



Insurance Scoring For Your Car

Using vehicle history in personal auto rating and underwriting

March 15, 2016

Don Hendriks ACAS ASA MAAA
Account Executive - Actuarial
CARFAX Banking & Insurance Group

Patrick Foy
Director, Product Development
TransUnion – Insurance Services Group

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.

Under no circumstances shall CAS seminars be used as a means for competing companies or firms to reach any understanding – expressed or implied – that restricts competition or in any way impairs the ability of members to exercise independent business judgment regarding matters affecting competition.

It is the responsibility of all seminar participants to be aware of antitrust regulations, to prevent any written or verbal discussions that appear to violate these laws, and to adhere in every respect to the CAS antitrust compliance policy.

Premium Leakage

In 2010...

- Rating error reduced premium revenue in the private passenger auto insurance industry by \$15.4 billion.
- Premium rating error represent[ed] 9.4 percent of a total \$164.1 billion in personal auto written premium.



Source: Bhat, Raj, PhD. "Better Analysis and Frequent Updates Stem Auto Insurance Losses." Verisk Review May, 2011.

Common Sources of Premium Leakage

Soft Fraud

- Incomplete information at quote
- Minor or unintentional inaccuracies on application

Hard Fraud

- Hidden vehicle damage
- Major, intentional misrepresentation on application

Life Changes

- Graduation
- New job with new commute
- Kids in school
- Retirement

Evolution of Auto Rating Plans

Traditional Rating Plans

- Driver Classification
 - Age, Gender, Marital Status
 - Driving Records
- Location Classification
 - Territorial Population Density
 - Territorial Crime Rate
- Vehicle Classification
 - Symbol and Model Year
 - Mileage and Use



Modern Rating Plans

- Driver-Specific Data
 - Credit History
 - Telematics data
- Location-Specific Data
 - Traffic Patterns
 - Weather Models
- Vehicle-Specific Data



What is Vehicle History?

CARFAX® Vehicle History Report™
An independent company established in 1986

Vehicle Information:
2008 LINCOLN TOWN CAR SIGNATURE LTD
 VIN: 2LNHM82V48X859724
 SEDAN 4 DR
 4.6L V8 FI SOHC
 REAR WHEEL DRIVE
[Standard Equipment](#) | [Safety Options](#)

Branded Titles: Rebuilt, Salvage

Accident / Damage reported

5 Previous owners

At least 1 open recall

269,223 Last reported odometer reading

Worth \$2,410 less than retail book value

Damage information

Mileage Data

Ownership Data

Title information

Detailed service history

CARFAX Ownership History			
The number of owners is estimated			
	Owners 1-3	Owner 4	Owner 5
Year purchased	2008	2009	2015
Type of owner	Rental	Taxi	Taxi
Estimated length of ownership	1 yr. 2 mo.	6 years	3 months
Owned in the following states/provinces	See Details	New York	New York
Estimated miles driven per year	---	42,728/yr	---
Last reported odometer reading	12,553	269,223	---

CARFAX Title History			
CARFAX guarantees the information in this section			
	Owners 1-3	Owner 4	Owner 5
Salvage Junk Rebuilt Fire Flood Hail Lemon	Alert! Problem Found	Alert! Problem Found	Alert! Problem Found
Not Actual Mileage Exceeds Mechanical Limits	No Problem	No Problem	No Problem
Alert! Severe problems were reported by a state Department of Motor Vehicles (DMV). This vehicle does not qualify for the CARFAX Buyback Guarantee.			

CARFAX Detailed History				
Owner	Date	Mileage	Source	Comments
Owner 1	06/06/2008		USA	Vehicle manufacturer and shipped to original dealer
Owner 1	06/12/2008		B. Sullivan Motor Vehicle Dept. Long Beach, WA	File owner reported that it registered as stolen. Title #1210V1842553 vehicle
Owner 2	09/18/2008	12,952	Sullivan Motor Vehicle Dept. Long Beach, WA	Title owner reported SALVAGE TITLE CERTIFICATE ISSUED
Owner 2	04/22/2009	12,943	Paragon Car Company	Vehicle sold with damage
Owner 3	04/19/2009		Ohio	New owner reported
Owner 3	07/04/2009		Ohio	SALVAGE TITLE CERTIFICATE ISSUED
Owner 3	08/08/2009		New York	Dealer took title of the vehicle while it was in inventory
Owner 3	08/08/2009		New York	SALVAGE TITLE CERTIFICATE ISSUED
Owner 3	08/08/2009		New York	Emergency inspection performed. Dealer had vehicle inspected to prepare for sale. Passed safety inspection. View details
Owner 4	08/09/2009		New York	SALVAGE TITLE CERTIFICATE ISSUED
Owner 4	09/03/2009	12,818	New York	Passed safety inspection
Owner 4	09/03/2009	12,818	New York	Passed emissions inspection
Owner 4	09/03/2014	228,812	New York	Passed safety inspection
Owner 4	09/03/2014	228,812	New York	Emergency inspection performed
Owner 4	07/04/2014		New York	Registration issued or renewed
Owner 4	06/08/2014	224,007	New York	Passed safety inspection
Owner 4	06/08/2014	224,007	New York	Passed emissions inspection
Owner 4	10/17/2014		New York	Accident reported with another motor vehicle
Owner 4	12/18/2018	247,212	New York	Passed safety inspection
Owner 4	12/18/2018	247,212	New York	Passed emissions inspection
Owner 4	02/08/2019		New York	Passed safety inspection
Owner 4	02/08/2019		New York	Passed emissions inspection
Owner 4	02/03/2019		New York	Registration issued or renewed
Owner 4	09/06/2019	266,190	New York	Passed safety inspection
Owner 4	09/06/2019	266,190	New York	Passed emissions inspection
Owner 4	09/03/2019	269,214	New York	Passed safety inspection
Owner 4	09/03/2019	269,214	New York	Passed emissions inspection
Owner 4	10/01/2019	269,223	New York	Passed safety inspection
Owner 4	10/01/2019	269,223	New York	Passed emissions inspection
Owner 5	10/05/2015		New York	New owner reported
Owner 5	10/05/2015		New York	SALVAGE TITLE CERTIFICATE ISSUED
Owner 5	10/05/2015		New York	REBUILT TITLE ISSUED
Owner 5	10/05/2015		New York	Title or registered as lost

Annual Mileage and Vehicle Use

The most powerful rating variables in Personal Auto



- Included in most traditional rating plans
- Often most powerful components of UBI rating models
- Required by statute for rating plans in California

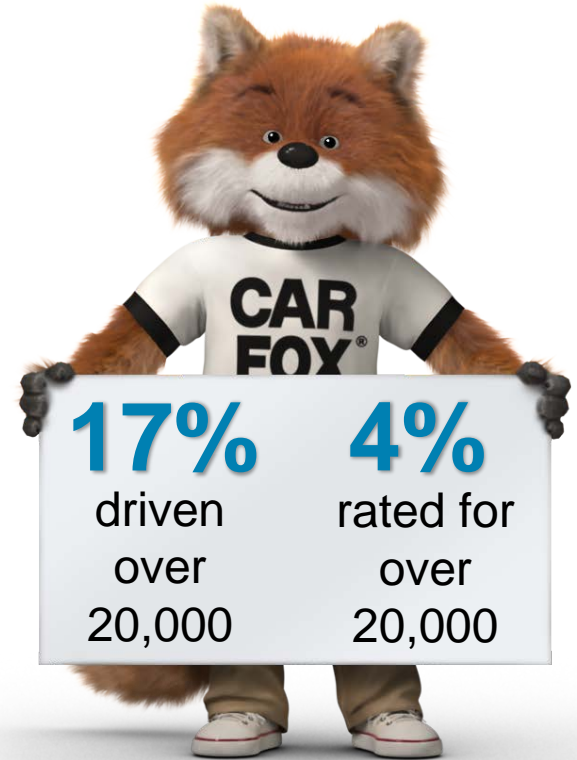
Annual Mileage as a Rating Variable

Verification is difficult

- Based on customer- or agent-reported information
- Can change over time

Self-reported data are inaccurate

- Almost **3** out of **4** cars driven over 20,000 miles per year are **improperly rated**
- Average self-reported mileage is about **6,000 less** than actual mileage



“Ohhhhhhhhhhh, you said Disney World!”

6,033 miles

Disneyland to Las Vegas



CARFAX HQ near DC



TransUnion HQ in Chicago



TransUnion's Atlanta Office



Don's office in Detroit

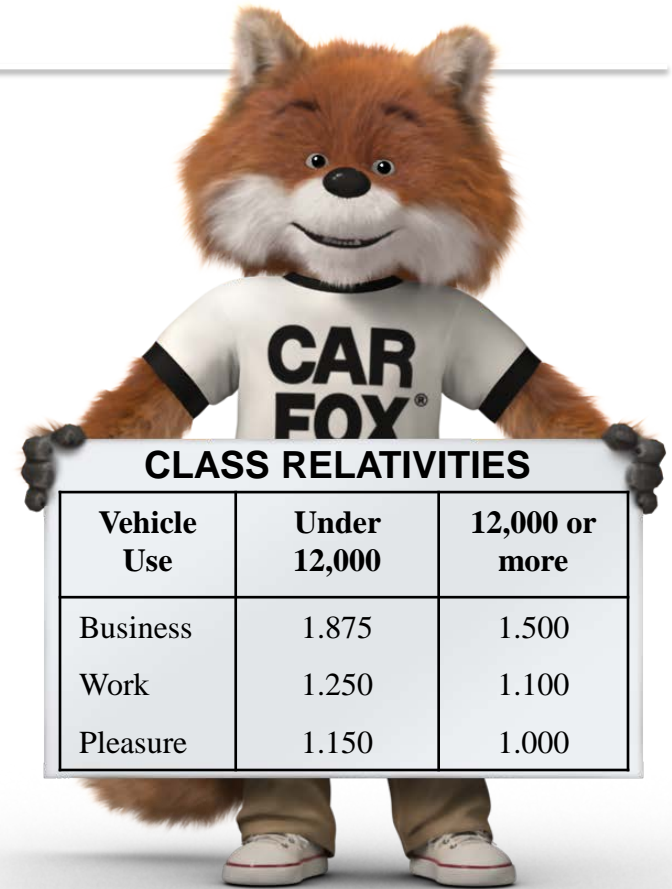


Walt Disney World



Leakage from Mileage

- Internal studies find some companies are better off *not using mileage* in their rating plans
- Company responses include:
 - Stop using mileage altogether
 - Use broad mileage bands
 - Implement expensive UBI programs



Verified Annual Mileage

- Mileage reported by verifiable third parties

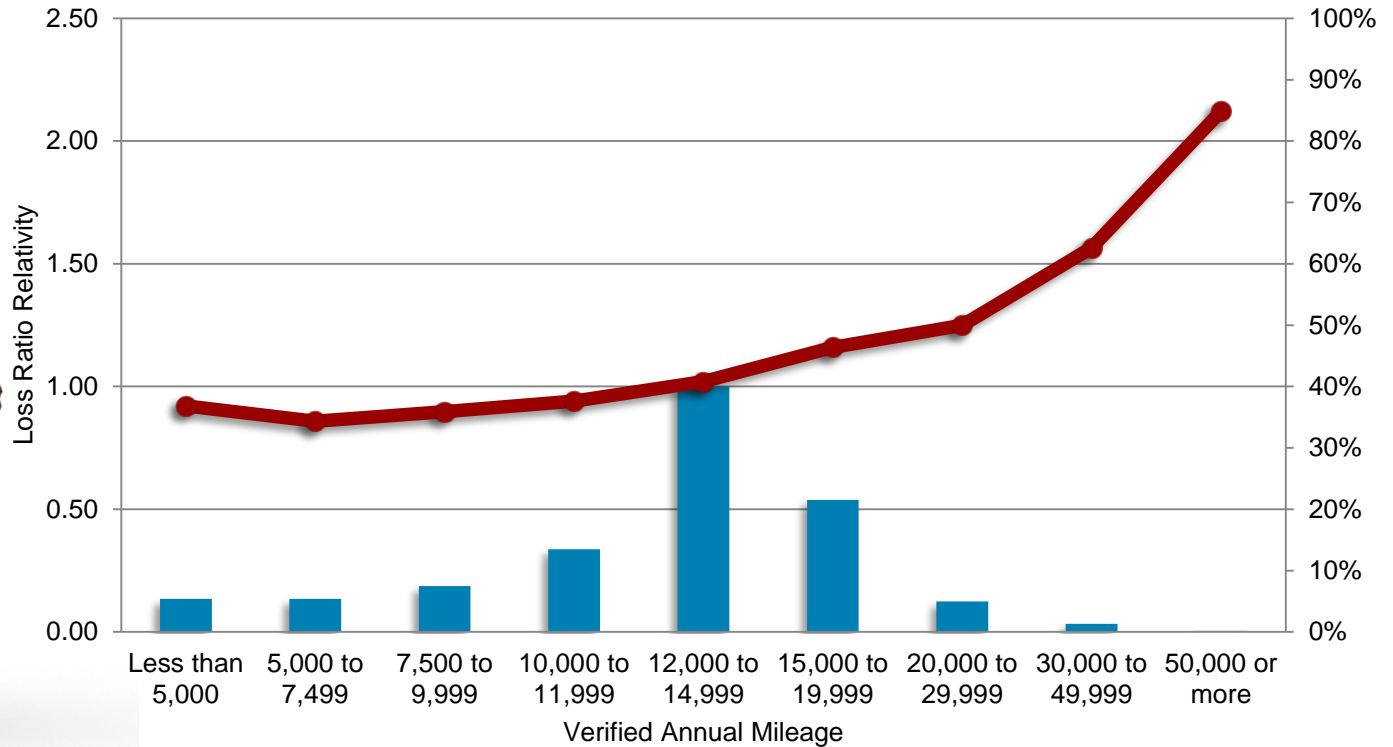
- State inspection stations
- Vehicle repair shops
- Dealerships

- Can be used in more granular mileage rating plans



- Already included in many rating plans
- Implementation is (relatively) simple
- Few regulatory concerns
- Often used in UBI to “slot” new insureds into appropriate mileage categories.

Lift from Verified Annual Mileage



Source: Insurance Institute for Highway Safety/Highway Loss Data Institute and CARFAX Mileage Study, 2013.

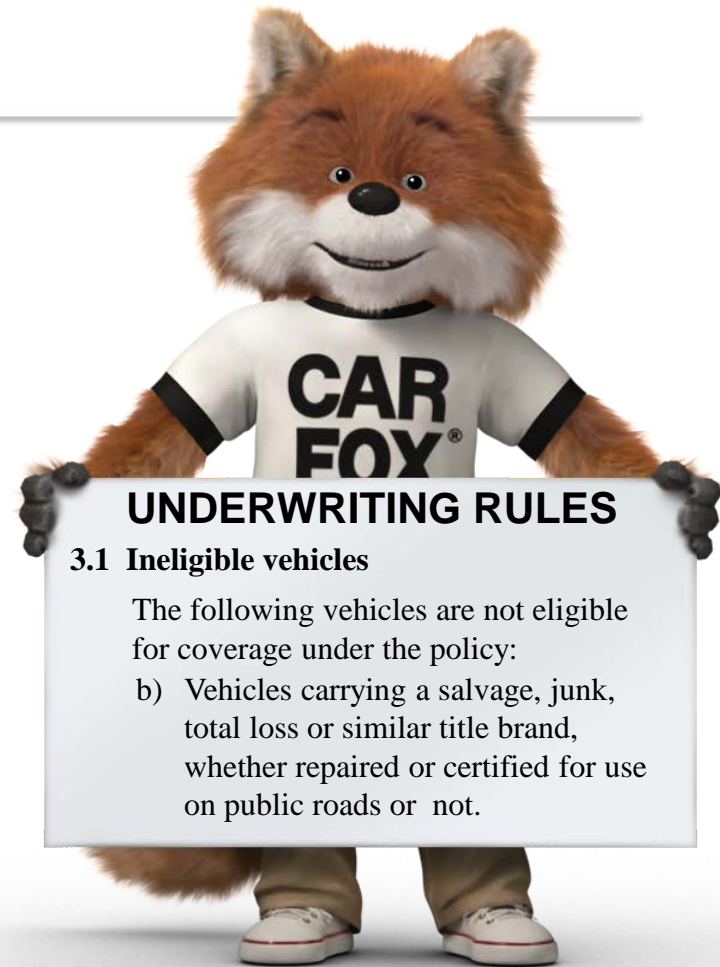
Current Registration Type

- Less likely to be fraudulently reported than self-reported use
 - Significant penalties for misreporting
 - Tax incentives in many states
- Used in underwriting to match customers to most appropriate coverage



Branded Titles

- **Salvage Titles**
 - Precluded by many underwriting plans
 - Difficult to identify without a copy of the title
- **Rebuilt Titles**
 - Repairs may not meet safety standards
 - Often incomplete or improper repairs
- **Fire and Flood Titles**
 - Possible damage to sensitive electronic or critical structural components



Flood Titles



Superstorm Sandy

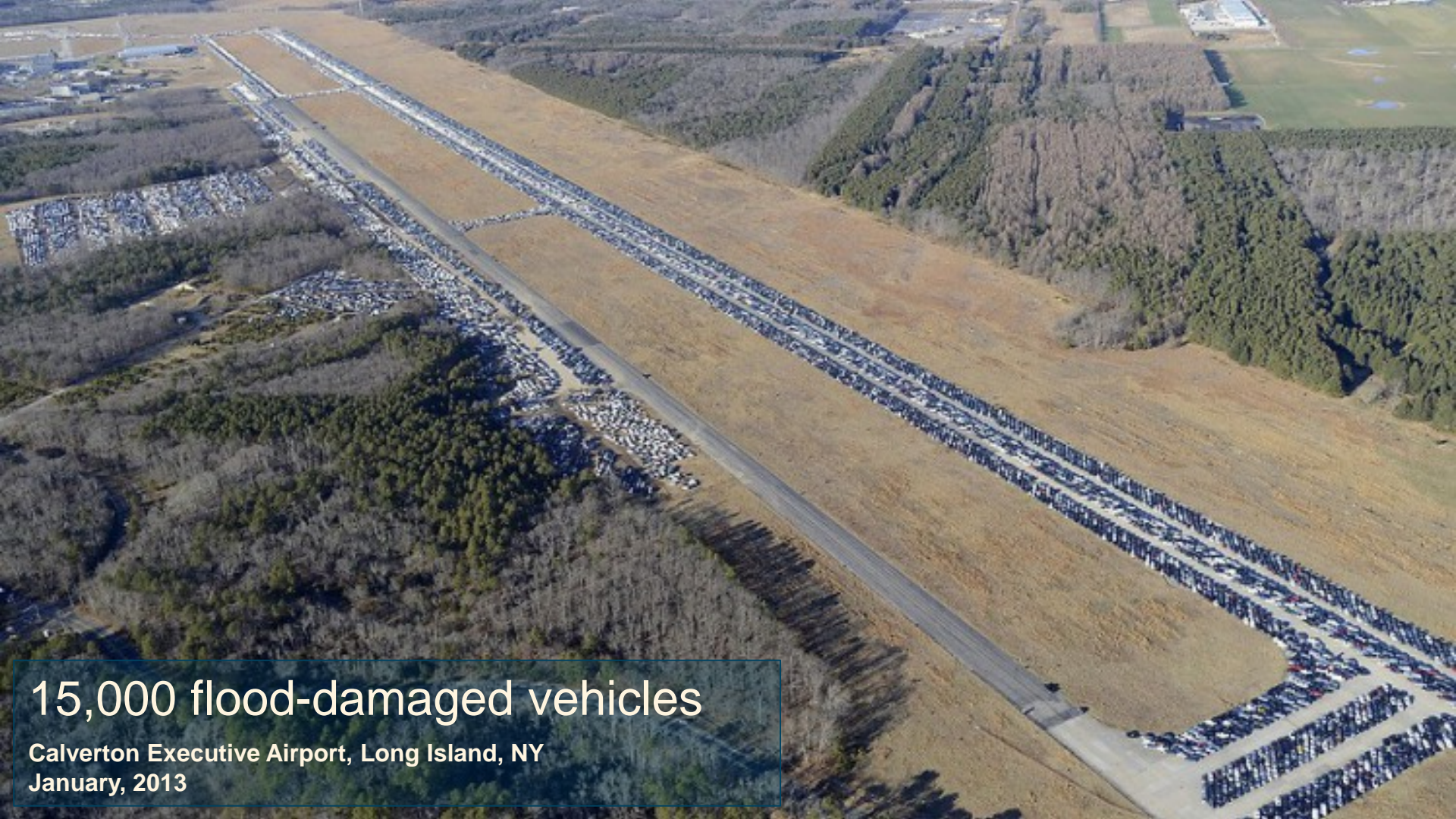
- **250,000** vehicles total flood losses

Hurricane Katrina

- **500,000** vehicles total flood losses

Problems with flood vehicles include:

- Damage to ABS components
- Damage to electronic safety system sensors
- Damage to passive and active restraint systems
- Internal rust in structural components



15,000 flood-damaged vehicles

Calverton Executive Airport, Long Island, NY
January, 2013

Severe Accidents

- Structural integrity is compromised
- Many sensitive parts may be improperly installed or remain unrepaired
- Low-quality aftermarket parts are prone to failure

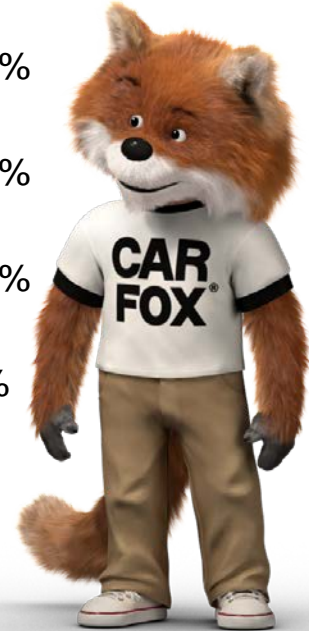
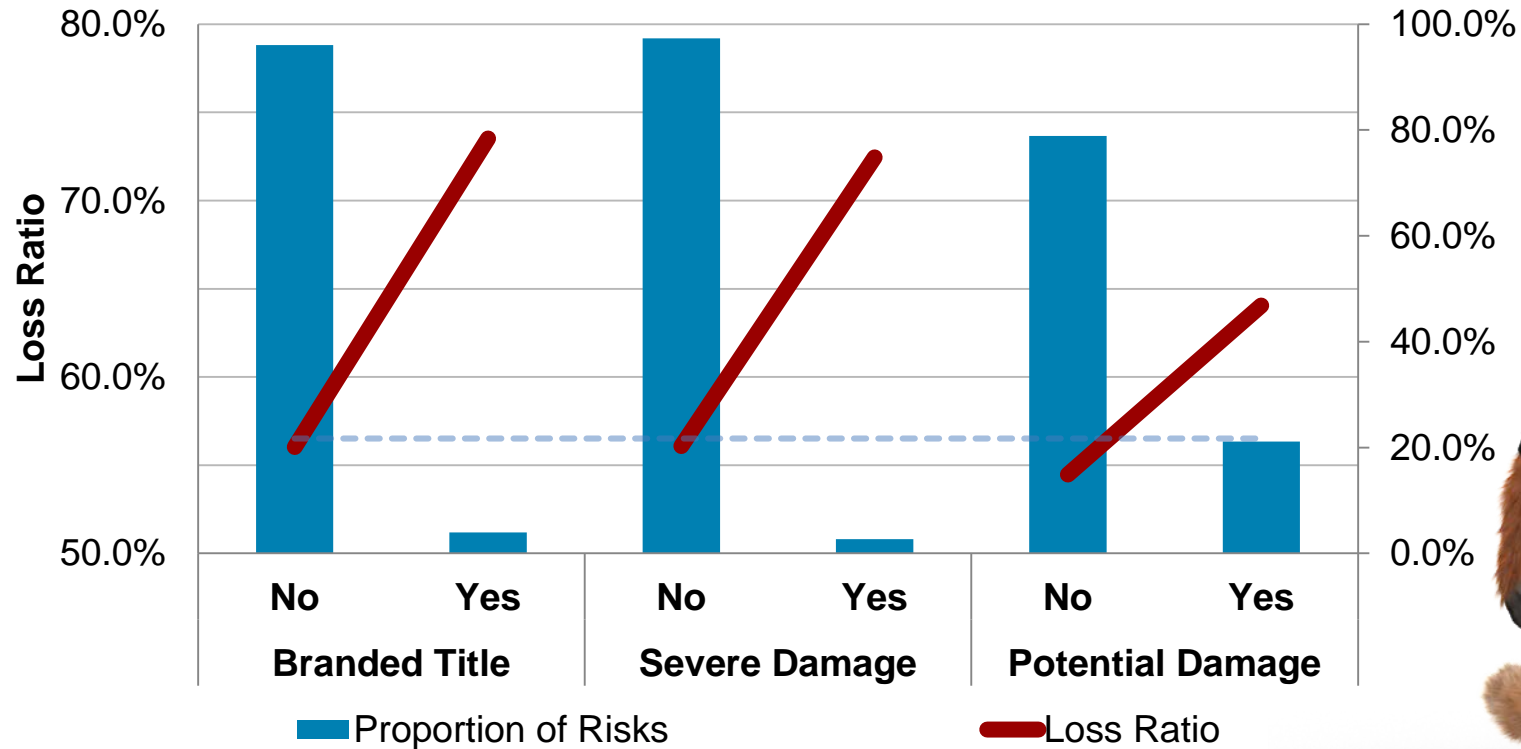


Minor Accidents

- Repairs may be done improper or incomplete
 - May cause sensitive electronics to fail
 - Damage to critical structural components may be missed
- Low-quality aftermarket safety components may fail under stress

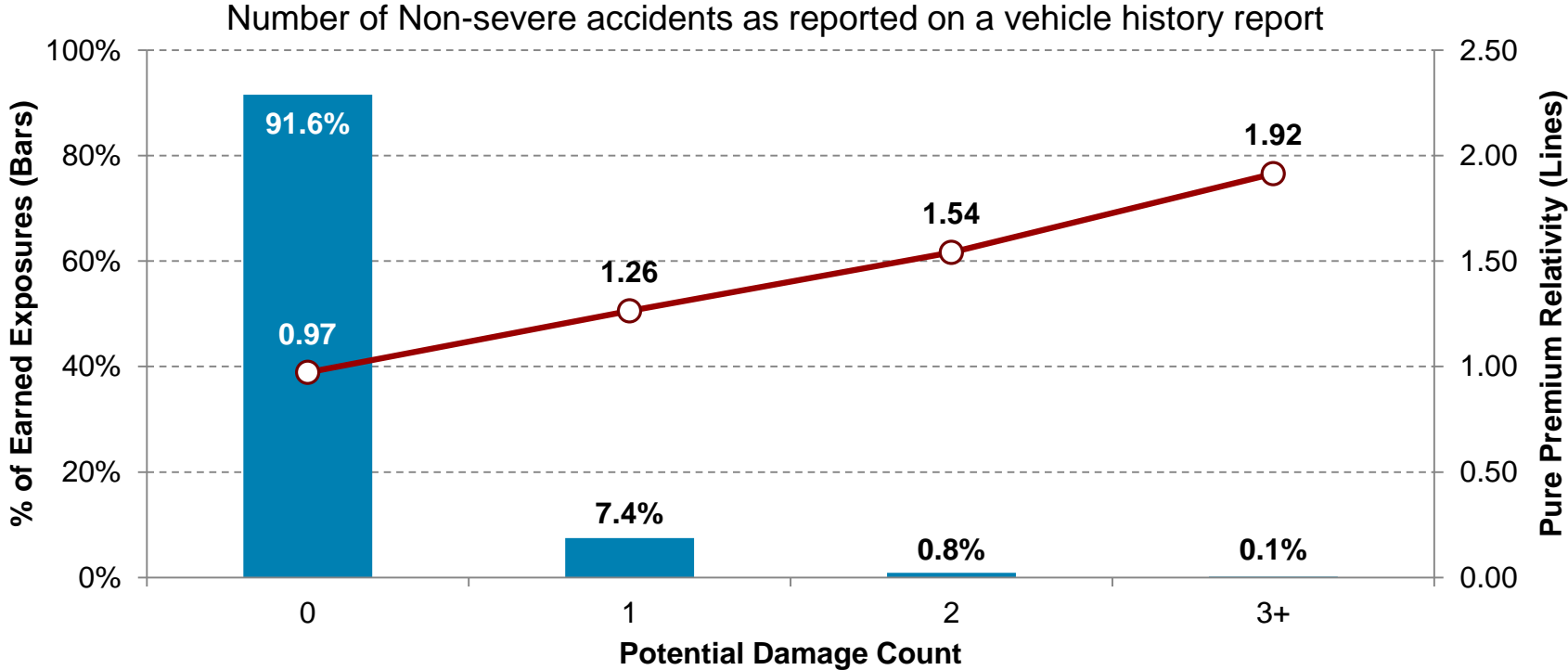


Loss Ratio Impact of Vehicle Damage



Source: TransUnion Performance Analytics Database, 2006-2010.

Individual Vehicle Data is Highly Predictive and Valuable



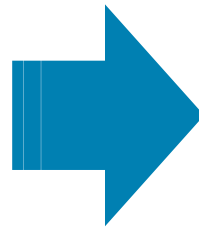
Source: TransUnion Performance Analytics Database, 2006-2010.

Capture the Most Predictive Vehicle Data in a Rate Plan

Build “standalone” rating components that price for each factor individually

OR

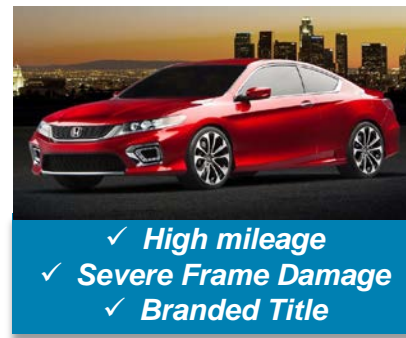
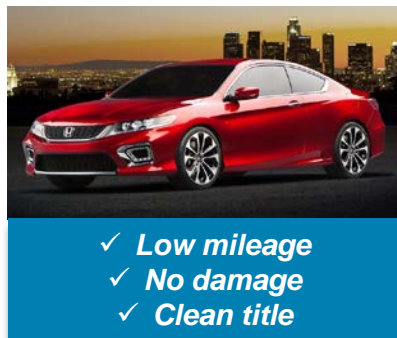
Build the most predictable components into a composite vehicle score



**Vehicle History
Score Model**

A Score Based on an Individual Vehicle's History Adds an Additional Layer of Granularity Beyond Traditional Symboling

Vehicle	Model Year	Make	Model	Trim Level	Rate using traditional rating	Vehicle History Score Tier	Possible rate incorporating vehicle history
A	2012	Honda	Accord	EX CPE 4-cyl	\$500	Excellent	\$400
B	2012	Honda	Accord	EX CPE 4-cyl	\$500	Good	\$450
C	2012	Honda	Accord	EX CPE 4-cyl	\$500	Average	\$500
D	2012	Honda	Accord	EX CPE 4-cyl	\$500	Poor	\$550
E	2012	Honda	Accord	EX CPE 4-cyl	\$500	Bad	\$625



Advantages of Using Vehicle Scoring

Objectivity

- Underlying data is accurate and verified
- A score is scalable and repeatable

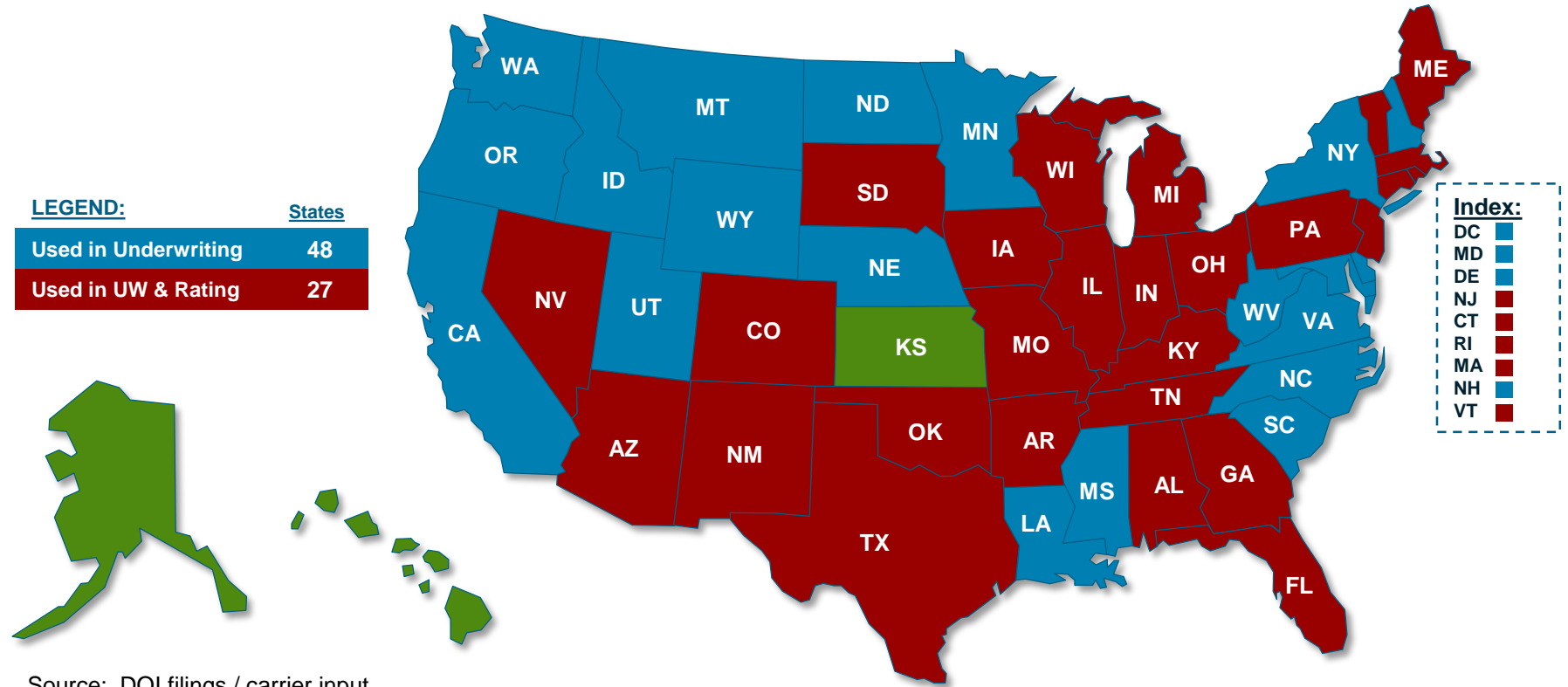
Regulatory acceptance

- 17-digit VIN only input; does not include consumer report information
- Scores modifiable to meet regulatory needs
- Possible acceptability in traditionally non-credit states

Multivariate approach

- Pure premium is dependent variable. Vehicle history data are independent variables
- GLM approach addresses possible correlation between model variables
- Vehicle history data minimally correlated with other variables, including symbols or credit
 - Any correlation that does exist can be offset in a control model
 - Pricing for individual vehicle history creates “net new” lift otherwise embedded in base rate

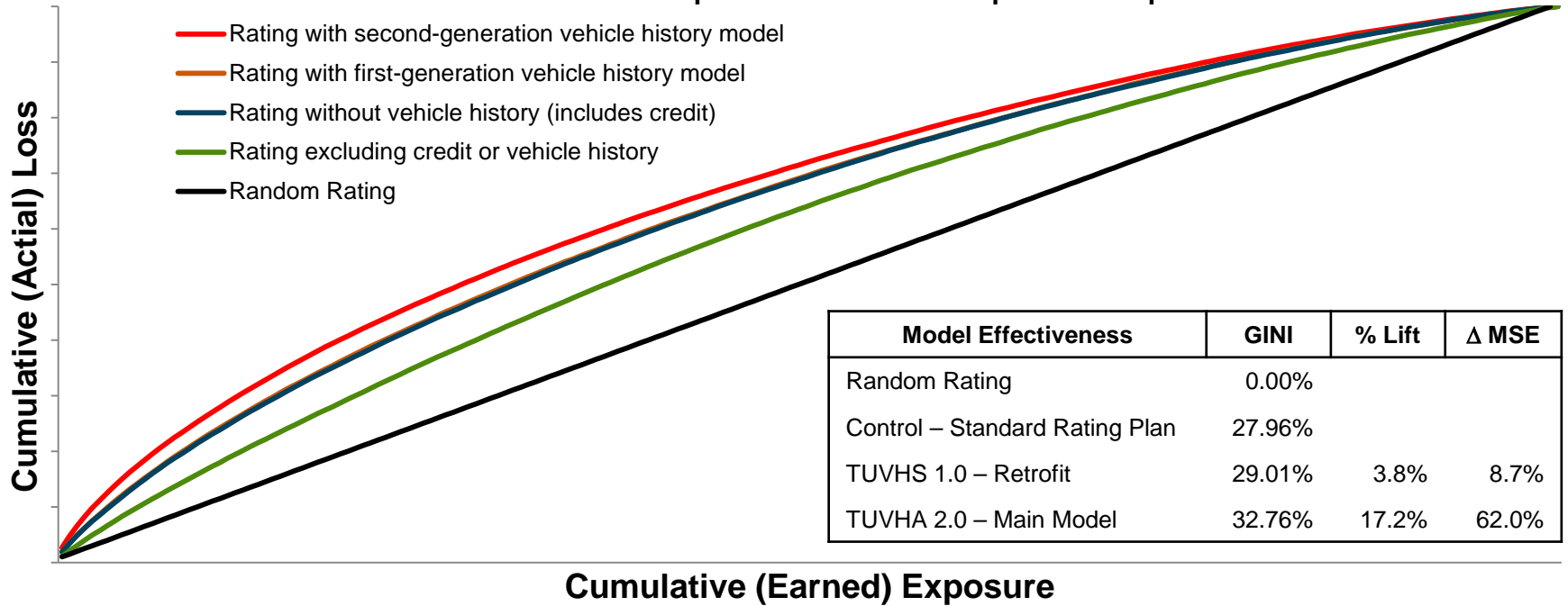
Use of Vehicle History in Underwriting & Rating is Spreading



Source: DOI filings / carrier input

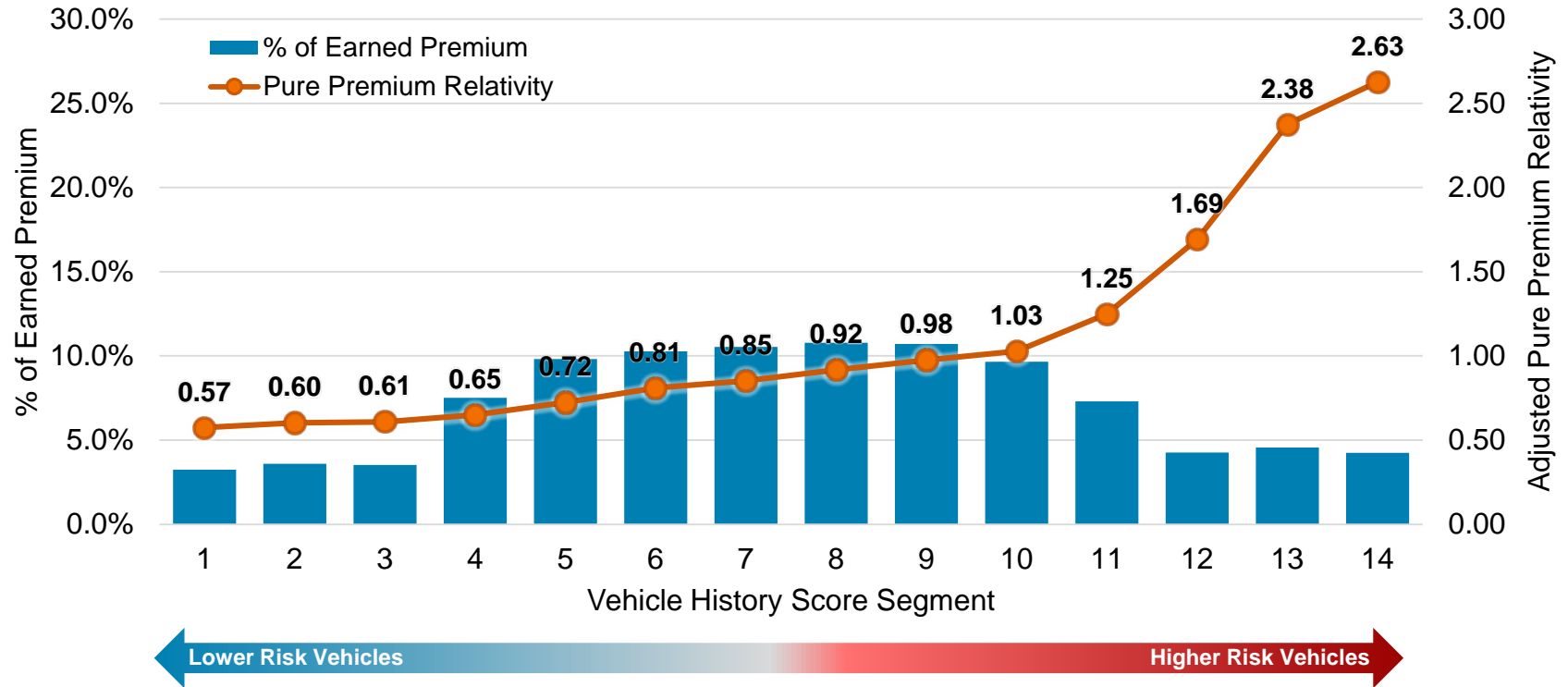
Rate Plans Using Individual Vehicle History are More Accurate

GINI coefficient comparison for sample rate plans



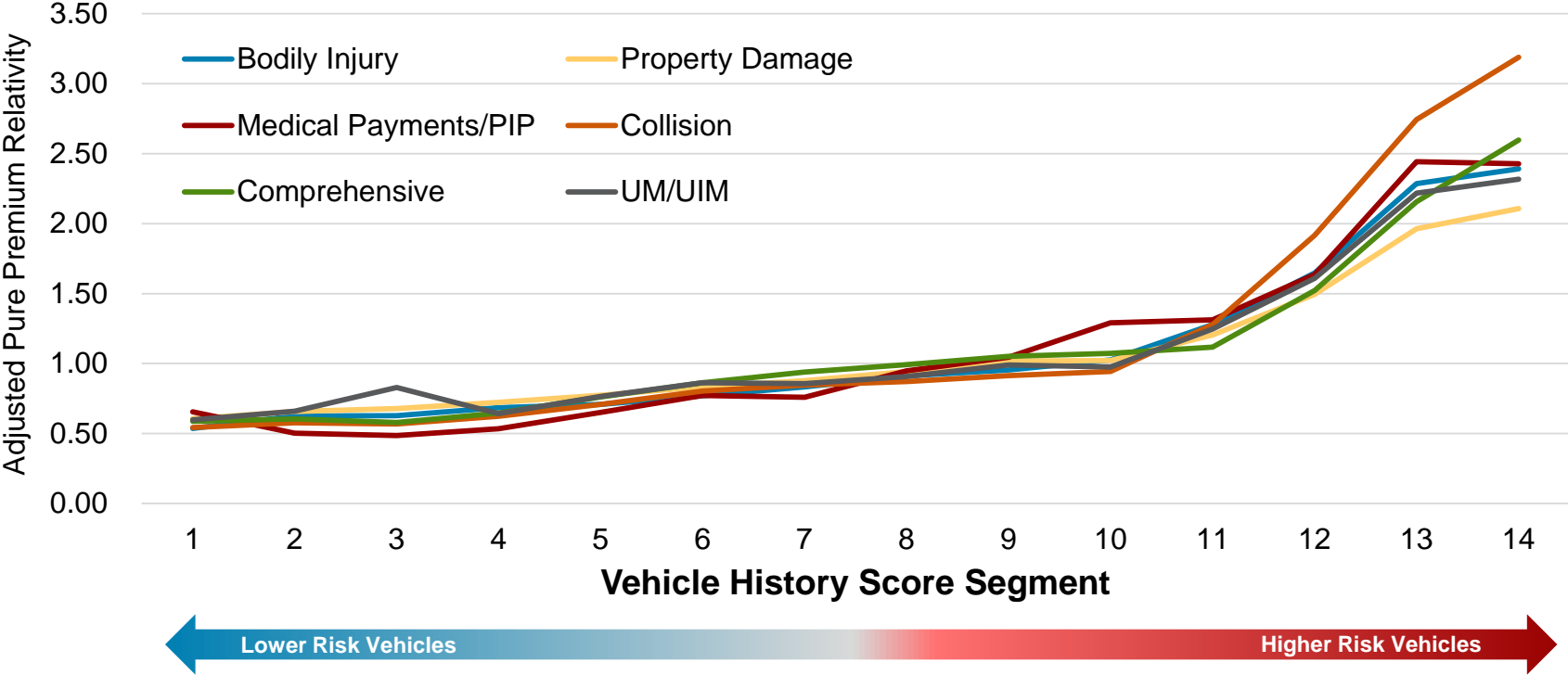
Source: TransUnion Performance Analytics Database, 2006-2010.

Example Pure Premium Lift of Second-Generation Vehicle History Model on a Multi-Carrier Dataset



Source: TransUnion Performance Analytics Database, 2006-2010.

Individual Vehicle Pricing Validates Across Coverages



Source: TransUnion Performance Analytics Database, 2006-2010.

Summary: Vehicle History in Rating

- Non-credit based risk score that represents combined relative risk of vehicle history components
 - Damage & branded titles
 - Historical mileage
 - Current and prior registration
 - Ownership history
- Significant lift generated not correlated with other rating variables in auto pricing plans, including credit
 - TransUnion studies have validated that vehicle history is uncorrelated with credit
 - Rate plan offset developed to address correlation that does exist
- 17-digit VIN is only input required

Vehicle History Helps Insurers

Pricing

- Better classify risks using existing rating plans
- Further refine rating plans with new variables
- Avoid premium leakage due to misclassification
- React to changes in customer behavior



Underwriting

- Better identify best coverage for each vehicle
- Gives specific, verifiable reasons for underwriting decisions
- Proactively avoid ineligible risks

Advantages of Vehicle History

- Works with existing rating plans
- Several components are of future loss:
 - Verified annual mileage
 - Branded titles
 - Prior damage
- Accurate ownership information
- No personal information means no FCRA worries
- Generally accepted by regulators

Thank You!

