August Edition

The Price is Right: An Introduction to Pricing Novel Products and Competitive Analysis

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Agenda

1. Overview
2. Setting the Rate Level
3. Creating Rating Plans
4. Q&A

Overview

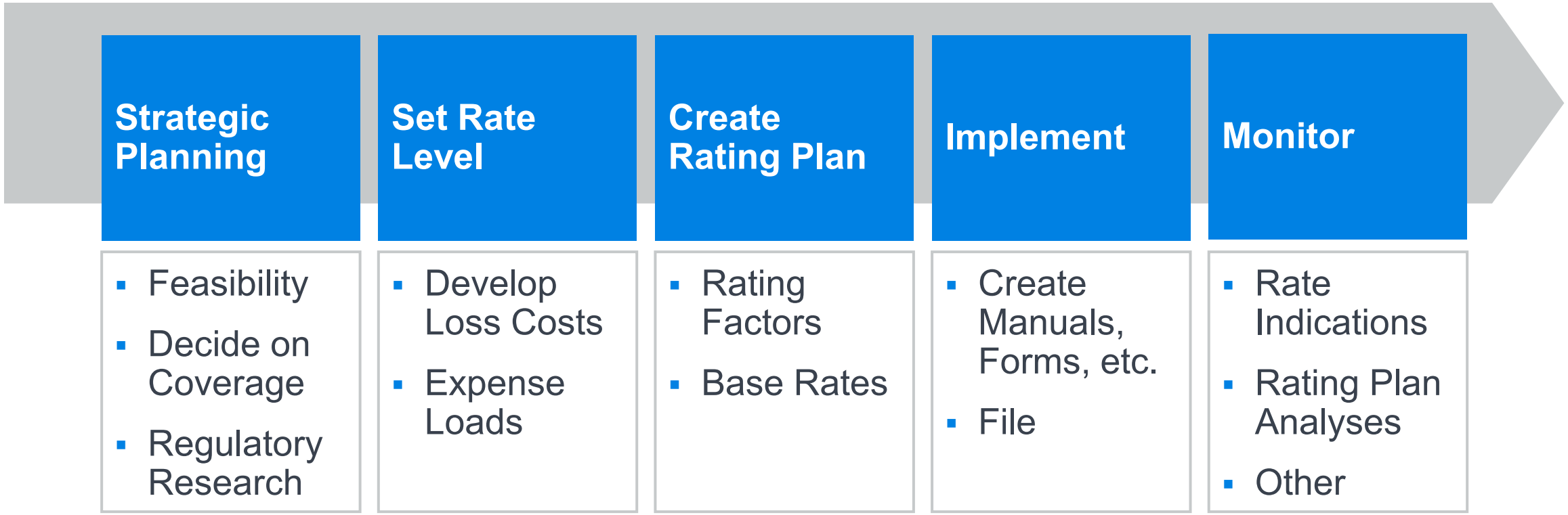
New Product Pricing Recipe:

1 part identifying the right tools

4 parts creativity

4 parts critical thinking

New Product Pricing Process



Types of New & Emerging Risks

New-to-You

- Expanding existing product into new state
- Creating new product for existing market

Familiar but Different

- Autonomous vehicles
- Ride share services
- Smart homes

Into the Unknown

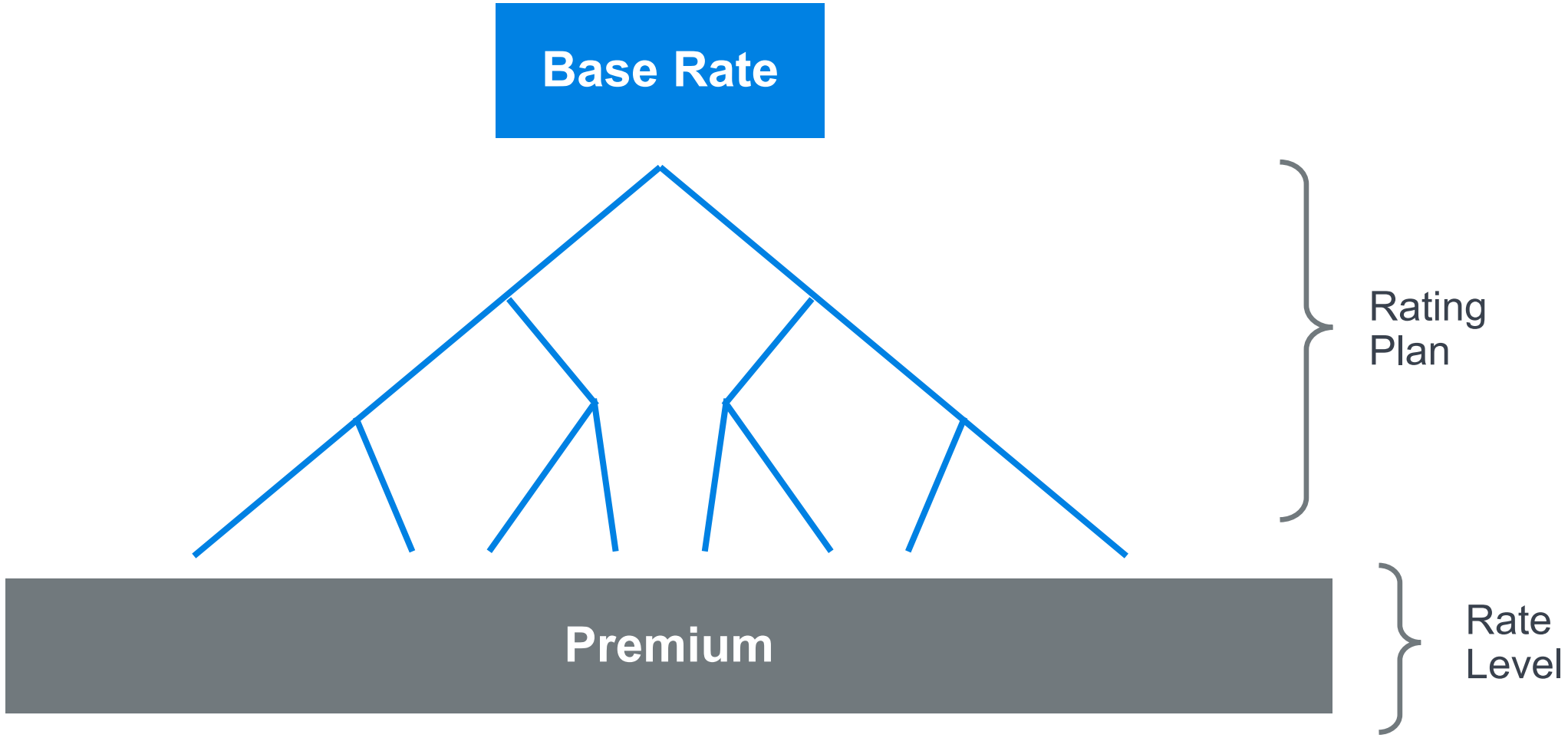
- Internet cyber attack
- Rocket transportation

Thematic Questions

- What is the exposure?
- What coverage is being offered?
- How is the exposure/coverage/frequency/severity similar to and different from an existing product?
- What are the risk characteristics that might drive frequency and severity?
- What are the anticipated expenses?

Setting the Rate Level

Rate Level vs Base Rate



Methodologies

1	Advisory Loss Cost Method
2	“Me-too” Method
3	Competitive Analysis
4	Ground-up Approach

Setting the Rate Level: Advisory Loss Cost Method

Advisory Loss Cost Method

1. Adopt advisory loss cost
2. Adjust for coverage differences (if applicable)
3. Determine rate by applying Loss Cost Multiplier (LCM):

$$Rate = Loss\ Cost\ x\ Loss\ Cost\ Multiplier\ (LCM)$$

$$where$$

$$LCM = \frac{1}{Expected\ Loss\ Ratio}$$

Advisory Loss Cost Method

Pro's

- Quick / easy to implement
- Simple to understand
- Requires minimal information
- Well-accepted by regulators

Con's

- Only useful for well-established LOB's
- May not be relevant for target market
- Rates may not be competitive

Advisory Loss Cost Example

- Your company is a well-established Homeowners insurer who is looking to start writing Private Passenger Auto coverage in order to offer packaged policies to customers.
- You've been tasked to lead the pricing and product development for this new product for every state, and you've been given an aggressive timeline.
- To get something to market quickly, you've decided to adopt advisory loss costs and rating plans in each state, starting with state X.
  - PPA Collision Advisory Loss Cost in State X = $150
- Expected Expense Ratio (Incl Profit) = 35%
  - → Expected Loss Ratio = 1 – 35% = 65%

Advisory Loss Cost Example (Cont.)

$$LCM = \frac{1}{0.65} = 1.538$$

$$Collision\ Rate = \$150\ x\ 1.538 = \$230.77$$

Setting the Rate Level: “Me-too” Method

“Me-too” Method

1. Select competitor from which to adopt either loss costs or rates
2. Adjust / load for anticipated expenses
3. Adjust for anticipated differences in coverage (if applicable)
4. Adjust for differences between market rates and actuarially indicated rates (optional)
5. Adjust for additional trend (optional)

“Me-too” Method

Pro’s

- Quick / easy to implement
- Simple to understand
- Requires minimal information
- Well-accepted by regulators

Con’s

- Only useful for LOB’s with existing writers
- How to select competitor?
- May not be able to find all required information from rate filings

Considerations when Selecting a Competitor

- Target market
- Market share
- Premium growth
- Profitability / rate adequacy
- Sophistication
- Reputation
- Availability of required data

“Me-too” Example

(Prior Example Continued)

- After reconsidering the competitiveness of the advisory loss costs, you instead decide to “me-too” ABC Insurance Company (ABC), a leading player in the market. Based on the indicated rate changes, your company decides to me-too ABC’s actuarially indicated rates as opposed to ABC’s proposed rates.

- ABC Insurance Company’s most recent rate filing in State X became effective 1/1/2021.

- You are targeting an effective date of 1/1/2023 in State X.

“Me-too” Example

Other Data

	ABC Ins Co	Your Company
Expense Ratio (Incl Profit)	33%	35%
Indicated Collision Rate Change	-5%	N/A
Implemented Rate Change	-1%	N/A
Loss Trend	-2%	N/A
Premium Trend	1%	N/A

“Me-too” Example (Cont.)

Step 1: Adjust for differences in expenses

- For expenses loaded into base rates:

$$Expense\ Adjustment\ Factor = \frac{LCM_{Anticipated}}{LCM_{Competitor}} = \frac{Expected\ Loss\ Ratio_{Competitor}}{Expected\ Loss\ Ratio_{Anticipated}}$$

$$= \frac{1\ -\ Expense\ Ratio^{*}_{Competitor}}{1\ -\ Expense\ Ratio^{*}_{Anticipated}}$$

** Includes profit & contingencies*

“Me-too” Example (Cont.)

Step 1: Adjust for differences in expenses

$$Expense\ Adjustment\ Factor = \frac{1 - Expense\ Ratio^{*}_{Competitor}}{1 - Expense\ Ratio^{*}_{Anticipated}} = \frac{1 - 0.33}{1 - 0.35} = 1.031$$

** Includes profit & contingencies*

“Me-too” Example (Cont.)

Step 2: Adjust for differences between market rates and actuarially indicated rates

$$Residual\ Rate\ Adjustment\ Factor = \frac{(1 + Indicated\ Rate\ Change)}{(1 + Implemented\ Rate\ Change)} = \frac{(1 - 5.0\%)}{(1 - 1.0\%)} = 0.960$$

“Me-too” Example (Cont.)

Step 3: Adjust for additional trend

$$Net\ Trend = \frac{(1 + Loss\ Trend)}{(1 + Premium\ Trend)} - 1 = \frac{(1 - 2.0\%)}{(1 + 1.0\%)} - 1 = -3.0\%$$

$$Trend\ Period = Eff\ Date_{Anticipated} - Eff\ Date_{Competitor} = 1/1/2023 - 1/1/2021 = 2\ years$$

$$Trend\ Adjustment\ Factor = (1 - 3.0\%)^2 = 0.941$$

“Me-too” Example (Cont.)

Step 4: Calculate Total Rate Adjustment Factor

Adjustment Type	Adj Factor
(1) Expense Adjustment Factor	1.031
(2) Residual Rate Adjustment Factor	0.960
(3) Trend Adjustment Factor	0.941
(4) Total Rate Adjustment Factor = (1) x (2) x (3)	**0.931**

Setting the Rate Level: Competitive Analysis

Competitive Analysis

Process

- **Phase 1:** Select competitors for analysis
- **Phase 2 *(Option 1)*:** Compare loss costs / average premiums from data in rate filings
- **Phase 2 *(Option 2)*:** Calculate and compare competitor premiums for a market basket dataset
- **Phase 3:** Select rate level
- **Phase 4:** Adjust loss cost / rate level for expenses, differences in coverage, etc.

Considerations when Selecting Competitors

- Target market
- Market share
- Premium growth
- Profitability / rate adequacy
- Sophistication
- Reputation
- Availability of required data

Creating a Market Basket

- Use in-force book from other state(s)
- Purchase from a vendor
- Permutation approach
- Simulation approach

Creating a Market Basket

Permutation Approach

1. Select risk characteristics to evaluate:

Driver Age	Marital Status	Model Year	
16	Single	2010	
25	Married	2015	…
35		2020	
55			
75			

2. Create record for every possible risk characteristic combination:

Record #	Driver Age	Marital Status	Model Year	…
1	16	Single	2010	…
2	16	Single	2015	…
3	16	Single	2020	…
4	16	Married	2010	…
…	…	…	…	…

Creating a Market Basket

Permutation Approach

Pro's

- Quick / easy to develop
- Allows for focus on key risk characteristics
- Useful for comparing differences in rating plans / identifying company to "me-too"

Con's

- May not be reflective of actual exposure distribution
- May create unrealistic scenarios which may distort average premiums
- Doesn't take many selected risk characteristics have a very large dataset
- May not be able to review every risk characteristic due to size of dataset

Creating a Market Basket

Simulation Approach

1. Determine expected cumulative distribution function (CDF) for every variable:

Driver Age	Expected CDF
16	2%
17	4%
..	…
99	99%
100	100%

2. Generate random number for each variable in dataset for as many records as desired
3. Assign value for each variable based on the cumulative distribution function assumed for each variable

Record #	Age Random #	Simulated Age	…
1	.991	100	…
2	.015	16	…
3	.985	99	…
…	…	…	…

Creating a Market Basket

Simulation Approach

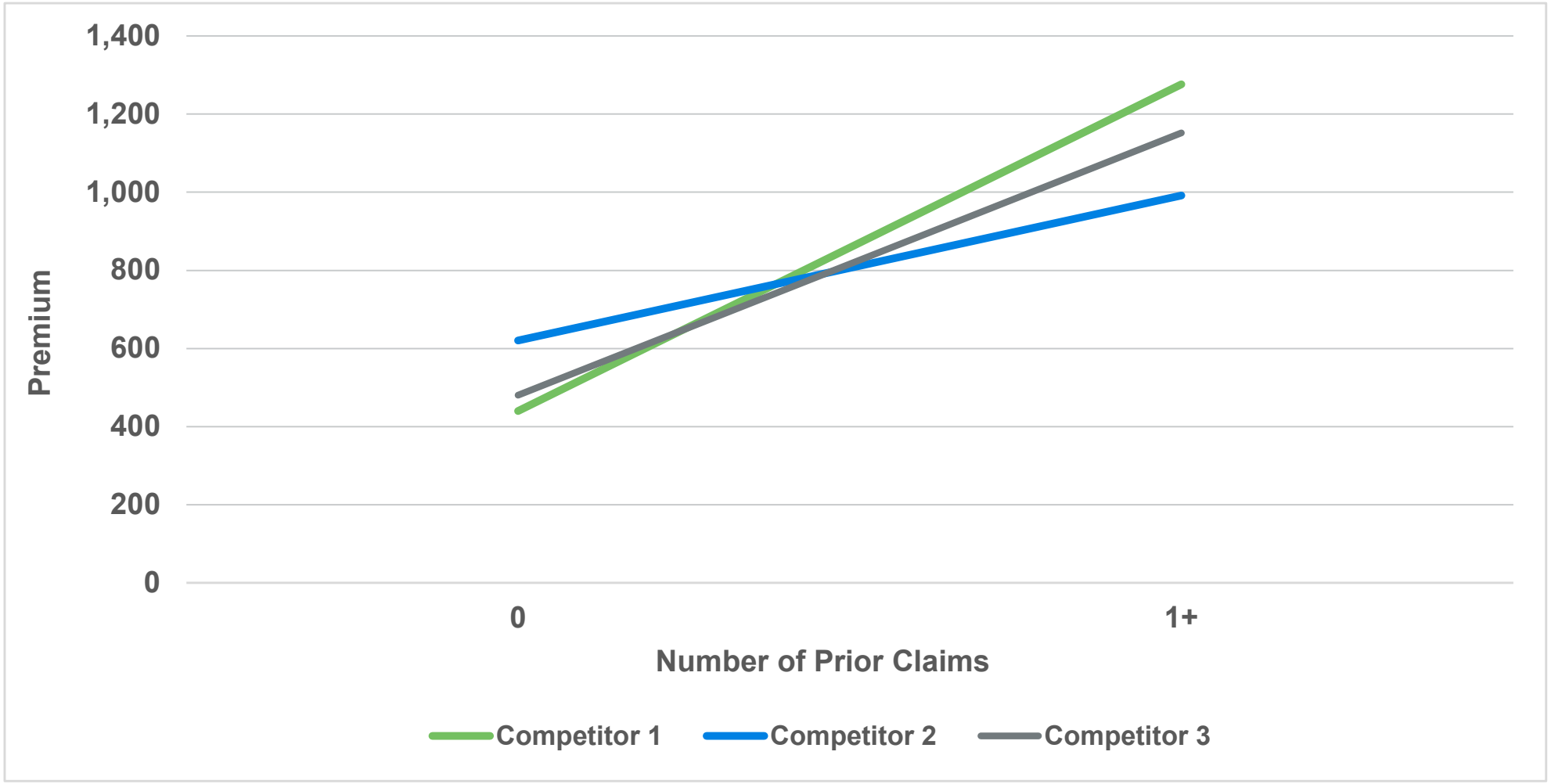
Pro's

- More accurately resembles expected exposure distributions on a univariate basis
- Average premiums may be more in line with reality
- Can review a wider range of risk characteristics without making dataset too big

Con's

- Time intensive to determine expected exposure distributions
- May be difficult to find data to support distributions
- Difficult to account for correlations between risk characteristics
- May create unrealistic scenarios which may distort average premiums

Competitive Analysis



Competitive Analysis

Pro's

- Generally easy to understand / get buy-in
- Generally well-accepted by regulators
- Gives sense of expected competitive position
- Can help identify competitor to "me-too"

Con's

- Can be time / resource intensive
- Necessary information may be difficult to find or unavailable
- Requires many assumptions which add to uncertainty of results
- Does not consider losses / profitability, only competitiveness
- May be difficult to accurately compare on an apples-to-apples basis due to differences in business models, coverage, etc.

Setting the Rate Level: Ground-up Approach

Ground-up Approach

1. Determine expected frequency
2. Determine expected severity
3. Calculate expected loss cost
4. Load in expenses, profit & contingencies

Ground-up Approach Example

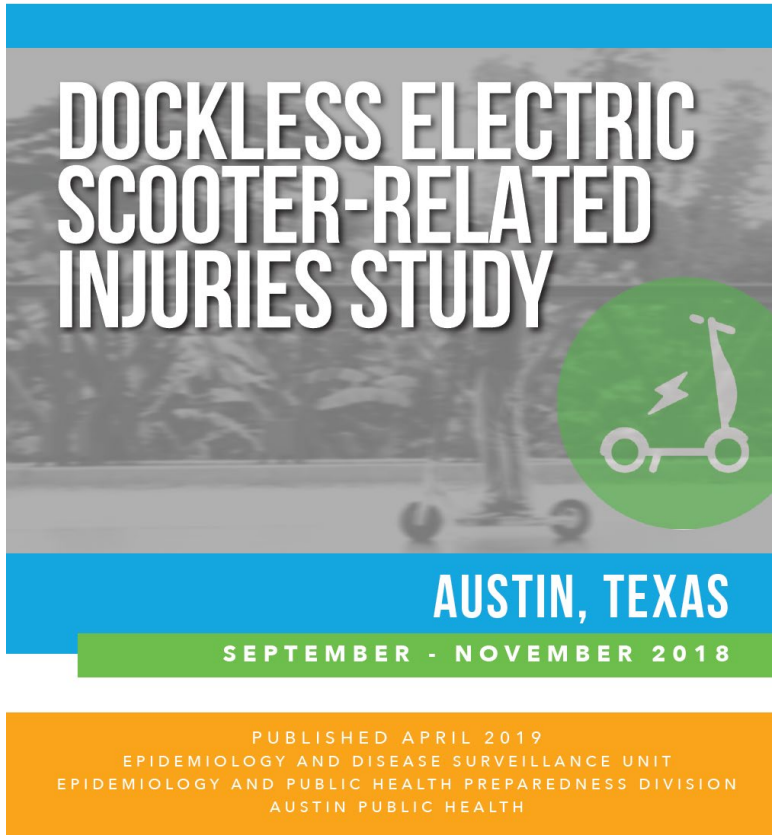
- Your company has decided to create a new E-Scooter rental insurance product, which will provide $2,000 of Medical Payments coverage to an individual renting an e-Scooter. You've been tasked with developing the rates for this product.

- Coverage will be provided on a per-minute basis.

- A quick search for rate filings yields no results, and to your knowledge there are no competitors offering similar coverage.

Ground-up Approach Example (Cont.)

Research Findings



JAMA Network Open

Original Investigation | Emergency Medicine

Injuries Associated With Standing Electric Scooter Use

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Abstract

IMPORTANCE Since September 2017, standing electric scooters have proliferated rapidly as an inexpensive, easy mode of transportation. Although there are regulations for safe riding established by both electric scooter companies and local governments, public common use practices and the incidence and types of injuries associated with these standing electric scooters are unknown.

OBJECTIVE To characterize injuries associated with standing electric scooter use, the clinical outcomes of injured patients, and common use practices in the first US metropolitan area to experience adoption of this technology.

DESIGN, SETTING, AND PARTICIPANTS This study of a case series used retrospective cohort medical record review of all patients presenting with injuries associated with standing electric scooter use between September 1, 2017, and August 31, 2018, at 2 urban emergency departments associated with an academic medical center in Southern California. All electric scooter riders at selected public intersections in the community surrounding the 2 hospitals were also observed during a 7-hour observation period in September 2018.

MAIN OUTCOMES AND MEASURES Incidence and characteristics of injuries and observation of riders' common use practices.

RESULTS Two hundred forty-nine patients (145 [58.2%] male; mean [SD] age, 33.7 [15.3] years) presented to the emergency department with injuries associated with standing electric scooter use during the study period. Two hundred twenty-eight (91.6%) were injured as riders and 21 (8.4%) as nonriders. Twenty-seven patients were younger than 18 years (10.8%). Ten riders (4.4%) were documented as having worn a helmet, and 12 patients (4.8%) had either a blood alcohol level greater than 0.05% or were perceived to be intoxicated by a physician. Frequent injuries included fractures (79 [31.7%]), head injury (100 [40.2%]), and contusions, sprains, and lacerations without fracture or head injury (69 [27.7%]). The majority of patients (234 [94.0%]) were discharged home from the emergency department; of the 15 admitted patients, 2 had severe injuries and were admitted to the intensive care unit. Among 193 observed electric scooter riders in the local community in September 2018, 182 (94.3%) were not wearing a helmet.

CONCLUSIONS AND RELEVANCE Injuries associated with standing electric scooter use are a new phenomenon and vary in severity. In this study, helmet use was low and a significant subset of injuries occurred in patients younger than 18 years, the minimum age permitted by private scooter company regulations. These findings may inform public policy regarding standing electric scooter use.

JAMA Network Open. 2019;2(1):e187381. doi:10.1001/jamanetworkopen.2018.7381

Key Points

Question What are the types of injuries associated with standing electric scooter use and the characteristics and behaviors of injured patients?

Findings In this study of a case series, 249 patients presented to the emergency department with injuries associated with electric scooter use during a 1-year period, with 10.8% of patients younger than 18 years and only 4.4% of riders documented to be wearing a helmet. The most common injuries were fractures (31.7%), head injuries (40.2%), and soft-tissue injuries (27.7%).

Meaning In this study, injuries associated with electric scooter use were common, ranged in severity, and suggest low rates of adherence to existing regulations around rider age and low rates of helmet use.

+ Invited Commentary
+ Supplemental content

Author affiliations and article information are listed at the end of this article.

A Look at e-Scooter Safety

Examining risks, reviewing responsibilities, and prioritizing prevention

April 2019

BIRD

Milliman

Ground-up Approach Example (Cont.)

Research Findings (Frequency)

- Austin Public Health Study:

(1) Number of First Party Injuries:	190
(2) Hours of E-Scooter Use during Experience Period:	182,333
(3) Indicated Frequency per Minute Driven:	0.0017%
= (1) / (2) / 60	

- Bird Safety Report:

(1) Injuries per Mile:	0.000037
(2) Average Miles per Trip:	1
(3) Average Minutes per Trip:	12
(4) Indicated Frequency per Minute Driven:	0.0003%
= (1) x (2) / (3)	

What would your selected frequency be?

Ground-up Approach Example - Polling Question

What would your selected frequency be?

A. 0.0017% (based on the Austin Public Health Study)

B. 0.0003% (based on the Bird Safety Report)

C. Blending of the two indications

D. None of the above

Ground-up Approach Example (Cont.)

Research Findings (Severity)

Treatment / Injury	Riders (n=228)
Received any radiograph or CT	183 (80.3%)
Any fracture	71 (31.1%)
Head Injury	92 (40.4%)
Contusions, sprains, and lacerations with no fracture or head injury	63 (27.5%)
Total / Average	**228 (100.0%)**

Excerpt from “Injuries Associated with standing Electric Scooter Use.” JAMA Network Open, January 2019

Ground-up Approach Example (Cont.)

Research Findings (Severity)

Treatment / Injury	Riders (n=228)	Selected Avg Cost	Total Cost
Received any radiograph or CT	183 (80.3%)	$3,000	$549,000
Any fracture	71 (31.1%)	$2,500	$117,500
Head Injury	92 (40.4%)	$1,000	$92,000
Contusions, sprains, and lacerations with no fracture or head injury	63 (27.5%)	$400	$25,200
Total / Average	**228 (100.0%)**		**$843,700**

$$Indicated\ Average\ Severity = \frac{843{,}700}{228} = \$3{,}700$$

Milliman

Excerpt from “Injuries Associated with standing Electric Scooter Use.” JAMA Network Open, January 2019

Additional Considerations

Identifying Limitations

- E-Scooter studies do not capture all accidents (hospital visits only)
  - Frequency → Understated?
  - Severity → Overstated?
- Will users be more likely to seek medical treatment if they have coverage?
- Any differences in geography / territory?

- ***Solution to uncertainty: Contingency Factor***

Contingency Factor

- Apply to loss costs or rates to account for additional uncertainty
- How to select?
  - Sensitivity testing of results
  - Gut / judgment

Ground-up Approach

Pro's	Con's
▪ Fun to blend creativity with actuarial concepts	▪ Increased uncertainty around rates ▪ Can be difficult to find needed information

Creating Rating Plans

Methodologies

1	Adopt (Your) Existing Rating Plan
2	“Me-Too” Competitor / Advisory Rating Plan
3	Use of Multiple Competitors
4	Judgment

Creating Rating Plans: “Me-too” Method

“Me-too” Method

1. Select competitor or advisory organization from which to adopt rating plan
2. Offset base rates for any differences in the proposed rating plan (i.e. adding / removing rating variables)
3. Adjust base rates for anticipated rate level

Considerations when Selecting a Competitor

- Target market
  - Competitor known to target certain market
  - Competitor has favorable competitive position for target market based on results of competitive analysis
- Market share
- Premium growth
- Profitability
- Reputation
- Sophistication / complexity of rating plan

“Me-too” Method

Pro’s

- Easy in concept
- Quick to implement
- Well-accepted by regulators

Con’s

- May be difficult to find all necessary data in publicly available filings
- May not be possible to implement proprietary / esoteric variables (e.g. Insurance Score, Tier)
- Potential disruption issues down the road

“Me-too” Method Example

Base Rate Offset

- In addition to adopting ABC’s rates, you’ve decided to “me-too” ABC’s rating plan.

- However, ABC’s rating plan includes a Good Student Discount, which your company doesn’t want to implement.

“Me-too” Method Example (Cont.)

Base Rate Offset

Good Student Discount	ABC Exposure Distribution	ABC Rating Factor	Proposed Rating Factor
Yes	5%	0.90	1.00
No	95%	1.00	1.00
Total / Average	**100%**	**0.995**	**1.00**

“Me-too” Method Example (Cont.)

Base Rate Offset

$$Base\ Rate\ Offset = \frac{Avg\ Rating\ Factor_{Competitor}}{Average\ Rating\ Factor_{Proposed}} = \frac{0.995}{1} = 0.995$$

Creating Rating Plans:
Use of Multiple Competitors

Use of Multiple Competitors Example

Deductible	Competitor 1	Competitor 2	Competitor 3	Competitor Avg	Selected
0	1.50	1.60	1.45	1.52	**1.52**
250	1.25	1.25	1.20	1.23	**1.23**
500	1.00	1.00	1.00	1.00	**1.00**
1,000	0.90	0.92	0.95	0.92	**0.92**
2,000	0.80	0.85	0.90	0.85	**0.85**

Use of Multiple Competitors

Pro's

- In concept, easy to understand
- Generally accepted among regulators

Con's

- Competitor rating plans may differ widely and be difficult to compare via relativities alone
- Difficult to determine what base rates should be without a rating engine / market basket analysis
- Competitor rating plans and availability may vary state-to-state

Creating Rating Plans: Judgment

Judgment Example

- You're developing a product for peer-to-peer car rental insurance, where car owners can rent out their vehicles by the hour to a licensed driver.

- Coverage for the product looks like traditional private passenger auto coverage with similar policy forms.

- Due to the similarity to a traditional private passenger auto product, your team decides to adopt the rating plan of an existing private passenger auto program currently in the market. However, your team wants to explore adding additional rating elements to the rating plan that may more specifically capture risk differences for a peer-to-peer rental product. You've been tasked with determining these rating elements.

Judgment Example (Cont.)

What Risk Characteristics Might be Predictive of Loss?

Judgment Example (Cont.)

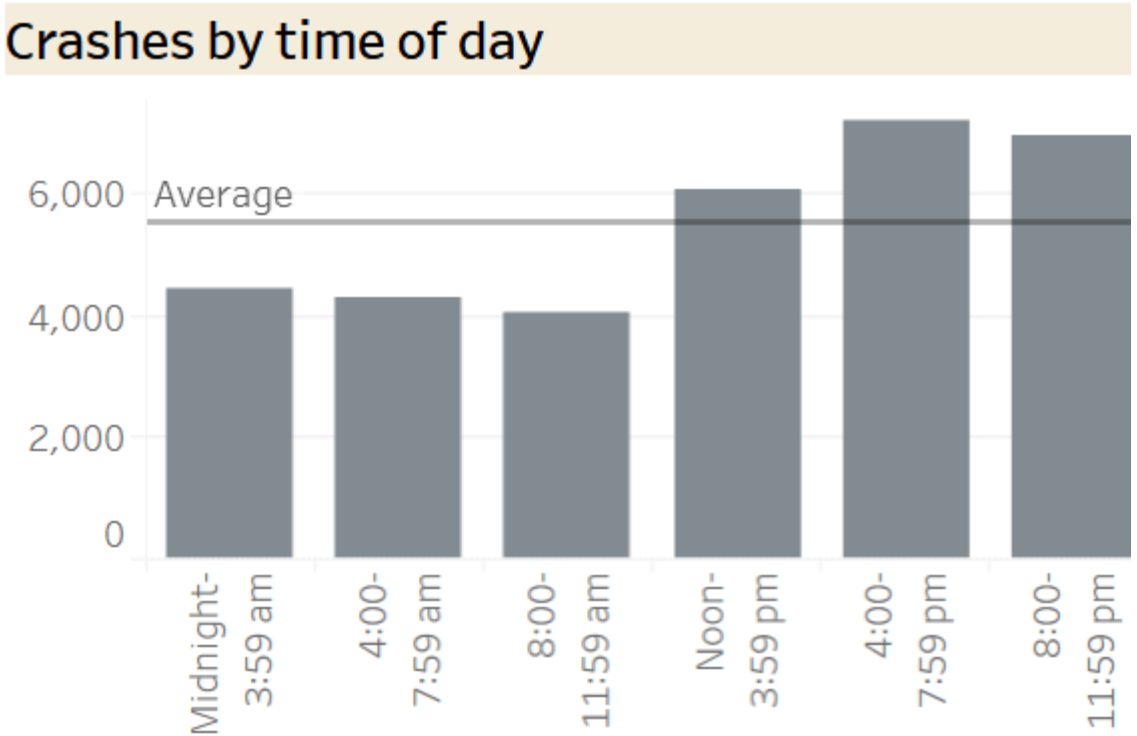
What Risk Characteristics Might be Predictive of Loss?

- Time of day rented / day of week?
- Time of year?
- Duration of rental?
- Renter's familiarity with area?
- Does the renter have experience driving in certain weather conditions?
- Does the renter own a car?
- Others?

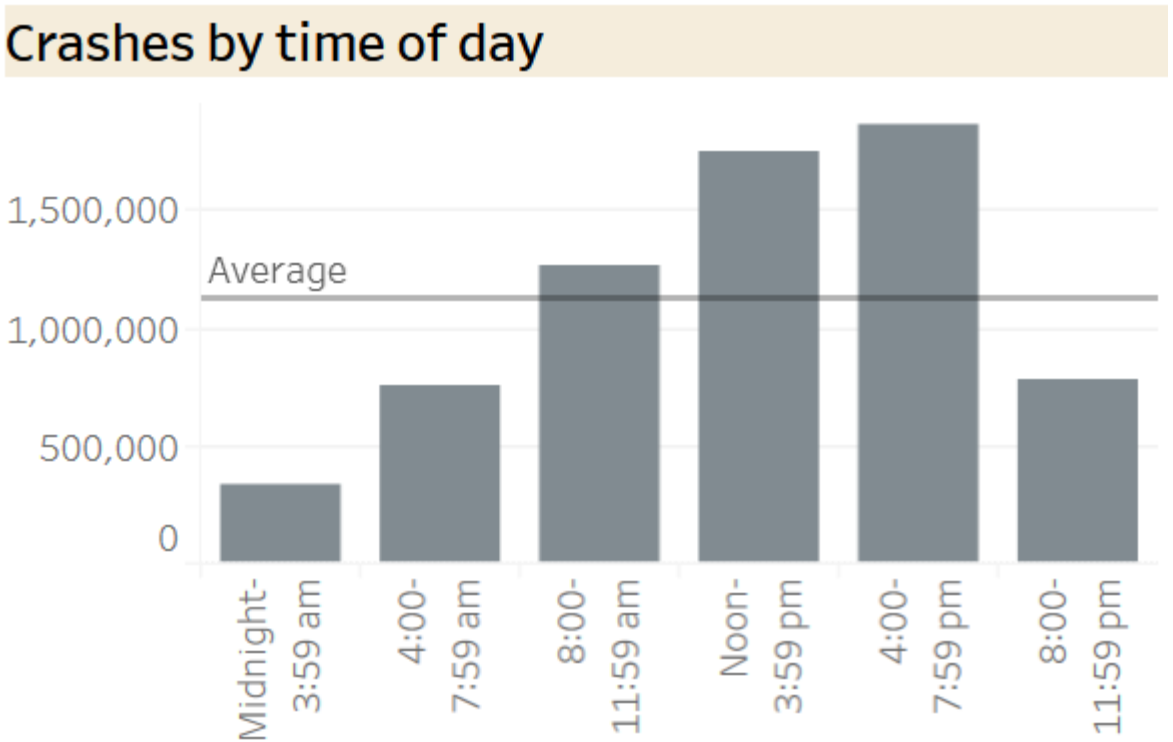
Judgment Example (Cont.)

Time of Day Rented

Fatal



Non-Fatal



National Safety Council's analysis of National Highway Traffic Safety Administration (NHTSA) Fatality Analysis Reporting System (FARS) and Crash Report Sampling System (CRSS) data sets

Judgment Example (Cont.)

Time of Day Rented

Time of Day	Fatal		Non-Fatal		Total	
	Number of Accidents	Frequency Relativity	Number of Accidents	Frequency Relativity	Number of Accidents	Frequency Relativity
Midnight-3:59 am	4,430	0.81	326,666	0.29	331,096	**0.29**
4:00-7:59 am	4,307	0.78	750,193	0.67	754,500	**0.67**
8:00-11:59 am	4,050	0.74	1,267,465	1.13	1,271,515	**1.13**
Noon-3:59 pm	6,078	1.11	1,749,471	1.56	1,755,549	**1.56**
4:00-7:59 pm	7,174	1.30	1,856,564	1.66	1,863,738	**1.66**
8:00-11:59 pm	6,956	1.26	772,227	0.69	779,183	**0.69**
Average	**5,499**	**1.00**	**1,120,431**	**1.00**	**1,125,930**	**1.00**

National Safety Council's analysis of National Highway Traffic Safety Administration (NHTSA) Fatality Analysis Reporting System (FARS) and Crash Report Sampling System (CRSS) data sets

Judgment Example (Cont.)

Time of Day Rented

- What about severity?
- Are there any limitations in the data?
- Are there any business considerations?
- What factors should we implement? Full indicated?
- What's our expected exposure distribution / what base rate offset is needed?

Judgment

Pro's

- No historical claims data required

Con's

- Difficult to find needed support
- Adds additional uncertainty
- Regulatory approval could potentially be challenging depending on product

Q&A

Milliman

Thank you

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