actuary should reject the null hypothesis that the models are the same and should use the model with the greater number of parameters.

In this example, the Chi-Square percentage is 0.02%. Thus, the actuary rejects the null hypothesis and selects the model with the greater number of parameters. In other words, the actuary selects the model with the prior claims history variable in it.

Judgment

It is important that the actuary evaluate the reasonableness of the model and diagnostic results based on knowledge of the claims experience being modeled. In this case, the statistical results are consistent with the intuitive expectation that frequency is higher with the presence of prior claims.

Decision

All four tests suggest the rating variable is predictive and should be included in the model (and ultimately the rating algorithm).

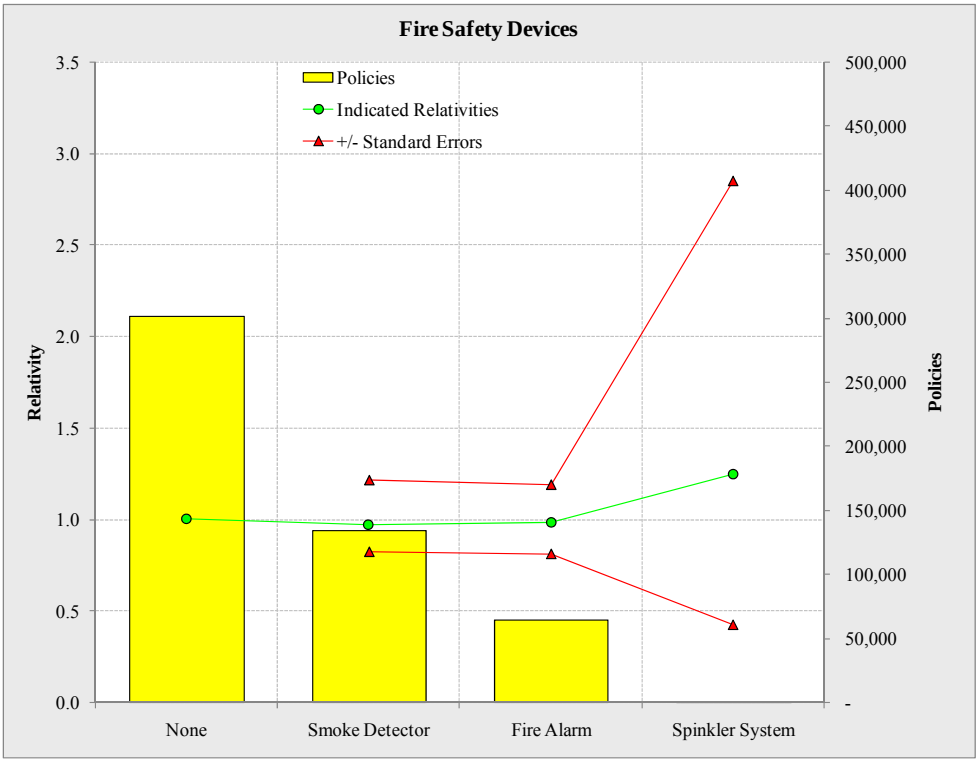
EXAMPLE UNPREDICTIVE VARIABLE

This section contains sample output from a multiplicative GLM fit to homeowners wind damage frequency data. The output isolates the effect of fire safety devices as an insignificant predictor of wind damage frequency, though the model contains other explanatory variables that must be considered in conjunction with this variable.

Parameters and Standard Errors

The following graph shows the indicated frequency relativities for the fire safety device variable, all other variables considered. The x-axis categories represent the different fire safety devices (the base being the level "none"), and the bars are the number of policies in each level. The lines represent the indicated wind damage frequency relativities and two standard errors on either side of the indicated relativities.

F.3 Main Effect Test for Fire Safety Device

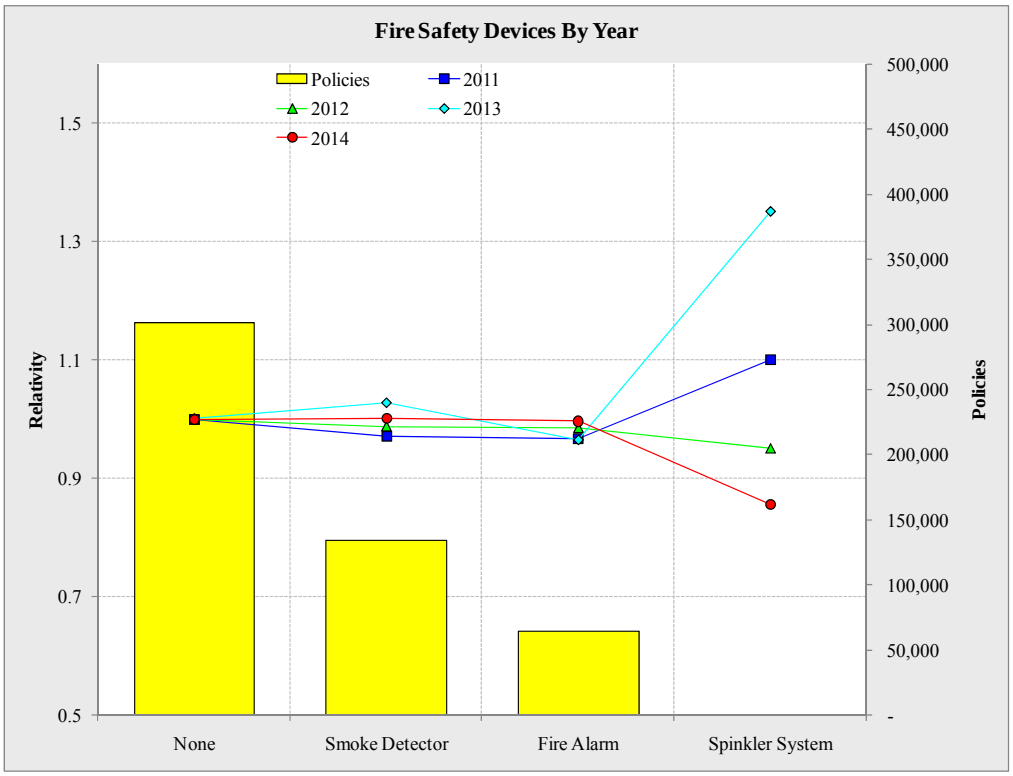


The indicated line is basically flat (i.e., indicated relativities are close to 1.00) for the levels that have a significant number of policies. The one category that has an indication substantially different than 1.0 (sprinkler system) has very wide standard errors around the indicated relativity, which is likely due to the small number of policies in that category. Thus, there appears to be little predictive power in this variable, and it should be removed from the wind damage frequency model.

Consistency Test

The following figure shows the pattern for each of the individual years included in the analysis. Like the last graph, the categories on the x-axis represent different fire safety devices, and the bars are the number of policies in each level. The lines represent the indicated relativities for each year.

F.4 Consistency Test for Fire Safety Device Claim



The patterns are consistent across the years for all categories but the sprinkler system. That category has little data, and the predictions are very volatile. These results confirm the conclusions derived from the parameter results and standard errors.

Statistical Test

The Chi-Square percentage for this variable is 74%. Percentages above 30% indicate that the null hypothesis, which asserts the models are the same, should not be rejected. If the models are "the same," then the actuary should select the simpler model that does not include the additional variable. (Chi-Square percentages between 5% and 30% are often thought to be inconclusive based on this test alone.)

Judgment

The existence of smoke detectors, sprinklers, and fire alarms does not seem to have any statistical effect on the frequency of wind damage losses. This is consistent with intuition.

Decision

All four tests suggest the rating variable is not predictive and should be excluded from the wind damage frequency model.