more model years old; a smog check is also required for vehicles four or more model years old upon transfer of ownership. Most of the odometer readings in the database are verified and accurate.

Our analysis was based on more than 4.5 million vehicles with valid odometer readings from the California Bureau of Automotive Repair over the period 2004 to 2009. We looked only at vehicles that had three valid odometer readings at approximate two-year intervals between 2004 and 2009. The two-year time interval between readings eliminated most change-of-ownership cases. Some cases in our data still had a smog check anniversary date that coincided with change of ownership. There is no easy way to eliminate these, but we believe this would be a very small proportion of the whole data set.

The first two odometer readings were used to calculate the “prior period” annual mileage. The second and third odometer readings were used to calculate the “subsequent period” annual mileage.² Finally, we calculated the percent change in the subsequent period from the prior period.

The odometer-based methodology used in rating assumes that there is consistency between the prior and subsequent period mileage estimates. In other words, the prior period annual miles should provide a good estimate of annual miles in the subsequent future period, and the percent change should be close to zero.

Results

Table 1 shows the average mileage change from prior to subsequent period by model year range. It also shows the percent of vehicles with mileage increases and mileage decreases along with the average increase or decrease. Overall, there is a mileage decrease of 1,097 miles from the prior period to the subsequent period. However, the average hides the real difference since the positive and negative variances cancel each other. The average change when we ignore the sign — that is, the absolute change — is 3,864 miles.

² For example, odometer readings from 2005 and 2007 were used to calculate the prior period (2005–2007) annual mileage. Then odometer readings from 2007 and 2009 were used to calculate the subsequent period (2007–2009) annual mileage.

Table 1: Change in Annual Miles by Model Year

Model Year	All Vehicles			Mileage Increase: Prior to Subsequent			Mileage Decrease: Prior to Subsequent		
Model Year	Count	Average Mileage Change	Mileage Change (disregard sign)	Count	% of total	Average Mileage Increase	Count	% of Vehicles	Average Mileage Decrease
1998-2001	2,049,968	-1,283	3,861	748,955	36.5%	3,527	1,301,488	63.5%	-4,051
1994-1997	1,527,178	-1,135	3,829	563,418	36.9%	3,650	964,343	63.1%	-3,931
1990-1993	716,996	-800	3,937	277,077	38.6%	4,058	440,385	61.4%	-3,857
Pre 1990	311,496	-371	3,887	123,942	39.8%	4,418	187,713	60.3%	-3,533
All	4,605,638	-1,097	3,864	1,713,392	37.2%	3,718	2,893,929	62.8%	-3,948

More vehicles had mileage decreases than increases — 62.8 percent versus 37.2 percent. When the vehicle had higher miles in the subsequent period, the difference between prior and subsequent periods got higher as the vehicles aged (3,527 miles for 1998–2001 model years versus 4,418 miles for pre-1990 model years).

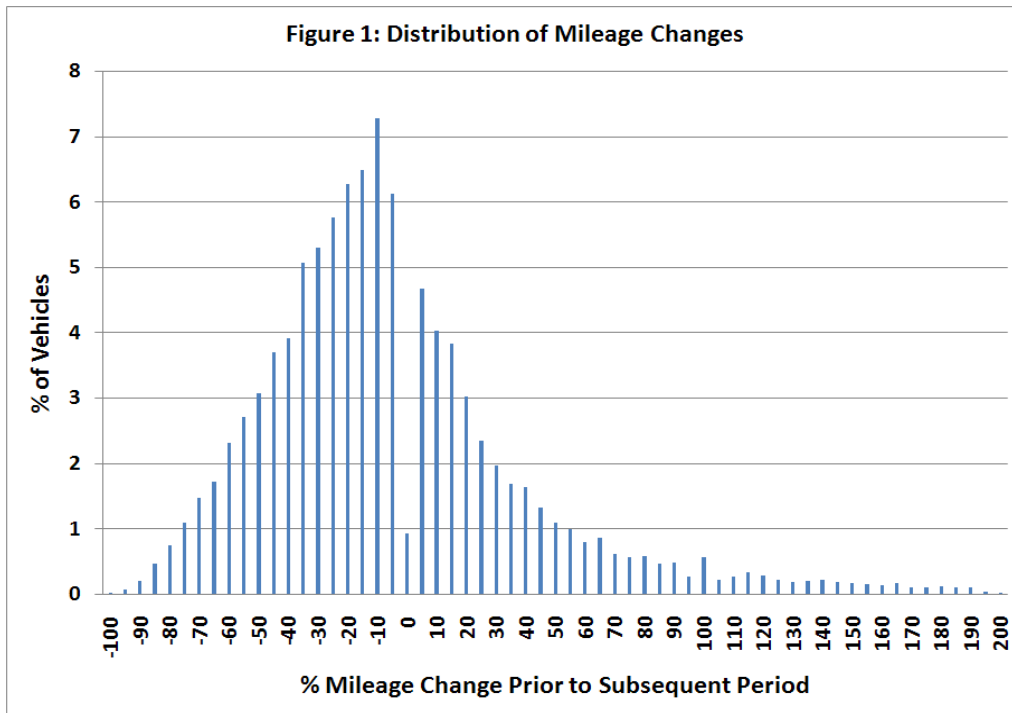


Figure 1 shows the percent change in annual mileage from the prior to subsequent period, a more granular level of the results shown in Table 1. Table 2 shows another look at the same data. It shows the percent of vehicles that exceed (either positive or negative) a certain mileage change. For example, 81.7 percent of vehicles had a mileage change of greater than 10 percent from the prior period; 52.2 percent had a change greater than 25 percent. More than half the vehicles would have a significant mileage error of 25 percent or more using the prior odometer reading as an estimate of subsequent annual mileage.

Table 2: % of vehicles exceeding a given mileage change

Mileage change %	% of vehicles exceeding change
5	92.9
10	81.7
15	70.7
20	60.9
25	52.2
30	44.6
35	37.9
40	31.7
45	26.4
50	21.5

Correction for two-year intervals

The analysis and results have a bias due to the structure of the odometer readings that were taken every two years. The percent change in annual miles reflects the change in the average miles driven from the first two-year period to the next two-year period. If the driving behavior within each two-year period were uniform, then our best estimate of average year-to-year mileage change (averaged over the four-year period) would be half the mileage change calculated above. This is the lower bound on the estimated year-to-year mileage change. Based on the analysis of the mileage changes over the four-year period, we know that mileage fluctuations are significant and just as turbulent over two years as they are over four. Consequently, the actual year-over-year mileage change would be higher than just taking half of the two-year percent change.

Normally, insurers would be faced with the same data limitations on odometer availability and time frames. Therefore, rating errors would be similar to what we show in this analysis.

Factors Affecting Annual Mileage

A number of factors impact driving behavior and the total number of annual miles a specific vehicle is driven. Foremost among these are:

- lifestyle changes
- vehicle changes in household

Lifestyle changes

Our lifestyles and where we live and work have a huge impact on annual miles driven. The demographic profile of the driver, public transit availability, commute distance, traffic congestion, and the profile of other drivers and vehicles in the household are some of the factors that affect annual mileage. These factors are dynamic and change constantly. People move, change jobs, get married. Teenagers in the household start driving. College students graduate and leave home. In today's economy, there are a significant number of people who are unemployed, looking for jobs, commuting longer distances, or working multiple part-time jobs. Every hour, 246 marriages begin, and 121 marriages end in divorce; more than 150 new driver's licenses are issued to 16-year-olds. All these factors influence how much we drive in a year. When odometer readings are used to predict future mileage, we ignore the lifestyle factors and assume that drivers will maintain the status quo in their lives for the following period.

Vehicle changes

Every year, 52 percent of household auto policies experience a change of vehicles or drivers. Looking at only vehicles changes, 30 percent of households add or replace at least one vehicle every year. When this happens, it affects the annual mileage of all other vehicles in the household. Generally, newer vehicles are driven much more than older vehicles. However, if an older vehicle in the household is passed on to a teenage driver, it tends to get driven more. Odometer-based mileage estimates fail to account for these household dynamics and significantly under- or overestimate future mileage, as evidenced in Table 1.

Summary

When odometer readings are used to estimate annual mileage and establish private passenger auto premiums, a key assumption is that future use of a vehicle will be similar to the vehicle's usage in the last one or two years. Our analysis of odometer-based methodology to estimate annual miles indicates that using this process causes significant errors. More than half the vehicles would have a rating error of more than 25 percent in the annual miles estimated. Lifestyle and vehicle changes are the main factors that cause a change in annual miles driven, and the odometer methodology fails to account for these changes.

The odometer-based method will likely result in a rating error that could lead to a significant premium undercharge or overcharge. The misallocation of premium creates long-term rating integrity issues for an insurer. If premium is insufficient, profitability is at risk and the insurer may attract less desirable risks. If policyholders are overcharged, the insurer quickly becomes uncompetitive and vulnerable to losing its best customers.

Consequently, when validating annual miles driven, odometer readings should be used as a baseline only and supplemented with additional data that accounts for changes in lifestyles and household vehicle mix.

About Quality Planning

A Verisk Analytics company, Quality Planning is focused on providing rating integrity solutions to auto and home insurers. Quality Planning works with insurance companies to identify areas of significant rating error through the use of sophisticated database management, statistical analysis and modeling, customized survey design, and highly targeted customer interaction. Quality Planning helps clients work within their existing rating plans and charge fair prices to policyholders based on a true representation of risk. The company was founded in 1985 and is headquartered in San Francisco. For more information, visit www.qualityplanning.com.