PINNACLE ACTUARIAL RESOURCES, INC. The Firm of Choice

Territory Analysis
Updates to the Traditional Methods

CAS RPM

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Agenda

- State of territory definitions today
- Reasons for modifying territories
- Available data
- Processes
  - Data
    - Availability and collection
    - Capping
    - Smoothing
    - Combining
  - Clustering
  - Selecting

Current Definitions

- Current sets
  - Often outdated
  - Uniform across product/policy
  - Less than optimal match of exposure
  - Developed in less than optimal ways
    - Technique
    - Basis for definitions
  - Tweaked over time
- Possibly leading to:
  - Misclassification
  - Misinterpretation of other factors
  - Anti-selection

Changing Landscapes

- Anyone else notice where there used to be a crop planted there is now a subdivision or a strip-mall?
- Over a 20-year period (1970-1990), the 100 largest urbanized areas in the United States sprawled out over an additional 14,545 square miles. That is more than 9 million acres of natural habitats, farmland and rural areas that have been converted to subdivisions, shopping centers, etc.
- What has happened since 1990?
  - Increased population density
  - Increased vehicle density
  - More new homes
  - Less populations in cities, more abandoned homes

Indianapolis

- 14 largest city in the U.S. according to 2010 Census
- 3rd largest in the Midwest
- One of the fastest growing regions in the Midwest.

County	City	Population	Pop Chg 4/1/00 - 7/1/09
Marion	Indianapolis	785,597	0.5%
	Remainder	105,282	33.2%
	Total	890,879	3.5%
Boone		56,287	22.1%
Hamilton		279,287	52.8%
Hancock		68,334	23.4%
Hendricks		140,606	35.1%
Morgan		70,876	6.3%
Johnson		141,501	22.8%
Shelby		44,503	2.4%
All Other		4,730,840	26.2%
Indiana		6,423,113	5.6%
http:\quickfacts.census.gov as of 3/3/11			

Geographic Rating

- Goal is to isolate variables to explain risk
- Use variables to segment property insured, coverage selections and insured characteristics
- Territory is used to explain differentiation in risk not picked up by other rating variables and to explain geographic differences
- Geographic difference can be due to
  - Population and vehicle density
  - Theft/crime rates
  - Hazards
  - Differences in mix of business
    - Properties insured
    - Vehicles driven

Upfront Considerations

- State regulations
  - Ex. OH must rate by city
- Available data
  - Internal
  - External
- System capabilities
- Types of analysis
  - Total state/line
  - By coverage/peril
- Historical events
  - Desire to remove or adjust for them
- Specific concerns
  - Management
  - Sales
- Competitive pressures and competitor boundaries

Deriving Territory Definitions

- Territory definition analysis is driven by a lot of numbers, analysis, statistical techniques, etc.
- However, there are still many areas where actuarial judgment plays an important roles

External Data

- Historical Insurance Industry data
  - ISO
  - HLDI
- Hazard data providers
- Census and other governmental data
  - Housing density
  - Traffic density
  - Crime statistics
  - Accident statistics
  - Home values
- Catastrophe Model Output

Basis for Data

- Statistics by
  - County
  - Zip Code
  - Census Block
  - Census Track
  - Address
- Location
  - Longitude
  - Latitude
  - Adjacency

Industry Data

- ISO
  - Auto
    - By coverage
    - Cat indicators
  - Home
    - By cause of loss
    - By coverage
    - Cat indicators
- HLDI
  - Auto
  - Available to members
  - By coverage
  - Comprehensive broken into fire, theft, glass and other

How much data is necessary?

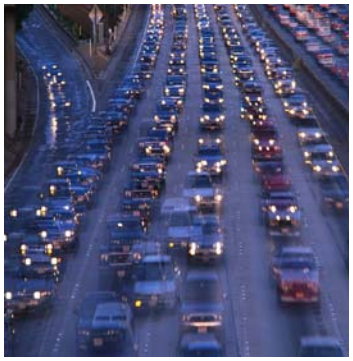
- Non-catastrophe
  - Generally 5-10 years depending on credibility of data
- Catastrophe
  - Much longer periods if available
  - HLDI provides 26 years
- Cat Modelers
  - Represents hundred's of years of experience and forecast of future events

Accounting for Catastrophes

- Company data
  - Usually cat and x-cat available
  - May not coincide with industry coding
- ISO
  - Cat and x-cat data
- HLDI
  - Comprehensive other than Fire, Theft and Glass
- Cat model data
  - AIR and RMS models
  - Wind/Hail models
  - Winter storm models
- Hazard data
  - Sinkholes
  - Distance to coast

Increased Segmentation in Definitions

- Auto
  - Territories by coverage
  - Territories by coverage group
- Home
  - Territories by peril
  - Territories by peril group
  - Territories by coverage
- Loss Components
  - Pure Premium
  - Frequency
  - Severity



Data Adjustments to Consider

- Average rating factors from all other variables
- Capping
- Smoothing
- Possibly clustering of partial components to add a further of smoothing
- Normalizing
- Inflationary adjustments
- Weighting together of various data sources

Capping

- Used at various places in process
- Average rating factors
  - Could have strange results based on distribution of book by zip code or other basis for analysis
- Large individual losses
- Large events or catastrophes

Territories by Coverage and Peril

- Since geographical location influence may not uniformly impact coverage or peril indications, separate definition sets by coverage or peril provide more optimal rate classification and factors
- Similar process for frequency/severity separate analysis
- There are ways to develop territory sets by coverage or peril and combine the sets into one consolidated set
  - May ease systems implementation

Auto Components

- Liability & Collision
  - Company
  - Industry
- Comprehensive
  - Non-Cat
    - Company
    - Industry
  - Cat
    - Company
    - Industry

Home Components

- Non-Weather
  - Fire, water, theft other property
    - Company
    - Industry
- Weather
  - Wind, hail, lightning and water
    - Non-Cat
      - Company
      - Industry
    - Cat
      - Company
      - Industry
      - Cat Modelers
        - Winter Storm
        - Wind/Hail
- Liability

Average Rating Plan Factors

- Adjustment of historical experience to a common level
- Removes distributional biases from the underlying data
- Assisted by generalized linear models
- Rating variables such as:
  - Age of driver
  - Insured Value of Homes
  - Protection Class
  - Deductible
  - Discounts
  - Claims surcharge

Smoothing

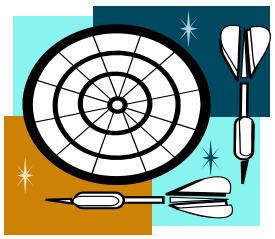
- Data at the basic element level lacks “credibility”
- Smoothing process allows inclusion of more localized data rather than statewide information
- Results in a rate or rate relativity for each individual zip code based upon the data within that zip code modified as necessary to include a significant number of observations

Smoothing

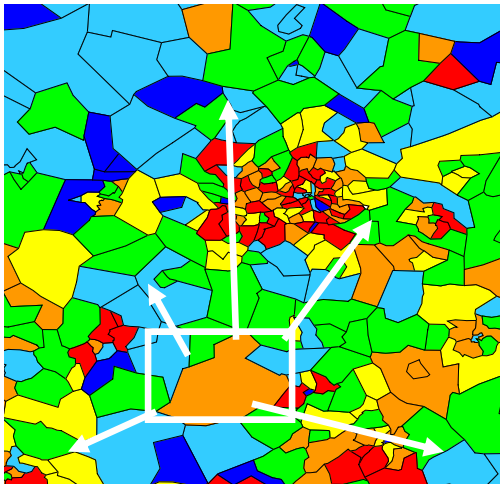
- Key smoothing variables
  - Predictive value of local data
  - Identification of complement data
  - How many observations are required to smooth
  - How far to allow smoothing search to continue
- Many equations are available to combine local data with surrounding information
  - Exposure Weighted Average
  - Straight Line Declining Distance formula
  - Squared Declining Distance formula
  - Werland-Christopherson Method

Smoothing Considerations

- State Borders and Corners
- Use of smoothing across state boundaries
- Potential separate smoothing of urban and rural areas
- Distance based smoothing process or contiguous based smoothing process

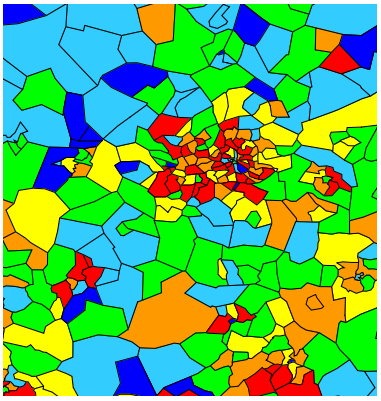


"Neighboring"



Smoothing Impact

Unsmoothed data



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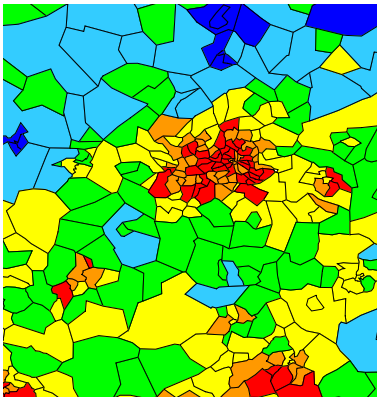

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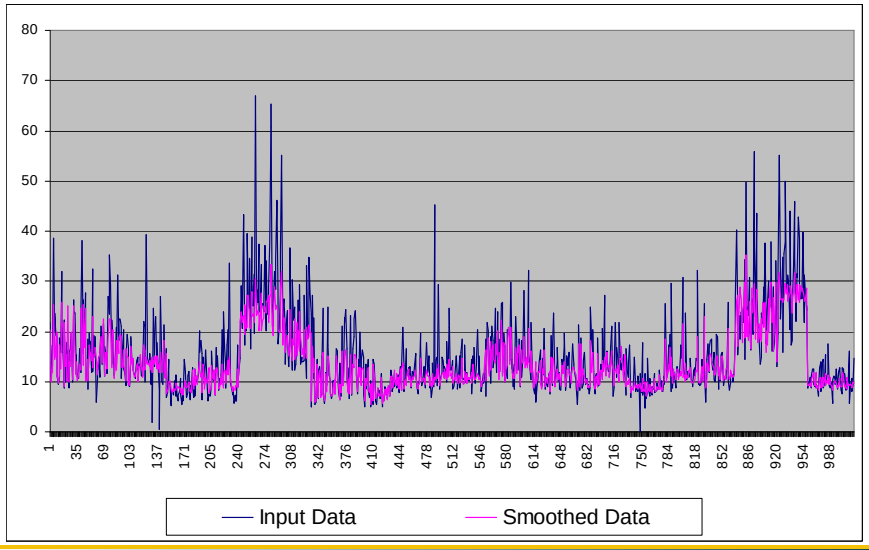
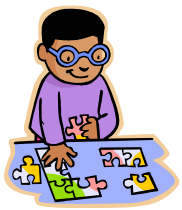


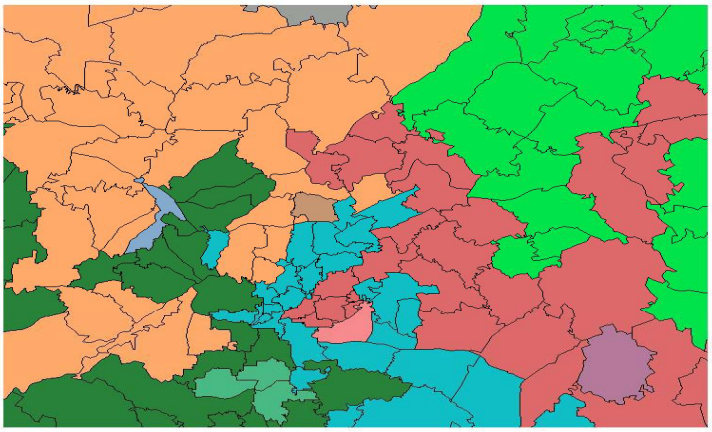
Clustering Process

- Grouping of areas based on similarity of statistics
- Begin with most detailed data and combine – bottom up approach
- Comparison can be based on percentage or value differences
- Contiguity can be a constraint



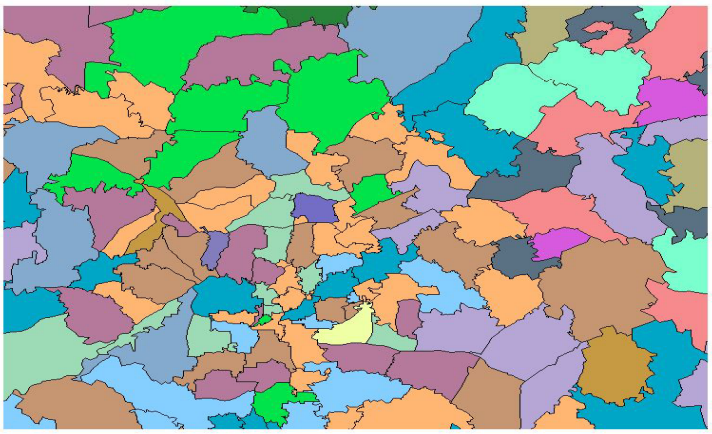
Contiguous Clusters

Contiguous Clustering



Non-Contiguous Clusters

Noncontiguous Clustering



Selection of Territories for Rating Purposes

- Smoothed data
- Clustered data
- Combination of Smoothed and Clustered
- Additional Judgment

Territory Definition Selections

- Helpful to look at a variety of cluster sets to provide guidance when making judgmental changes

Cluster To Review									
15	14			15			16		
Proposed Terr:	Exposure Weighted PP	Exposure	Zip Count	Exposure Weighted PP	Exposure	Zip Count	Exposure Weighted PP	Exposure	Zip Count
1	385	16396	4	385	16396	4	400	7262	2
2	353	4929	3	353	4929	3	373	9134	2
3	317	3665	3	317	3665	3	353	4929	3
4	297	9170	9	297	9170	9	317	3665	3
5	266	10391	9	278	4670	4	297	9170	9
6	229	44776	42	255	5721	5	278	4670	4
7	197	71087	49	229	44776	42	255	5721	5
8	181	63994	62	197	71087	49	229	44776	42
9	165	120410	133	181	63994	62	197	71087	49
10	150	82311	118	165	120410	133	181	63994	62
11	139	61094	58	150	82311	118	165	120410	133
12	130	54651	47	139	61094	58	150	82311	118
13	117	69135	33	130	54651	47	139	61094	58
14	103	4261	3	117	69135	33	130	54651	47
15		0		103	4261	3	117	69135	33
16		0			0		103	4261	3

Territory Definition Selections

- Judgmental selections need to be done to take into consideration several variables, for example:
  - Size of resulting territories
  - Past events distorting results
  - Competitive considerations

15	15			15adj			
	Clu15			Clu15adj			
Proposed Terr:	Exposure Weighted PP	Exposure	Zip Count	Exposure Weighted PP	Exposure	Zip Count	Terr Exp/ Tot Exp
1	385	16396	4	369	24,990	10	4.06%
2	353	4929	3				
3	317	3665	3				
4	297	9170	9	280	19,561	18	3.17%
5	278	4670	4				
6	255	5721	5				
7	229	44776	42	229	44,776	42	7.27%
8	197	71087	49	197	71,087	49	11.53%
9	181	63994	62	181	63,994	62	10.38%
10	165	120410	133	165	120,410	133	19.54%
11	150	82311	118	150	82,311	118	13.36%
12	139	61094	58	139	61,094	58	9.91%
13	130	54651	47	130	54,651	47	8.87%
14	117	69135	33	116	73,396	36	11.91%
15	103	4261	3				

Why Re-Discover Territories

- Better match of rate with exposure
- Action to avoid anti-selection
- Greater availability of external data
- More companies are developing territories based upon their experience rather than using ISO territories
- Desire for greater segmentation
- Tools now readily available to easily analyze data and develop indicated definitions based on <u>your</u> historical experience

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Thank You for Your Attention

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