E2: Enhanced GLMs and vehicle grouping

Duncan Anderson & Sami Abdel-Gadir

EMB
Agenda

Enhanced GLMs and vehicle grouping

Duncan Anderson  Sami Abdel-Gadir
Interactions

![Graph showing interactions vs policyholder age]
Interactions
Interactions

Policyholder Age
Why are interactions present?

- Because that's how the factors behave
- Because the multiplicative model can go wrong at the edges
  - $1.5 \times 1.4 \times 1.7 \times 1.5 \times 1.8 \times 1.5 \times 1.8 = 26!$
## Interactions

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Saddles
Saddles - model comparison
Motor frequency - out of sample
Saddles - model comparison
Motor frequency - out of sample
Saddles - model comparison
Motor frequency - out of sample

Exposure  Observed  Saddle  Original
Saddles - model comparison
Motor frequency - out of time

[Graph showing comparison between Exposure, Observed, Saddles, and Original data]
Saddles - model comparison
Motor renewals - out of sample

Exposure
Observed
Saddles
Original
Machine vs man
Machine vs man
Machine vs man

What is the underlying process?
Machine vs man

What are the underlying drivers?
Machine vs man

What segments can I dream up?

Young mothers with 4x4s doing the school run

Old people driving a Honda Jazz going slowly in front of me
Key messages

– “Saddle” method of interaction detection can identify many subtle interactions and yield materially more predictive models
– This is no replacement for thought – carefully constructed manual factor combinations can also yield material benefits
Agenda

Enhanced GLMs and vehicle grouping

Duncan Anderson  Sami Abdel-Gadir
The starting point – the ABI 50 vehicle classification

- New vehicles classified according to:
  - Damage and parts costs
  - Repair times
  - New car values
  - Performance
  - Security
- 50 groups in use plus suffixes
- Imported cars and specialised purpose vehicles e.g. kit cars are not classified
How good is ABI 50 for risk models and pricing?

- Useful benchmark
- Public awareness
- Very good predictor of total loss?
- Good predictor of claim frequency?
- Better predictor of AD claims experience than TP?

But...

- does not acknowledge all vehicle attributes
- does not make full use of the 50 groups
- is a one-size fits all vehicle group the best option?
Insurer classifications
Postcoding - framework

- Standard Policy Factors
- Random Noise
- External Geographical Factors
- Residual Spatial Variation
Spatial smoothing

- Credibility family method
- Can adopt distance based or adjacency based approach
Car classification – translating the framework

- Standard Policy Factors
- Random Noise
- External Vehicle Factors
- Residual Spatial Variation
Back to basics

Dimensions

Body style

Safety

Performance

Security

Cost

Brand Appeal

Use
Body style classification

It’s hard!

- No universally adopted system in place
- Many variants to classify
- New bodystyles have emerged
- Some vehicles attempt to defy classification
Car classification – translating the framework

External Vehicle Factors
Performance
Dimensions
Safety
Security
Costs
Bodystyle Classification

Standard Policy Factors

Random Noise

Residual Spatial Variation

Vehicle Weight
Exposure — TPPD Frequency
Car classification – translating the framework

- **Standard Policy Factors**
- **Random Noise**
- **External Vehicle Factors**

**Residual Spatial Variation**

Unsmoothed ➔ Smoothed

Requires a vehicle space...

**Attribute 1**

**Attribute 2**
Example adjacencies
Putting it all together

Classifying existing cars

Classifying new cars
Performance vs. ABI (TP)
Key messages

- Techniques learned from postcode classification can be successfully applied to car classification
- There are practical challenges around making best use of external data but these can be overcome