

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.**
-

Model Year and Vehicle Rating

LeRoy Boison, FCAS, MAAA
CAS RPM Seminar
March 19-21, 2012
Philadelphia

Discussion Topics

- Model year rating
- Vehicle rating
- GLM applications
- Commercial auto applications

Distant Yesterday

- Based exclusively upon MSRP.
- Applied only to 1st party property coverages.
- Same Symbol for both comprehensive and collision.
- Combined with “Age” as opposed to “Model Year” Rating.

Yesterday

- Late 70's 2 significant changes
 - Introduction of Model Year Rating
 - Introduction of Damageability/Repairability into Symbol

Model Year Rating

Age	Factor	Model Year	Factor
		$X + 2$	$(1.05)(1.05)$
		$X + 1$	1.05
1	1.00	X	1.00
2,3	0.85	$X - 1$	0.95
4,5	0.75	$X - 2$	0.90
6 & over	0.65	$X - 3$	0.85

Model Year Rating

- Typically uses constant multiplicative relationship between model years
- Typically 5% for Comprehensive and Collision
- Limited to X model years with catch all for older vehicles

Model Year Rating

- Created a mechanism by which individual vehicle model years could be recognized – ***not really utilized except by several innovators.***
- Some companies are using for liability coverages – inconsistent - some positive, some negative – overlaps with mileage

Model Year

- The ability to use model year effectively together with specific models has not been realized.
 - **E.G. If the 1995 Honda Civic or 2007 Toyota Corolla has the highest theft rate as recently published – shouldn't it have a higher rate than the later models?**

Stolen Cars Vary By Model Year

- Here are the 10 most stolen vehicles as reported by the NICB — the number in parentheses is the model year most stolen:
- [Honda Civic](#) (1995)
- [Honda Accord](#) (1991)
- [Toyota Camry](#) (1989)
- [Ford F-150](#) (1997)
- [Chevrolet C/K 1500](#) (1994)
- [Acura Integra](#) (1994)
- [Dodge Ram Pickup](#) (2004)
- [Nissan Sentra](#) (1994)
- [Toyota Pickup](#) (1988)
- [Toyota Corolla](#) (2007)

Why older cars?

- For over 25 years, the National Insurance Crime Bureau (NICB) has published *Hot Wheels*, an annual report of America's 10 most stolen vehicles. While popular expectations have been that newer, more expensive vehicles would top the list, the data has repeatedly shown quite the opposite, with older, less flashy models topping the list
- Mid-1990 Hondas and Toyotas frequently dominate the yearly top-10 stolen car list. Because they are so popular, there is always a market for parts. Thieves like to steal them and chop them up, which can bring in more money than selling the car whole.

Progressive Rating

	Class	MM	Symbol	
1995 Honda Civic	HC1	0.99	5	
1989 Toyota Camry	TC1	0.96	8	
1991 Honda Accord	HA1	1.23	11	92-93 factor, 1.33 for '94-98, drops to .75 in 98
1994 Dodge Caravan	DG1	0.99	8	
1990 Acura Integra	AI1	0.99	14	
1991 Nissan Sentra	NS1	0.9	5	

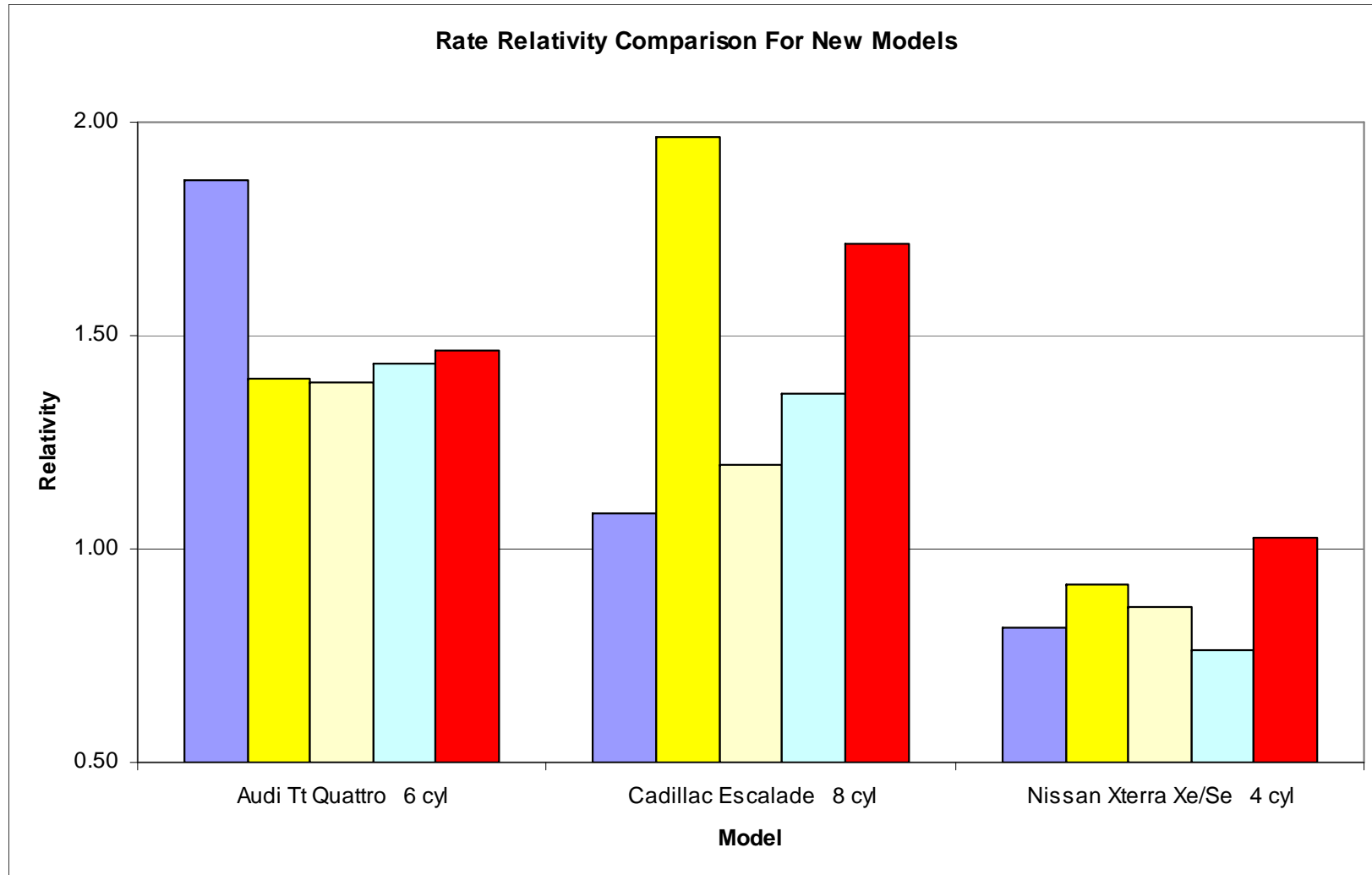
Immobilizer

- 1999 and 2000 Honda Civics do not come with an electronic immobilizer, however all Hondas from 2001 and onward are equipped with an immobilizer. Immobilizers became mandatory on all new cars sold beginning September 2007. The devices enable an engine computer to recognize an electronic code in the key. If the code in the key and the engine don't match exactly, the vehicle can't be started.

Vehicle Rating

- New vehicles are usually rated by “comparison to similar” existing vehicle – **becoming less accurate as new, different vehicle type are being introduced.**

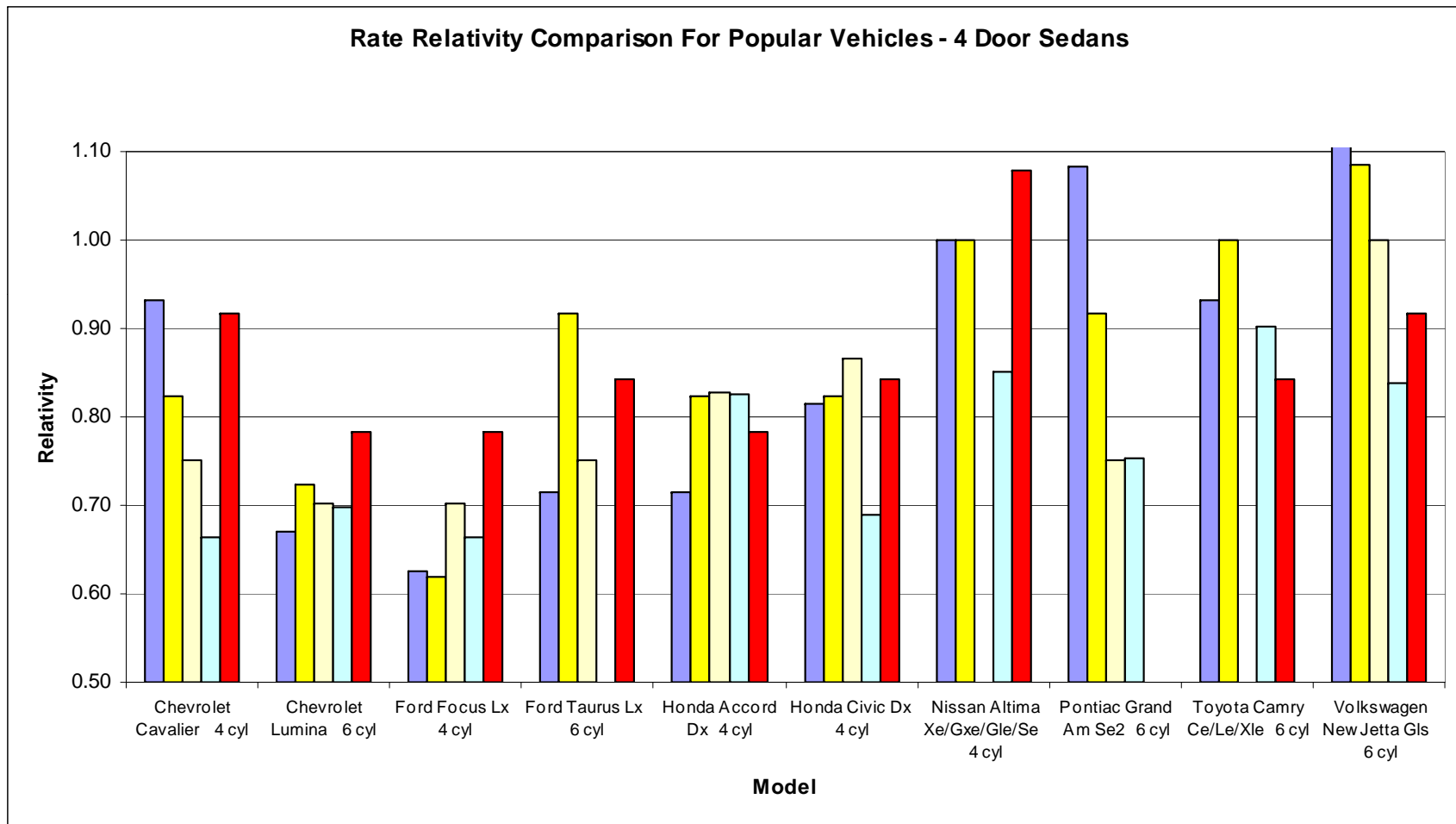
Significant Differences By Company for New Models



Significant Differences By Company for New Models

- Difference in rates > 80%
- The Porsche Boxster symbol assignment from inception dropped at least 5 symbols.

Significant Differences By Company for Most Popular Models



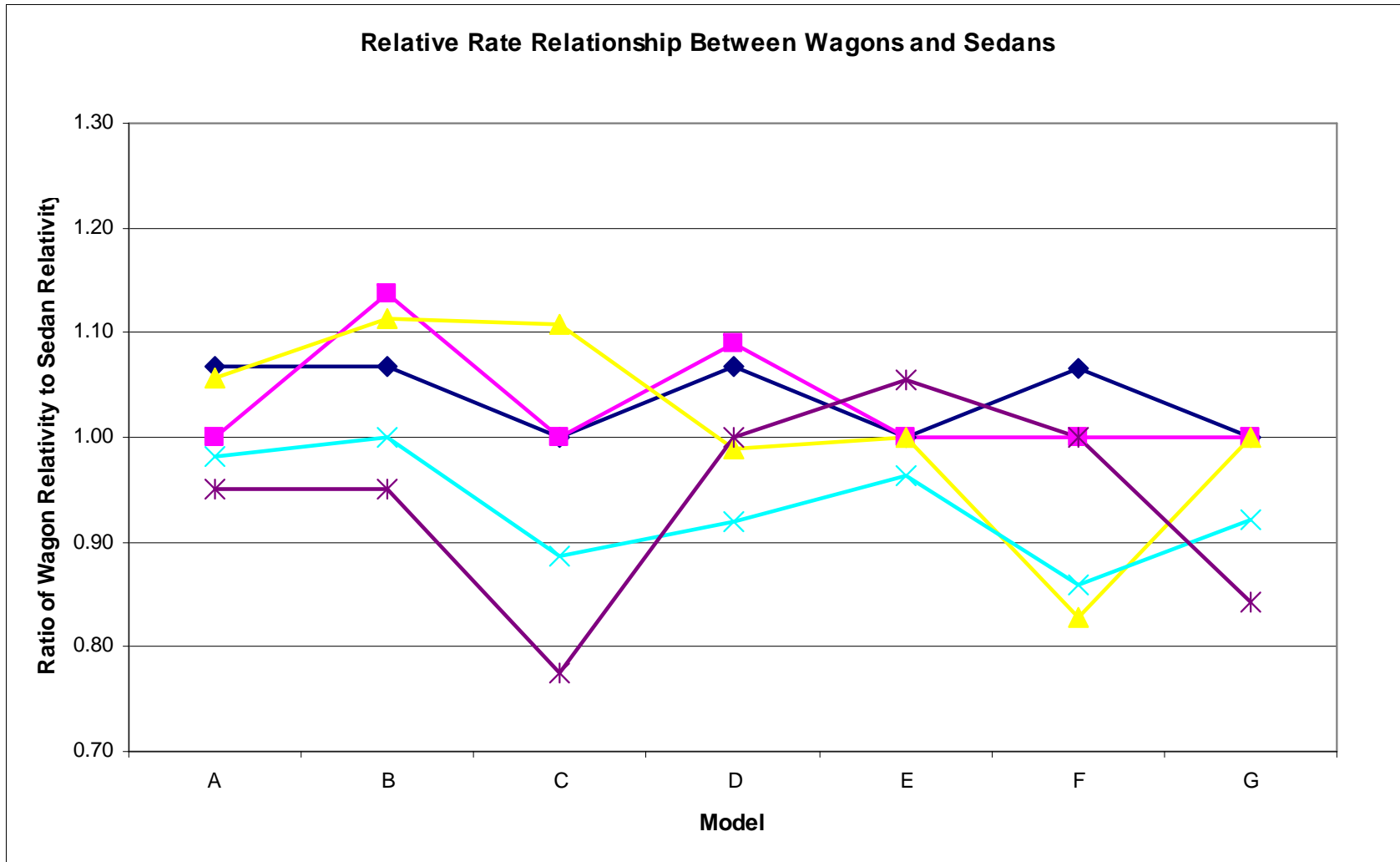
Significant Differences By Company for Most Popular Models

- Smallest difference with high and low company is 16%
- Greatest difference is 44%
- Average difference is 28%

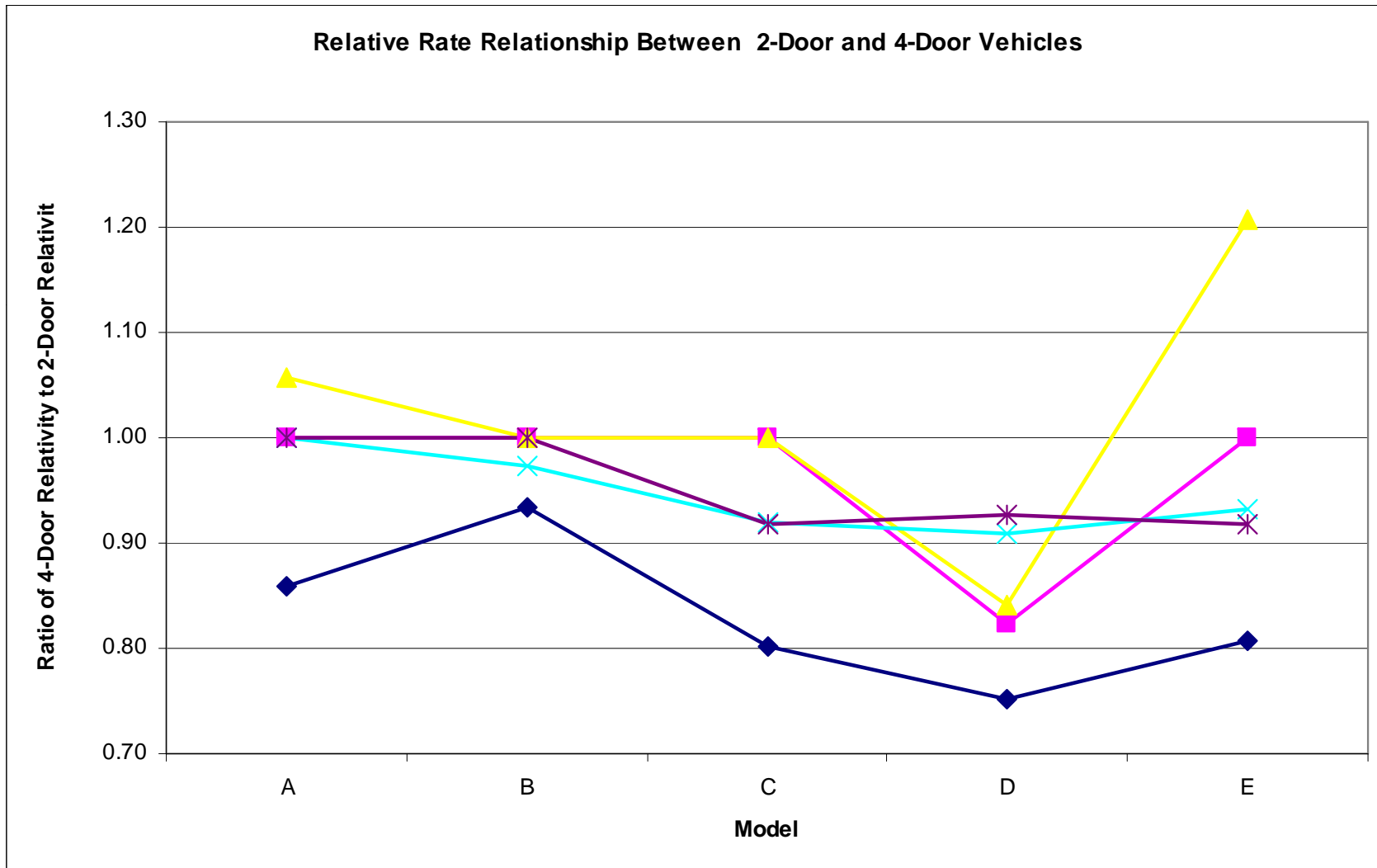
Sports/Luxury Models

- Variations for “published” rates are 32% to 137%
- Differences may be greater as some companies do not provide “published” rates for these models

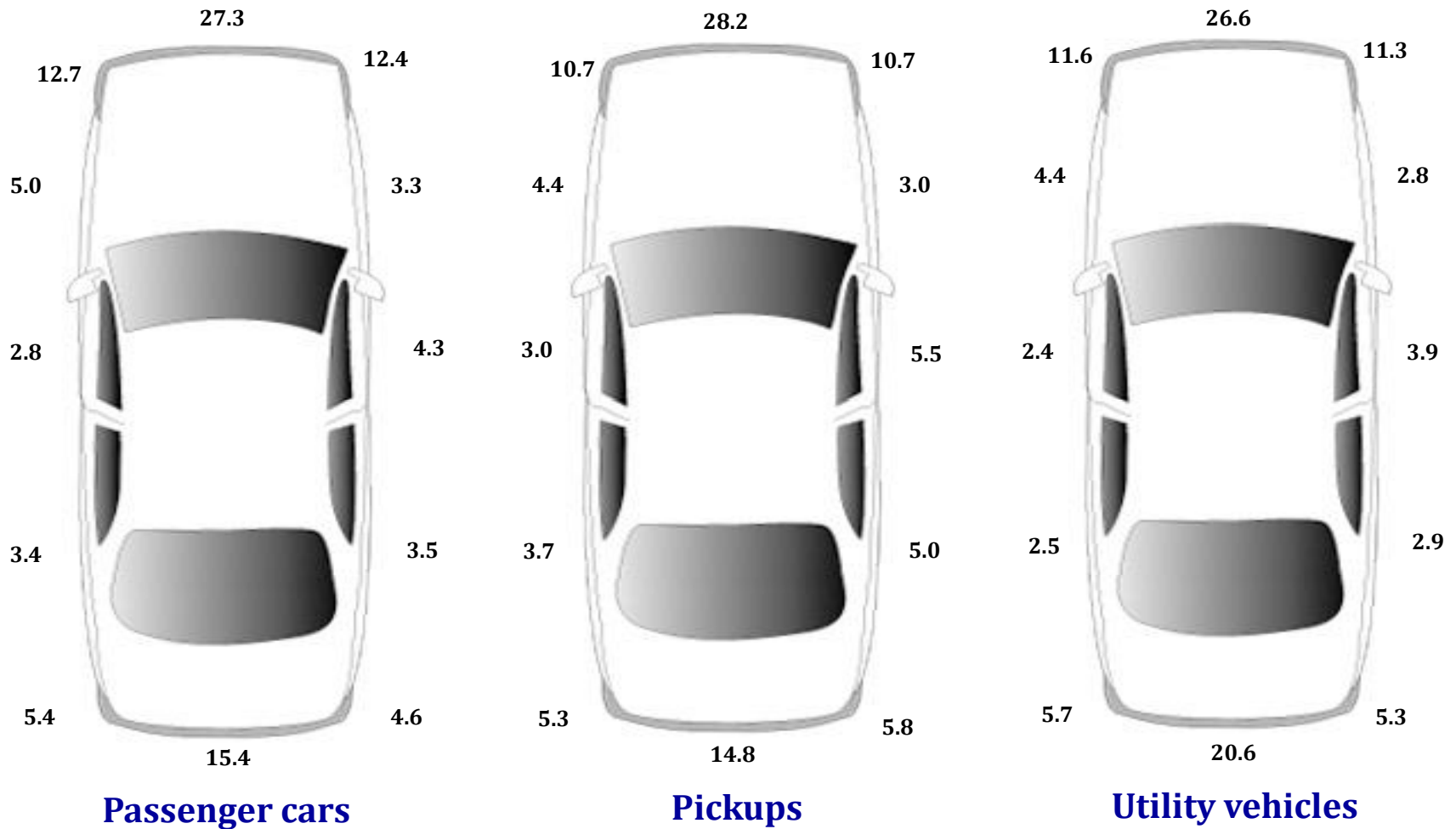
Differences Exist By Type of Models



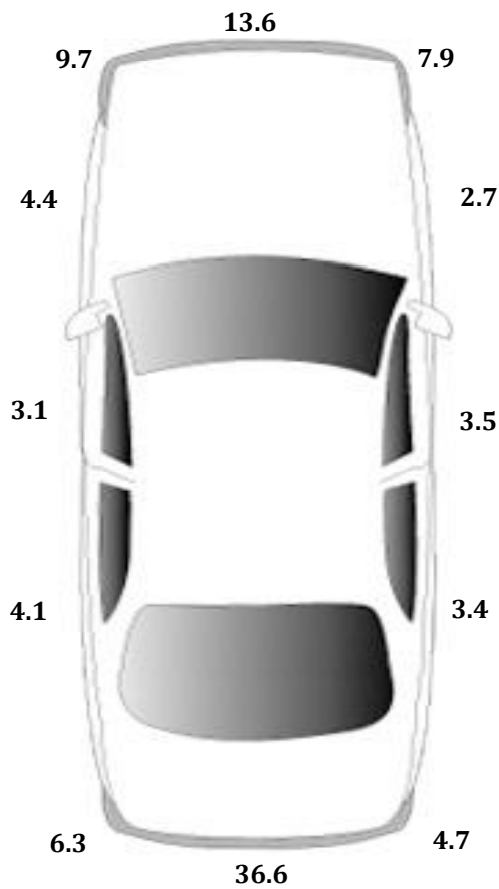
Differences Exist By Type of Models



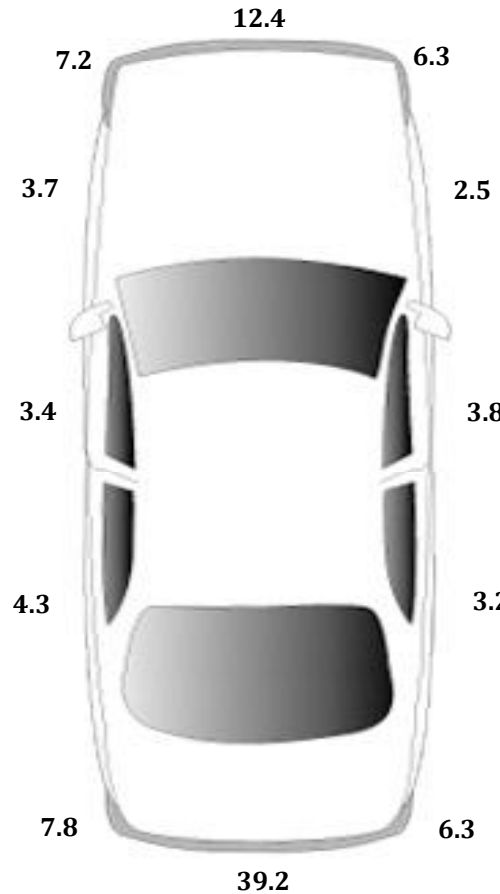
Percent of Collision Claims by Point of Impact By Vehicle Type



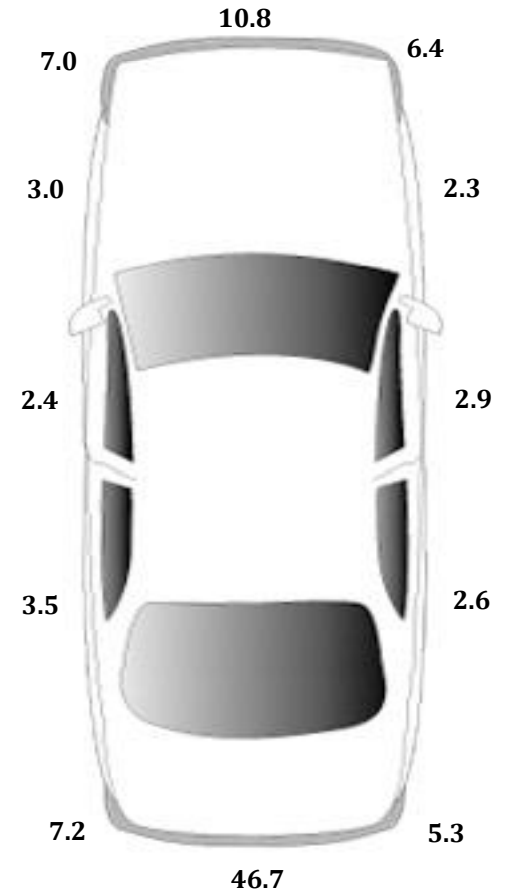
Percent of Property Damage Liability Claims by Point of Impact by Vehicle Type



Passenger cars



Pickups



Utility vehicles

Solution to Rear Accidents

- Back up avoidance device
 - beep, beep, beep
 - camera
- Mirror

Mandatory Backup Camera Legislation

- NHTSA estimates that once the new regulations will cost the auto industry between \$1.9 and \$2.7 billion annually, once they go into effect. The cost per vehicle would be just shy of \$159-\$203 for cars without a pre-existing navigation screen, and \$53-\$88 for cars with a screen.

Interestingly, NHTSA estimates the industry-wide expense of the measure at between \$1.9 billion to \$2.7 billion, and it reportedly acknowledges that its own cost-benefit analysis standards indicate that the price tag of the regulation will far outstrip the cost associated with lives saved by the law. That is, NHTSA uses a working figure of the "comprehensive cost for a statistical life" at \$6.1 million, but the costs per life saved by the backup camera legislation would likely tally somewhere between \$11.3 to \$72.2 million.

Electronic Stability Control

- Electronic stability control could prevent nearly one-third of all fatal crashes and reduce rollover risk by as much as 80%; effect is found on single- and multiple-vehicle crashes

ESC - availability

- ESC is standard on 40 percent of 2006 passenger vehicle models and optional on another 15 percent. It's standard on every 2006 Audi, BMW, Infiniti, Mercedes, and Porsche. Another 8 vehicle makes (Cadillac, Jaguar, Land Rover, Lexus, Mini, Toyota, Volkswagen, and Volvo) offer at least optional ESC on all of their models. But ESC, standard or optional, is limited to 25 percent or fewer models from Chevrolet, Dodge, Ford, Hummer, Mazda, Mitsubishi, Saturn, Subaru, and Suzuki

Aluminum Parts, Hybrid Cars Boost Crash Costs

- Auto repair costs are going up in part because of changes in parts and new, more complex vehicles, an insurance information management firm said.
-(NU Online News Service, March 3, 12:25 p.m. EST)

What do Callaway Golf Clubs and Lamborghini have in common?



Woven Carbon Fiber vs. Forged Carbon



Driving Technology

The photo above shows part of a Callaway club using traditional weave (left) versus one using Forged Composite. In the latter case, fiber chips are mashed together like composite hash browns and formed in a mold so accurate that even part numbers can be stamped into the piece.



Forged Carbon advantages



- Standard woven carbon fiber is typically made layer by layer and infused with epoxy or in premade sheets, which are baked to a form in a vacuum oven known as an autoclave.
- Forged composite takes a different route by taking a toothpaste-like mixture of carbon fibers and epoxy and forming parts in a mold with over six tons of pressure.
- The result is cheaper carbon-fiber-reinforced materials that can be made in less time.

New Electric Cars - Tesla Model X



Tesla

- Range of 300 miles
- Model X Performance accelerates from 0 to 60 mph in less than 5 seconds
- Model S Performance accelerates from 0 to 60 in 4.4 seconds, faster than a Porsche 911 Carrera.
- We expect to begin production of Model X in late 2013, ramping up deliveries in early 2014. Model X

Edmunds - Top 10 High-Tech Car Safety Technologies

1. Tire-pressure monitoring
2. Adaptive cruise control/collision mitigation
3. Blind-spot detection/side assist/collision warning
4. Lane-departure warning/wake-you-up safety
5. Rollover prevention/mitigation
6. Occupant-sensitive/dual-stage airbags
7. Emergency brake assist/collision mitigation
8. Adaptive headlights and/or night-vision assist
9. Rearview camera
10. Emergency response

Lane Departure Warning

- **Lane departure warning** helps keep inattentive drivers from inadvertently veering into another lane of traffic and causing a collision, which the National Traffic Safety Administration says accounts for 17 percent of all vehicle crashes. The system looks for highway lane markings via an embedded camera and generates a signal if the vehicle is in the process of crossing them; engaging the turn signals before purposefully changing lanes temporarily deactivates the alert. A few systems can “nudge” the car back into their lane if necessary via braking or steering intervention.

Collision Warning/Avoidance

- **Collision warning/avoidance** works with an advanced version of cruise control that uses sonar sensors to maintain both a set speed and distance from the nearest car in its path. If the sensors determine the car is closing in on the vehicle or other obstruction in its path too quickly (like when the driver isn't paying close enough attention) it will engage audible and visual alerts, tension the safety belts and pre-prime the brakes to full force in anticipation of an emergency stop. Lexus' system goes a step further by using a small camera to monitor the driver's eyes and will activate itself sooner if he or she is not looking forward at the time. Some systems will take over and apply the brakes if the driver isn't reacting quickly enough to help avoid or minimize the impending collision.

Forbes Safest Cars

- **Blind-spot warning** employs a set of sensors and/or cameras to detect other cars just to the side and rear of a vehicle and alerts a driver to their otherwise unseen presence. Some blind spot warning systems further include a Cross Path Detection function that also warns motorists of traffic that's approaching from the side when backing out of a parking space or garage. Infiniti's latest twist on the technology, called Blind Spot Avoidance, will actually intervene with selective braking to help a motorist avoid sideswiping another vehicle

Not all new technology have worked as expected

- Anti-lock brakes
- 3rd brake lock

Conversely – “Good” or “Bad” New Technology

- Blue tooth – “hands free” phone
- Windows enabled
- Email transcription – digital/oral

Lexus - Enform®



Smart Phones

- The demand for Internet technology is rising to new heights with the news today that by 2016, 92 million vehicles will feature technology to integrate smartphones into motor vehicles, according to a new report by [Juniper Research](#), forecasting smartphone-automobile integration as “all but standard” within five years.
- Although insurers will see certain inherent risks, such as the potential for an increase in distracted driving incidents, the benefits will be in the technology's ability to deliver commercial Telematics.

Peltzman Effect

- The **Peltzman effect** is the hypothesized tendency of people to react to a safety regulation by increasing other risky behavior, offsetting some or all of the benefit of the regulation. It is named after Sam Peltzman, a professor of Economics at the [University of Chicago Booth School of Business](#)

Predictive Modeling Applications

Advantages of using Vehicle Characteristics for Rating

- **Easier to rate newer vehicle types.**
- More accurate reflections of safety equipment and other vehicle characteristics.
- For physical damage coverages, and now Liability and PIP vehicle differences can account for significant differences in rates between different insureds.
- Reflect specific differences by Model Year

Considerations

- Need VIN.
- Append external data via Polk, HLDI, ISO, CARFAX or other.

Possible Vehicle Characteristics

Model year	High performance code	Roof type
Symbol	Ton rating	Transmission
Daytime running lights	Vehicle existing damage	Theft deterrence device
Anti lock brakes	Anti theft device	New / Used indicator
ESC (Electronic stability control)	Emergency brake assist/collision mitigation	
Airbags/passive restraint	Cost price new	Blind-spot detection/side assist/collision warning
Height, weight, wheel base	Body type	Tire Pressure Monitoring
Engine type/size	Emergency response	# of doors
Make	Lane Keeping	Backup avoidance
Model	Adaptive headlights and/or night-vision assist	Construction
Segmentation	Fuel type	

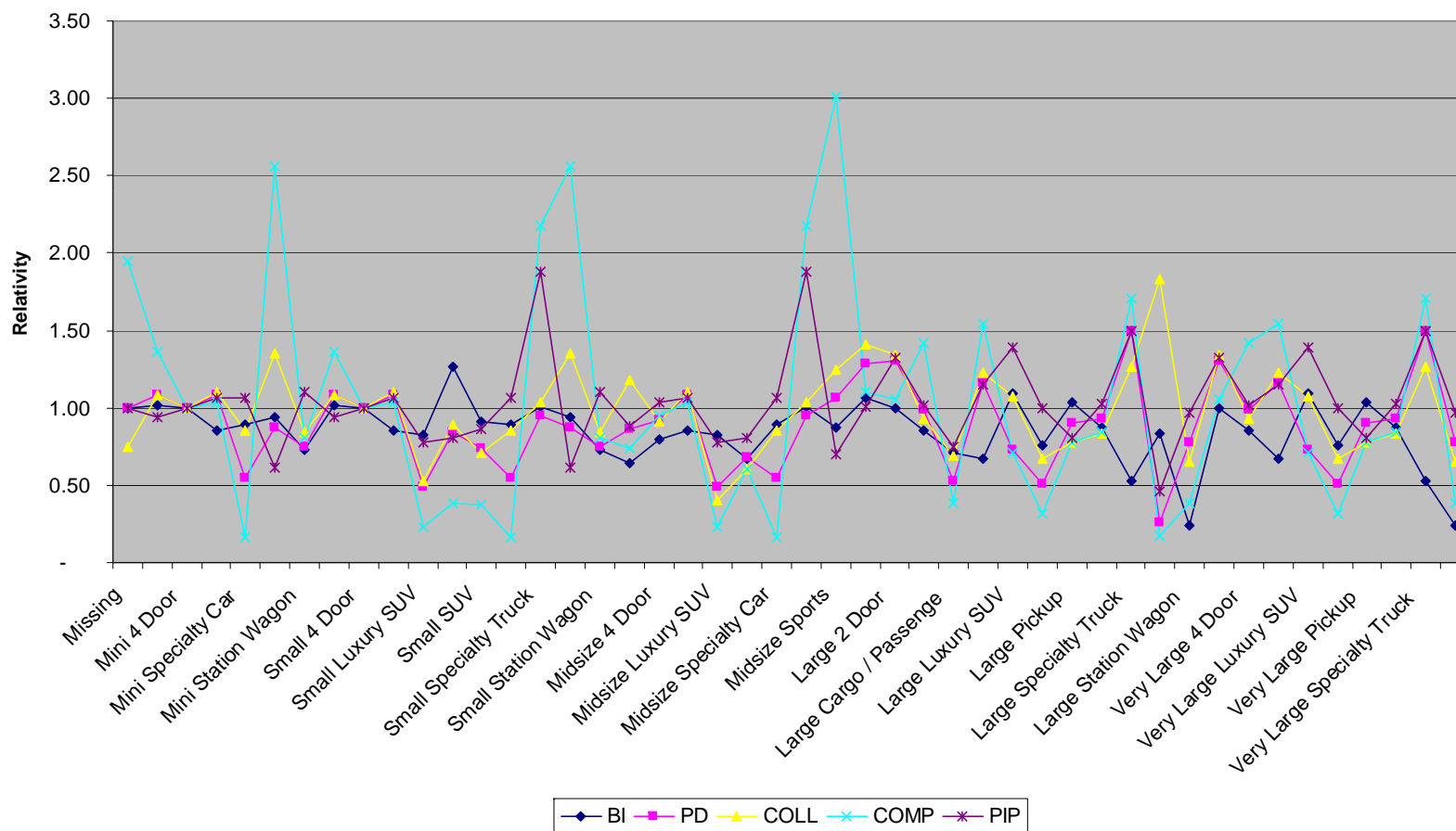
Additional Non-traditional Characteristics

- Branded title
- Length of last ownership
- Salvaged
- Prior damage
- Was vehicle repossessed
- Lien/Lease

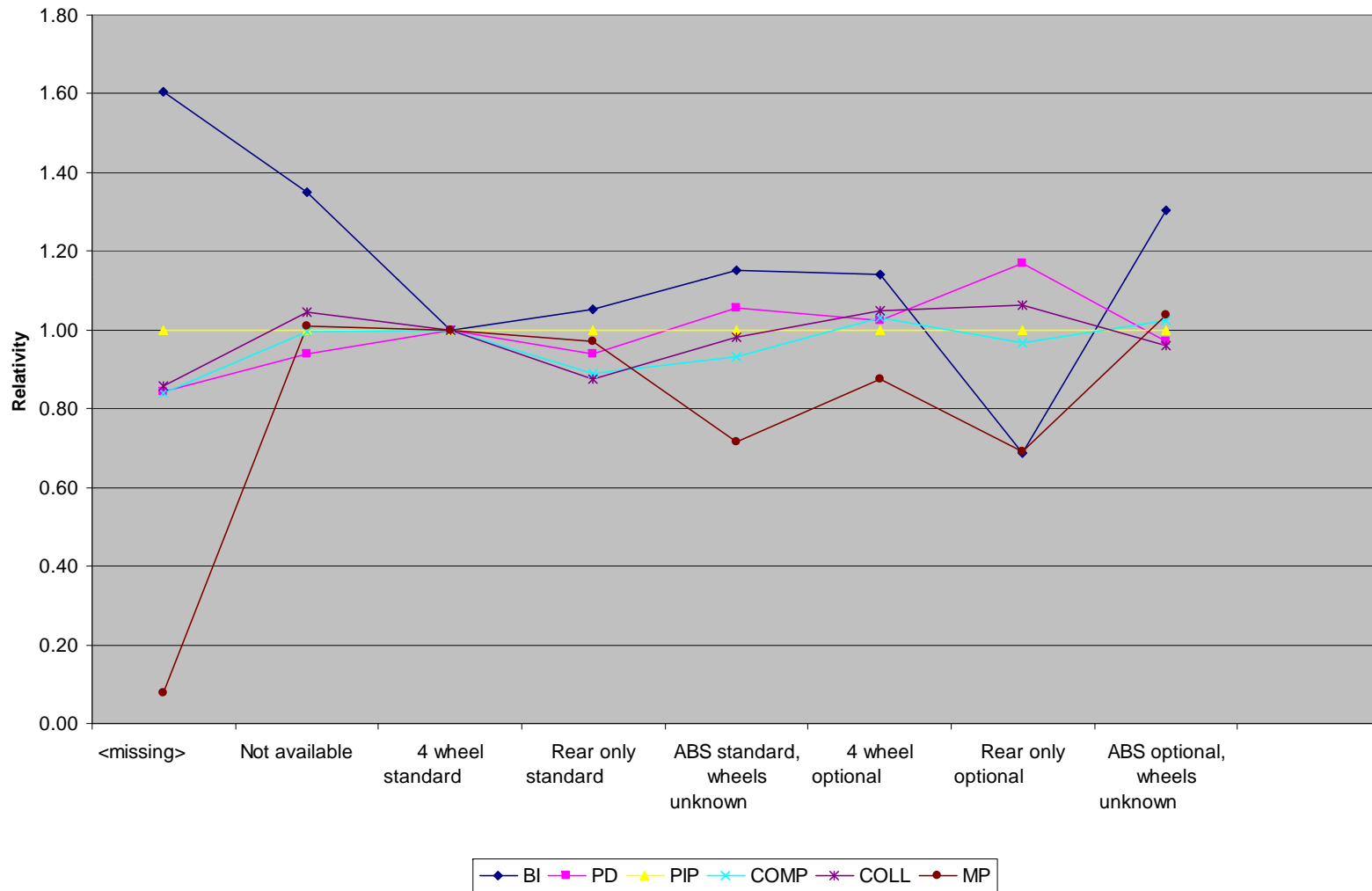
Segmentation Example

Compact Pickup	Full Size Utility	Basic Economy (Car)
Midsize Pickup	Sport Utility	Lower Midsize (Car)
Fullsize Pickup	Mini Sport Utility	Upper Midsize (Car)
Heavy Duty Pickup	Medium/Heavy Trucks	Upper Midsize Specialty (Car)
Minivan (Passenger)	Basic Luxury (Car)	Traditional Large (Car)
Minivan (Cargo)	Middle Luxury (Car)	Basic Sporty (Car)
Passenger Van	Prestige Luxury (Car)	Middle Sporty (Car)
Full Size Van (Cargo)	Entry Level (Car)	Prestige Sporty (Car)

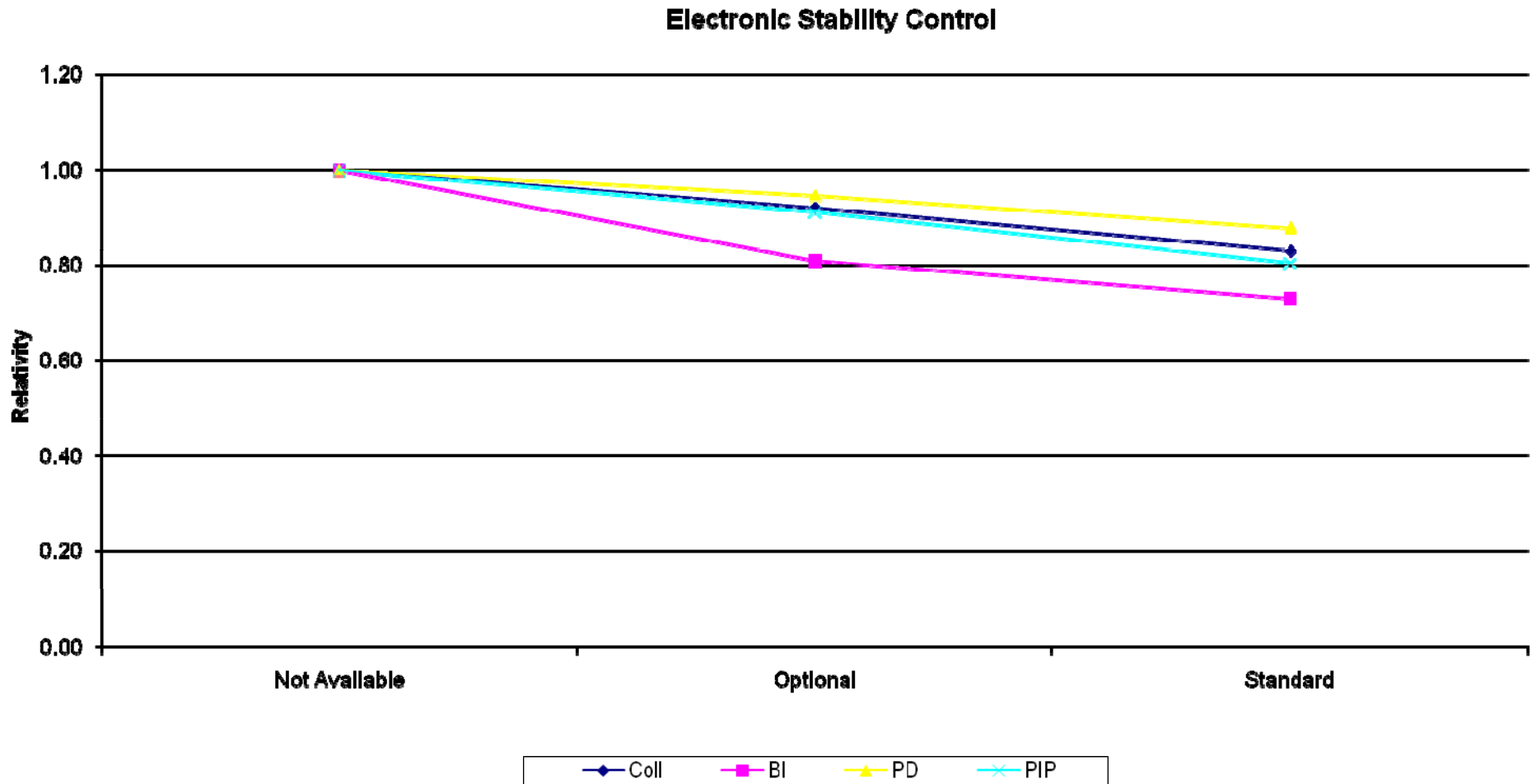
Vehicle Class - Indicated Pure Prem Relativities



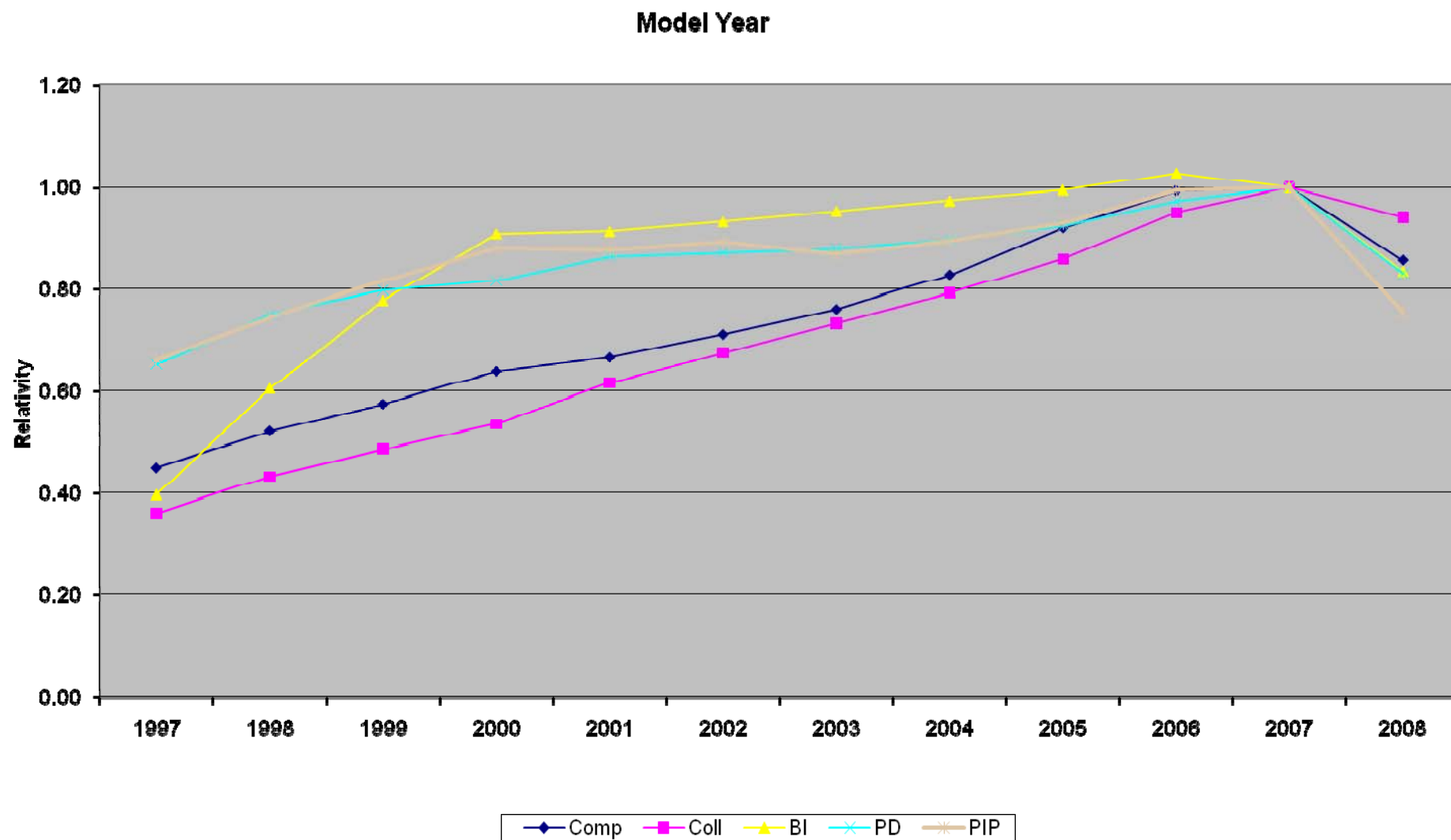
Anti_lock_brakes



Results - Electronic Stability Control

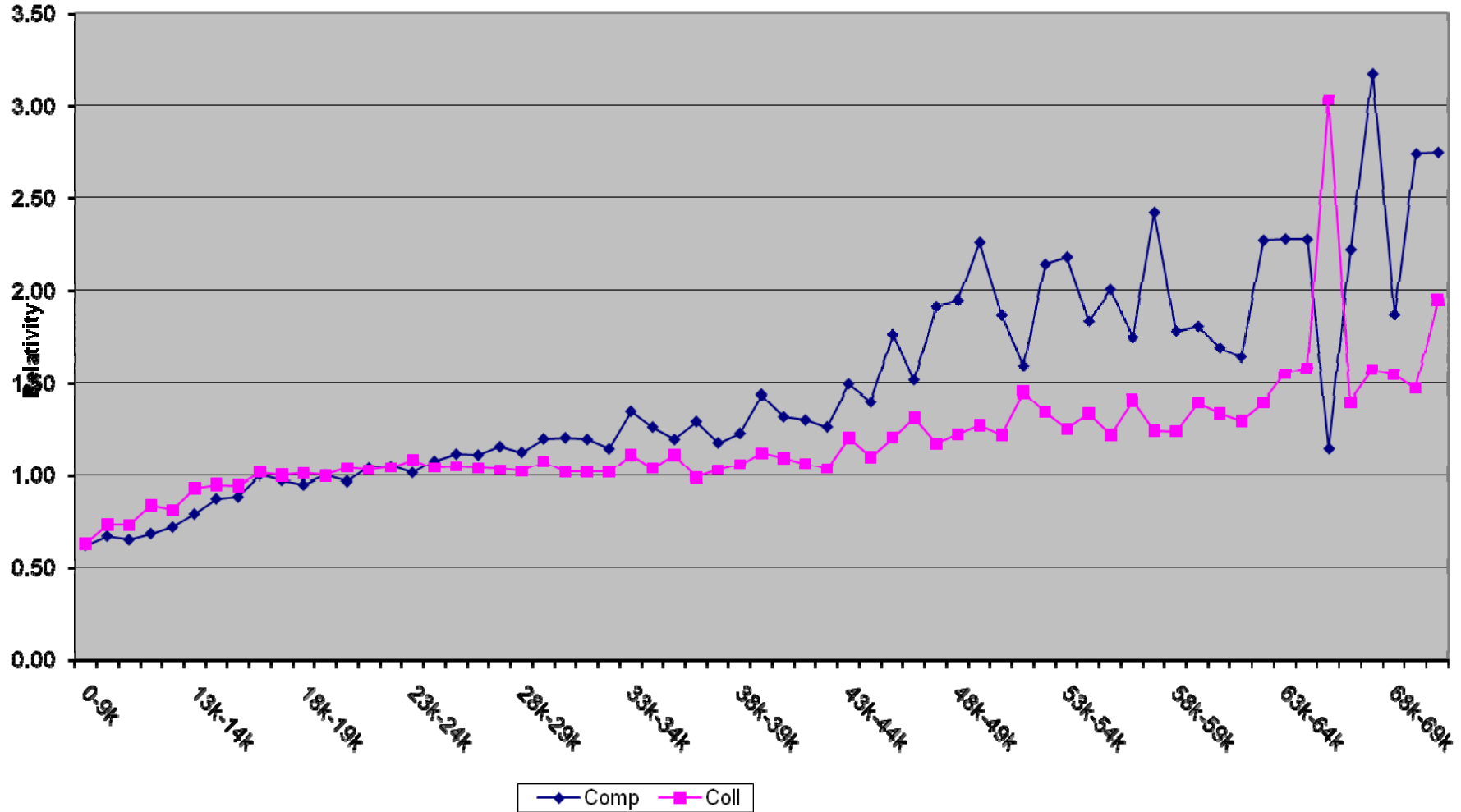


Results - Model Year

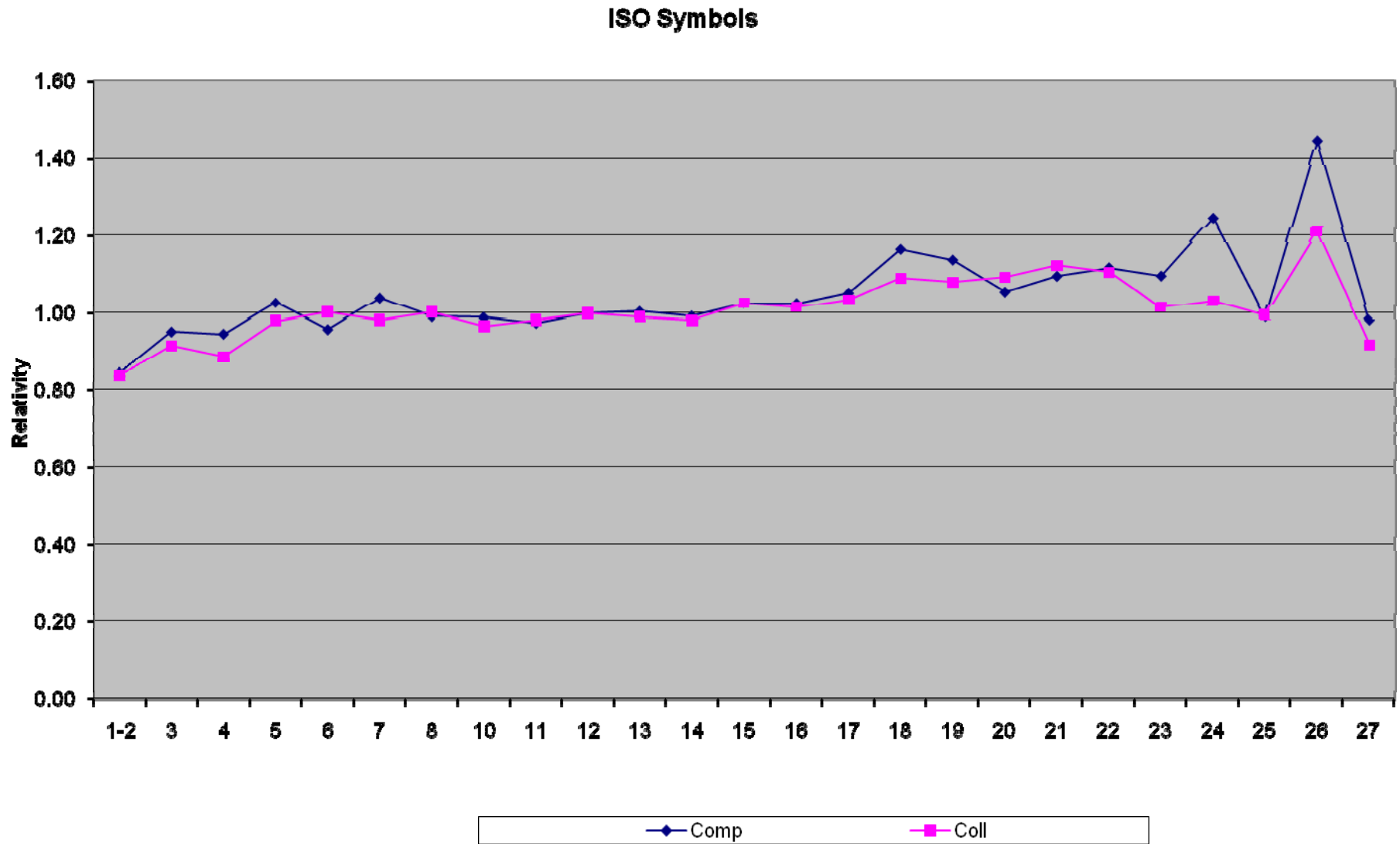


Results - Base List Price (Polk)

Base List Price

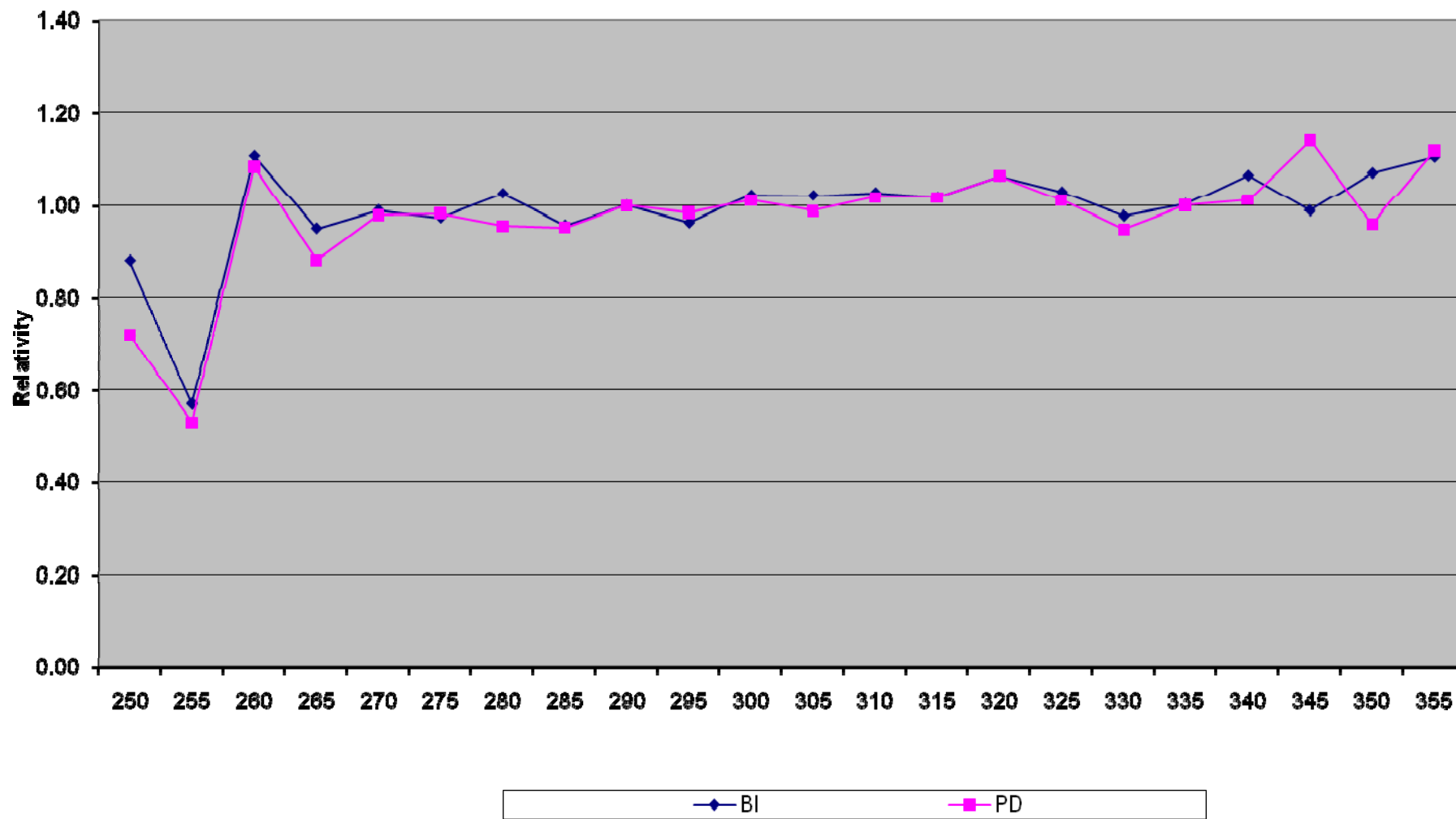


Results - ISO Symbols



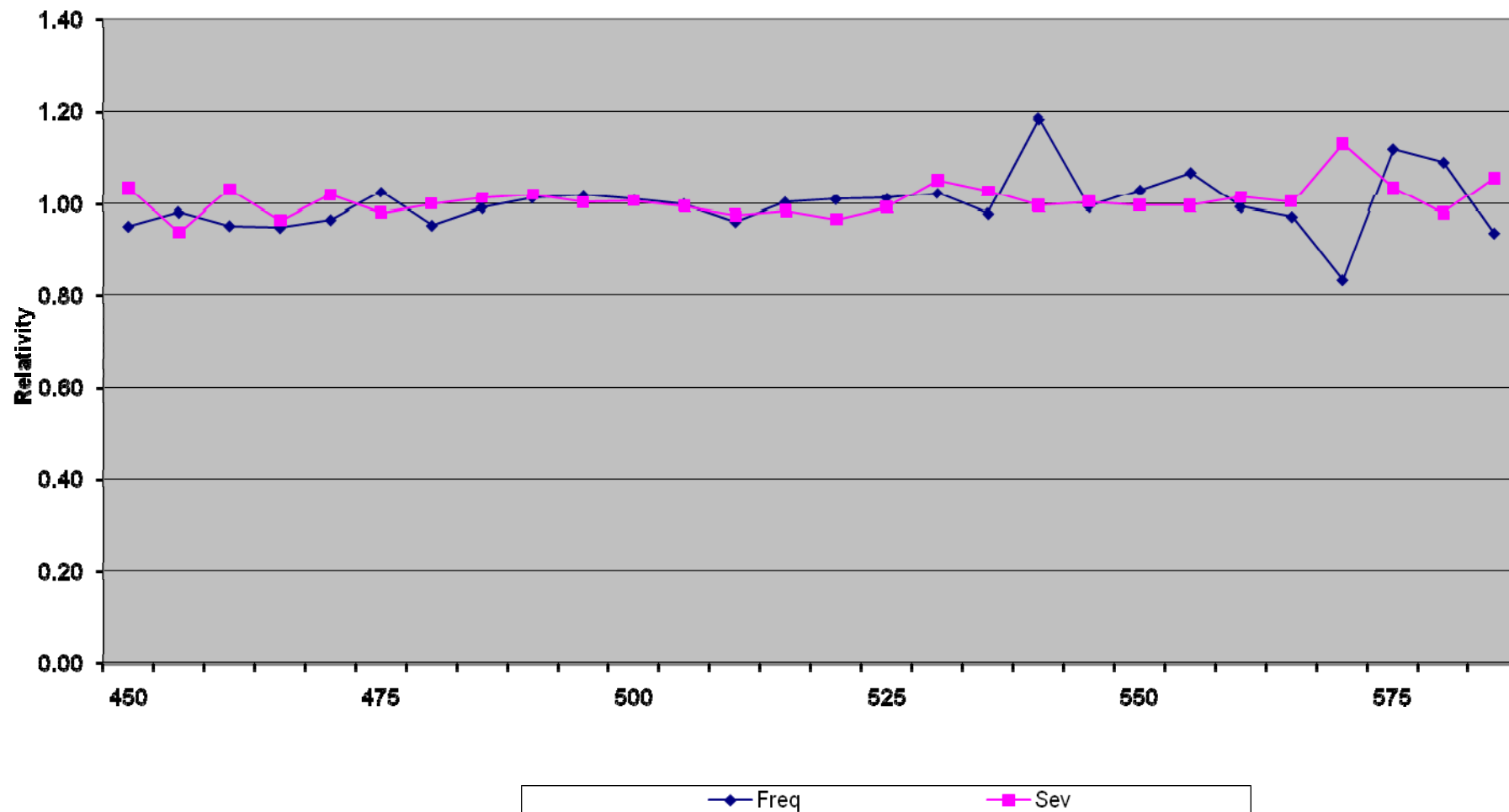
Results - ISO Symbols (Liability)

ISO Symbols (Liability)



Results - ISO Symbols (PIP)

ISO Symbols (PIP)



Good Timing to Evaluate Change

- ISO in process of changing physical damage symbols from 27 to 75
- ISO will no longer have access to HLDI data

Effect of Latest Economic Crisis on Rating

- New cars sales for January '09 down 40-50%
- Cash for clunkers
- Premium trend effects
- Potential effect on older cars which are being kept longer
- More fuel efficient cars

The new small cars

Fiat-Chrysler 500



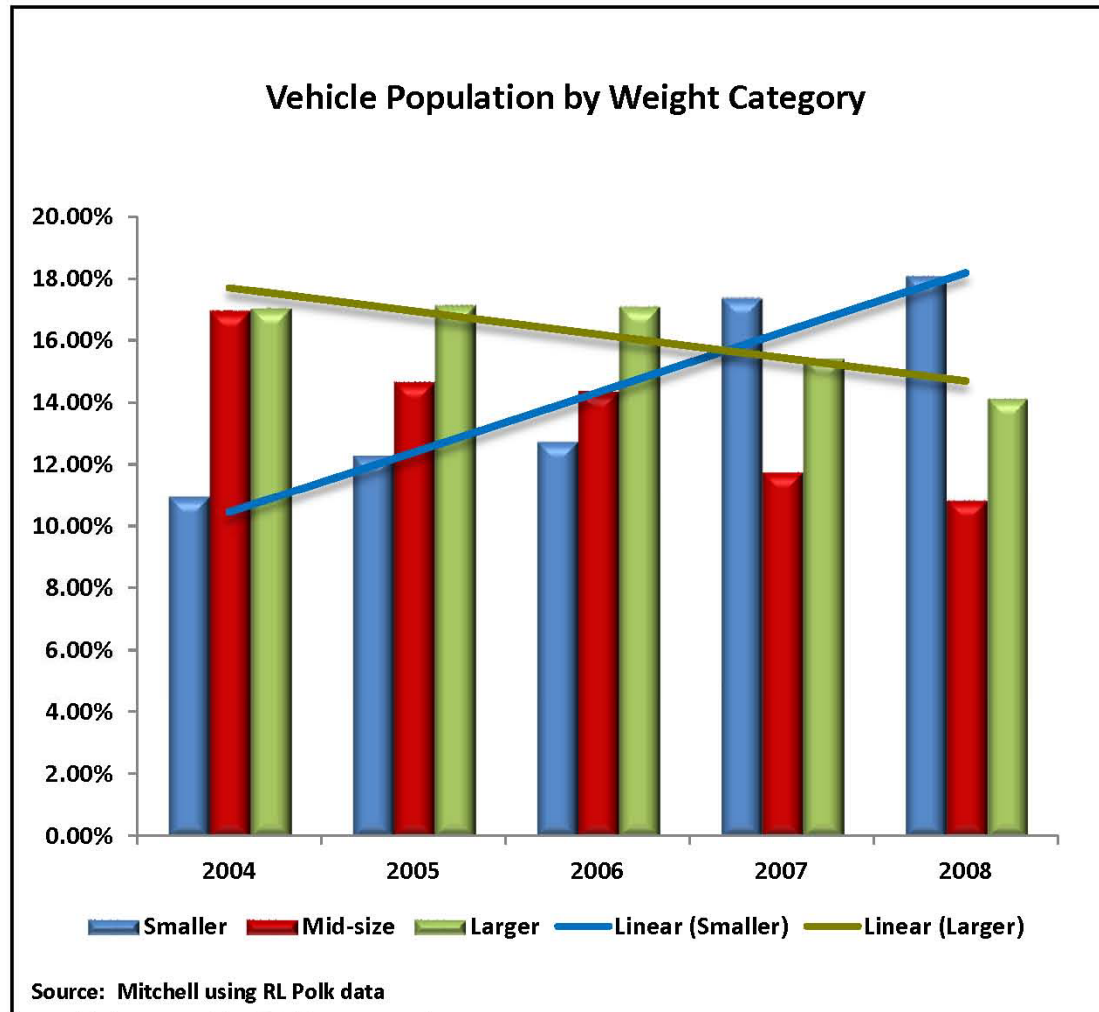
Chevrolet Sonic



Ford Fiesta

Trends Towards Lighter Vehicle Persists

Vehicle Size Mix



- From 2006 to 2007, smaller cars passed larger vehicles in numbers on the road
- Mid-size and heavier vehicle steadily decrease since 2006
- SUV's are only 7.9% of 2010 new vehicle sales
- Small cars are getting more options

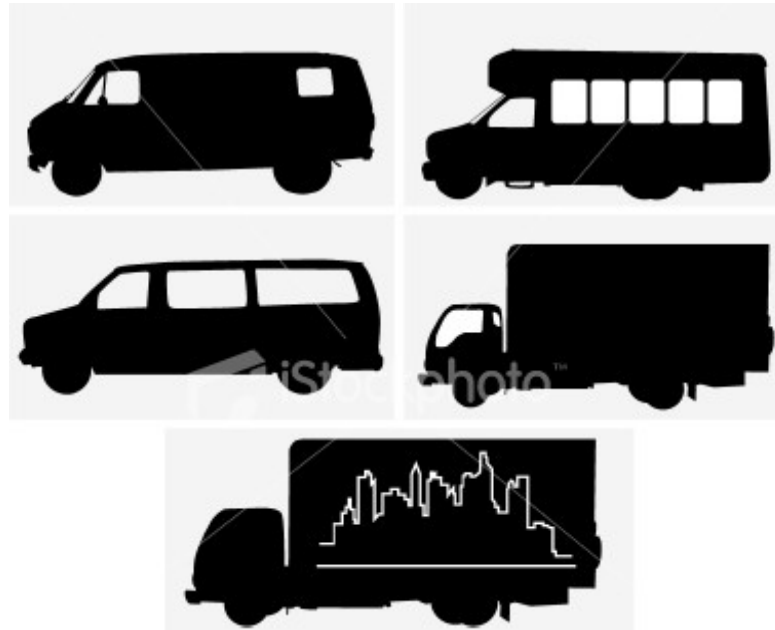
Telematics

- And of course – how is the car itself driven
- Supplemental to rating based on Damageability/Repairability
- Extremely important but is more a driver rating rather than vehicle rating issue

Commercial Auto Applications

- VIN decoding works as well in CA as PPA
 - Truck VINs define their ICC weight class (which is more detailed than ISO weight classes)
 - Truck VINs define their ICC weight class (which is more detailed than ISO weight classes)
 - Private passenger types (cars) are not typically symbol rated in CA and either can be or the vehicle characteristics can be used to create a simplified symbol system.
 - Many of the characteristics that PPA VIN decoding returns are also available and valuable for CA (passive restraints, antilock breaks, engine size, model year)
 - However, VIN only contains information about the truck as it left the assembly line and many features are added post production

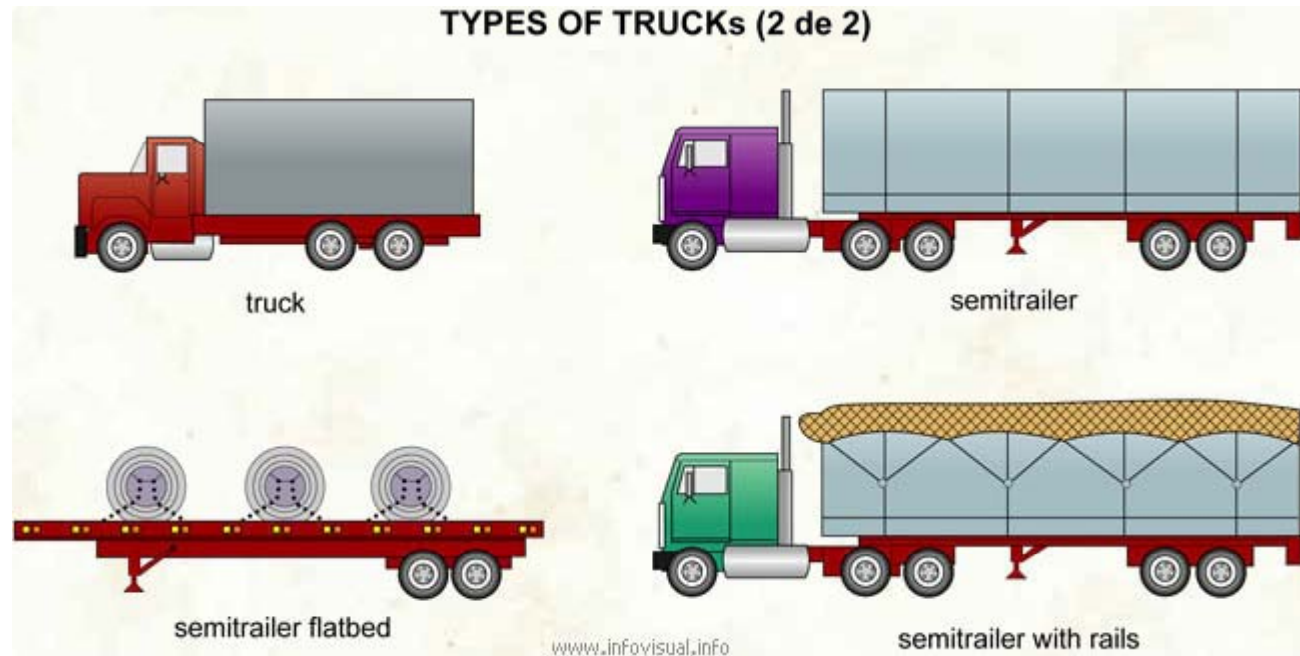
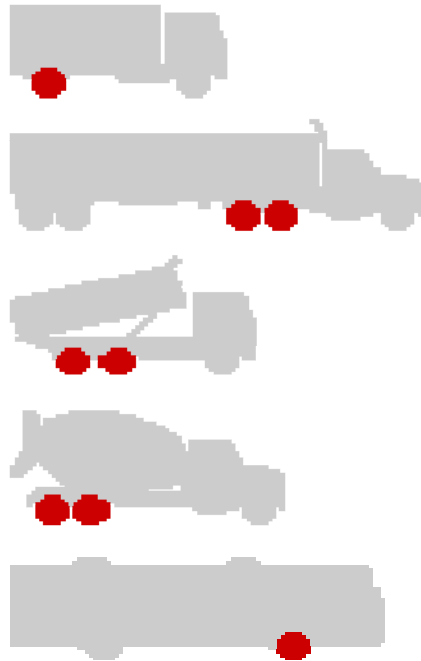
Not All Trucks are the Same



Commercial Auto Applications

- The type of container on a truck (aka body type) also matters (refrigerator, dump, flatbed, box, tanker, cranes and specialize equipment (e.g. scaffolding for ladders etc.))
- The type of container on a trailer also matters (refrigerator, low boy, flatbed, box, tanker) as does what kind of cargo you're hauling (coiled steel, chemicals, grain, perishables, less than trailer load (LTL), sand and gravel, moving and storage)

Types of Loads



Commercial Auto Applications

- Mileage information is typically not available/verifiable unless the insured is engaged in for hire trucking, however, Standard Industrial Classification (SIC) codes can be a strong indicator of mileage/vehicle use. For example, contractors normally drive to the jobsite while wholesalers tend to drive routes to retailers all day and florists make deliveries.

Commercial Auto Applications

- Personal use is also a key factor (pickup trucks and company cars with a cooler full of beer at a softball field on Thursday night are a real and difficult risk). Unfortunately, it is hard to verify until after a claim, especially on small risk where a fenced garaging location may not be verified due to policy size.

Vehicle Weight

- ISO's class plan has four vehicle weight classes: Light, Medium, Heavy and Extra-Heavy.
- Alternatively, the Interstate Commerce Commission (ICC) developed eight weight classes that do a much better job of grouping similar vehicles that are readily verifiable using VINs.

ICC Weight Classes

Truck Class Definitions



Commercial Light Duty Trucks - Examples: Minivan, Utility Van, Multi-Purpose, Pickup, Mini-Bus, Step Van.

Where the Gross Vehicle Weight is:

Class 1 (Gvw 0 - 6000)

Class 2 (Gvw 6001 - 10000)

Class 3 (Gvw 10001 - 14000)



Medium Duty Trucks - Examples: City Delivery, Large Walk-in, Bucket, Landscaping.

Where the Gross Vehicle Weight is:

Class 4 (Gvw 14001 - 16000)

Class 5 (Gvw 16001 - 19500)

Class 6 (Gvw 19501 - 26000)



Heavy Duty Trucks - Examples: Refuse, Tow, City Bus, Furniture, Conventional, COE, Fuel, Fire Engine, Refrigerated, Dump, Cement.

Where the Gross Vehicle Weight is:

Class 7 (Gvw 26001 - 33001)

Class 8 (Gvw 33001 - 150000)

Vehicle Weight

- This verifiable approach to vehicle weight also addresses popular misconceptions regarding specific vehicle types.
- The most common misperception is that all pick-up trucks are “Light.” Most large pickup trucks have gross vehicle weights well in excess of the “Light” limit of 10,000 pounds.

National Underwriter – July, 2007

- “From a physical damage perspective, new designs in trucks to reduce their weight and streamline them for fuel efficiency have led to more damage to the vehicle in lower speed collisions.
- Where a steel bumper used to protect the tractor with minimal front-end damage, now an entire engine hood must be replaced with engine parts, which are now protected”

Thank You for Your Attention

Visit us at pinnacleactuaries.com

LeRoy Boison, FCAS, MAAA

516.746.7149

lboison@pinnacleactuaries.com