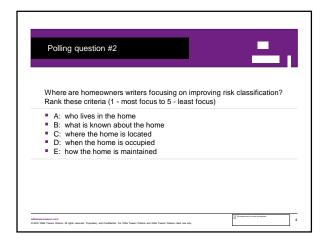
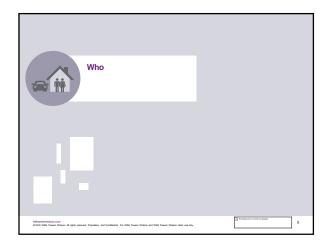
Aims and Advances in Personal Lines Risk Classification	
Claudine Modlin	
March 20, 2018	
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Antitrust Notice	
The Casualty Actuarial Society is committed to adhering strictly to the letter and spirit of the antitrust laws. Seminars conducted under the	
auspices of the CAS are designed solely to provide a forum for the expression of various points of view on topics described in the programs or agendas for such meetings.	
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violate these laws, and to adhere in every respect to the CAS antitrust compliance policy.	
-Milliannessanarium 2	
	_
Polling question #1	
	-
Where are auto writers focusing on improving risk classification? Rank these criteria (1 - most focus to 5 - least focus)	
A: who drives the car B: what is known about the car C: where the car is driven	
D: when the car is driven E: how the car is driven	
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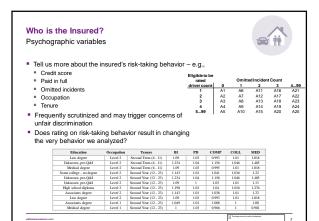
Who is the Insured? Age/Gender

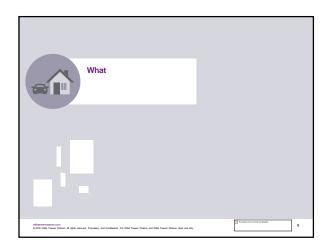


Beyond the standard usage of driver age and gender in auto rating plans, household composition variables have become widely used and increasingly granular:

			HOUSEHO	LD COMPOS	ITION 2			
AGE OF YOUNGEST DRIVER	GENDER OF YOUNGEST DRIVER	#OF ELIGIBLE VEHICLES	# OF MARRIED DRIVERS	ві	PD	MP	CP	cı.
16 or less	F	0	0-1	1.000	1.000	1.000	1.000	1.000
16 or less	F	0	2+	1.000	1.000	1.000	1.000	1.000
16 or less	F	- 1	0-1	3.400	3.010	2.423	1.166	2.660
16 or less	F	- 1	2+	3.400	3.010	2.423	1.166	2.660
16 or less	F	2+	0-1	1.000	1.000	1.000	1.000	1.000
16 or less	F	2+	2+	1.000	1.000	1.000	1.000	1.000
16 or less	M	0	0-1	1.000	1.000	1.000	1.000	1.000
16 or less	M	0	2+	1.000	1.000	1.000	1.000	1.000
16 or less	M	1	0-1	4.800	4.040	2.423	1.191	3.240
16 or less	M	1	2+	4.800	4.040	2.423	1.191	3.240
16 or less	M	2+	0-1	1.000	1.000	1.000	1.000	1.000
16 or less	M	2+	2+	1.000	1.000	1.000	1.000	1.000
17	F	0	0-1	1.000	1.000	1.000	1.000	1.000

- | Gender X now required in some states
 | Set the end state 3 classes of gender or many more?
 | Will gender become less relevant with advances in UBI or public policy concerns on controllability?





| Vehicle groups (symbols) consider far more than retail price and apply to most coverages | Vehicle attributes (e.g., weight, horsepower) generally considered in symbol determination | Luxury vehicle indicators more prevalent | Great interest in autonomous safety features | Vehicle wake | Model | STYLE | LUXURY | STYLE | ST

What is Insured?

What is Insured? Vehicle



Vehicle ownership – carriers are considering length of vehicle ownership and vehicle age when added to policy

Vehicle Tenure	Vehicle Age at Add Date	Length of Vehicle Ownership	Multi car	Full covg Status	81	PD	COMP	COLL	MED	PIP	UMBI	UMPD	LOAN	RENT	TOW
1223	1014	8	N	A	1.05	1.07	1.05	1.08	1.13	1.15	1.15	1.05	1.05	1.08	1.0
1223	1014	8	N	8	0.99	0.99	0.99	0.99	0.99	0.99	0.29	0.99	0.99	0.99	0.9
1223	1014	8	N	N	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.9
1223	1014	8	Y	A	1.12	1.09	1.09	1.06	1.09	1.15	1.09	1.05	1.09	1.06	1.0
1223	1014	8	Y	8	1.04	1.04	1.07	1.08	1.04	1.04	1.04	1.05	1.07	1.08	1.0
1223	1014	8	Y	N	1.04	1.04	1.03	1.04	1.04	1.04	1.04	1.04	1.03	1.04	1.0
1223	1014	c	N	A	0.97	0.95	0.97	1	1.04	1.06	1.07	1	0.97	1	
1223	1014	c	N	8	0.91	0.92	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.9
1223	1014	c	N	N	0.91	0.92	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.9
1223	1014	c	Y	A	1.04	1.01	- 1	0.97	1.01	1.06	- 1	0.97	1	0.97	0.9
1223	1014	c	Y	8	0.95	0.95	0.98	1	0.95	0.96	0.95	1	0.95	1	
1223	1014	c	Y	N	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.9
1223	1519	в	N	A	1.24	1.23	1.22	1.2	1.24	1.25	1.22	1.2	1.22	1.2	1.
1223	1519	8	N	8	1	- 1	0.99	1	1	- 1	- 1	1	0.22	1	
1223	1519	8	N	N	1	- 1	0.99	1	1	1	- 1	1	0.99	1	
1223	1519	в	Y	A	1.15	1.15	1.22	1.08	1.21	1.23	1.15	1.05	1.22	1.08	1.0
1223	1519	8	Y	8	1.05	1.05	1.08	1.12	1.06	1.06	1.05	1.12	1.05	1.12	1.1
1223	15 19	8	v	N	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.0
1223	1519	č	N	Ä	1.05	1.05	1.05	1.04	1.05	1.05	1.05	1.04	1.05	1.04	1.0
1223	1519	c	N	8	0.87	0.87	0.56	0.86	0.86	0.85	0.85	0.85	0.86	0.86	0.8
1223	1519	c	N	N	0.87	0.87	0.56	0.86	0.86	0.85	0.85	0.85	0.86	0.86	0.8
1223	1519	c	Y	A	1.05	1.05	1.08	0.96	1.05	1.09	1.03	0.95	1.05	0.96	0.9
1223	1519	c	Y	8	0.95	0.95	0.96	1	0.94	0.94	0.94	1	0.95	1	
1223	1519	c	Y	N	0.95	0.95	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.9
1223	20999	в	N	A	1.24	1.31	1.31	1.31	1.29	1.25	1.25	1.31	1.31	1.31	1.2
1223	20999	8	N	8	1	- 1	0.99	0.99	0.99	0.99	0.29	0.99	0.99	0.99	0.5
1223	20999	8	N	N	1	- 1	0.99	0.99	0.99	0.99	0.29	0.99	0.99	0.99	0.5
1223	20999	в	Y	A	1.21	1.24	1.32	1.11	1.3	1.29	1.21	1.11	1.32	1.11	1.1
1223	20999	8	Y	8	1.1	1.1	1.11	1.17	1.09	1.09	1.09	1.17	1.11	1.17	1.1
1223	20999	в	Y	N	1.1	1.1	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.0
1223	20999	č	N	Ä	1.05	1.14	1.14	1.13	1.12	1.1	1.1	1.13	1.14	1.13	1.1

What is Insured? Vehicle



Vehicle history – carriers are considering history of the individual vehicle (e.g., issues with titles, flooding, etc.)

Vehicle History Trigger	Age of Junk or Salvage Title Incident	AAF count	NAF count With Company	NAF count Without (Company		ВІ	PD	COMP	COLL
N	N	1999	0	1999	1999	99.99	99.99	99.99	99.99
N	N	1999	1999	0	0	99.99	99.99	99.99	99.99
N	N	1999	1999	0	1999	99.99	99.99	99.99	99.99
N	N	1999	1999	1999	0	99.99	99.99	99.99	99.99
N	N	1999	1999	1999	1999	99.99	99.99	99.99	99.99
N	x	0	0	0	0	100	100	100	100
N	x	0	0	0	1999	100	100	100	100
N	x	0	0	1999	0	100	100	100	100
N	x	1999	0	1999	0	100	100	100	100
N	x	1999	0	1999	1999	100	100	100	100
N	x	1999	1999	0	0	100	100	100	100
N	x	1999	1999	0	1999	100	100	100	100
N	x	1999	1999	1999	0	100	100	100	100
N	x	1999	1999	1999	1999	100	100	100	100
у	A	0	0	0	0	109.99	109.99	109.99	109.99
y	A	0	0	0	1999	109.99	109.99	109.99	109.99
y	A	0	0	1999	0	109.99	109.99	109.99	109.99
v	A	0	0	1999	1999	109.99	109.99	109.99	109.99

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What is Insured? Home

- Similar to vehicle symbols, trend toward classifying homes into groups based on certain characteristics e.g.,

 Divelling score (age of home, # stories, sq footage, number of rooms/bathrooms, RCV/ACV etc)

 Roof score (valuation, age, composition, etc)

 Basement score (includes foundation type and percent of basement finished)

 Age of Heating/Renovation* Plumbing Cooling Electric Renovation* Plumbing Cooling Electric Renovation* Plumbing Cooling Electric Renovation*

Roof Valuation	Age	Composition Shingle/ Architectural	Slate	Tile	Wood Shingle/ Shake	Metal/ Superior Poured/ Poured Concrete	All Others
RC	All	1.000	1.000	1.000	1.000	1.000	1.000
ACV	0-5	0.951	0.980	0.971	0.971	0.980	0.951
ACV	6-8	0.862	0.945	0.917	0.917	0.945	0.862
ACV	9-11	0.804	0.922	0.882	0.882	0.922	0.804
ACV	12-14	0.745	0.898	0.847	0.847	0.898	0.745
ACV	15-17	0.686	0.874	0.811	0.811	0.874	0.686
ACV	18-20	0.627	0.851	0.776	0.776	0.851	0.627
ACV	>20	0.607	0.843	0.764	0.764	0.843	0.607

Age of		Heating/		
Renovation*		Cooling	Electric	Roof
0	0.02	0.04	0.06	0.05
1	0.02	0.04	0.05	0.04
2	0.01	0.03	0.04	0.03
3	0.01	0.03	0.03	0.03
4	0.00	0.02	0.03	0.03
5	0.00	0.02	0.02	0.02
6	0.00	0.01	0.02	0.02
7	0.00	0.01	0.01	0.01
8	0.00	0.01	0.01	0.01
9	0.00	0.01	0.01	0.01
10-49	0.00	0.00	0.01	0.00
50+	0.00	0.00	0.00	0.00

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What is Insured? Coverage

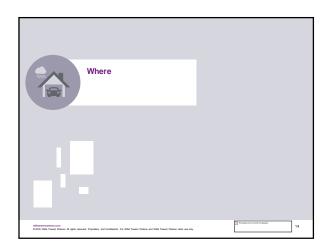


- Carriers leveraging external data to improve replacement cost estimates, which results in more homogeneous risk classes
- Carriers also studying coverage selections (e.g., limits, deductibles, endorsements/optional covers) in terms of both effect on loss and behavioral indicator.

- vv	nen an insured	buys more coverage for jeweiry, what does that tell you about the risk:	r
	Name	Attribute	Weight
LRY R	TO 03	No Information	0

Name	Attribute	Weight
JWLRY_RTO_03	No Information	0
JWLRY_RTO_03	No/Low Jewelry (0.000 to 0.010)	0
JWLRY_RTO_03	> 0.010 to <= 0.025	0
JWLRY_RTO_03	> 0.025 to <= 0.050	0
JWLRY_RTO_03	> 0.050 to <= 0.075	-8
JWLRY_RTO_03	> 0.075	-15
JWLRY_RTO_03	Legacy Agency Markets - Not Collected or Stored	0
JWLRY RTO 03	Legacy Agency Markets - Invalid or Missing Value	0

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Steady trend toward more granular rating territories, often leveraging third party data and advanced analytics methodologies Carriers investigating territory definitions that are independent of postal codes or other non-insurance definitions of area What types of concerns are being (re)raised about geographic rating

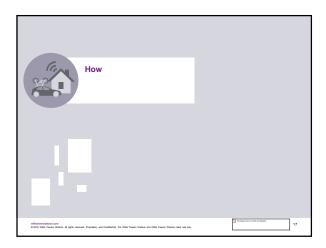
Where is the Insured?

Where is the Insured? Geographic rating



- For home rating algorithms, rating by peril has become widely accepted
 May involve separate territory boundaries and/or relativities
 A particular peri may relate to natural events, which raises question on viability of geographic rating and reliance on cat models
 Some cat models are widely accepted (e.g., hurricane) whereas others are not

Territory Factors											
Form	Territory	X-CAT FIRE	X-CAT LIABILITY	X-CAT THEFT	X-CAT WIND	X-CAT WATER	X-CAT OTHER	CAT WIND	CAT WATER		
HO-3	505	0.728	0.925	0.613	0.750	0.650	0.958	0.943	0.943		
HO-3	506	0.553	0.702	0.465	2.144	0.493	0.728	0.716	0.716		
HO-3	507	0.611	0.777	0.514	2.371	0.773	0.628	0.791	0.791		
HO-3	508	0.692	0.879	0.582	1.418	0.617	0.710	0.896	0.896		
HO-3	509	0.811	1.031	1.101	1.663	0.724	0.833	1.051	1.051		
HO-3	510	0.638	0.811	0.537	0.657	0.807	0.655	0.826	0.826		
HO-3	511	1.271	1.041	0.689	0.843	0.730	1.078	0.733	0.733		
HO-3	512	0.706	0.897	1.107	1.447	0.630	0.929	0.914	0.914		
HO-3	513	1.190	0.818	0.541	0.663	0.574	0.847	0.576	0.576		
HO-3	514	0.810	1.030	0.682	1.661	1.024	1.066	1.049	1.049		



How is it Used?

Vehicle

- Trend toward more granular accident/violation rating
 Counts by type (e.g., minor, major violation)
 Time since last incident
 Severity of accident
 Consideration of

- Consideration of Indicates at the driver level and policy level
 Accident counts with prior vs current carrier
 Advances in Usage-based auto!!!
 Effect on 'traditional' rating variables
 Still learning how to sort personal from commercial (livery) exposure

Risk Group	Risk Tier	Rated Vehicle Type	Coverage	Driver Age	Number of Chargeable Occurrences	Months Since First Occurrence	Months Since Second Occurrence	Factor	
В	Z	PP	BI	18	0	0	0	1	_
В	z	PP	BI	18	1	11	0	1.89	
В	Z	PP	BI	18	1	23	0	1.7325	
В	z	PP	BI	18	1	35	0	1.575	
В	z	PP	BI	18	2	11	11	2.4806	
В	z	PP	BI	18	2	11	23	2.4806	
В	Z	PP	BI	18	2	11	35	2.4806	
В	Z	PP	BI	18	2	23	23	2.2739	
В	Z	PP	BI	18	2	23	35	2.2739	
В	Z	PP	BI	18	2	35	35	2.0672	
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