Practical Applications of Predictive Analytics

Predictive Analytics For LTC Experience Studies

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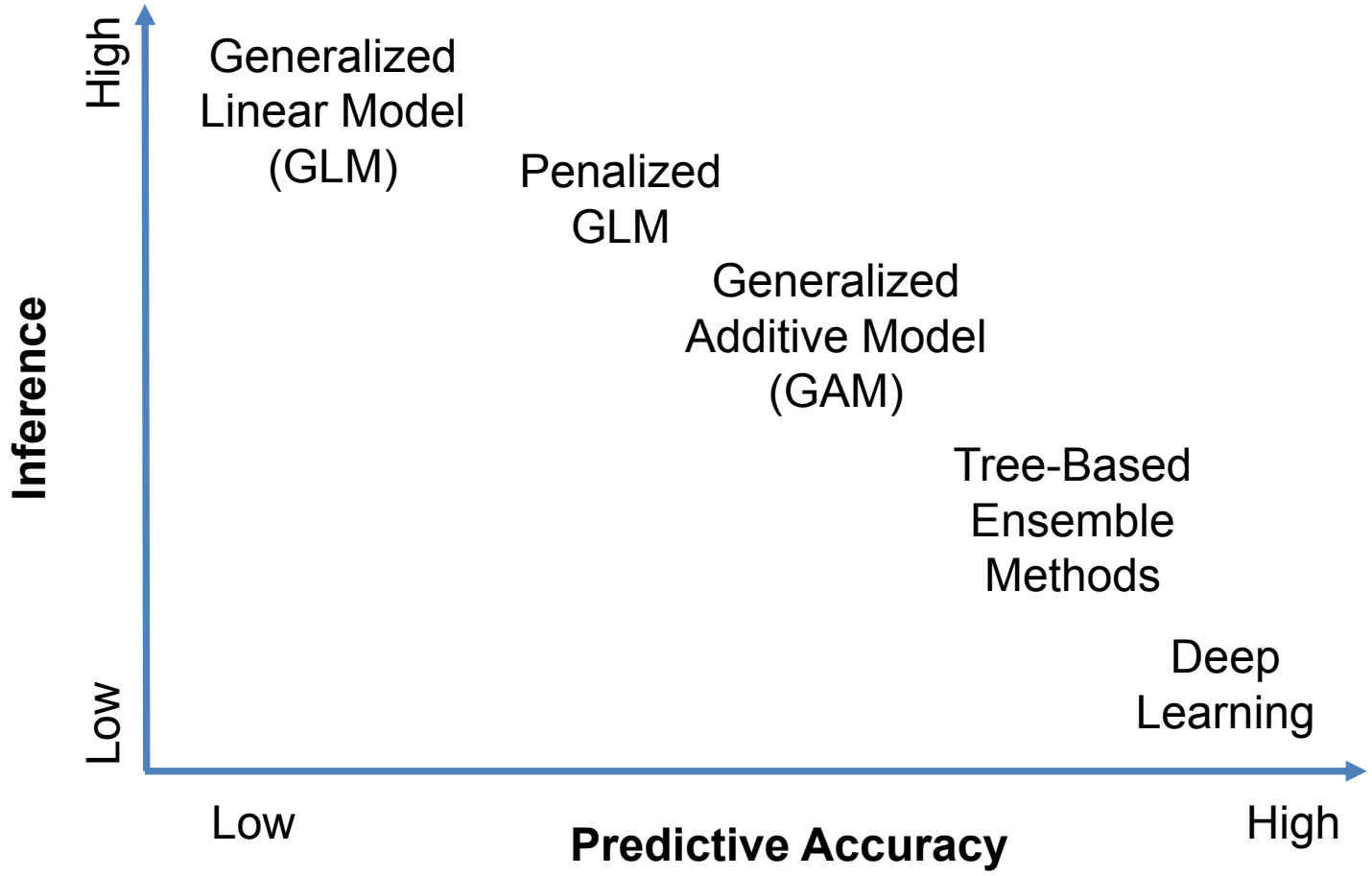
Predictive modeling is complementary

- Traditional actuarial techniques have their uses
- Predictive modeling can provide a supplemental view
- All techniques have their pros and cons
- Performing analysis more than one way is beneficial
- A stronger work product will likely be the result

Inference vs Predictive Accuracy



Source: Adapted From "An Introduction to Statistical Learning" By Gareth James • Daniela Witten • Trevor Hastie • Robert Tibshirani

As the predictive accuracy of a technique increases, the inference we get from it generally decreases

Views about pros and cons

	Traditional Actuarial	GLMs & Survival Analysis
Advantages to Traditional Actuarial Approach	- Familiarity - Often easier to explain - Not as much model risk with a smoothed table	- Learning curve - Can be difficult to interpret - Must not violate key model assumptions
Disadvantages to Traditional Actuarial Approach	- Credibility becomes an issue quickly - Difficulties with a large number of variables - Statistical significance not explicit	- Data can be “stretched” for inference - Flexibility to have more variables and interactions - Explicit standard error, goodness of fit statistics

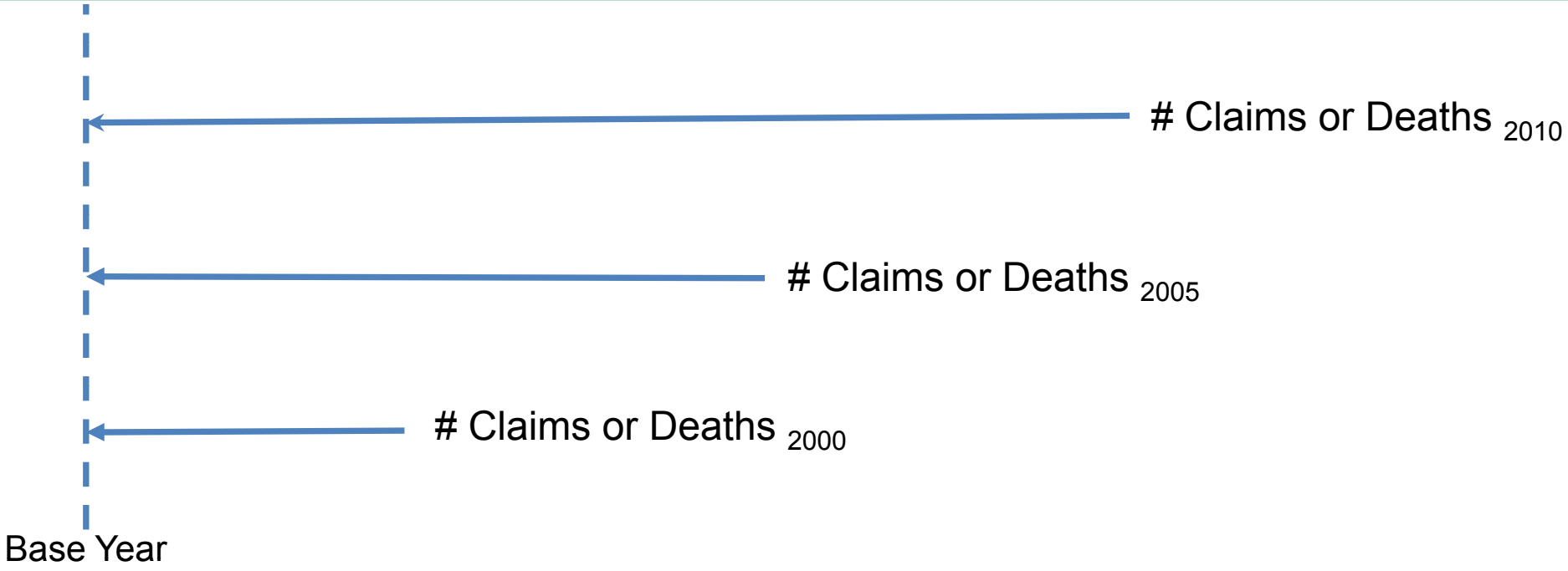
Using complementary approaches can bring the best of both worlds to an actuarial analysis and recommendation

Predictive modeling applications

Areas where predictive modeling can offer additional insights over traditional actuarial techniques:

- Morbidity and mortality improvement estimation
- Claim benefit inflation estimation
- More precise attribution analysis
- Parameter uncertainty estimation

Application to improvement

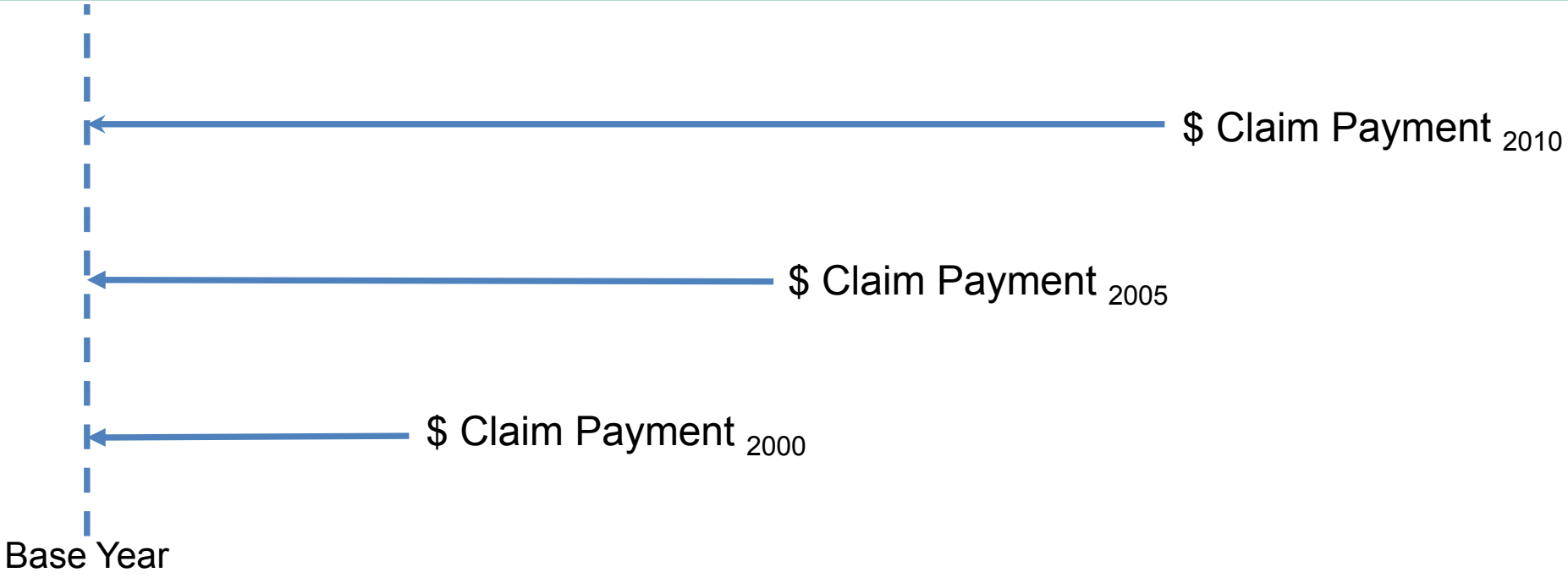


A GLM was fit to claim incidence, including a calendar year driver variable – a similar model was fit to mortality experience

The resulting calendar year regression coefficients indicated the level of cumulative improvement relative to a “Base Year”

Incidence and mortality improvement were seen to decline for later calendar years and older ages

Application to claim benefit inflation

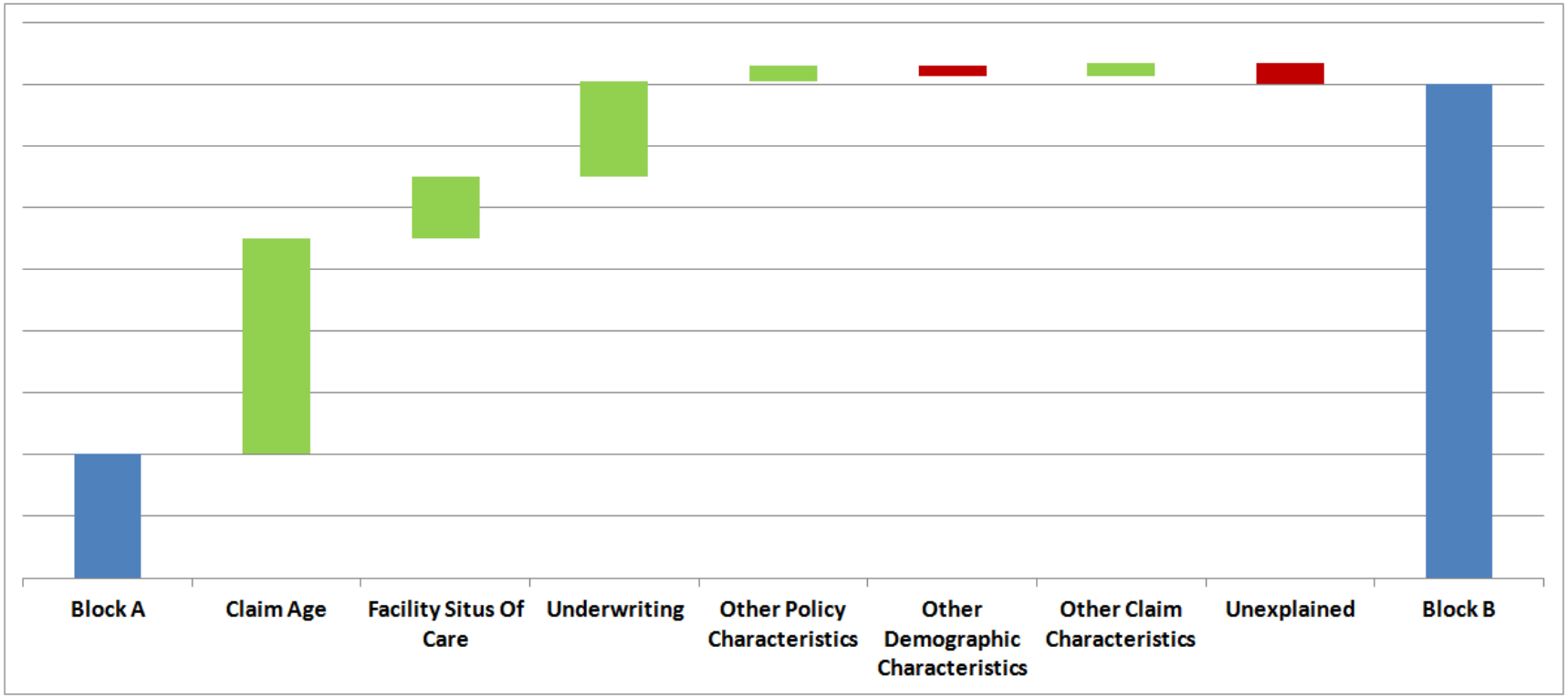


A GLM was fit to claim payment data, including a calendar year driver variable

The resulting calendar year regression coefficients indicated the level of cumulative benefit inflation relative to a “Base Year”

Benefit inflation estimates were obtained, and were used to help inform projected benefit inflation trends

Application to attribution analysis

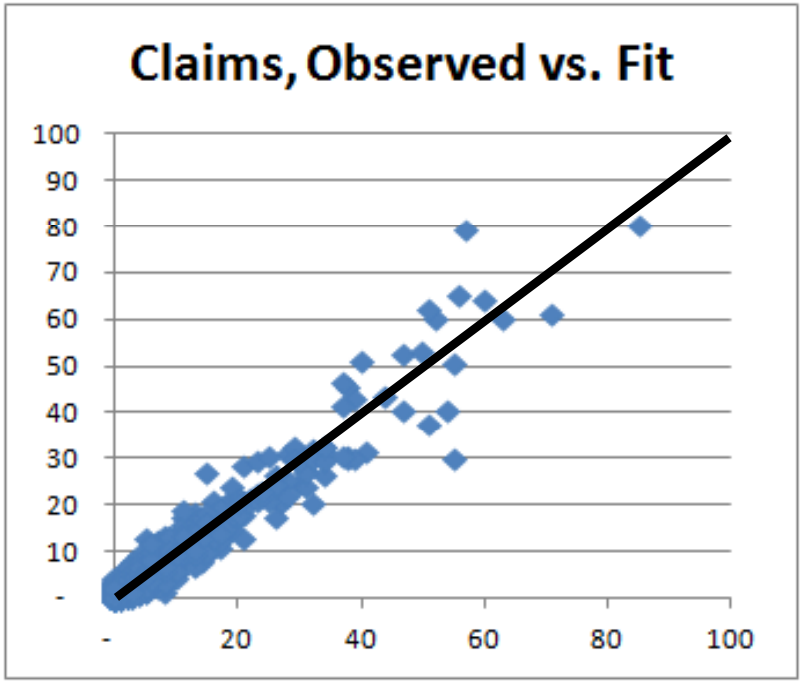


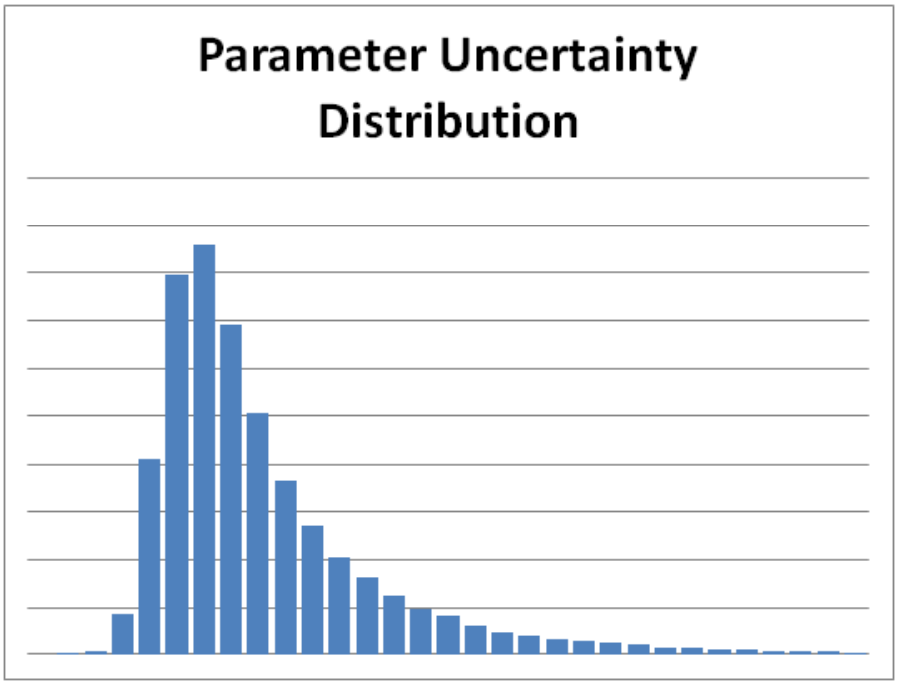
Source: Analysis based on Genworth LTC experience data

A Cox survival analysis model's results, combined with actual exposures, was used to attribute differences in recovery rates for two blocks of business

Primary drivers are claim age, facility claims, and underwriting, and their relative quantification became possible

Application to parameter uncertainty





Source: Analysis based on Genworth LTC experience data

A Poisson GLM was fit to claim incidence data (left hand side)

The predictive model's parameter variance-covariance matrix was simulated to estimate the parameter uncertainty of incidence for EC purposes at a non-diversified level

The results were similar to the results from an earlier study which used non-predictive analytical techniques

Summary

- Predictive models can be used to enhance more basic techniques, and to provide further insights
- Additional applications include claim management and underwriting processes
- Careful with over-dispersion in Poisson GLMs
- Careful with time dependency in survival analysis
- Exciting new techniques to bring to actuarial work