

ISO Risk Analyzer®

Personal Auto

Environmental Module

Location Component of Loss Costs

- Territories should be ***big***
 - Have a sufficient volume of business to make credible estimates of the losses.
- Territories should be ***small***
 - Driving conditions vary within territory.

Some Environmental Features Related to Auto Accidents

- Proximity to Business Districts
 - Workplaces
 - Busy at beginning and end of work day.
 - Shopping Centers
 - Always busy (especially on weekends).
 - Better traffic lights & turn lanes.
 - Restaurants
 - Low traffic impact during day.
 - Schools
 - Increased signage and enforcement.

Some Environmental Features Related to Auto Accidents

- Weather
 - In combination with terrain.
 - Variability as well as typical conditions.
- Traffic Density
 - Less traffic sharing the same space decreases odds of collision.

Combining Environmental Variables

- Individually, the variables have predictable - but small - effect.
- Variables could have positive and negative effects.
- ISO built a model to calculate the combined effect of all variables.
 - Based on countrywide data, calibrated to very local conditions
- Losses are modeled by coverage and frequency severity separately
 - Allows for flexibility in relation of variables to loss

Data Sources

- ISO Data & Analytics
 - Statistical Data & Ratemaking Analyses
 - Weather Data (AIR)
- Additional Insurer Data – Development Partners
- Third-Party Data

Data Sources - Examples

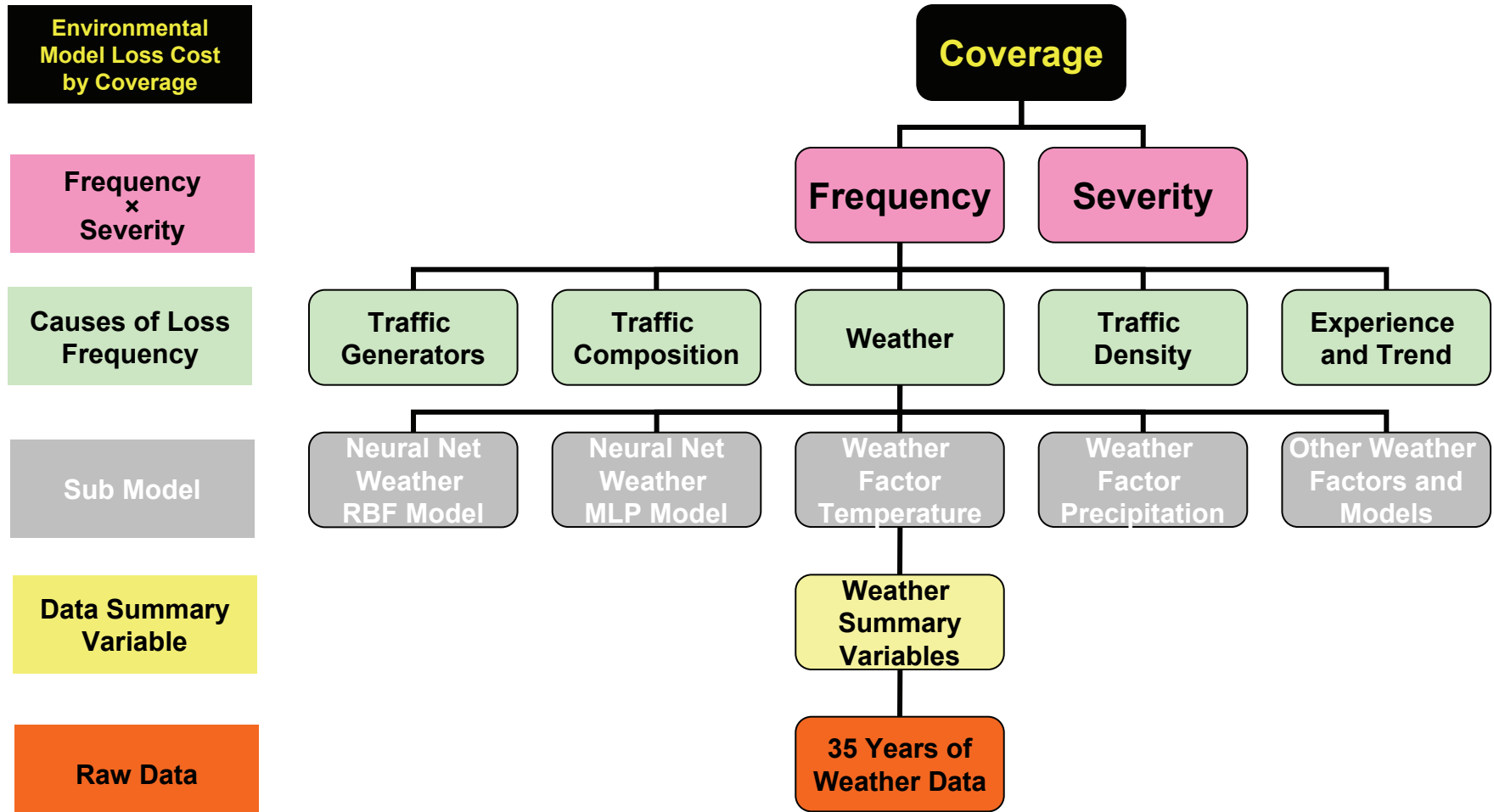
- **Comprised of over 1000 indicators**

- **Weather and Terrain**
- **Traffic Density and Driving Patterns**
- **Traffic Composition**
- **Traffic Generators**
- **Experience and trend**

Modeling Techniques Employed

- **Sampling** — Stratification, Train / Validation / Test (TVT) partition.
- **Exploratory Data Analysis (EDA)** — univariate analysis, transformations, known relationship to loss.
- **Sub models / data reduction** — neural nets, splines, principal component analysis, k-means clustering.
- **Spatial Smoothing** — parameters related to auto loss patterns.
- **Variable Selection** — Stepwise, cross-validation and bootstrap techniques.

Weather Component



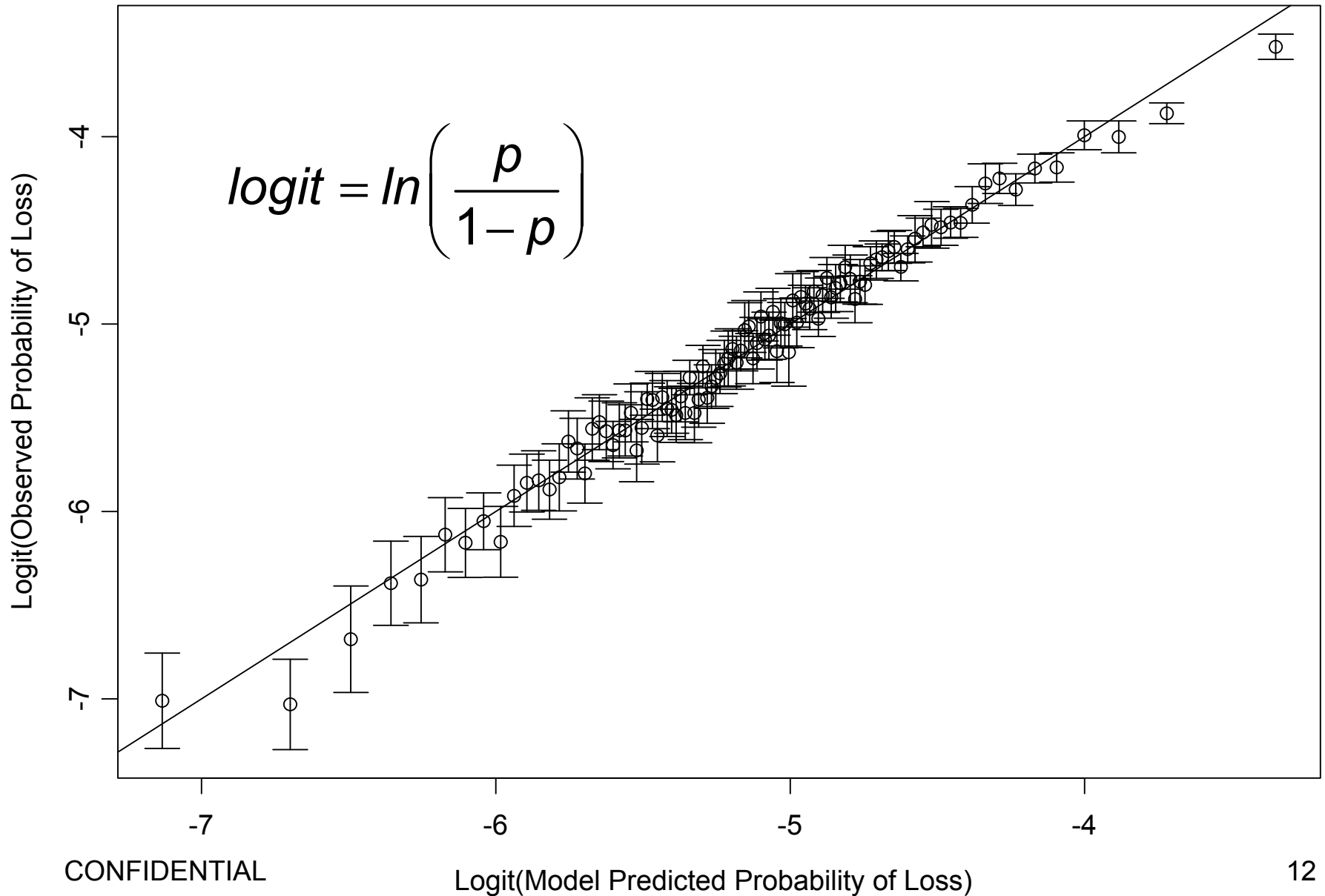
Model Output

- Separate Models by Coverage
 - e.g. Bodily Injury Liability, Comprehensive
- ISO Risk Analyzer output is:
 - **Predicted Loss Cost**
 - **Relativity – Normed to ISO territory**
 - **Components**
 - **Reason Codes**
 - **Scores**

Model Testing and Review

- ISO conducted extensive testing in order to confirm predictive ability in total and by component.
- ISO had the model peer reviewed by Professor Abba Krieger, Chair of the Statistics Department at University of Pennsylvania's Wharton School:
 - “Created with diligence that one rarely sees in industry.”
 - “All of the coefficients were significant ---”
 - “The coefficients made sense and the results were reproducible.
 - “It is clear that these models perform well.”

BI Model Diagnostics



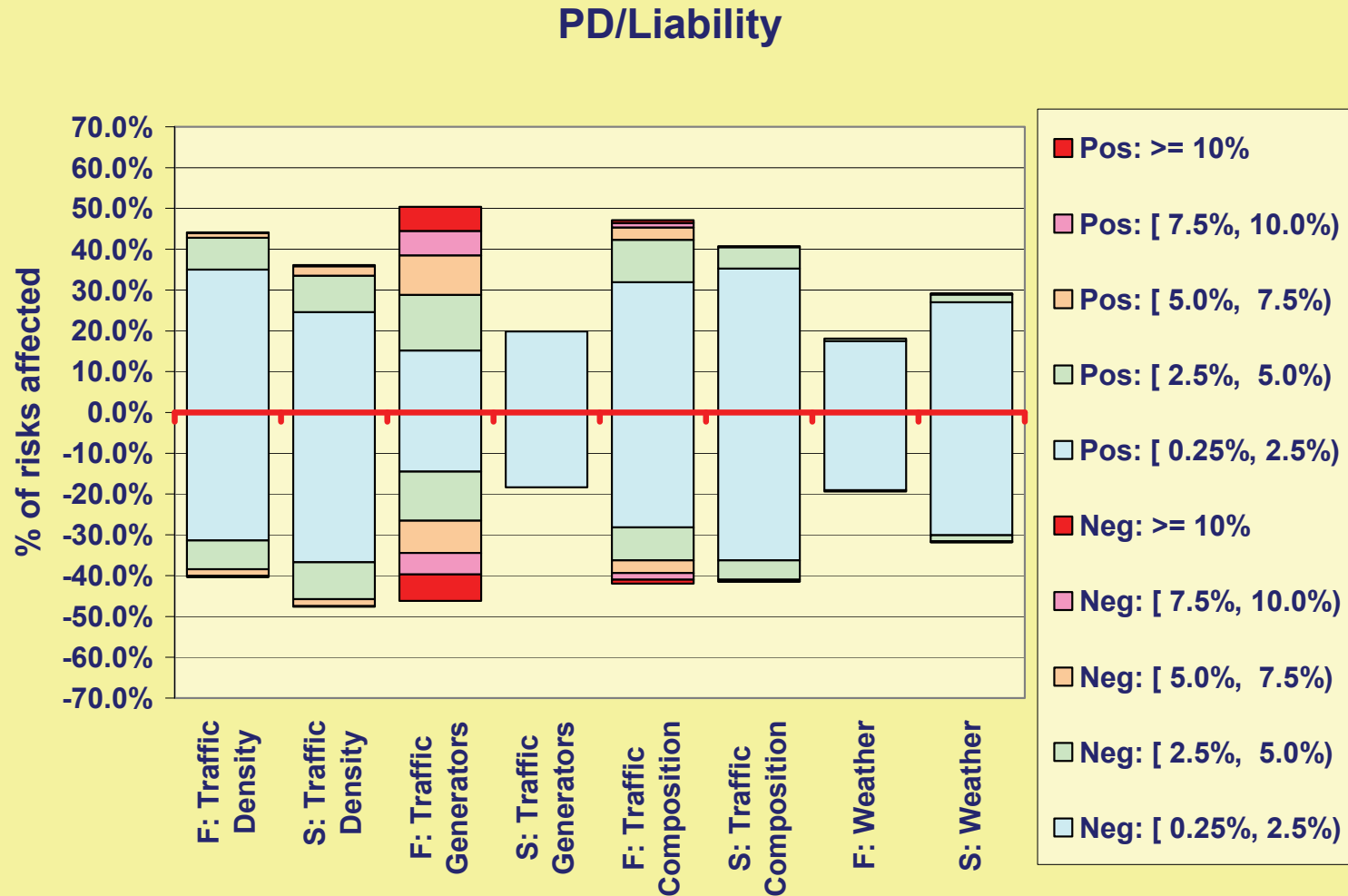
Reason Codes

Predicted Loss Costs will be accompanied by
up to 5 *Reason Codes*

- *Reason Codes* are distinct for each coverage
- *Reason Codes explain the departure from territory rating*
 - Ranked from greatest to least impact on rating
 - Identifying the effect in terms of eight dimensions:
likelihood or severity of loss (2) by (4) components
 - Each reason code also indicates the relative magnitude and direction associated with the reason

Reason Codes

Distribution of Component Reasons



ISO's Filing Plans

- ISO will be filing a rating rule based on Environmental module of Risk Analyzer Model
- Filing an optional rating plan
- Rating Rule “sits on top of” the existing ISO rating plan
- Rating rule with a multiplicative factor corresponding to a scoring range

Structure of ISO Rating Rule

<u>Score</u>	<u>Multiplier</u>
744 – 800	0.75
712 – 743	0.80

464 – 537	1.00

258 – 289	1.20
200 – 257	1.25