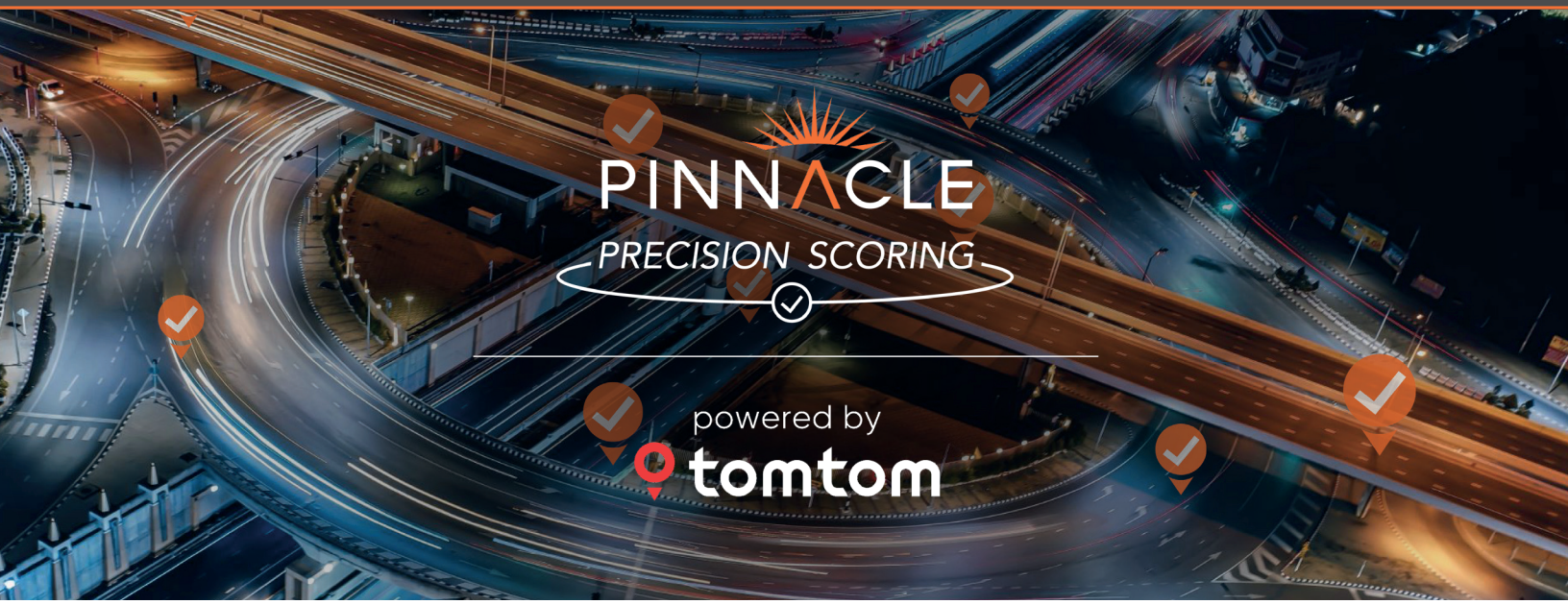
PINNACLE
ACTUARIAL RESOURCES

PINNACLE PRECISION SCORING



PINNACLE PRECISION SCORING POWERED BY TOMTOM

TomTom is a leading provider of navigation software and location technology to automakers across the globe. Their systems gather driver, map and traffic information to provide real-world context for data that insurers need to accurately price policies.

TomTom's rich and deep data is a goldmine for insurers, but effectively and efficiently leveraging that data for precise pricing requires a very high level of data processing, analytics and modeling expertise.

Pinnacle applies our insurance and analytics expertise to TomTom data to the specific and customized needs of insurance companies. Pinnacle helps insurers develop a wide array of solutions, including rating territories, geographical rating factors and road context scores for usage-based insurance programs.

THE POWER OF PINNACLE'S PREDICTIVE ANALYTICS

Pinnacle's consultants know how to bring all relevant information variables together for comprehensive and truly useful analyses that can make a difference for insurers. Pinnacle helps TomTom focus your data on your business for better business results.

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LOCATION, LOCATION, LOCATION

For companies writing automobile insurance, geographical location is one of the most significant rating variables. It stands to reason: the likelihood of being involved in an accident and the subsequent cost of that accident are impacted by where that vehicle operates. Driving a vehicle in Manhattan involves different risks than driving a vehicle in upstate New York.

The characteristics of geographical location are key drivers of insurance costs, including:

- **Traffic density:** The more vehicles there are on a given road, the more likely it is that a vehicle will be involved in a car accident
- **Road design:** Characteristics such as road curvature, visibility and intersection design (stoplight versus a stop sign or a roundabout) can impact the likelihood of an accident
- **Speed:** How fast a person drives can impact the likelihood of being involved in an accident, especially relative to the speed limit and to the speed of the vehicles traveling on the same road
- **Enforcement of traffic laws:** Enforcement (or lack thereof) can impact the speed at which vehicles travel and how safely vehicles are operated

USING REAL ROAD USAGE DATA

TomTom systems gather all data associated with road segments and related road usage characteristics. Pinnacle leverages that data to determine more accurate rating and pricing.

To address the pace at which changes in geographical risk are incorporated into the rating process, and to address the issue of the environment within which vehicles are bring driven, Pinnacle has teamed up with TomTom to include road usage data in the insurance rating process.

Examples of the data used include various measures of speed (median, average, harmonic average), speed limit, vehicles on the road and time traveled on road segments.

Pinnacle derived a number of characteristics from the TomTom data, including:

- **Traffic density:** Number of vehicles traveling on a particular road segment during a defined time period
- **Speed Variance:** Measures of the variability in speed on a particular road segment during a defined time period
- **Speed to speed limit:** Ratio of the speed vehicles traveling on a road segment to the speed limit of that road segment

HOW WE DO IT

Pinnacle has tested TomTom data to demonstrate its applicability to auto insurance pricing.

The first evaluation was at the census-block level. Pinnacle also evaluated TomTom data at the ZIP code level based on a contributory database maintained by Pinnacle and CARFAX. The size of that database is comparable to a top 10 auto insurance company.

As part of our analysis of the Pinnacle and CARFAX data, we reviewed one-way summaries of the TomTom data to identify initial insights. For example, the longer the average travel time of a trip on a road segment, the lower the claim frequency. Conversely, the wider the variation of speed on a road segment, the higher the claim frequency.

The TomTom data can be broken down by time of day and day of the week. As an example, if a larger proportion of time on the road is at 2 a.m. in the morning, the higher the claim frequency. Also, the larger the proportion of time spent on a road at 5 p.m., the higher the claim frequency.

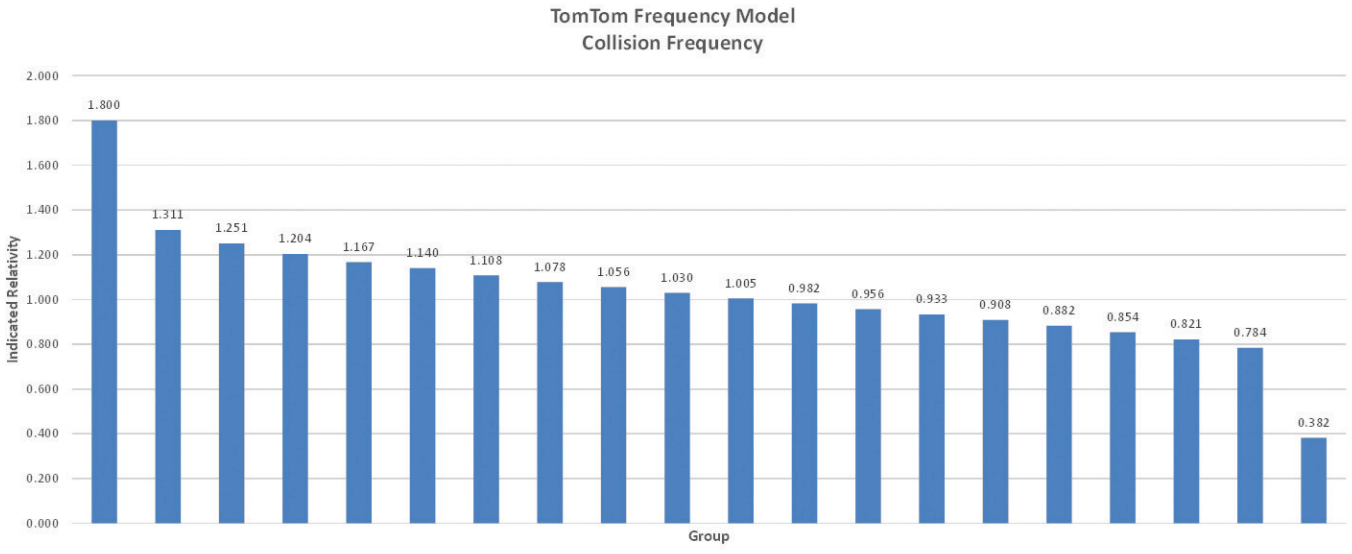
MODELING PROCESS

We process the TomTom data, review it for reasonability, and use the following approach to ensure the TomTom data adds unique, valuable information to the insurance price development process.

First, Pinnacle uses a traditional rating factor indication development process using the available insurance risk characteristics. We used a GLM (generalized linear model) for this initial development.

We then used machine learning to develop a model using only TomTom characteristics.

Next, we incorporated this score into the rating variable model as a final validation. The results of this analysis demonstrated significant lift. As an example, for collision frequency based on Pinnacle's Precision Scoring, the graph shows 20 groups of equal size and resulting indicated relativities that range from 0.382 to 1.80. This lift is in addition to the lift achieved by all the other rating factors.



PINNACLE PRECISION SCORING AT WORK

There are several ways that this information can be implemented, both operationally and at different geographical levels.

This score can be incorporated in the development of revised territory definitions. This would allow a company to implement this data in an approach that is consistent with its current rating structure.

The score can also be included as a direct rating factor. The score is developed based on the most recent characteristics of the geographical unit, so pulling the score at the time of rating would ensure the more recent geographical risk is reflected.

This data could also be used in conjunction with a UBI program, which would allow insurance companies to better place their UBI data in proper context.

Since data is continuously updated, scores or territory definitions can be updated with new data at whatever frequency the company desires.

THE VALUE OF OUR FRAMEWORK

Pinnacle's evaluation leverages TomTom data to provide an easy-to-use score. Contact us to learn more!