

# 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

Environmental  
Model Loss Cost  
by Coverage

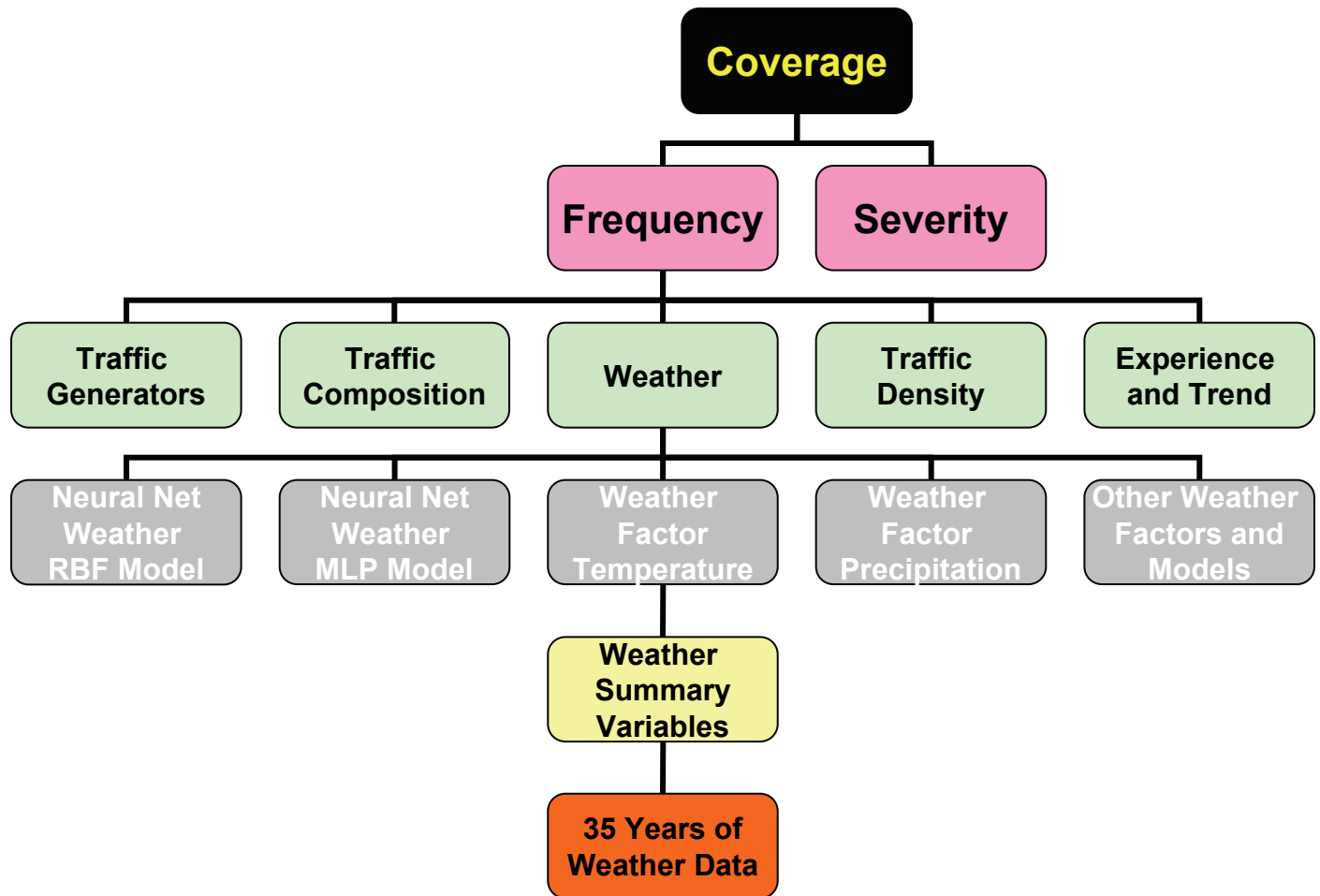
Frequency  
×  
Severity

Causes of Loss  
Frequency

Sub Model

Data Summary  
Variable

Raw Data



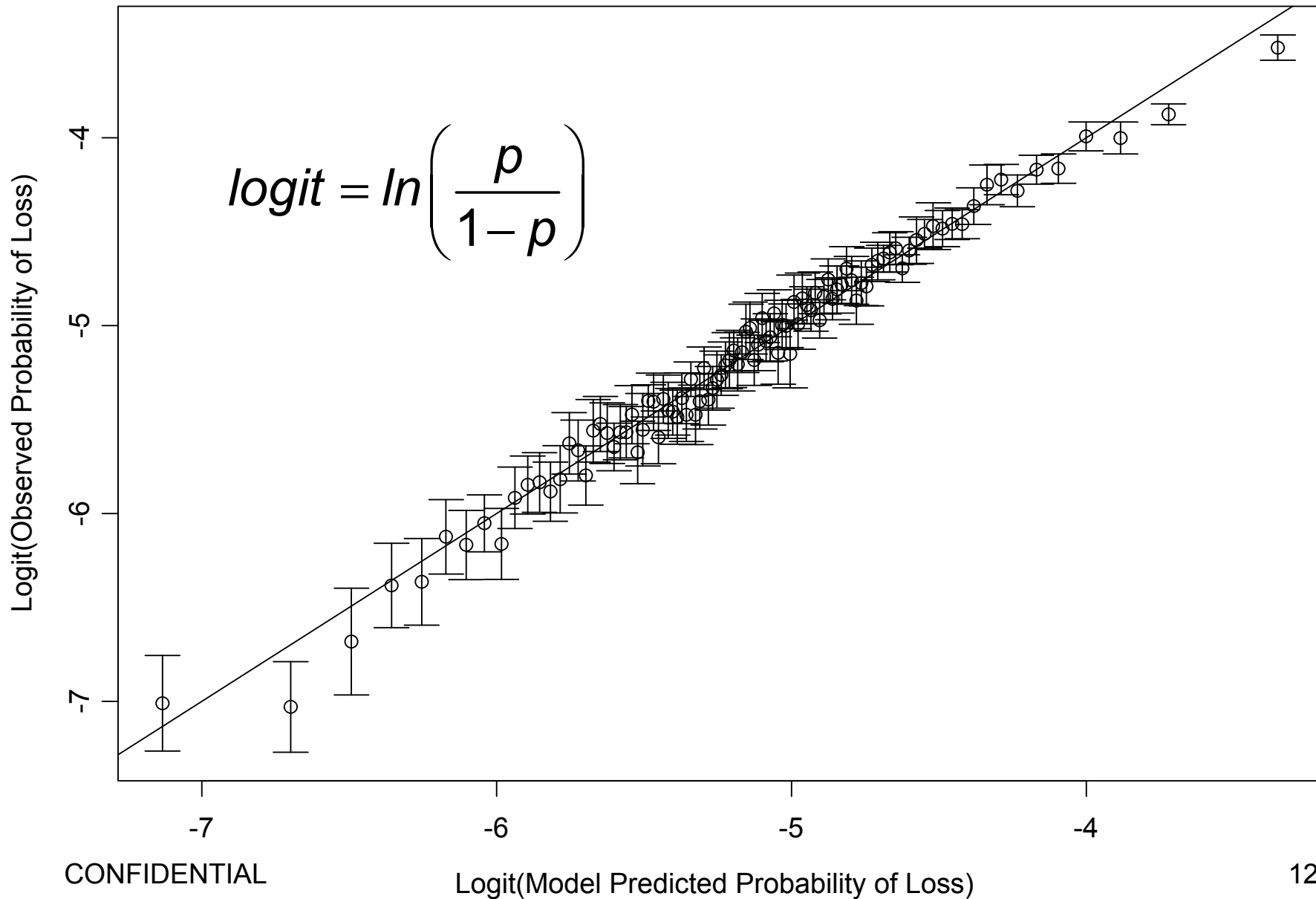
# Model Output

- 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



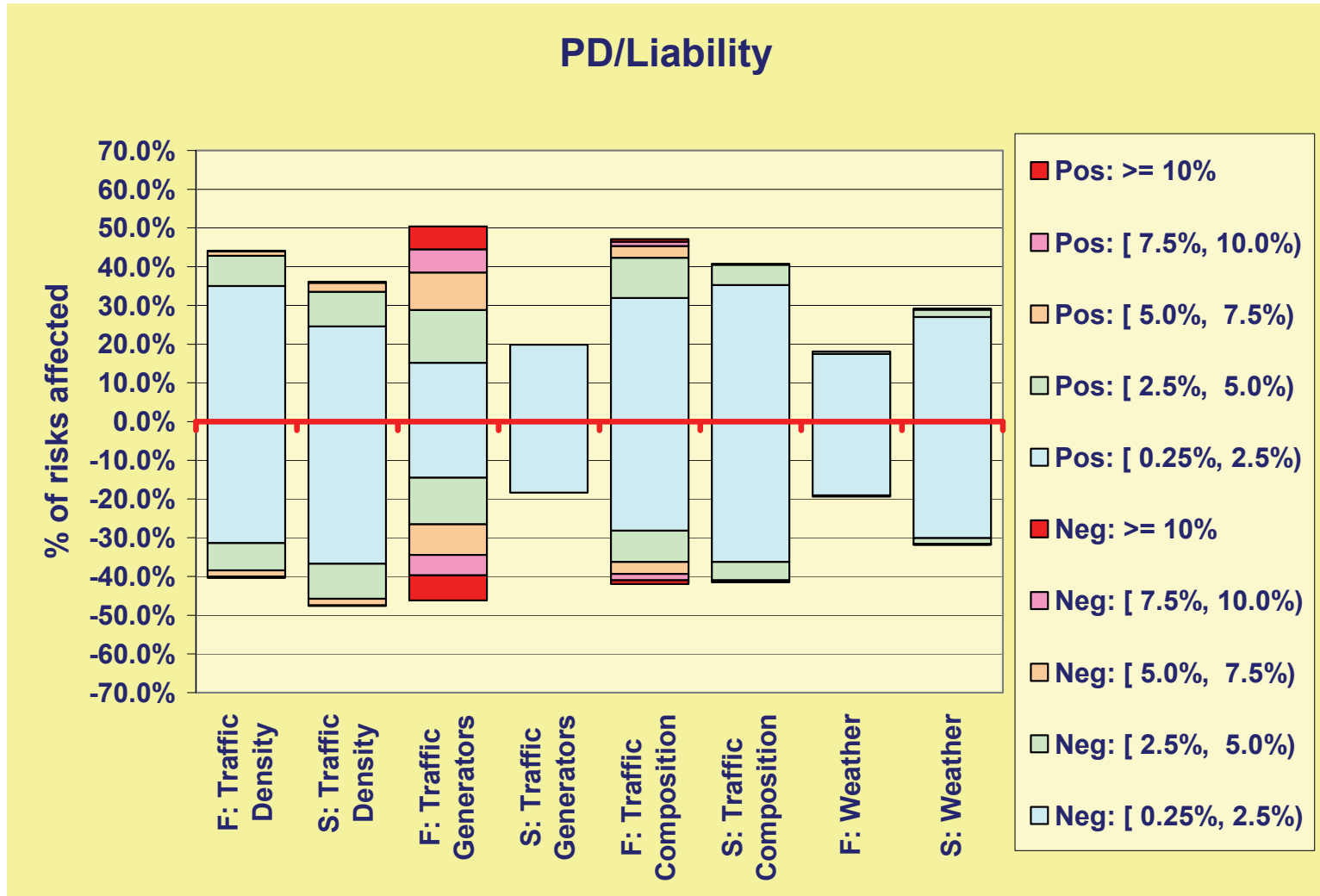
# Reason Codes

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
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464 – 537	1.00
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258 – 289	1.20
200 – 257	1.25