

E2: Enhanced GLMs and vehicle grouping

Duncan Anderson & Sami Abdel-Gadir

EMB

Agenda

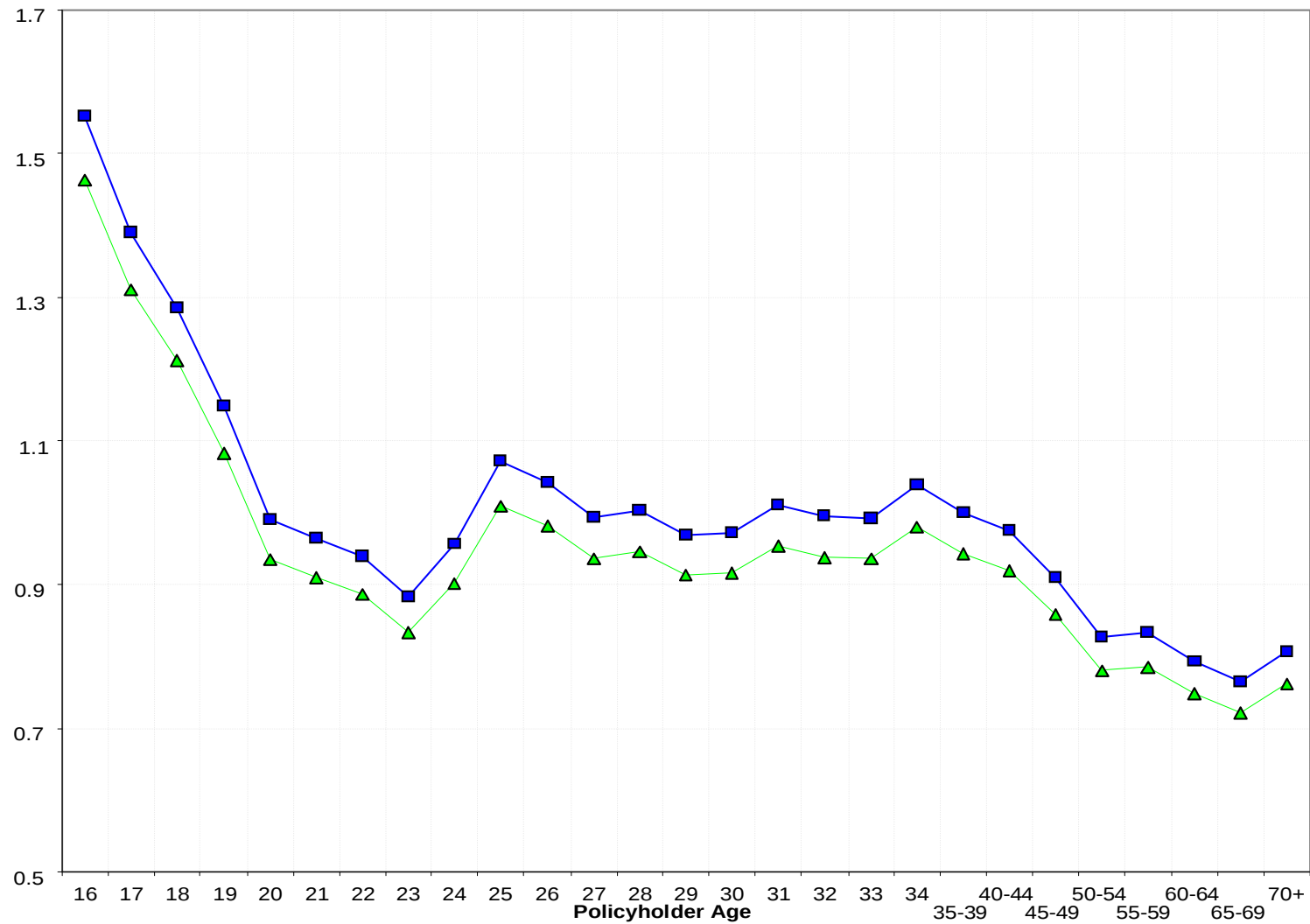
Enhanced GLMs

Duncan Anderson

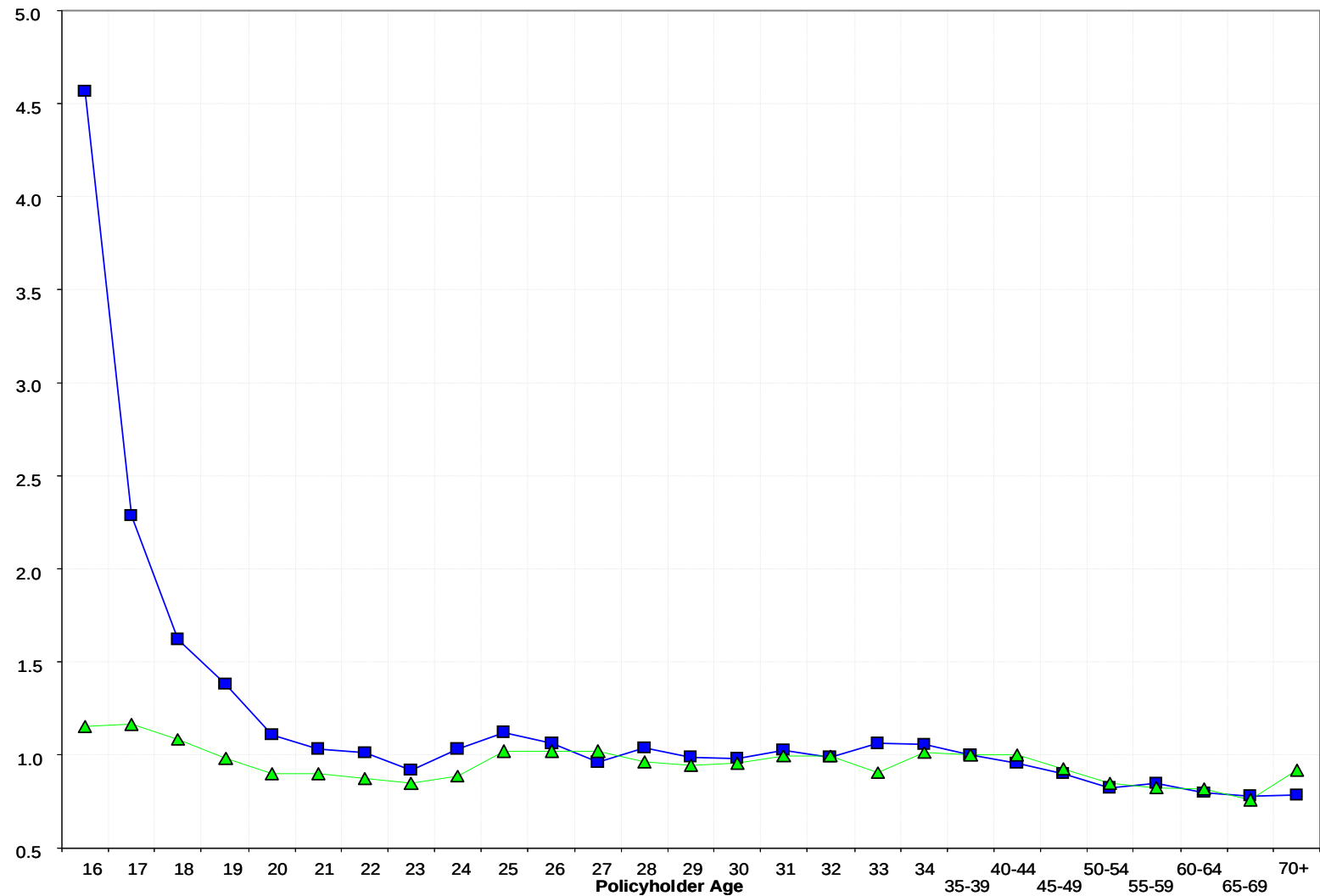
and vehicle grouping

Sami Abdel-Gadir

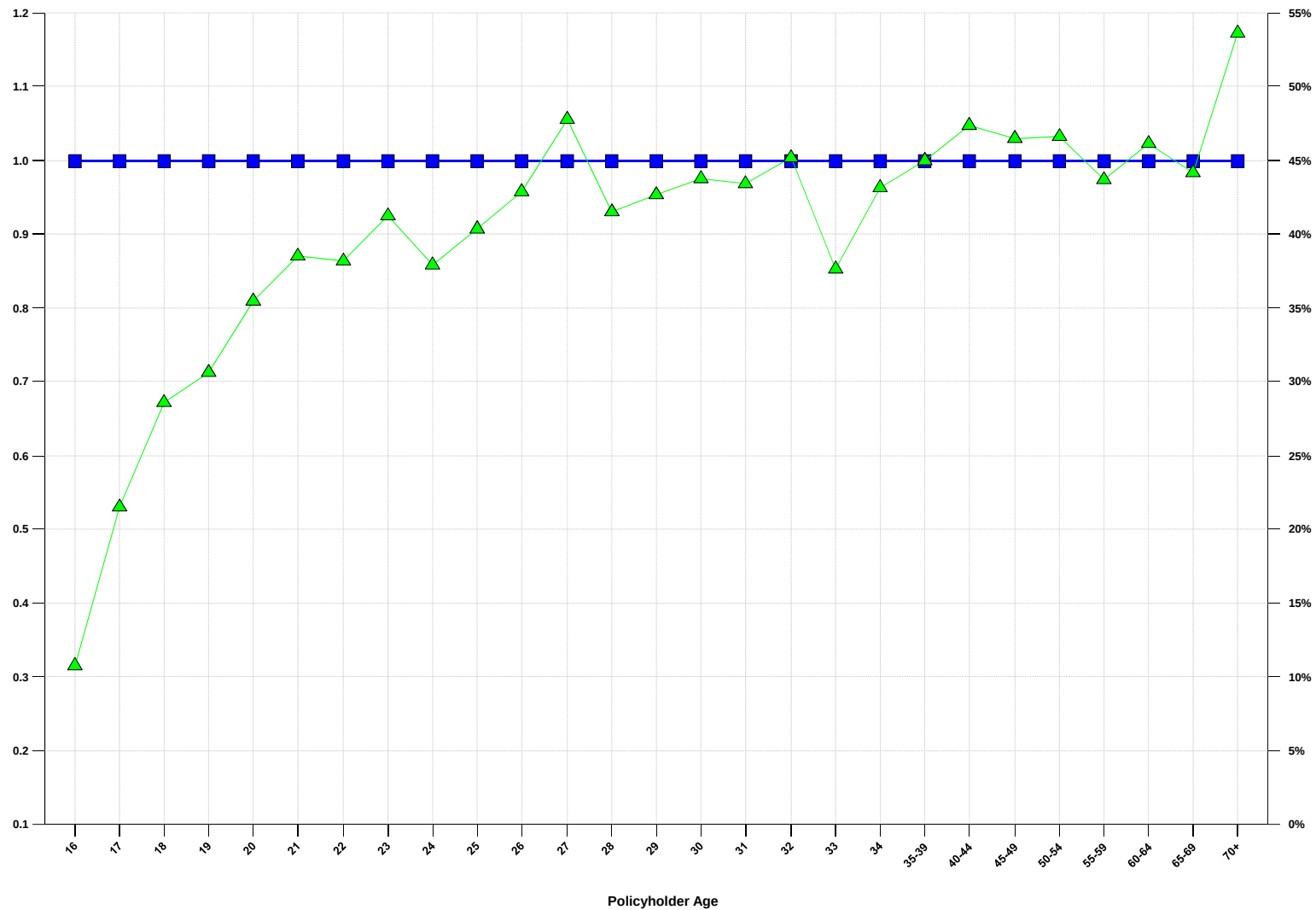
Interactions



Interactions



Interactions



Why are interactions present?

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

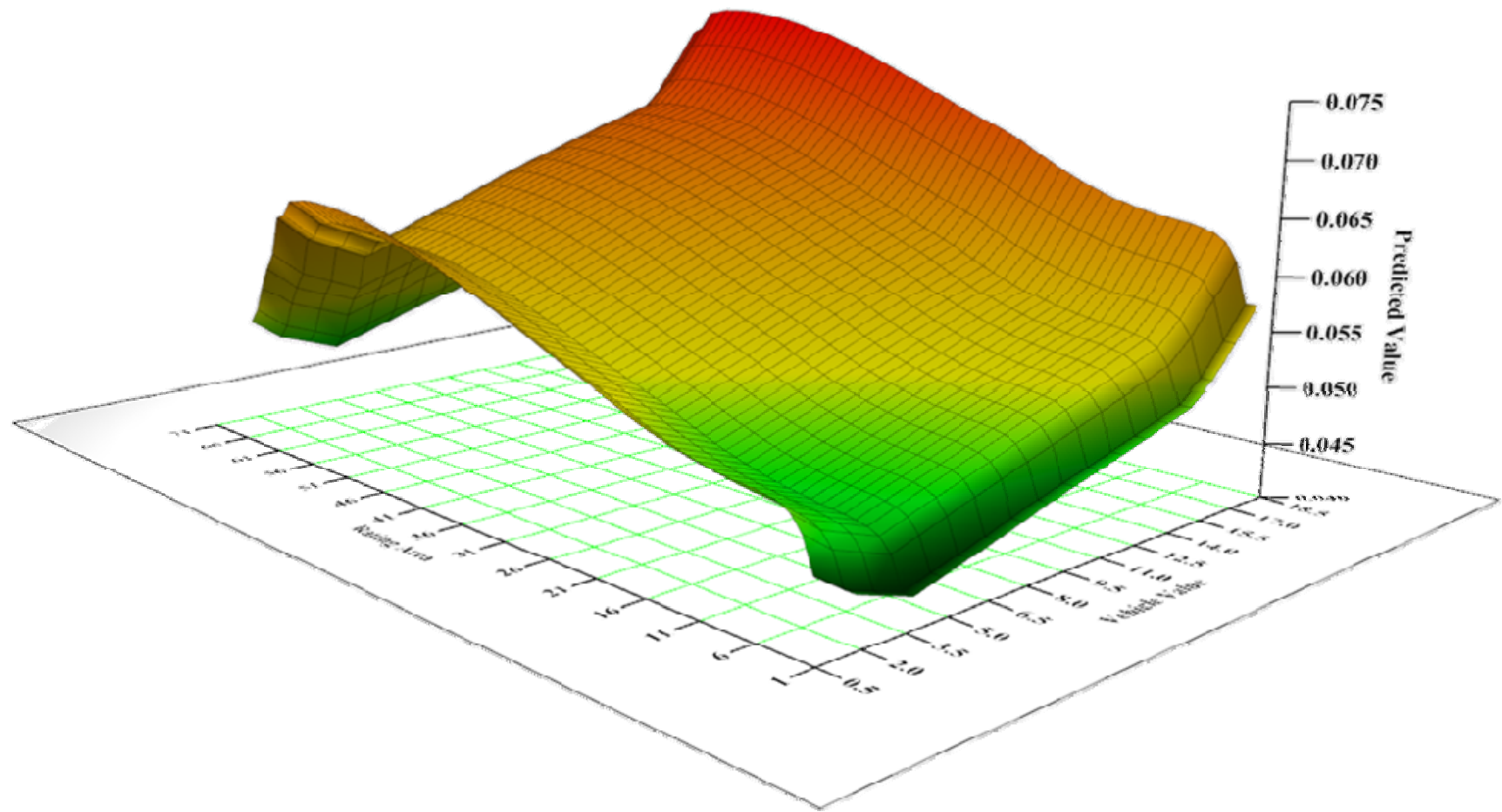
Interactions

		Vehicle group									
		β	β	-	β	β	β	β	β	β	β
Age	β	-	-	-	-	-	-	-	-	-	-
	β	-	-	-	-	-	-	-	-	-	-
	β	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-
	β	-	-	-	-	-	-	-	-	-	-
	β	-	-	-	-	-	-	-	-	-	-
	β	-	-	-	-	-	-	-	-	-	-
	β	-	-	-	-	-	-	-	-	-	-
	β	-	-	-	-	-	-	-	-	-	-
	β	-	-	-	-	-	-	-	-	-	-

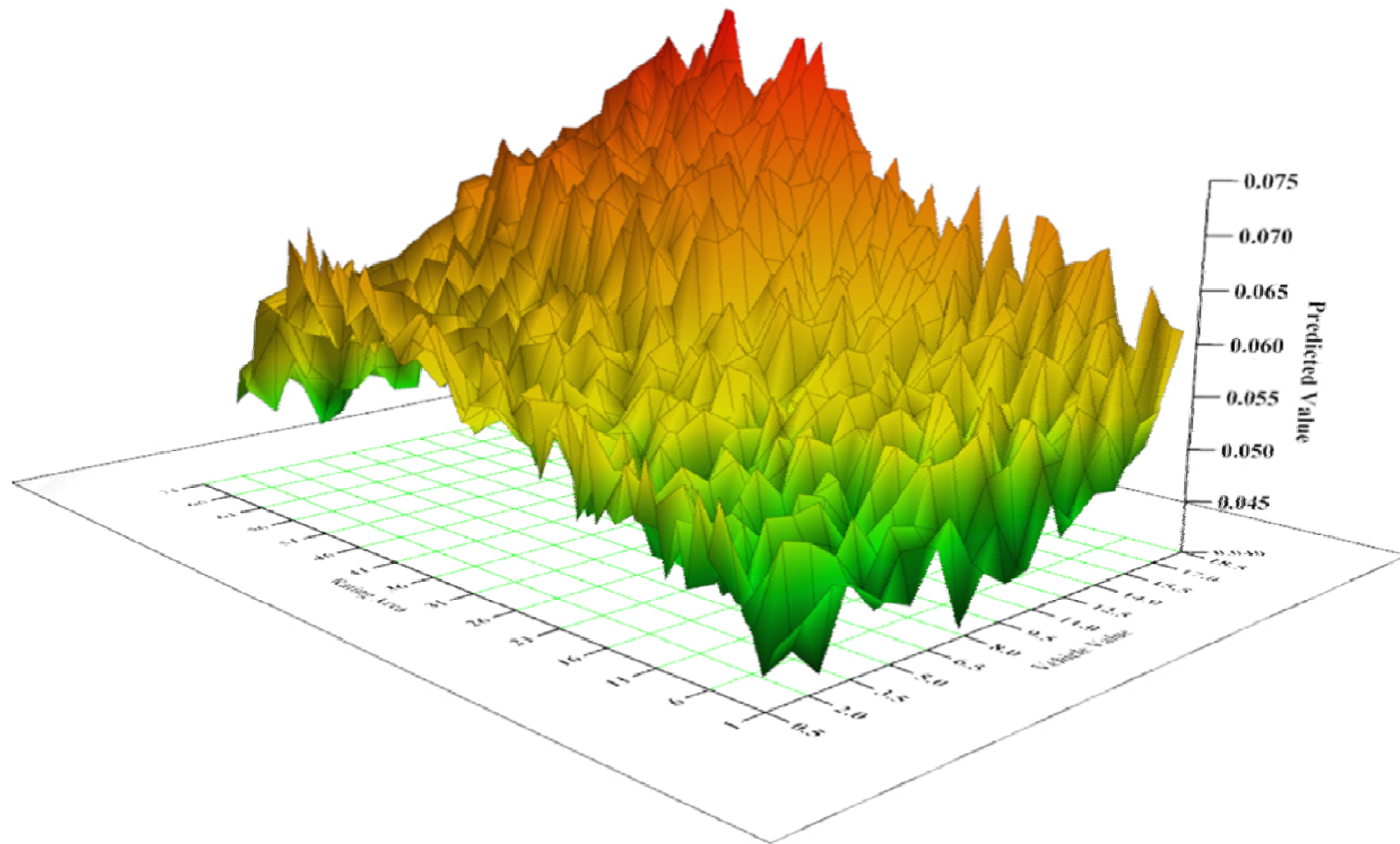
		Vehicle group									
		β	β	-	β	β	β	β	β	β	β
Age	β	β	β	-	β	β	β	β	β	β	β
	β	β	β	-	β	β	β	β	β	β	β
	β	β	β	-	β	β	β	β	β	β	β
	-	-	-	-	-	-	-	-	-	-	-
	β	β	β	-	β	β	β	β	β	β	β
	β	β	β	-	β	β	β	β	β	β	β
	β	β	β	-	β	β	β	β	β	β	β
	β	β	β	-	β	β	β	β	β	β	β
	β	β	β	-	β	β	β	β	β	β	β
	β	β	β	-	β	β	β	β	β	β	β

		Vehicle group									
		β	β	-	β	β	β	β	β	β	β
Age	β	-	-	-	-	-	-	-	-	-	-
	β	-	-	-	-	-	-	-	-	-	-
	β	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-
	β	-	-	-	-	-	-	-	-	-	-
	β	-	-	-	-	-	-	-	-	-	-
	β	-	-	-	-	-	-	-	-	-	-
	β	-	-	-	-	-	-	-	-	-	-
	β	-	-	-	-	-	-	-	-	-	-
	β	-	-	-	-	-	-	-	-	-	-

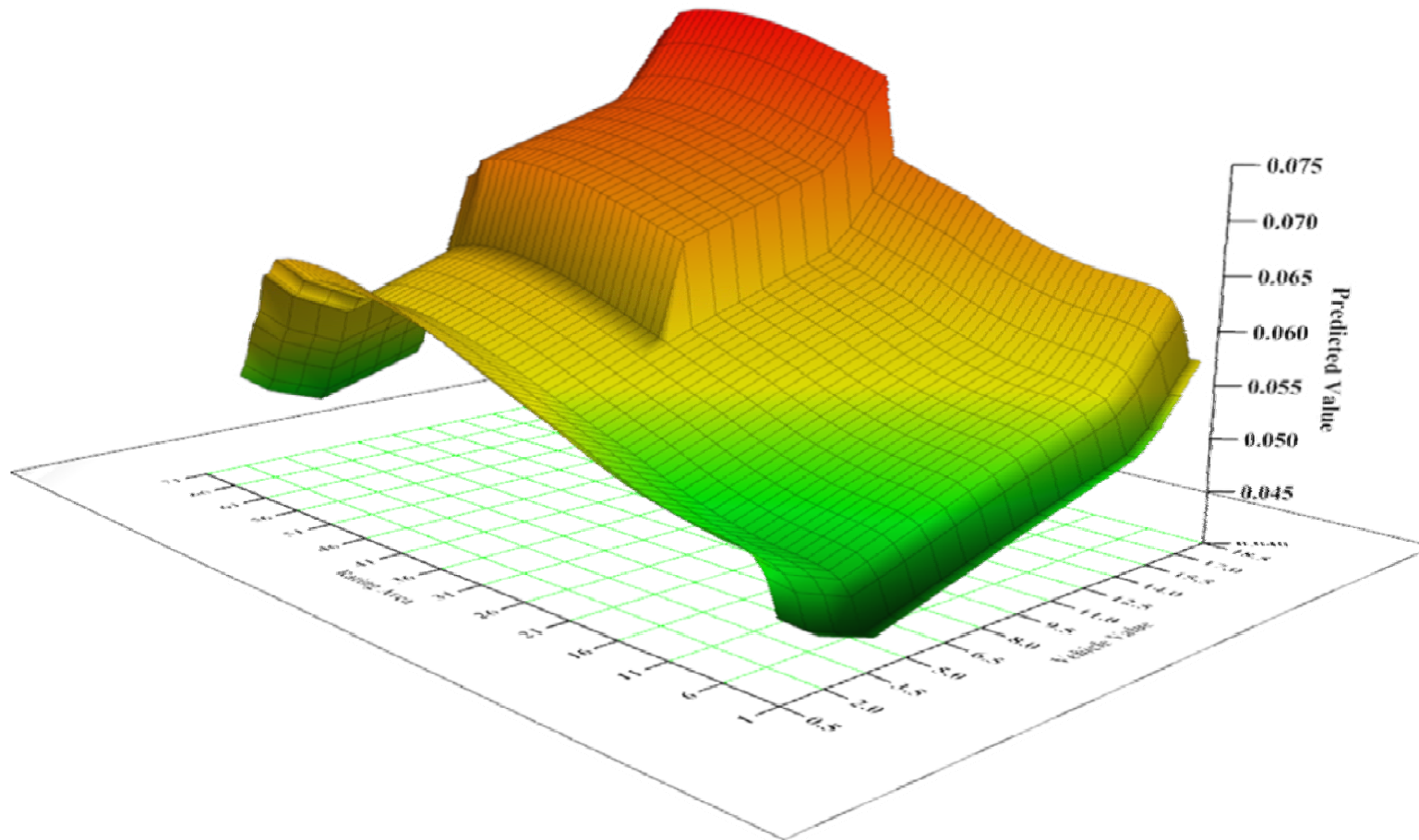
Example



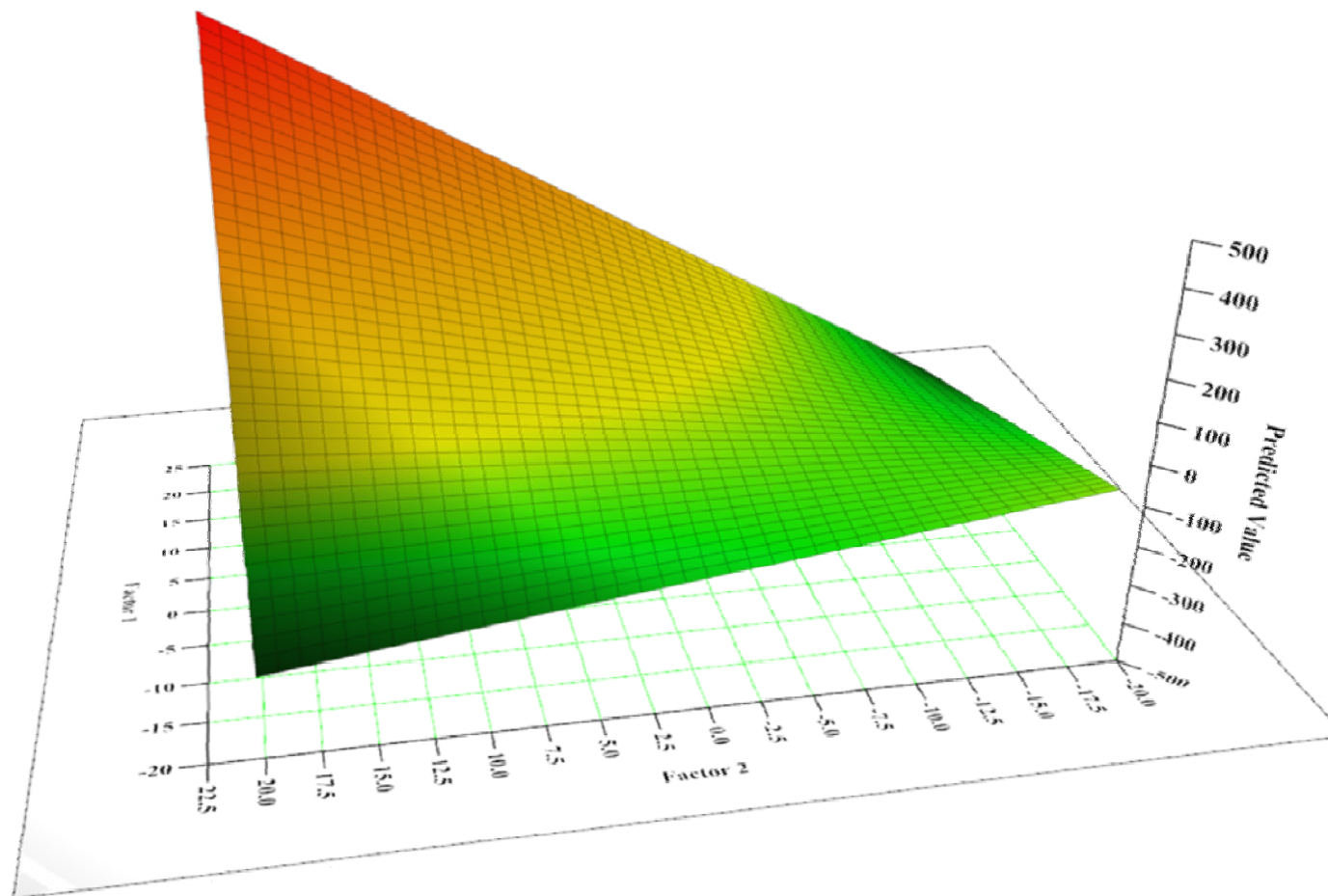
Example



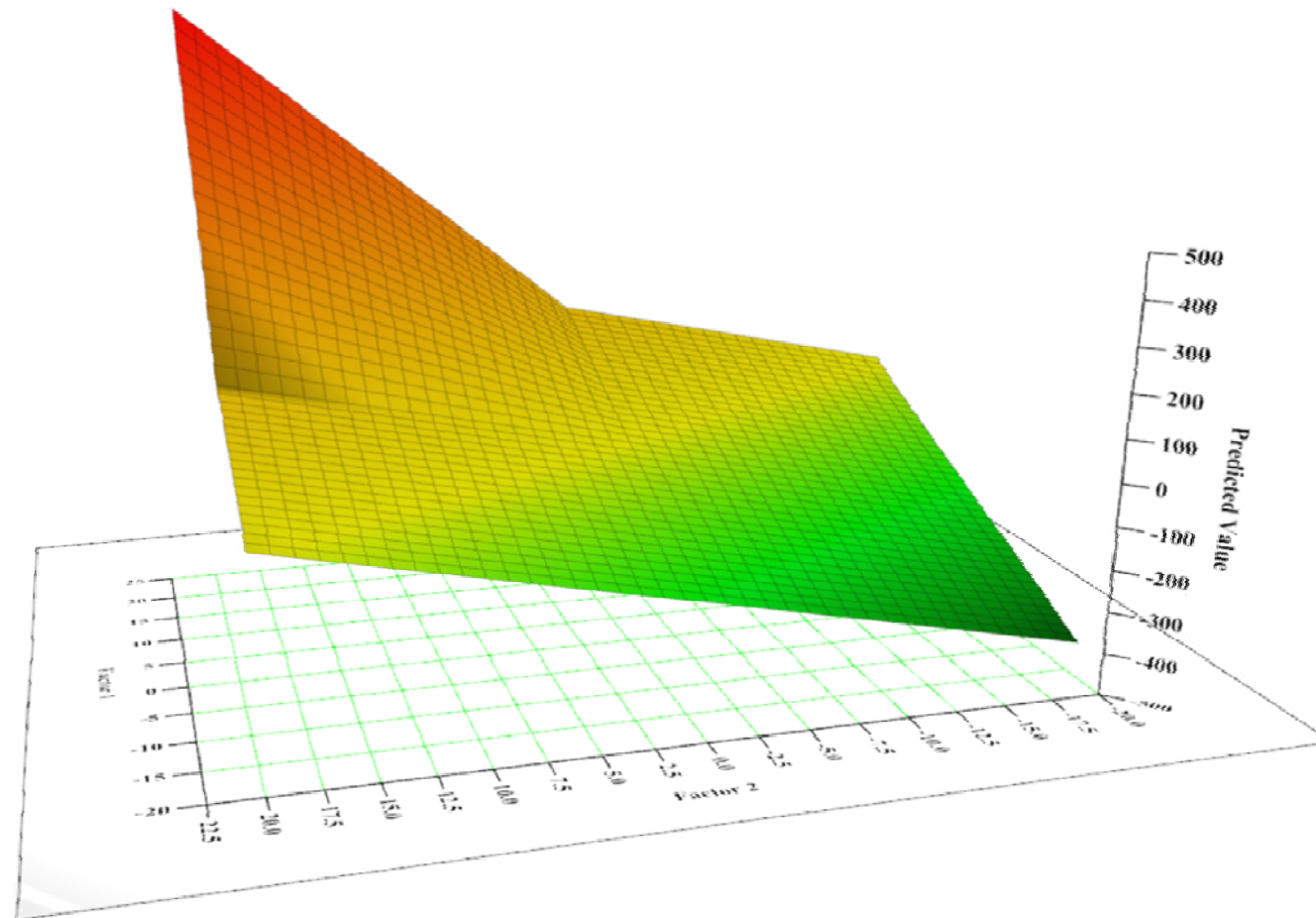
Example



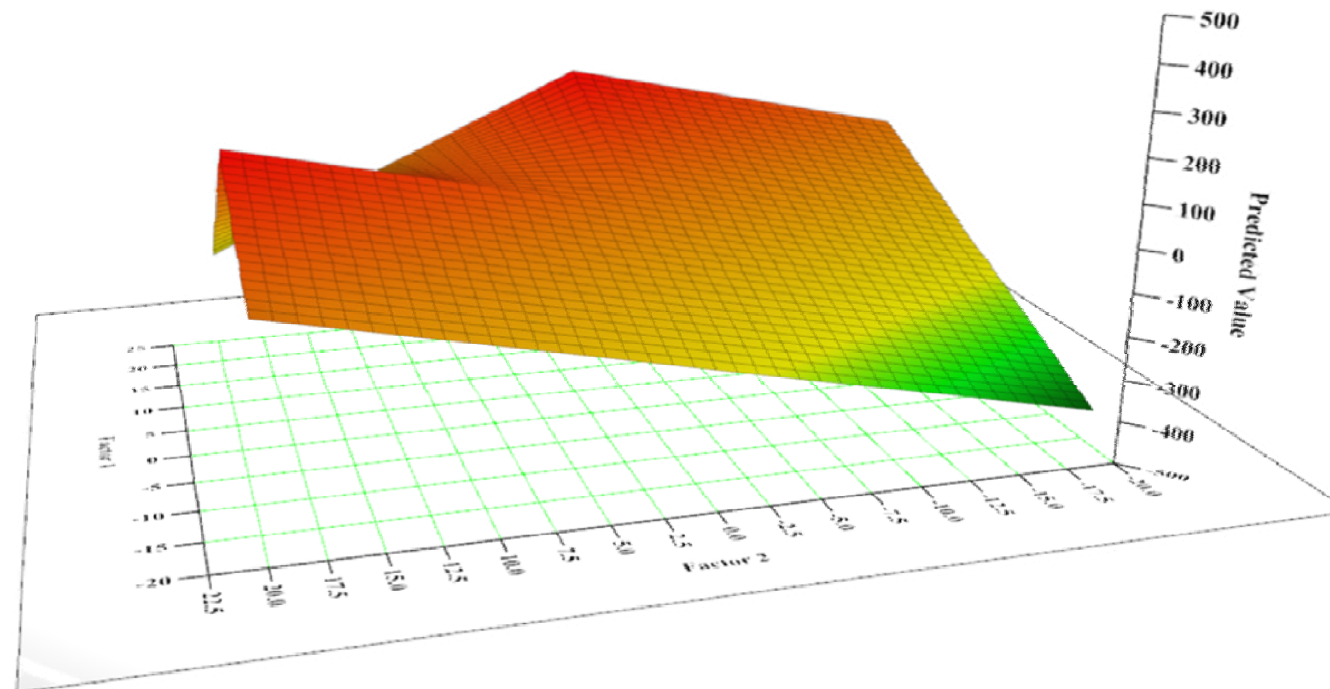
Saddles



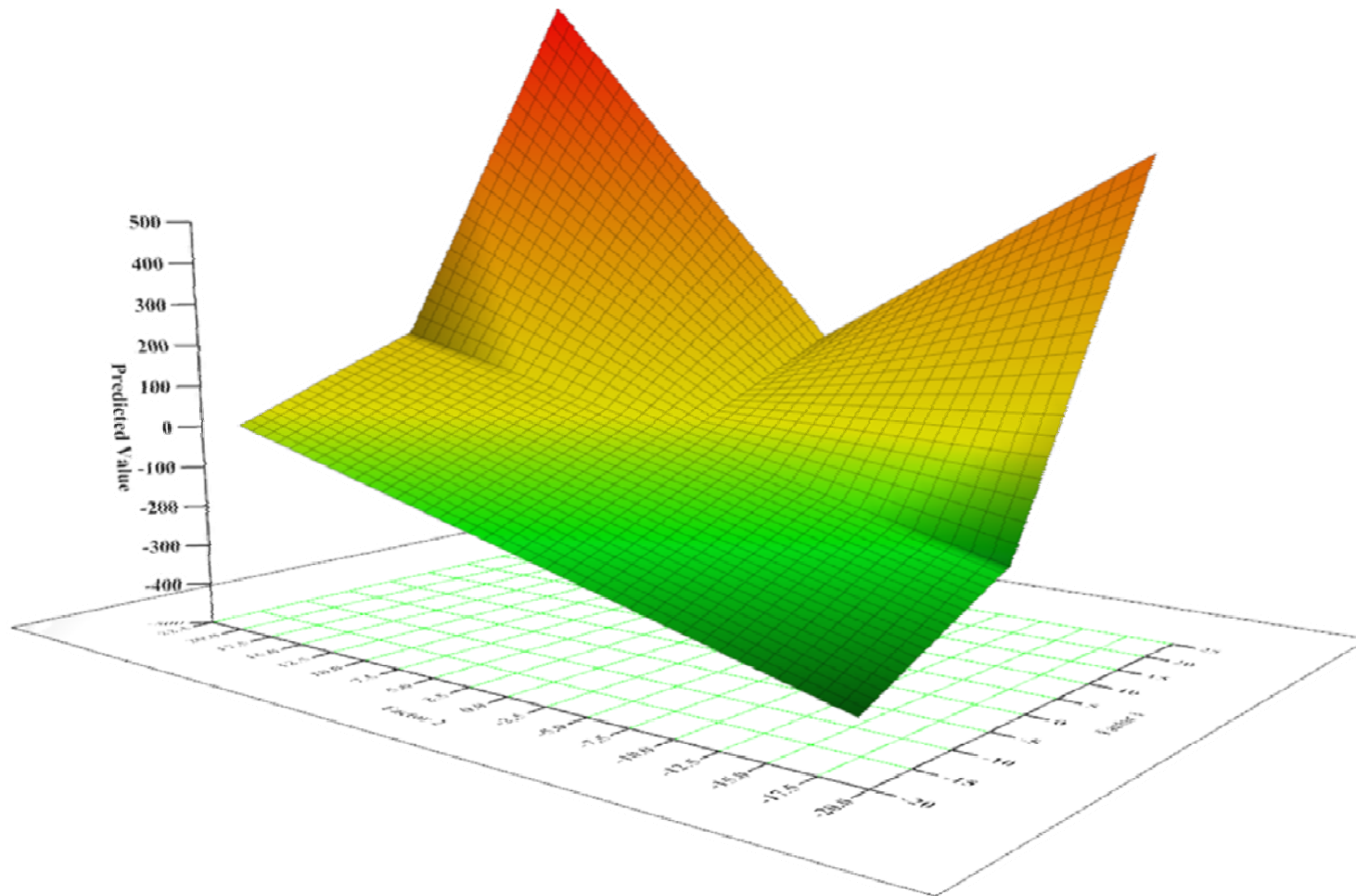
Saddles



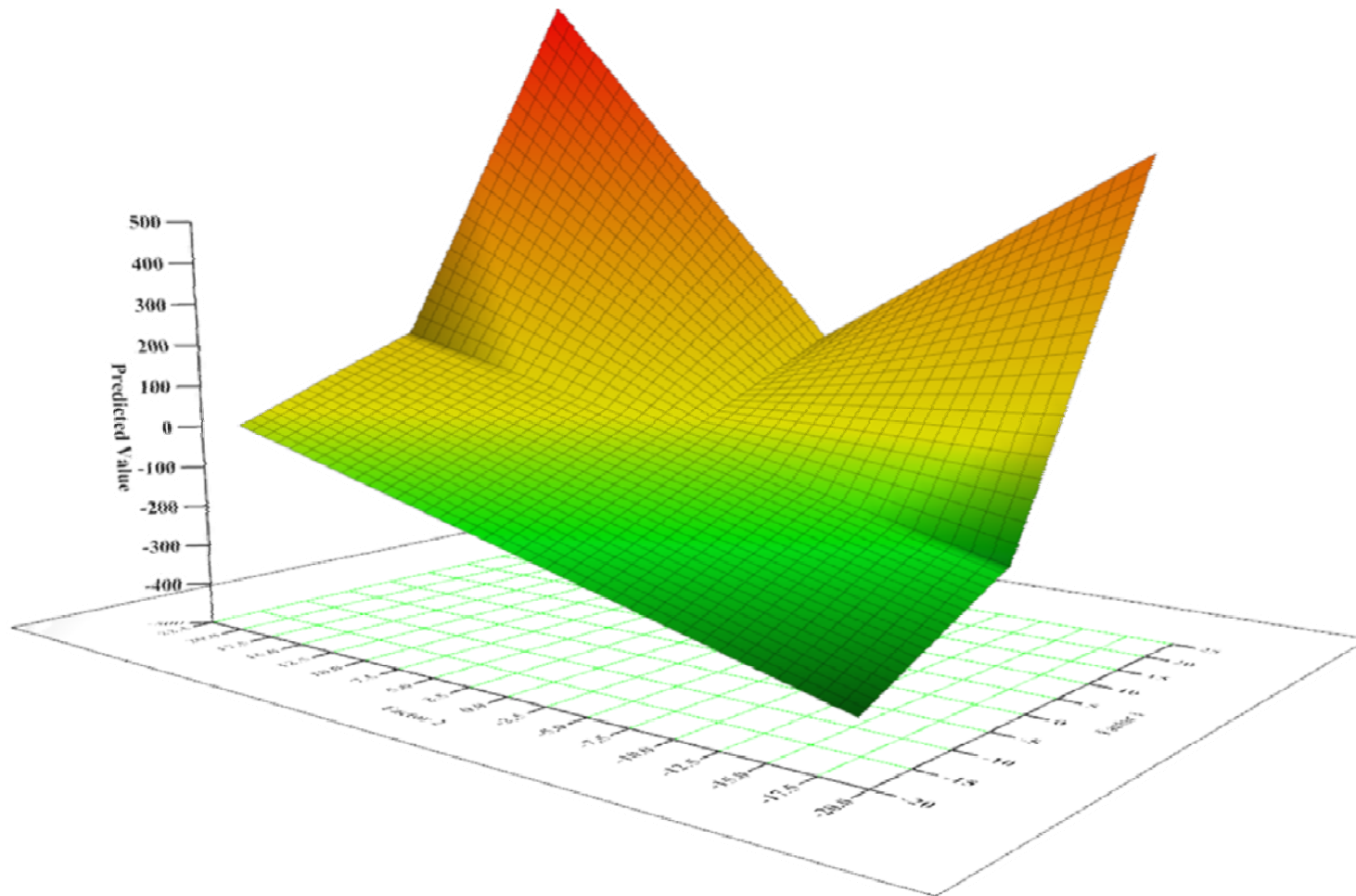
Saddles



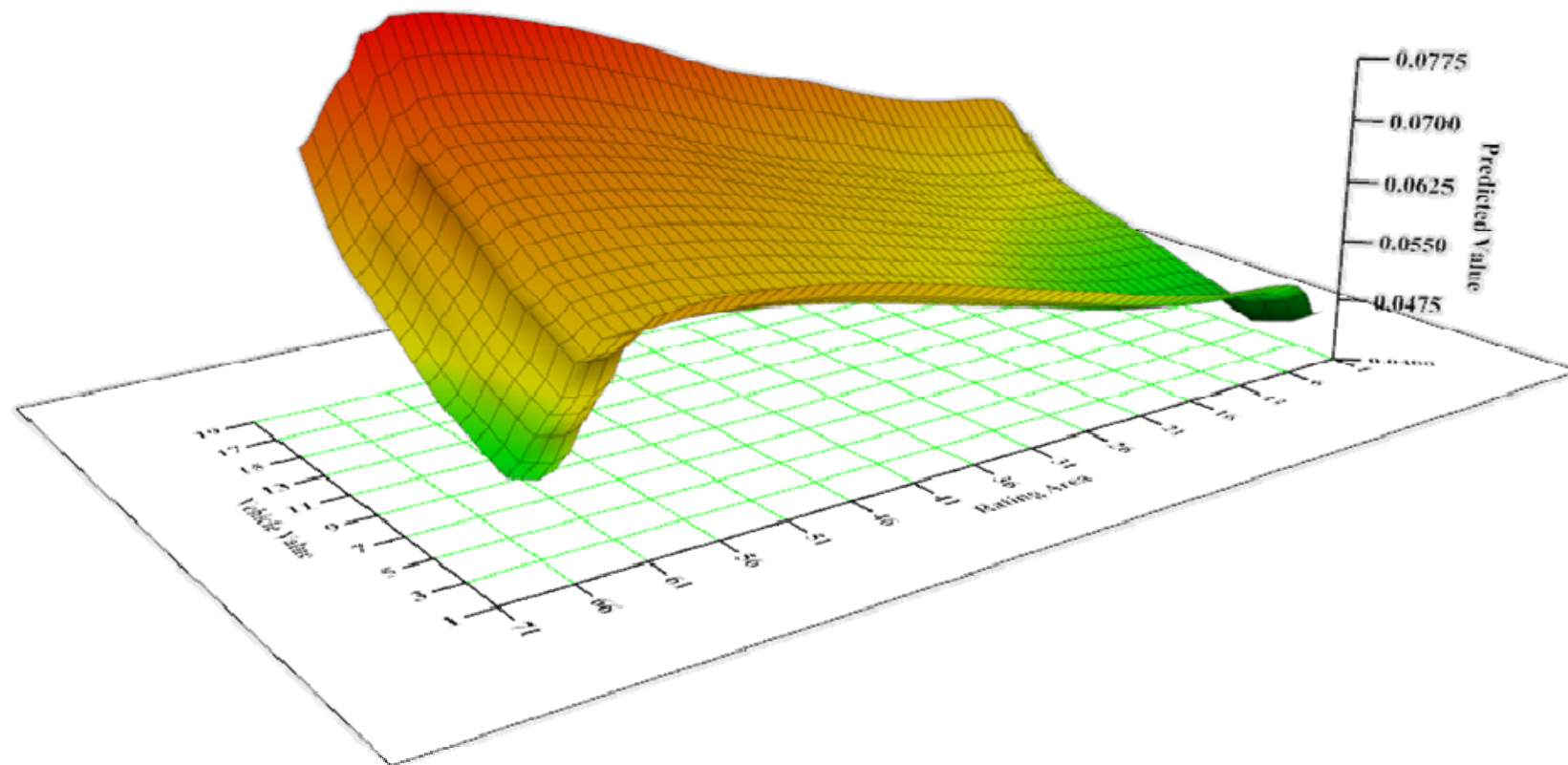
Saddles



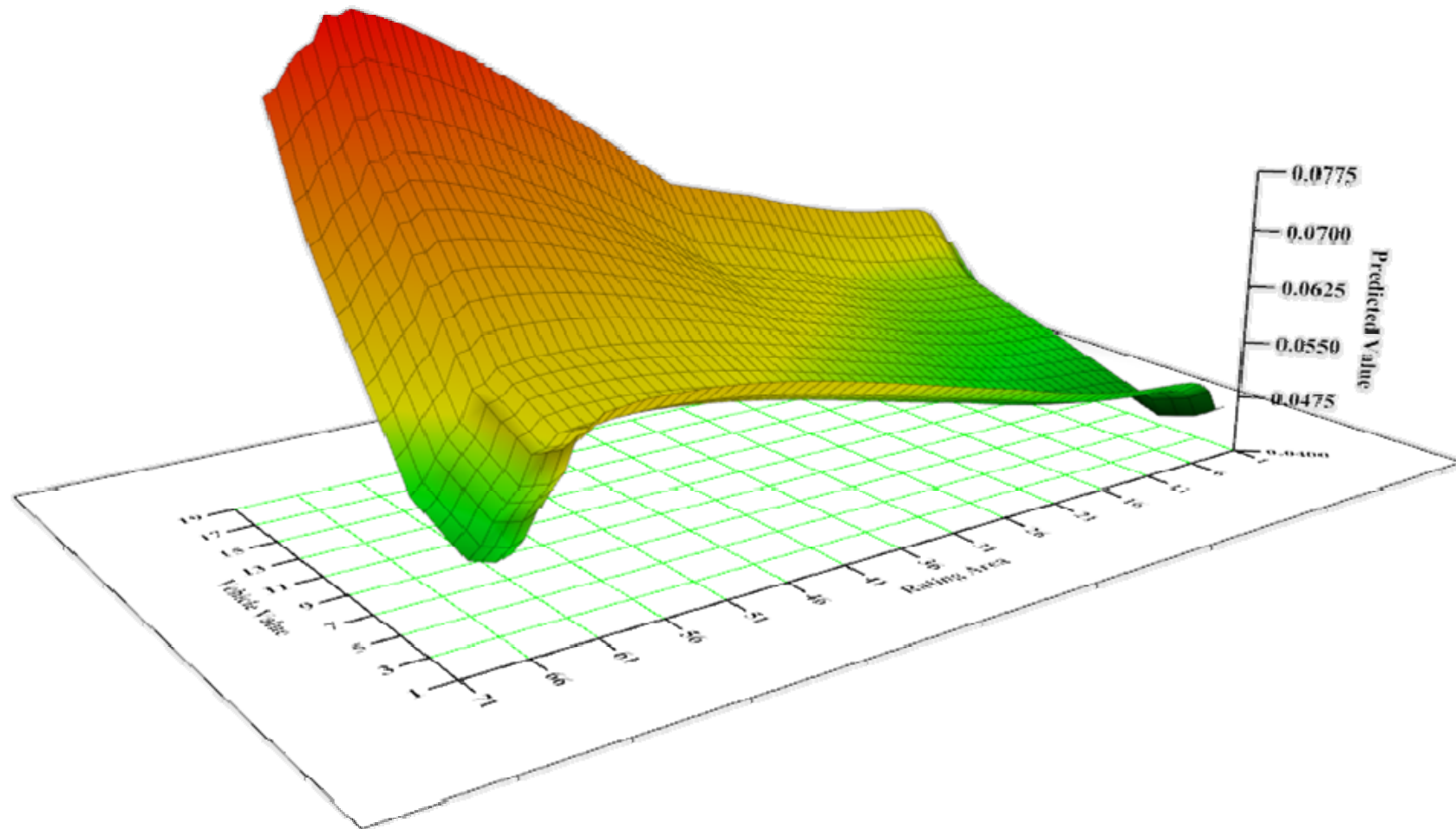
Saddles



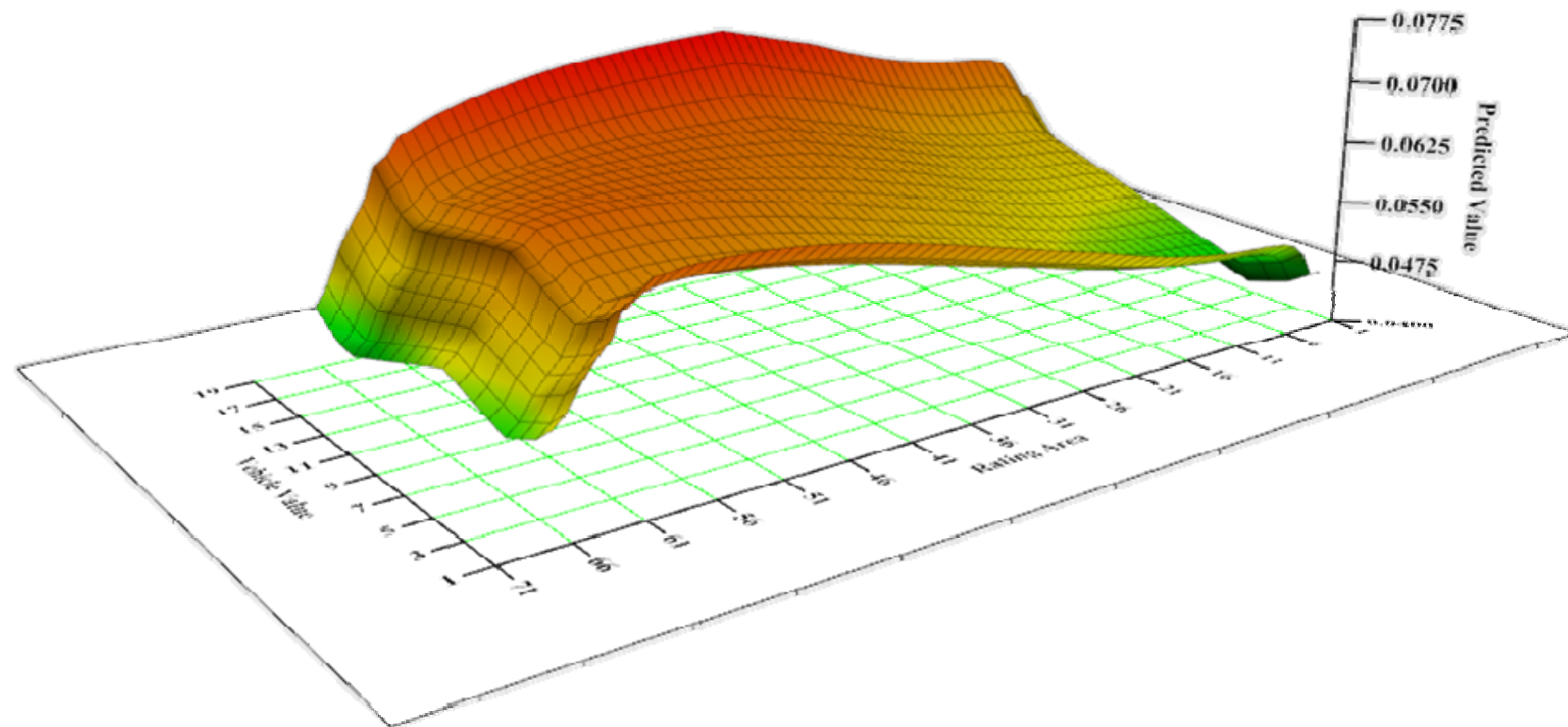
Saddles



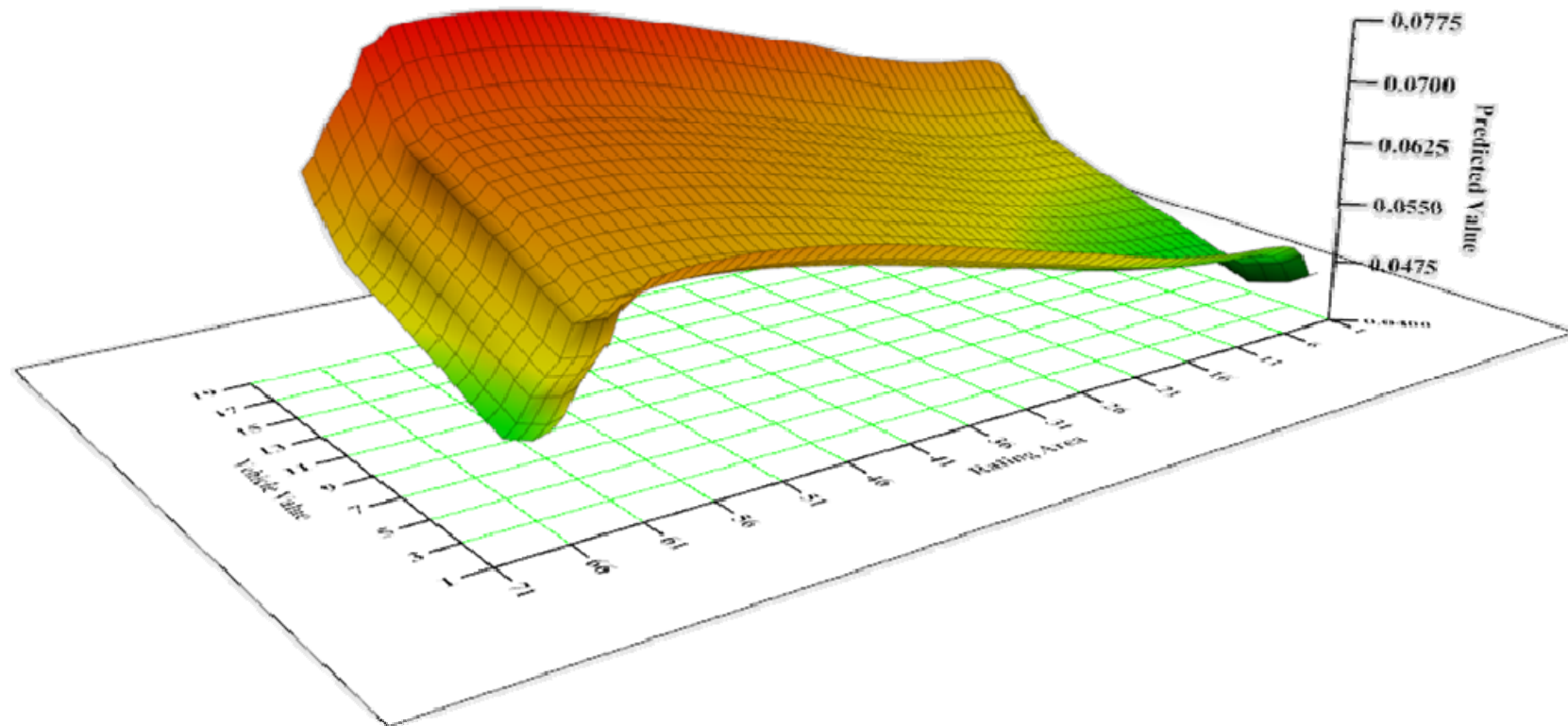
Saddles



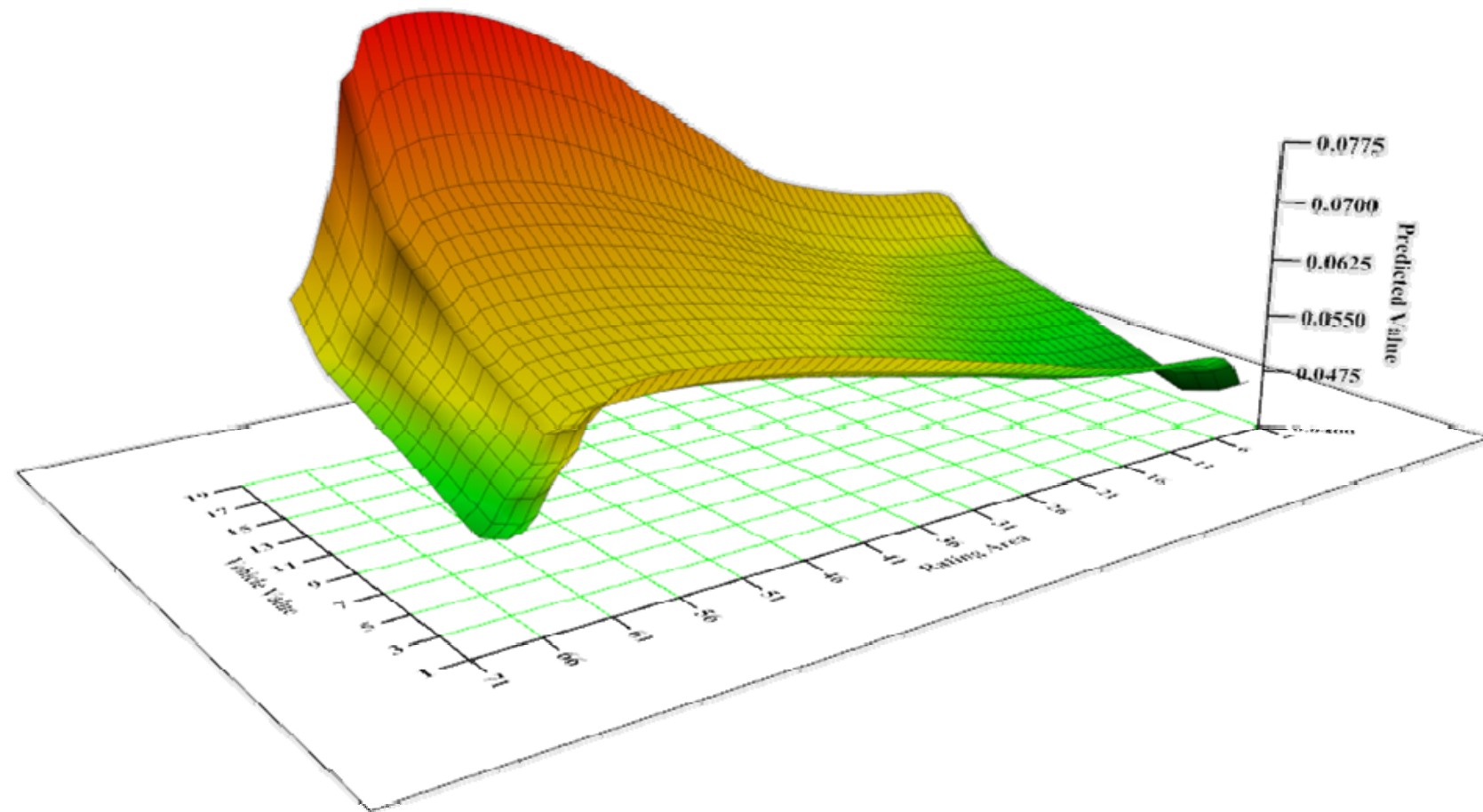
Saddles



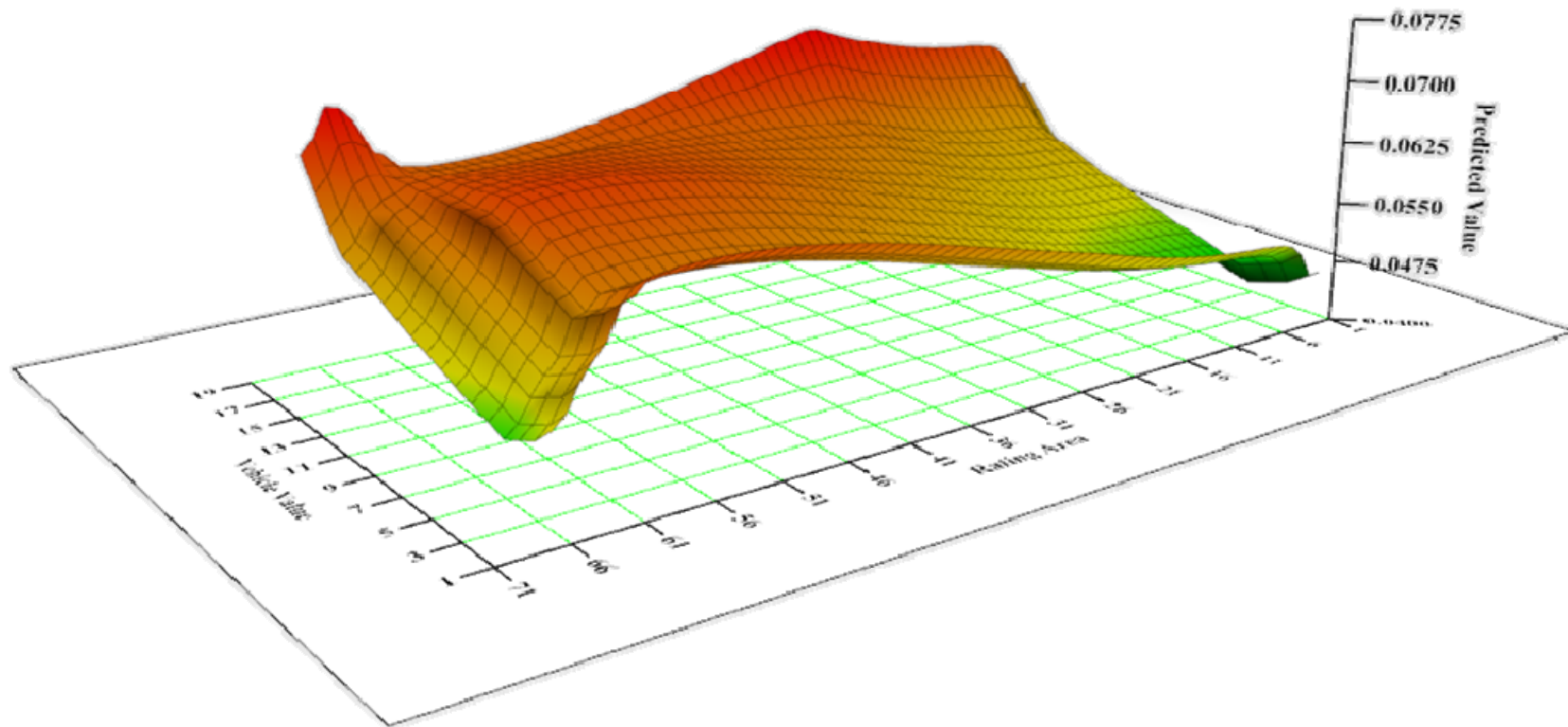
Saddles

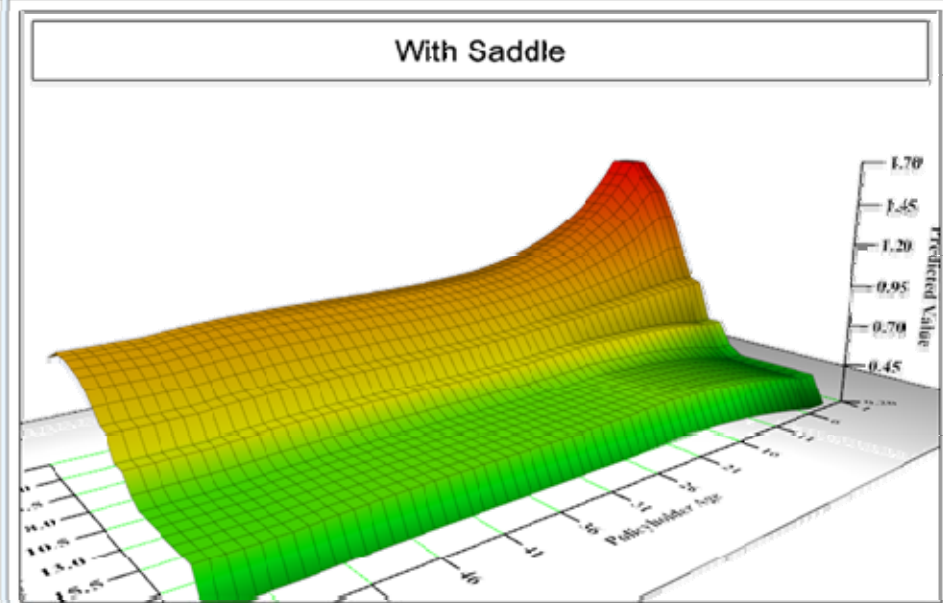
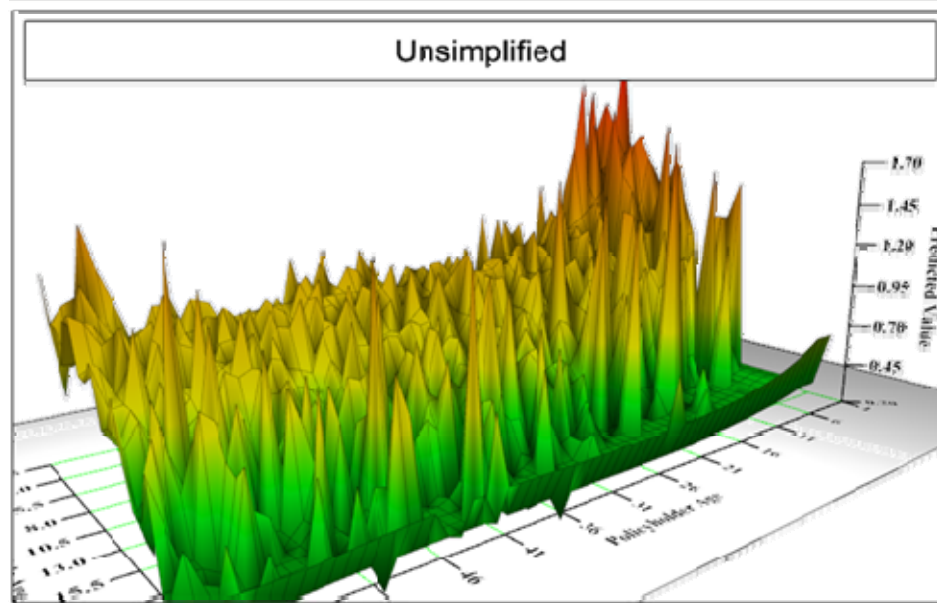
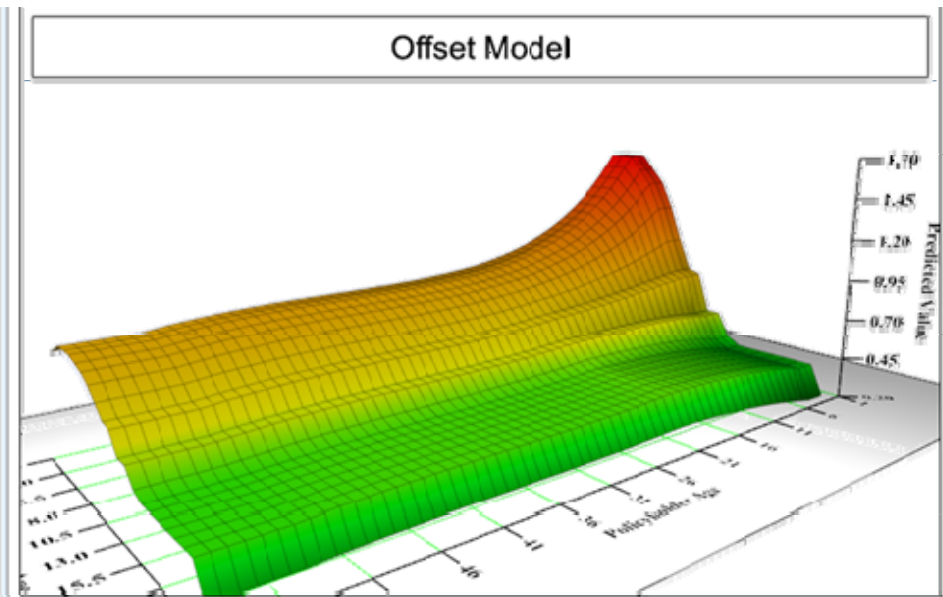
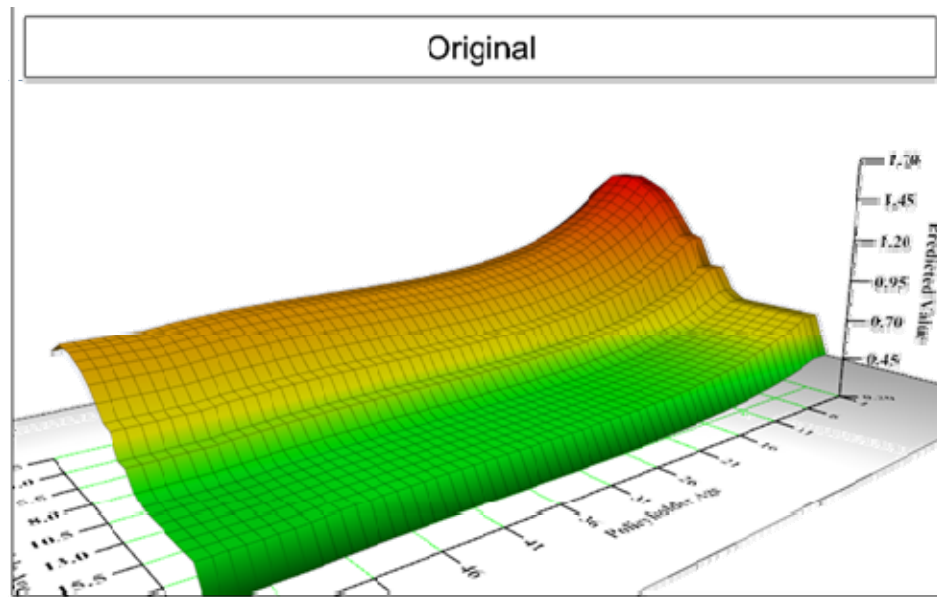


Saddles



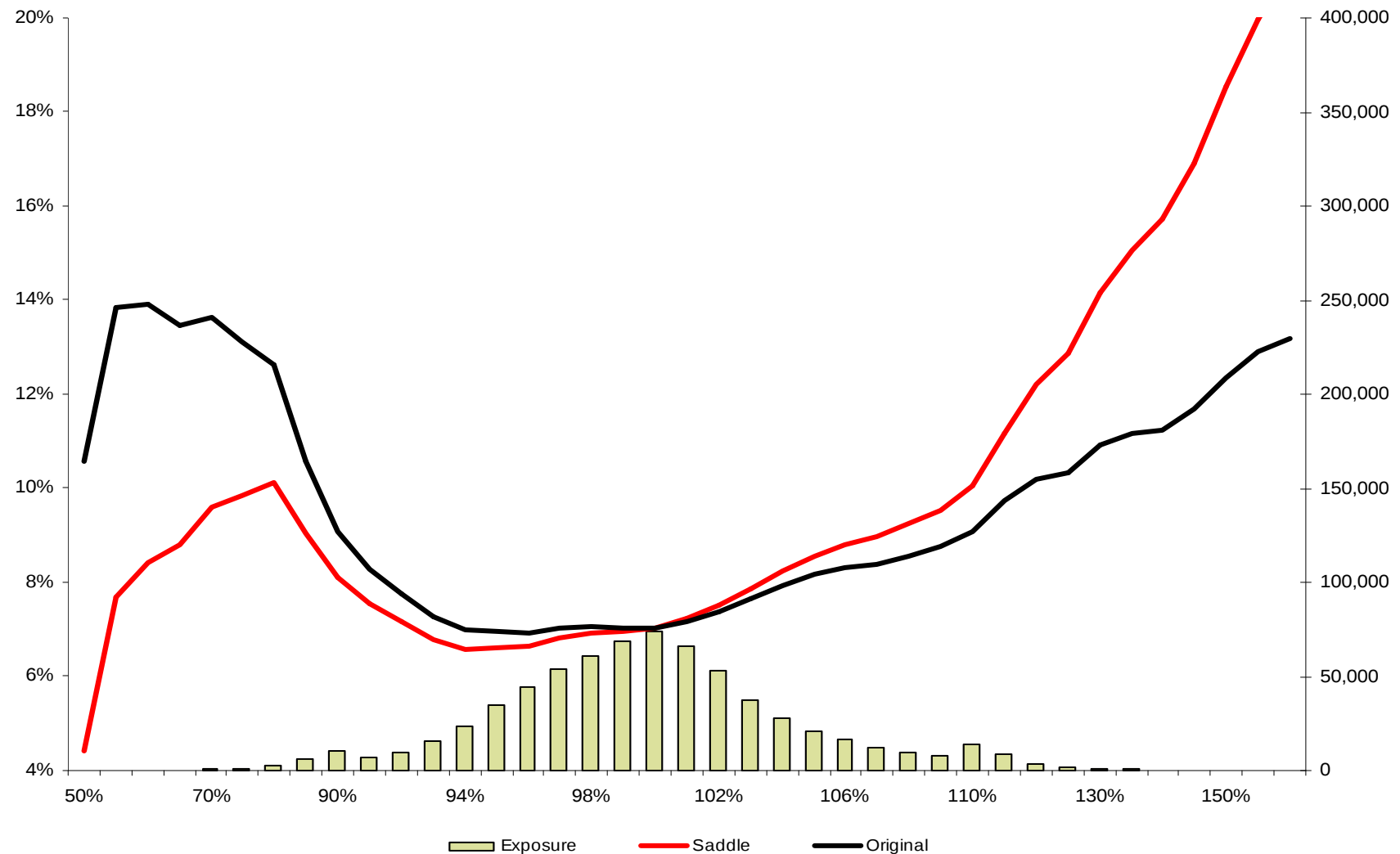
Saddles





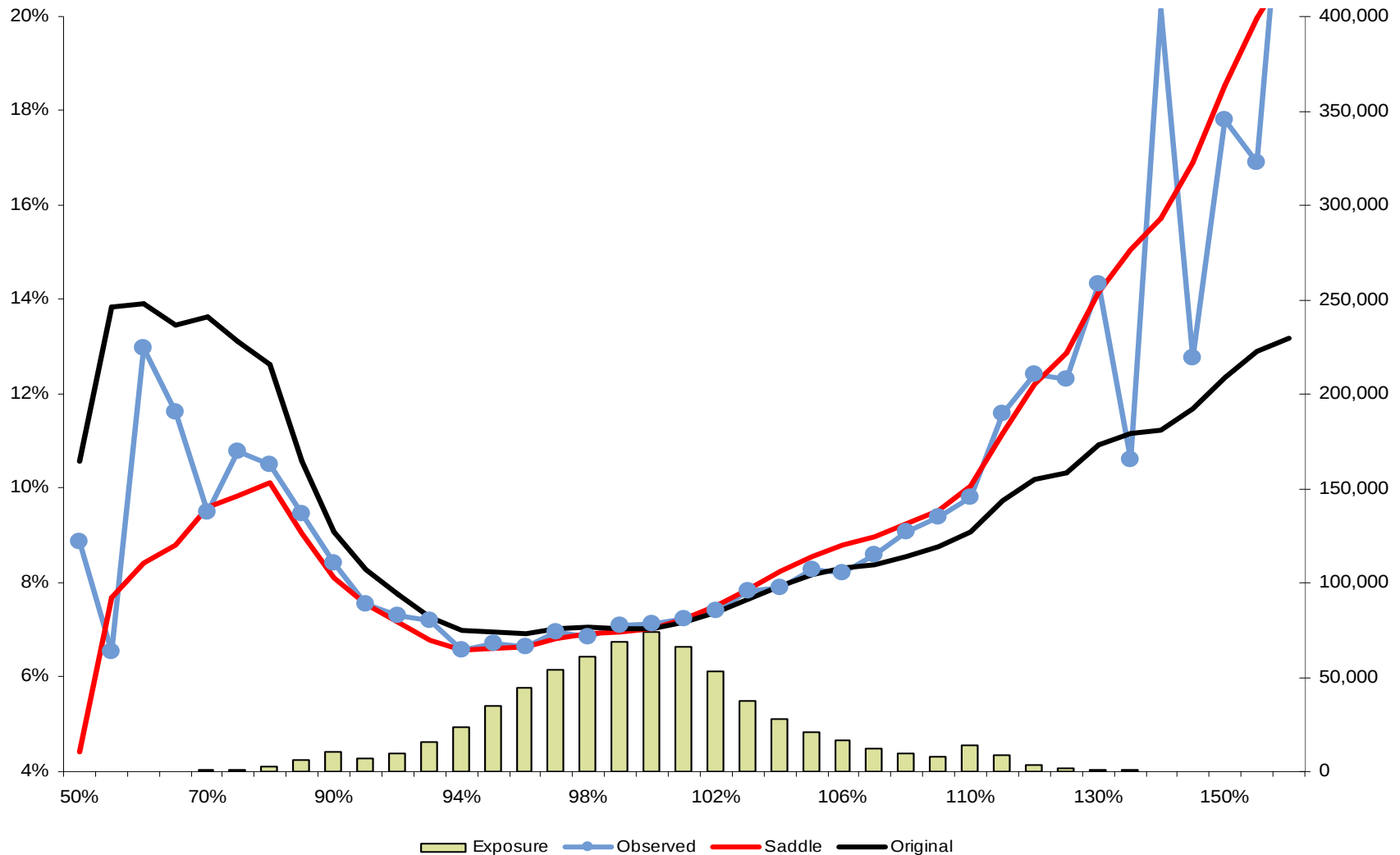
Saddles - model comparison

Motor frequency - out of sample



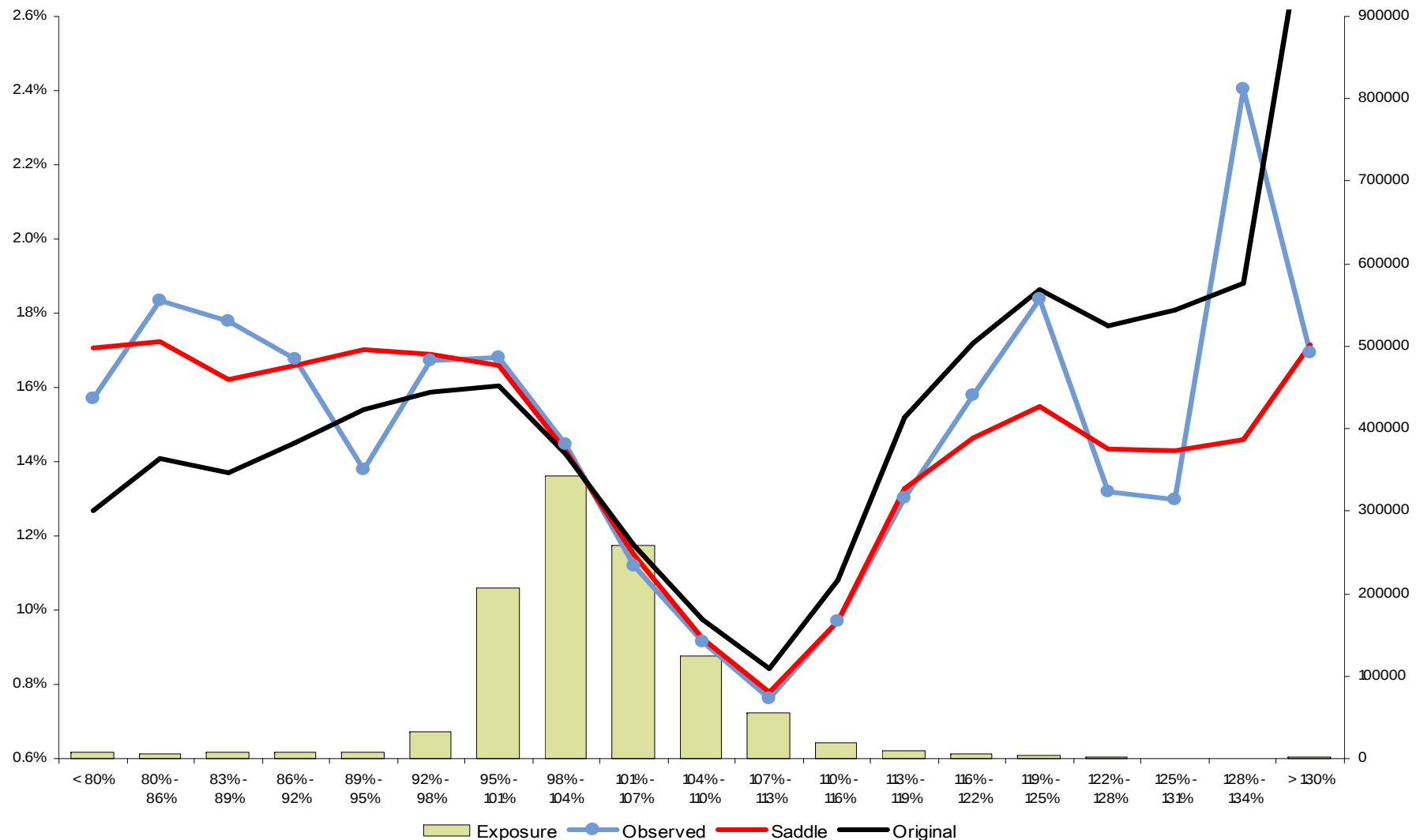
Saddles - model comparison

Motor frequency - out of sample



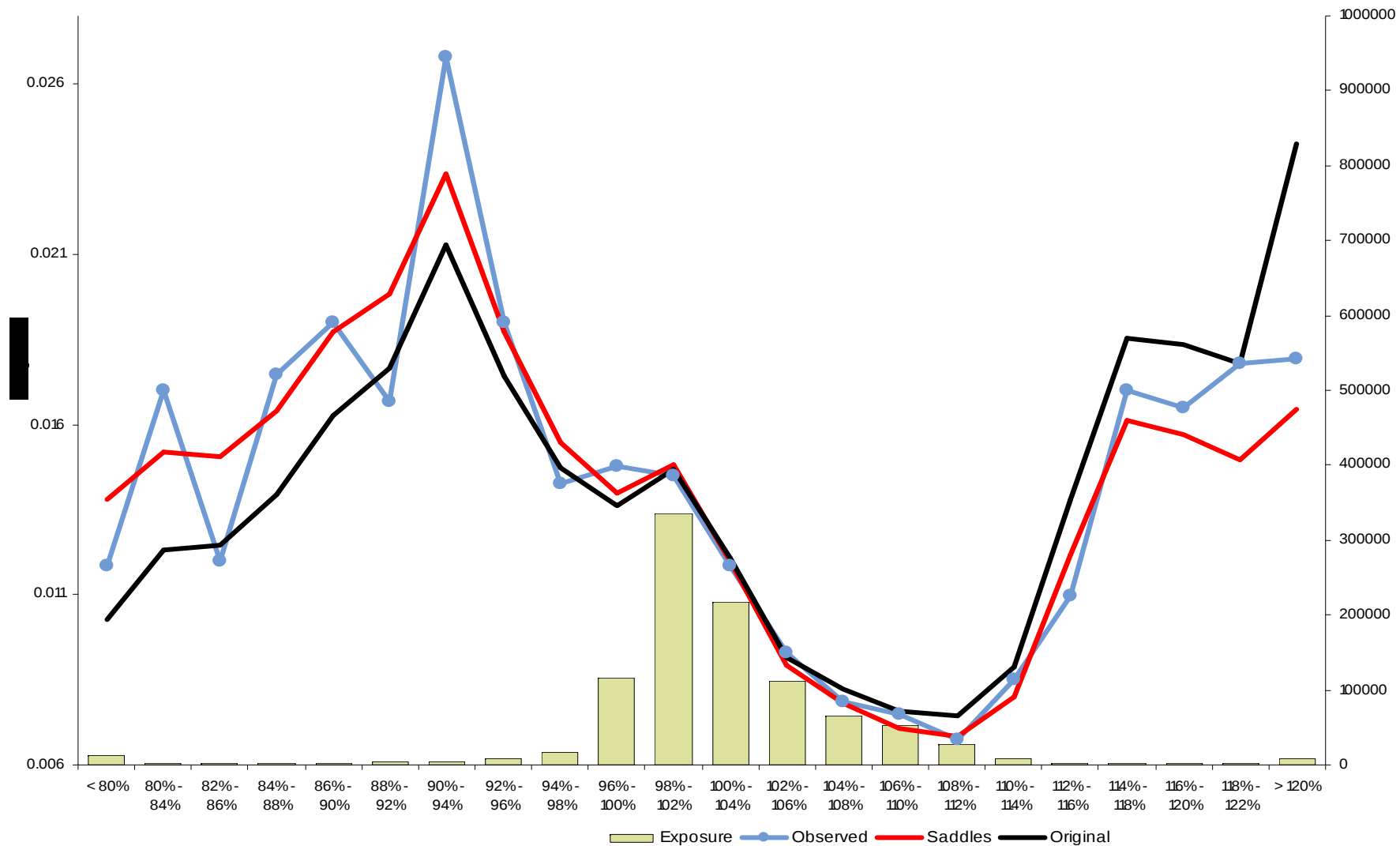
Saddles - model comparison

Motor frequency - out of sample



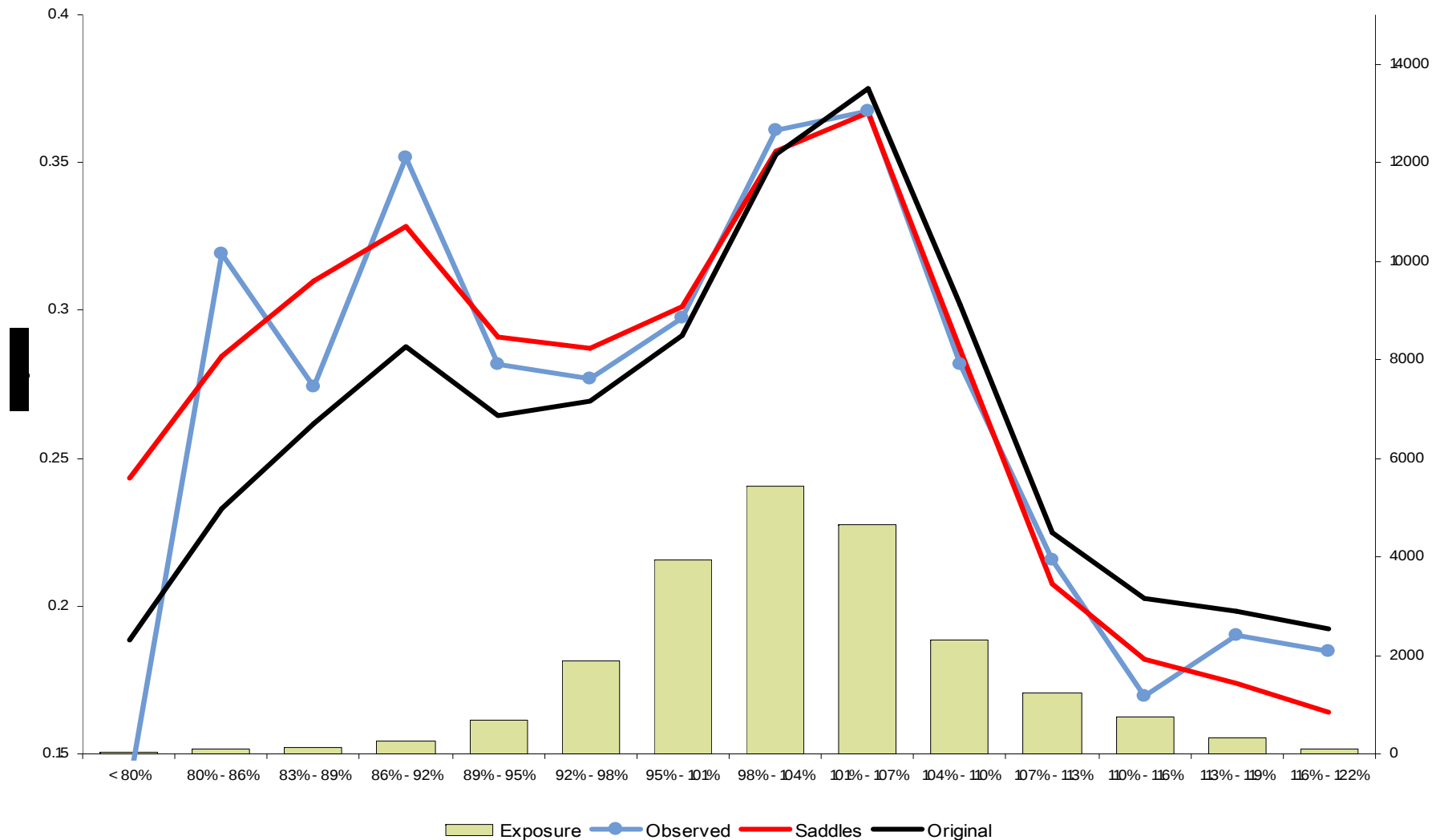
Saddles - model comparison

Motor frequency - out of time



Saddles - model comparison

Motor renewals - out of sample



Machine vs man



vs



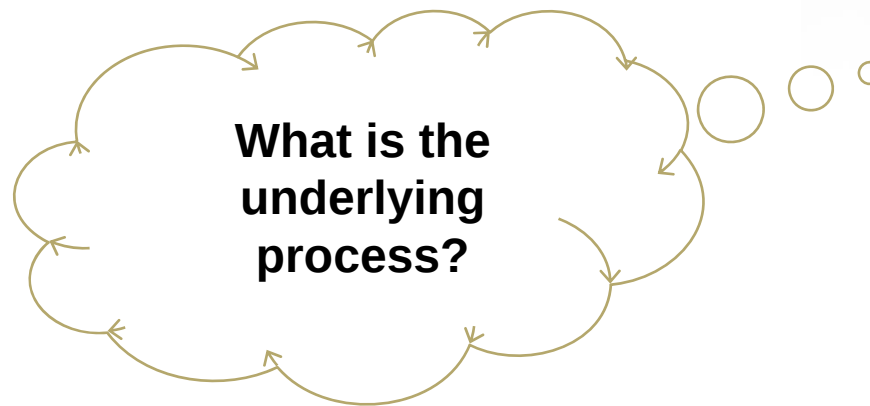
Machine vs man



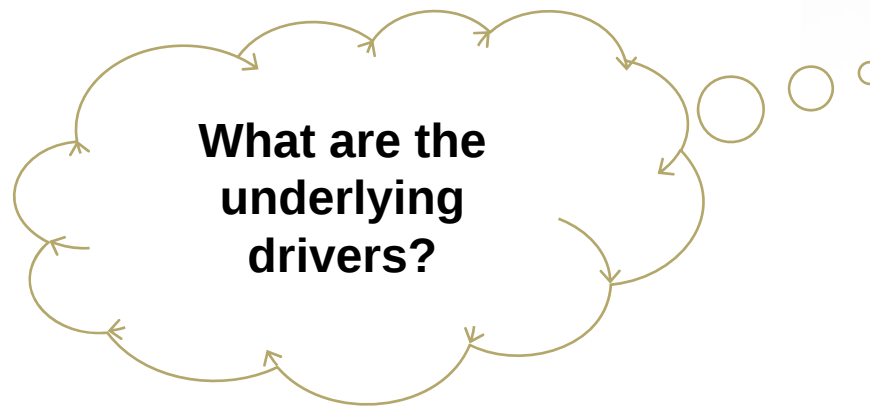
vs



Machine vs man



Machine vs man



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

Duncan Anderson

and vehicle grouping

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
- For details see: <http://www.thatcham.org/abigrouprating/index.jsp?page=429>

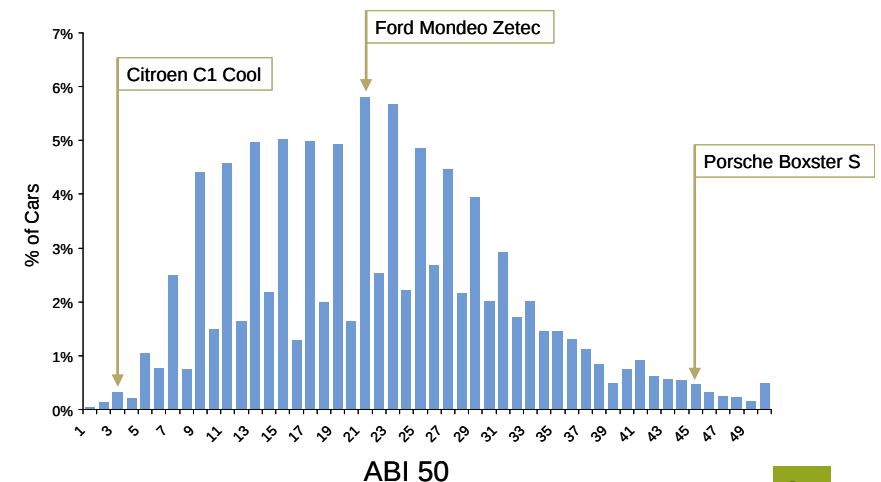
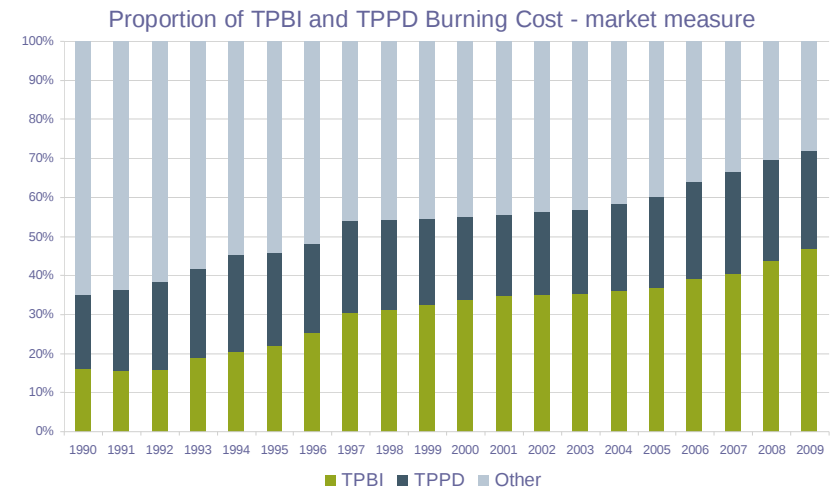


How good is ABI 50 for risk models and pricing?

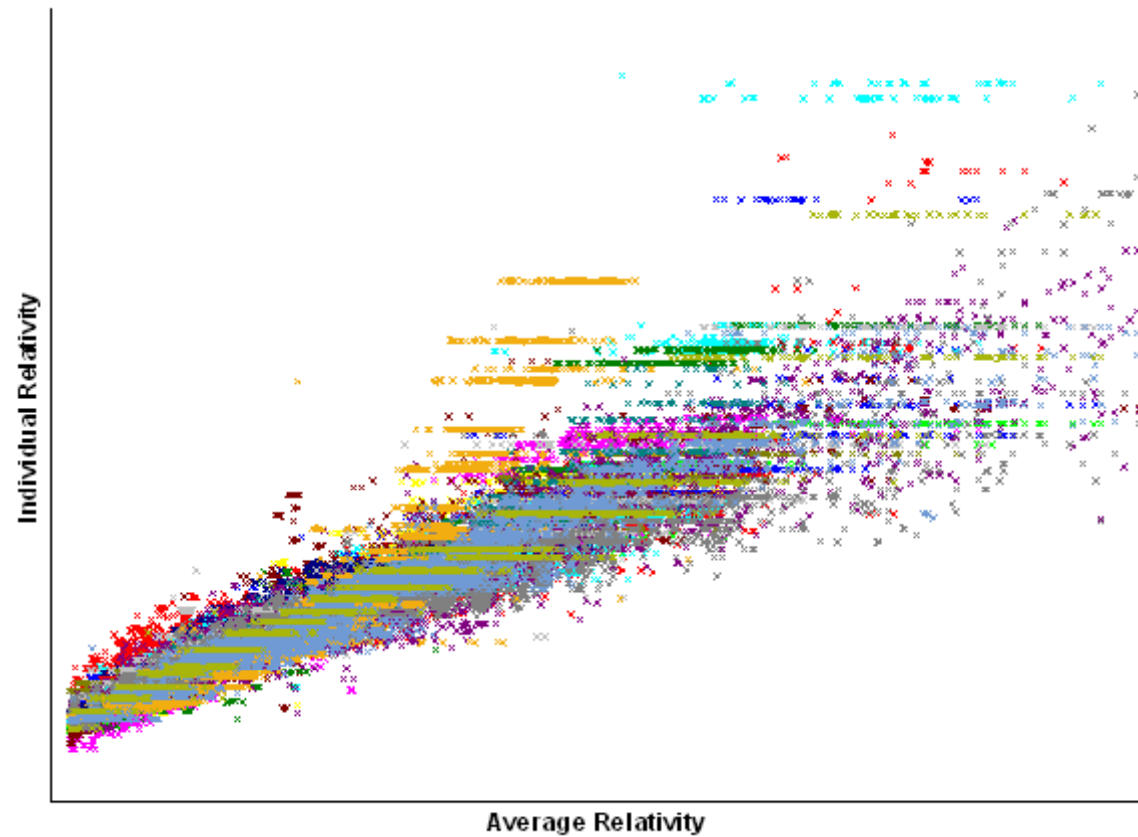
- Useful benchmark
- Public awareness
- Very good predictor of total loss?
- Good predictor of claim frequency?
- Better predictor of AD claims experience than TP?

But...

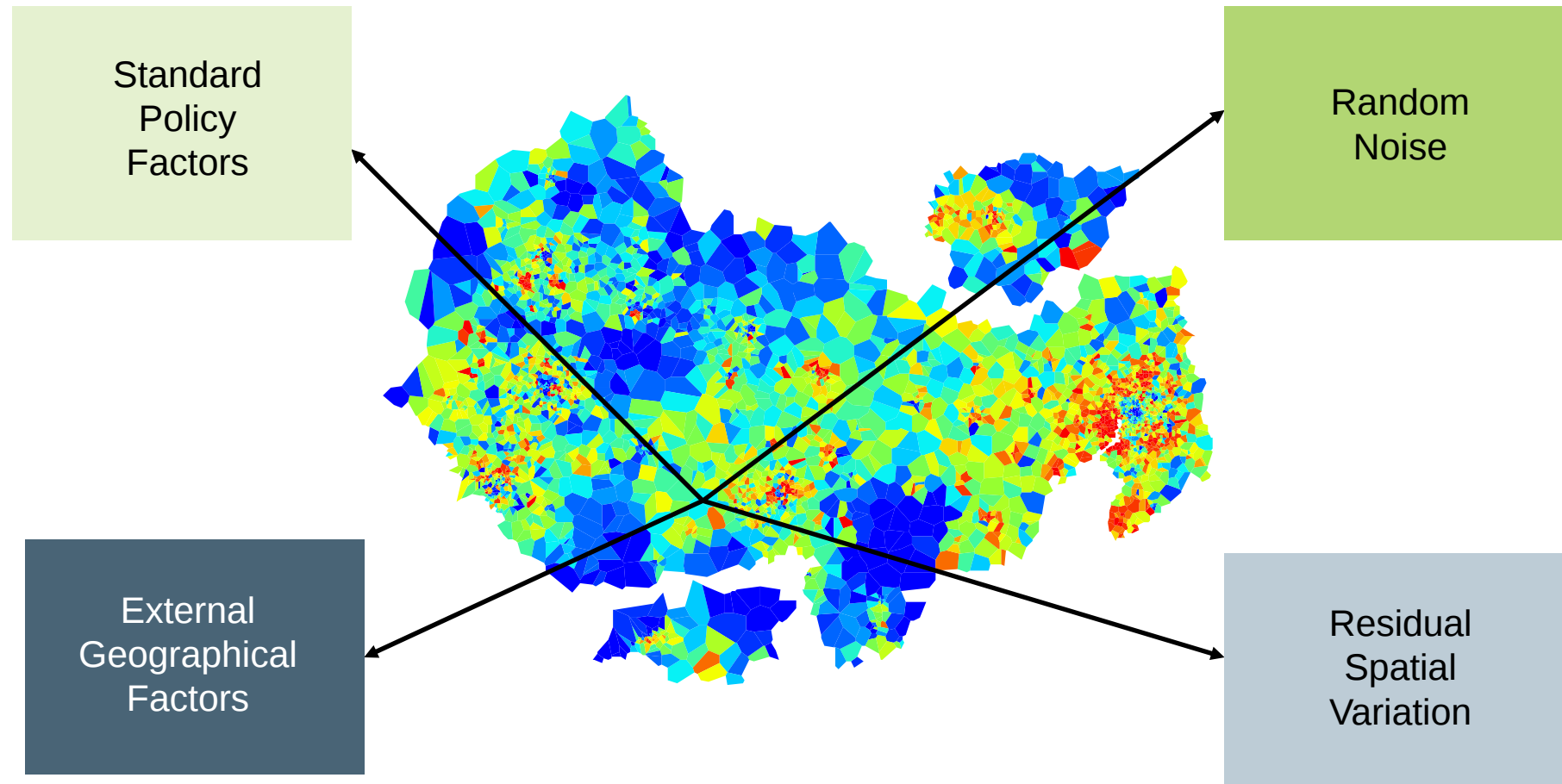
- does not acknowledge all vehicle attributes
- does not make full use of the 50 groups
- is a one-size fits all vehicle group the best option?



Insurer classifications



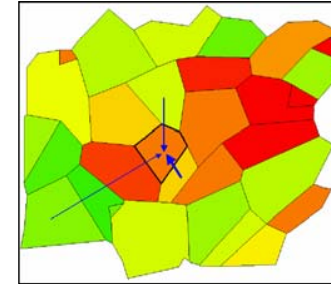
Postcoding - framework



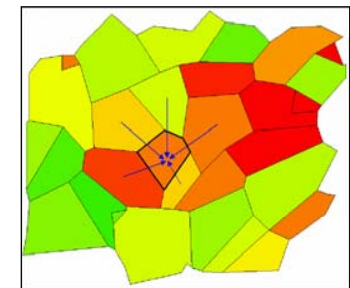
Spatial smoothing

Residual
Spatial
Variation

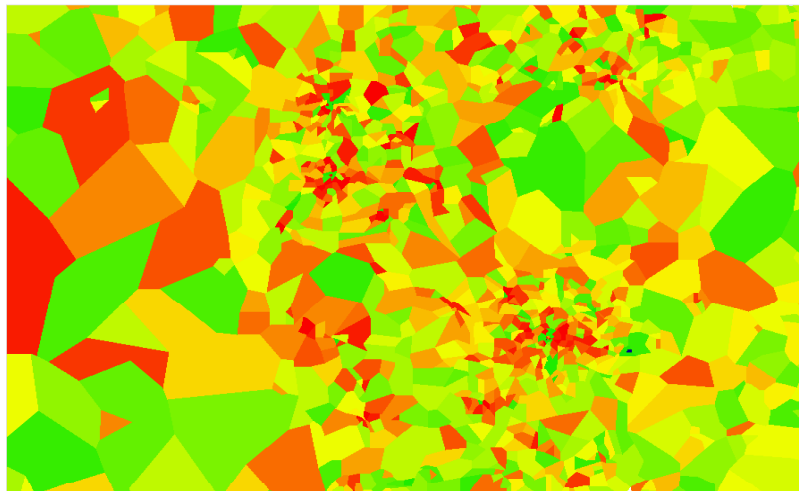
- Credibility family method
- Can adopt **distance based** or **adjacency based** approach



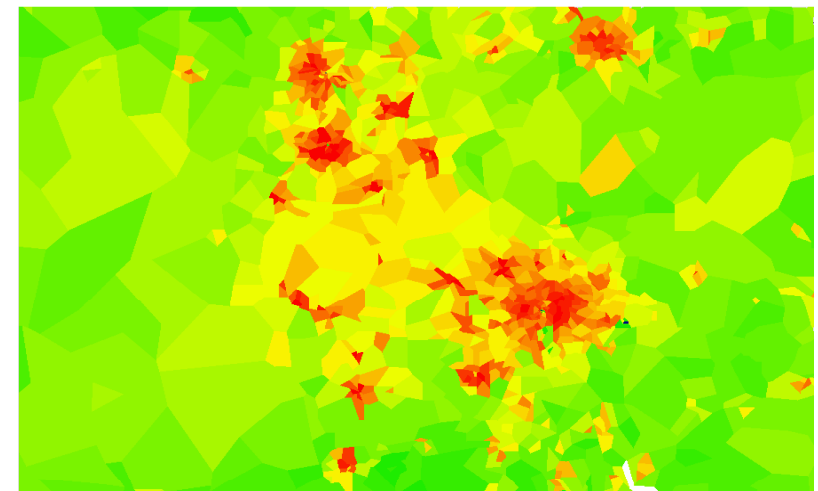
Distance



Adjacency

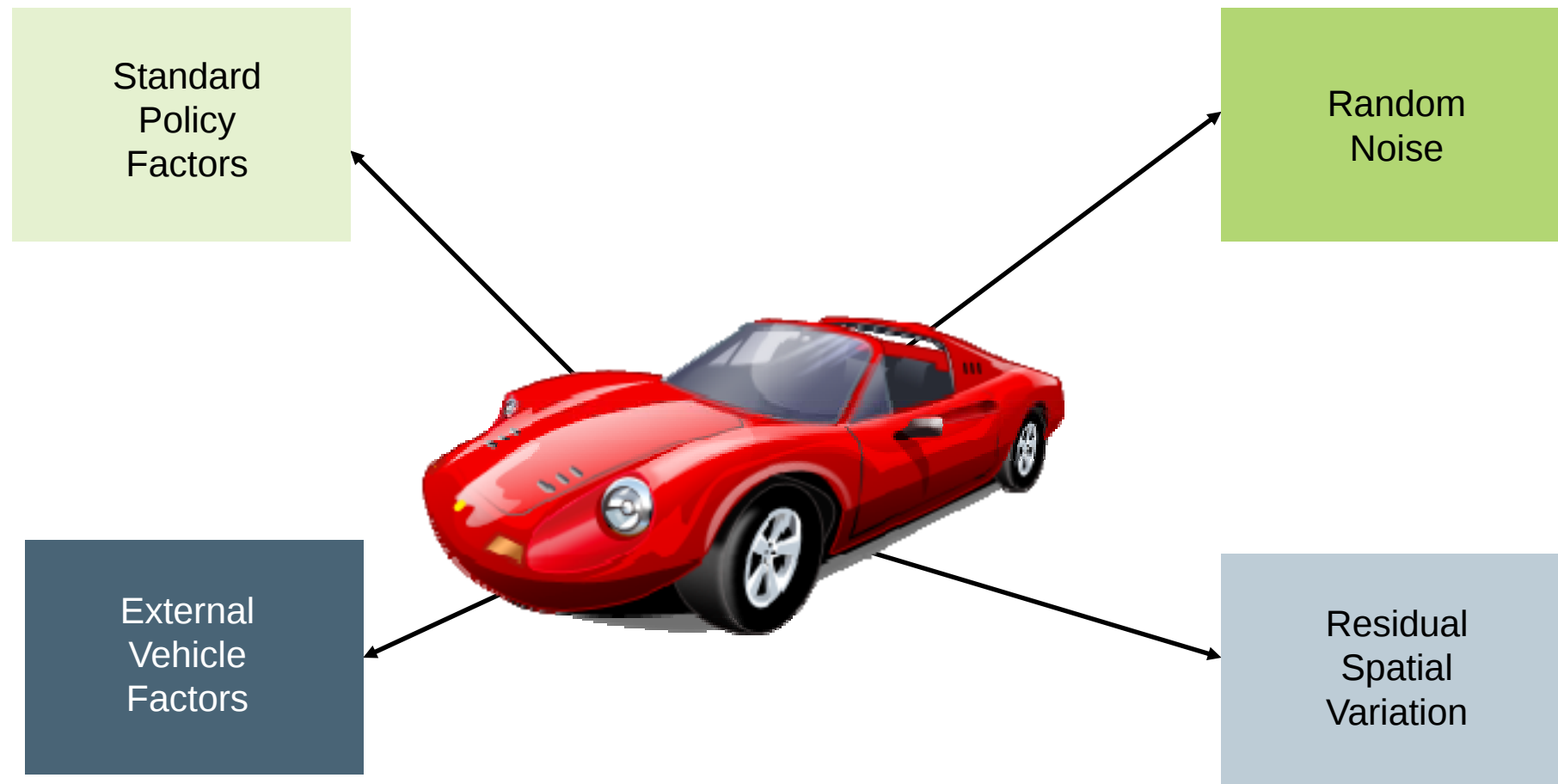


Unsmoothed



Smoothed

Car classification – translating the framework



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

Hatchback

Spider



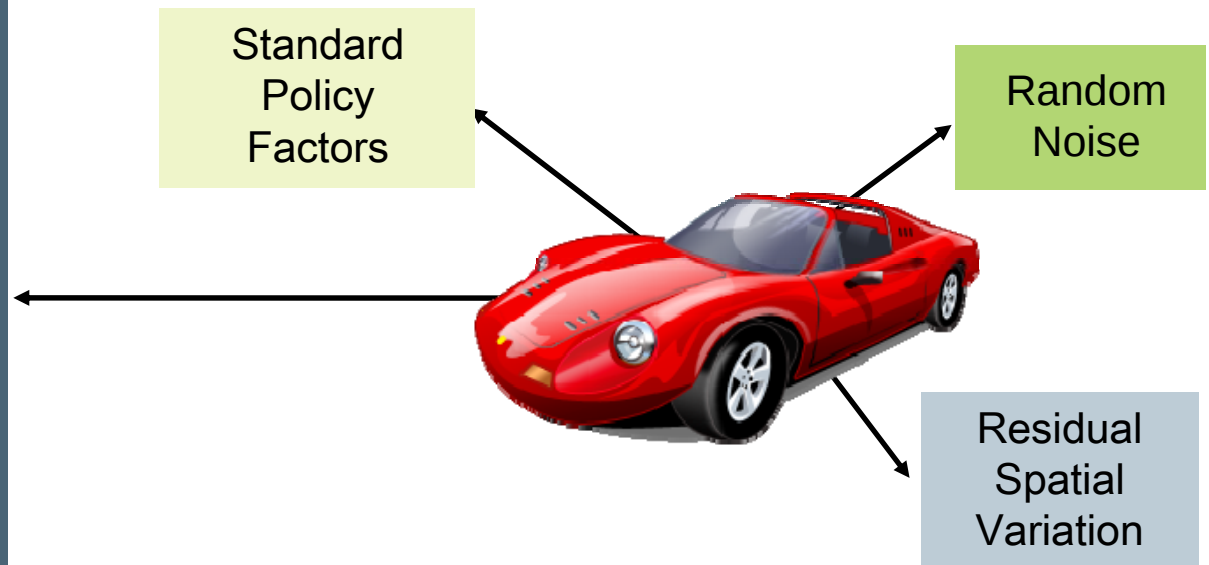
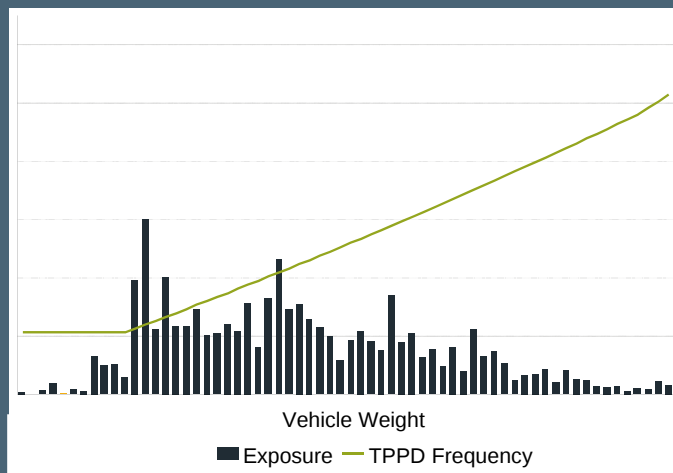
Cabriolet

Saloon

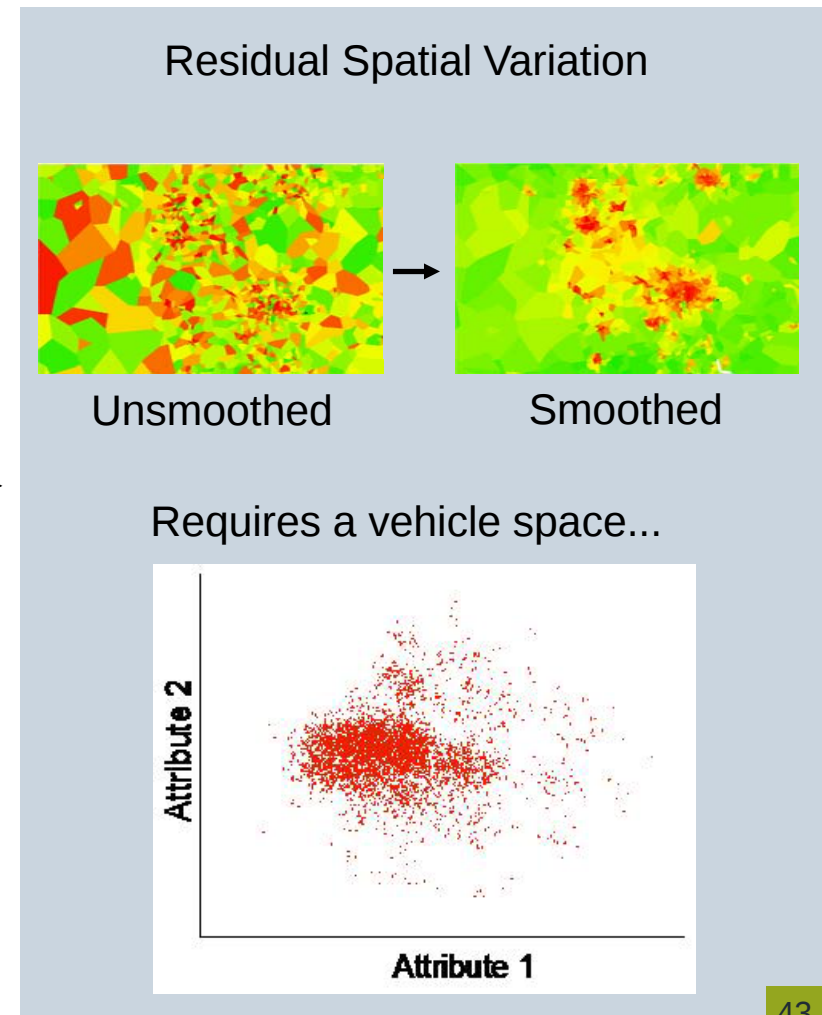
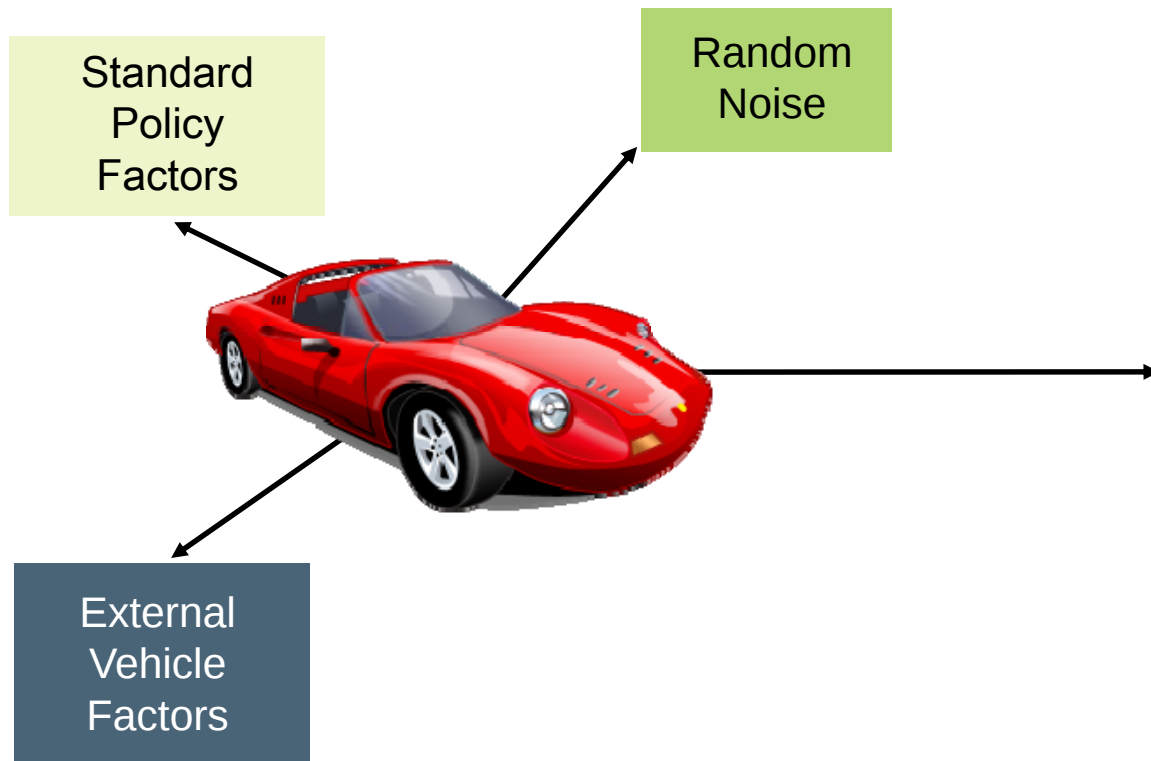
Car classification – translating the framework

External Vehicle Factors

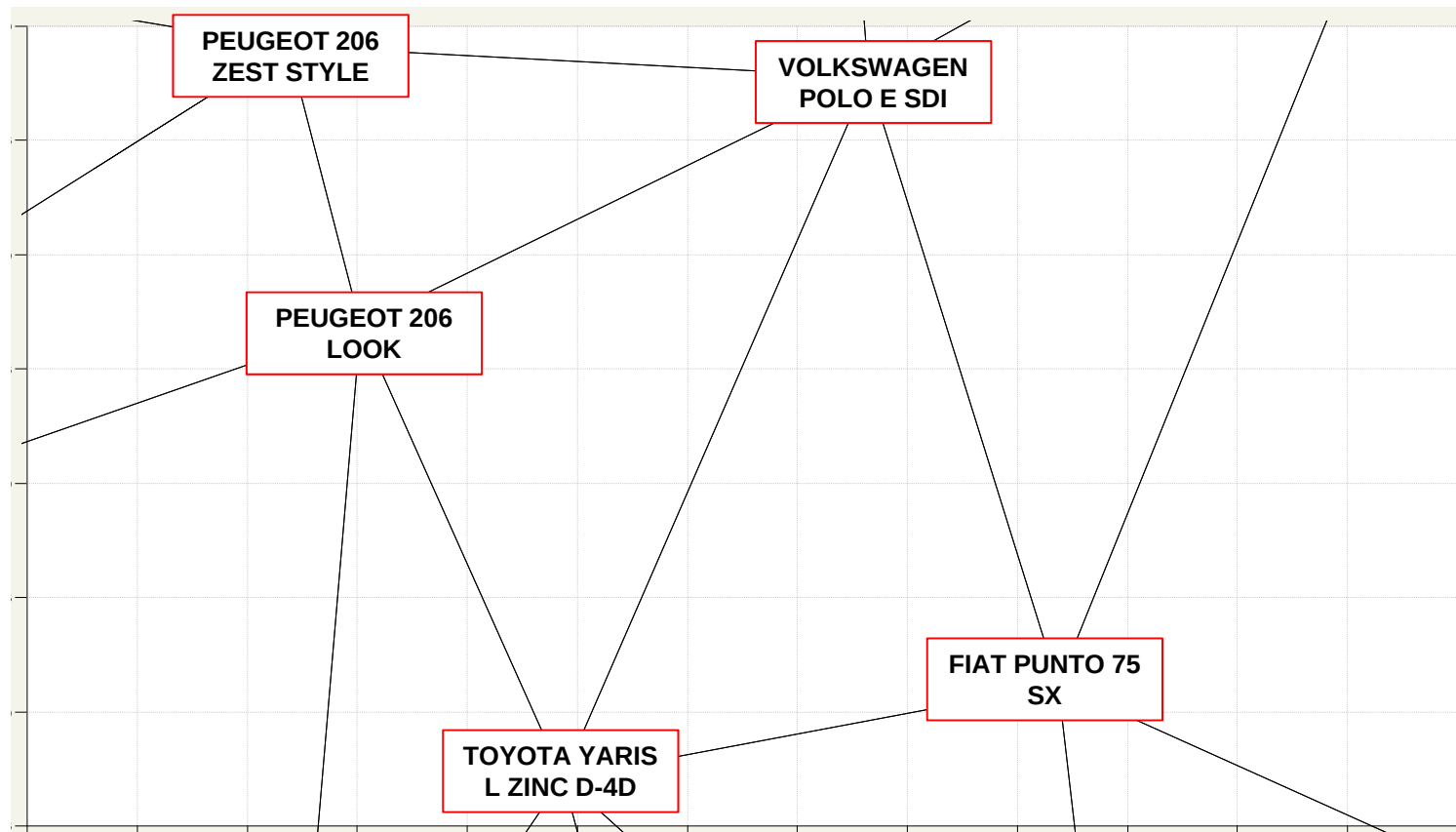
Performance
Dimensions
Safety
Security
Costs
Bodystyle Classification



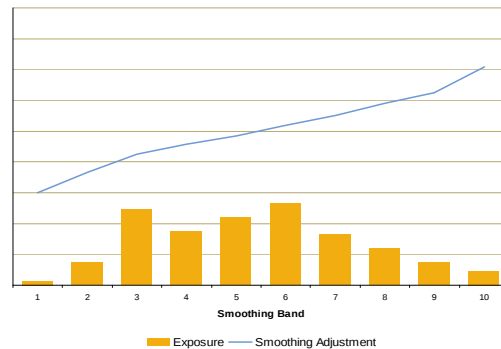
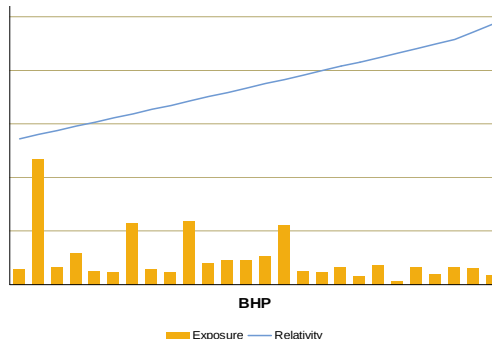
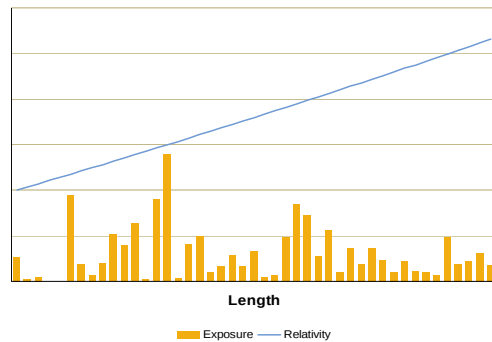
Car classification – translating the framework



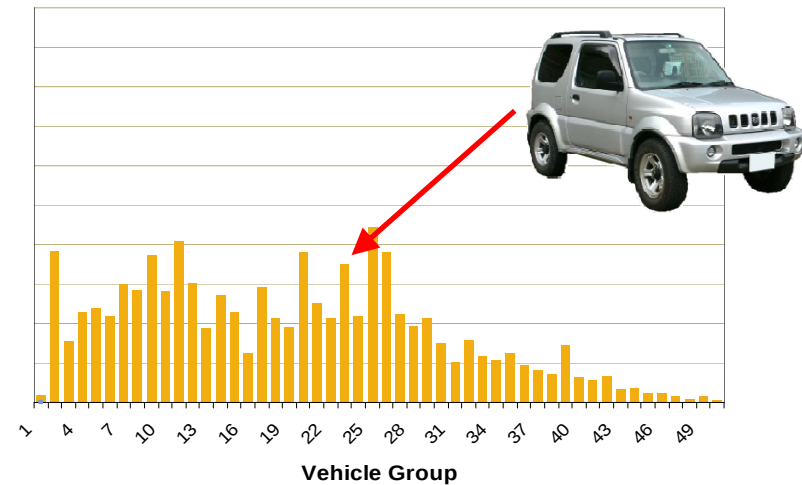
Example adjacencies



Putting it all together



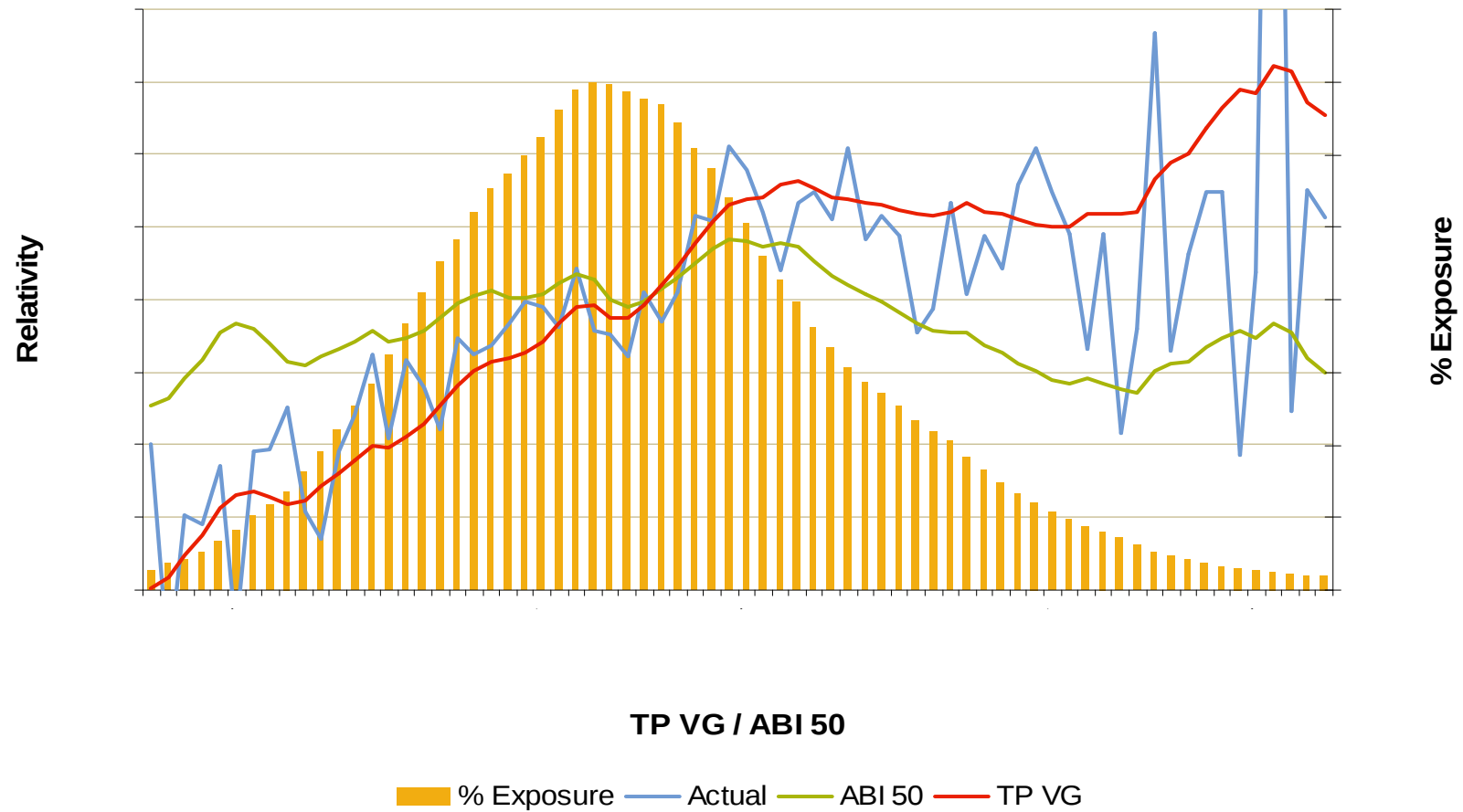
Classifying existing cars



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