

# Statistical Work in Motor Insurance

**Technical Workshop, Sarajevo , 10 June 2015**

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## Single records vs aggregated records

(1) Business Statistics:

Aggregated data are absolutely sufficient and much easier to handle.

(2) Risk/Calculatory Statistics:

Single information is - albeit not required - very advisable!

## Risk statistics / calculatory statistics

- differentiated after relevant rating / risk criteria
- give detailed information on
  - portfolio and claims situation and development by risk category
  - net risk premium by risk category
- serve as a solid basis for the company's own tariffication

# Why single records for risk and calculatory statistics?

- (1) With aggregated data by risk group, you have to stick to the given tariff structure. With single records modifications or refinements of the tariff structure can easily be done.
- (2) The data management of the insurance companies is based on single information on contracts and claims so that for them the data export should easily be done.

(3) Single information makes it easier to check the data

Errors in the individual data records cannot be found unless separate records are used for the validation of data.

(4) Statistical observations might be biased by strong random effects, e. g. due to large-scale claims or natural catastrophes. Removal of such unwelcome random effects is in an adequate way only possible on the basis of single data records.

## Which items should be published per risk category?

- number of standardized contracts (one-year-contracts)
- number of claims
- claims expenditure
- claims frequency = number of claims per 1000 standardized contracts
- average amount of claims = claims expenditure / number of claims
- net risk premium (loss costs) = claims frequency \* average amount of claims  
= claims expenditure / number of standardized contracts

- annual average premium = net risk premium
  - + risk margin
  - + cost margin
  - + profit margin
  - + taxes

## Collecting the data Exchange of information between





# Some Data about the German Motor Market

# German Motor insurance: premium income, 2014\*

Distribution of gross premiums written, in EUR billions

Motor insurance overall:

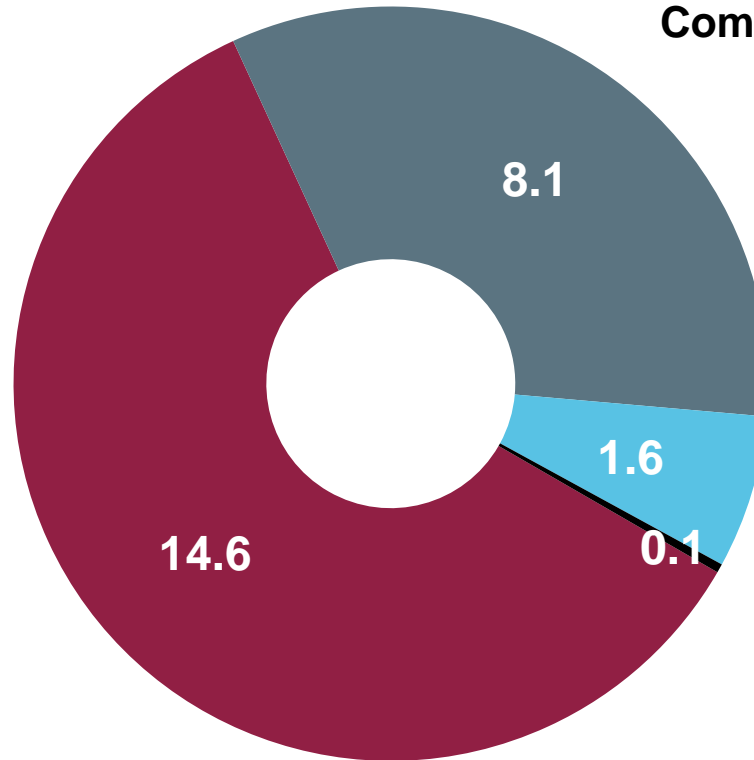


**MTPL**  
59.8%

**Comprehensive casco**  
33.3%

**Partial Casco**  
6.5%

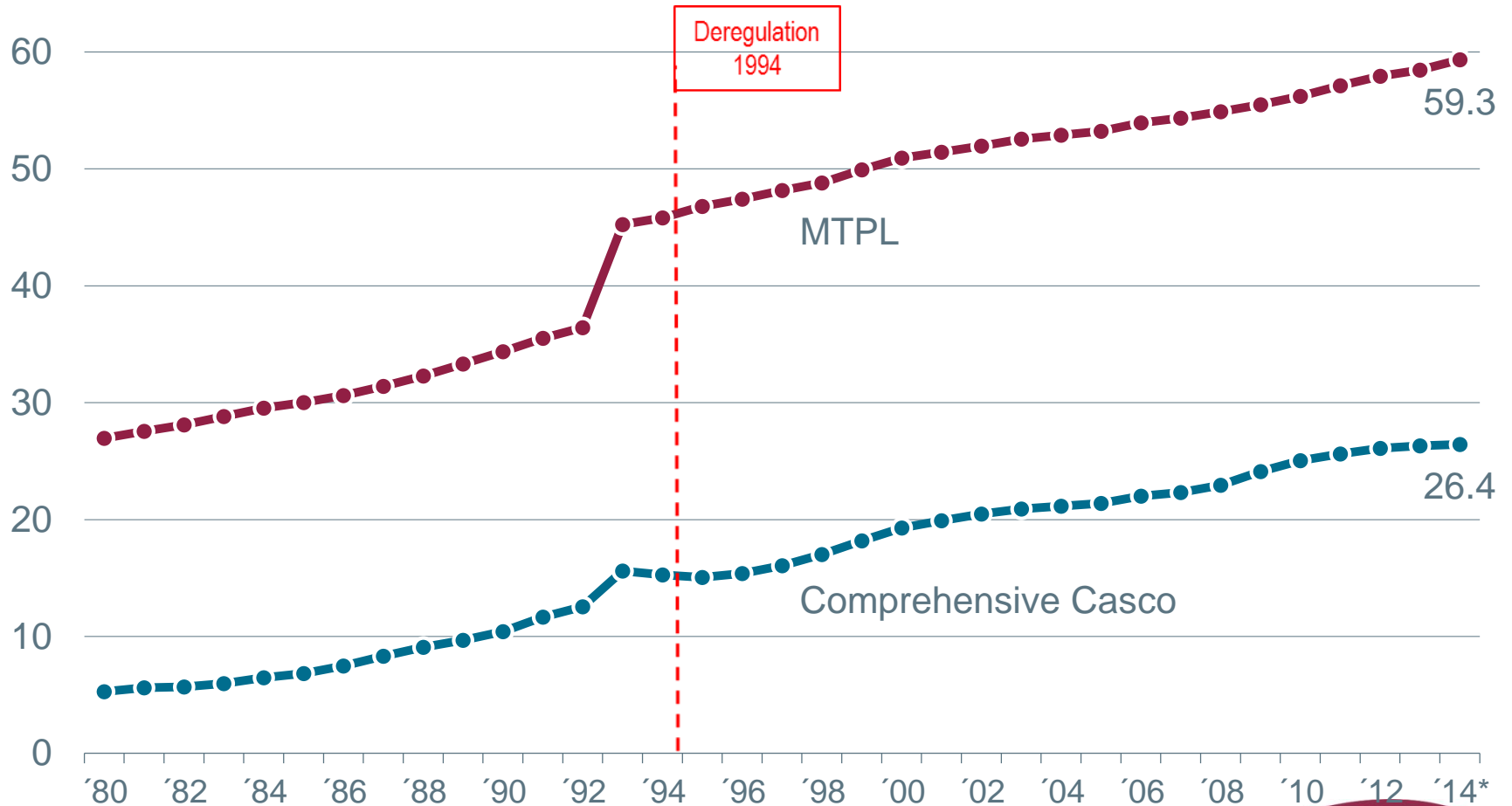
**Passenger accident**  
0.4%



\* Preliminary result (status 26/02/2015)

# Development of German motor insurance contracts

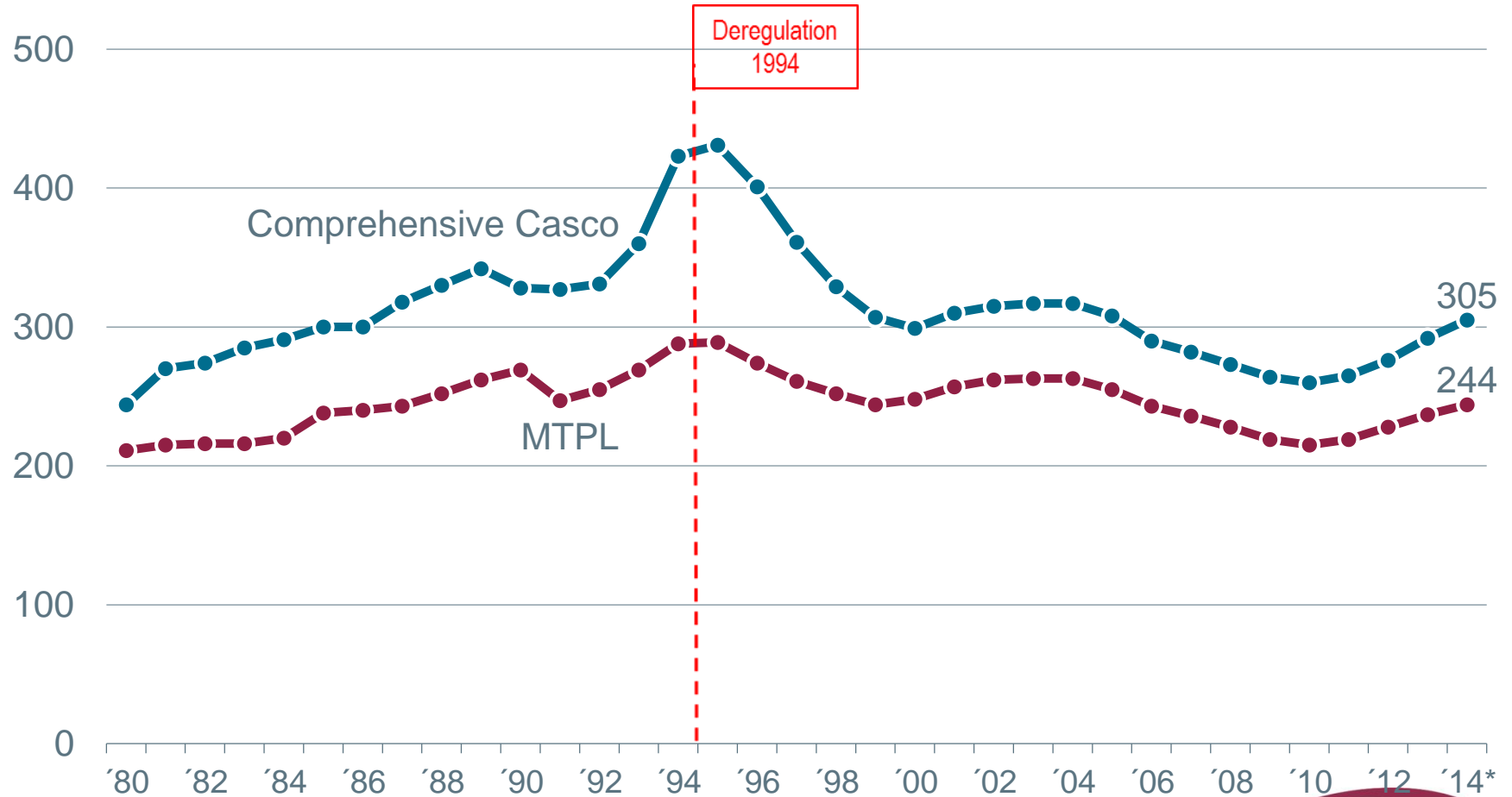
MTPL and comprehensive casco, standardized contracts, in millions



\* Preliminary result (status 26/02/2015)

# Development of German average annual motor premium

MTPL and comprehensive casco, in EUR

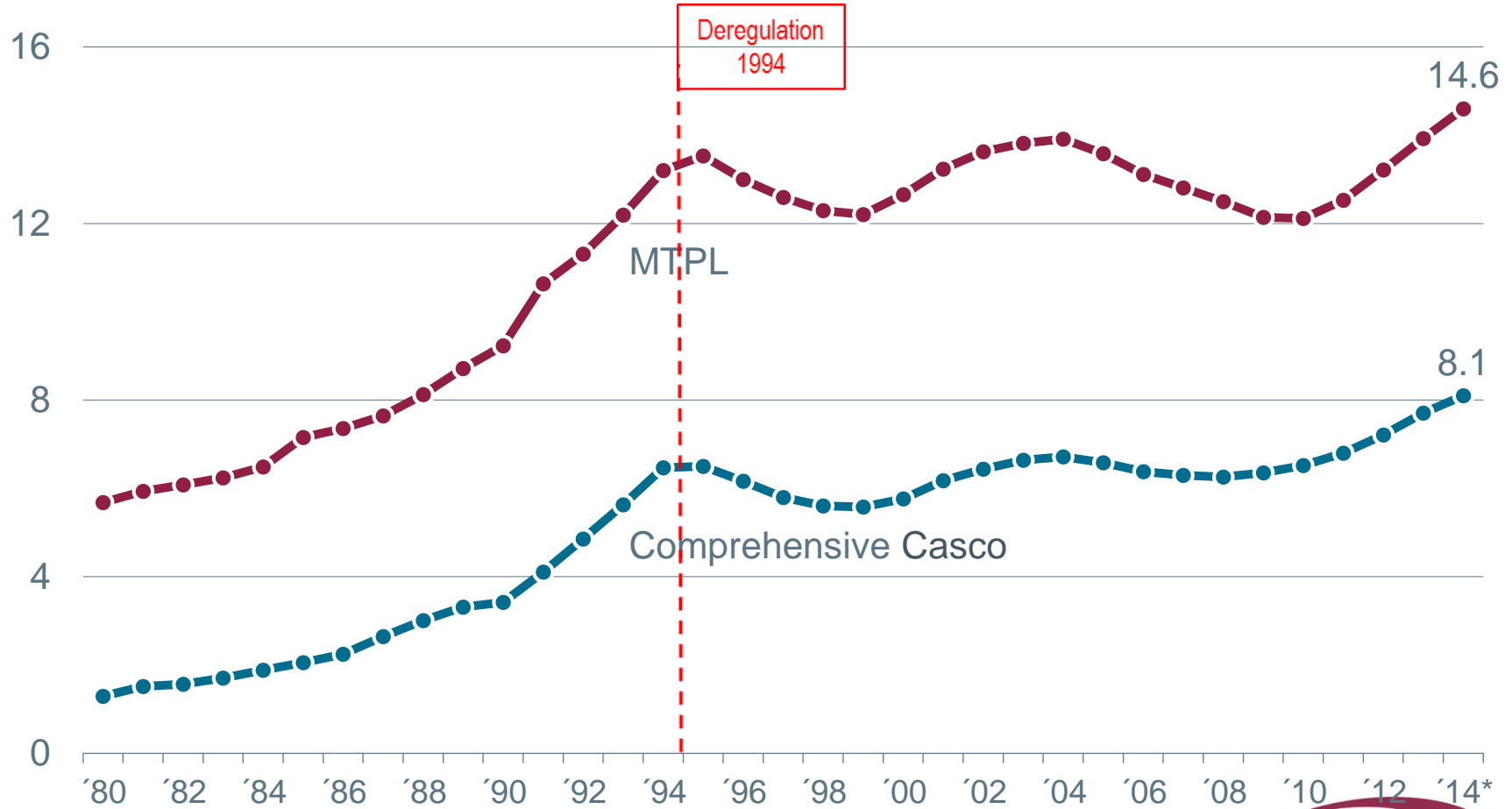


\* Preliminary result (status 26/02/2015)

04/06/2015

# Development of German gross motor premium income

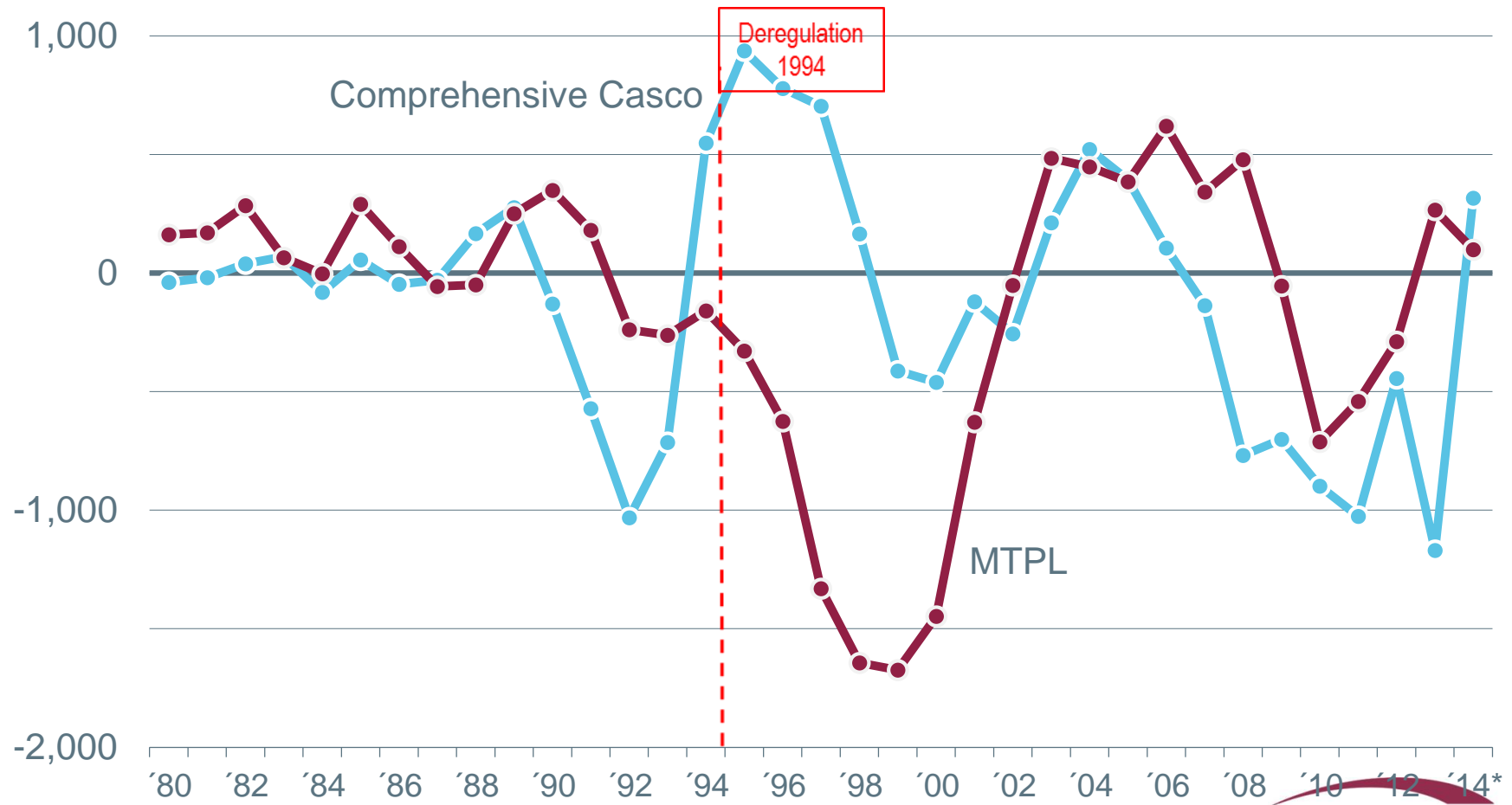
MTPL and comprehensive casco, in EUR billions



\* Preliminary result (status 26/02/2015)

# Underwriting results German motor insurance

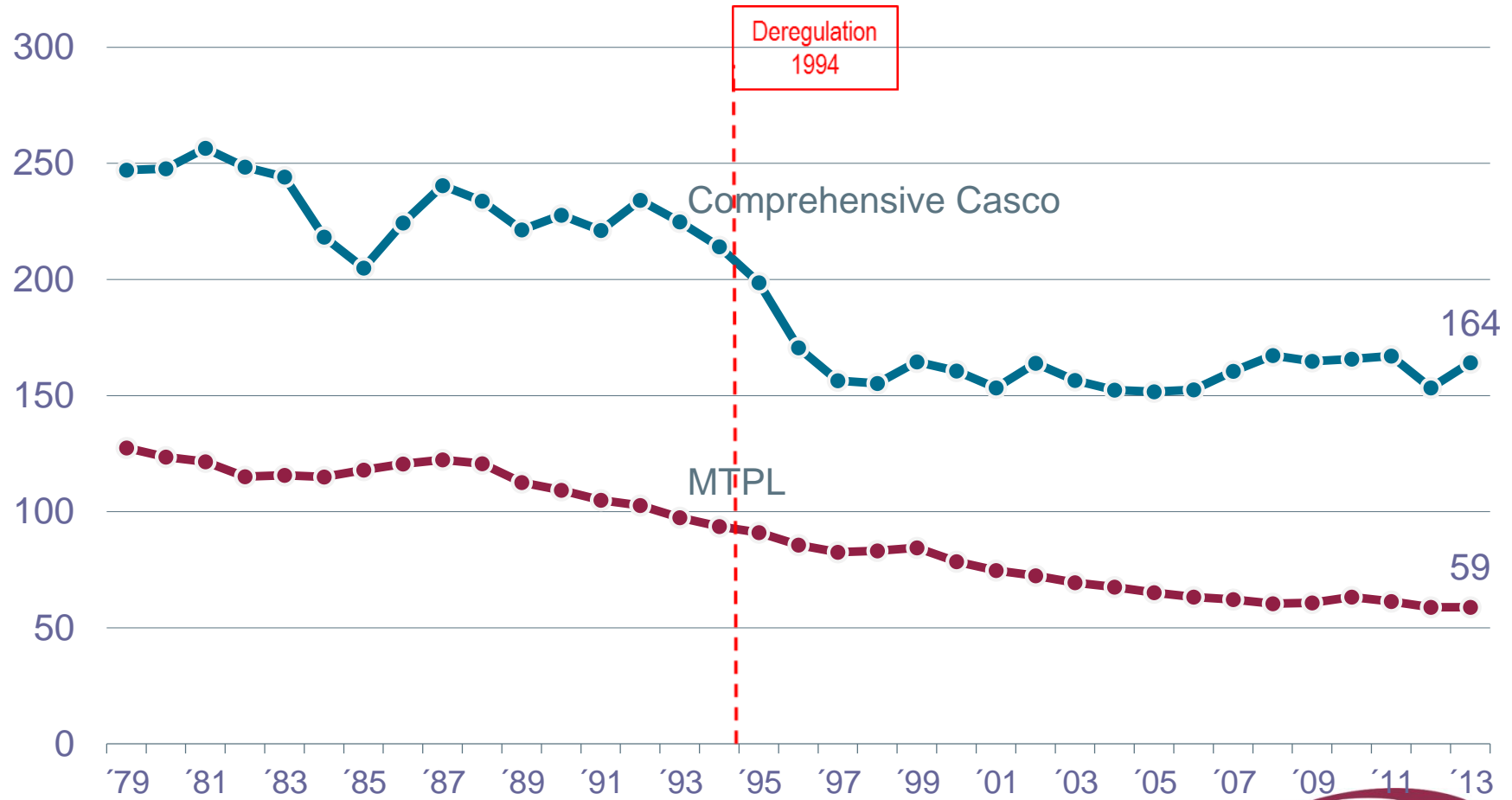
MTPL and comprehensive casco, in EUR millions



\* Preliminary result (status 26/02/2015)

# Development of German motor claims frequency

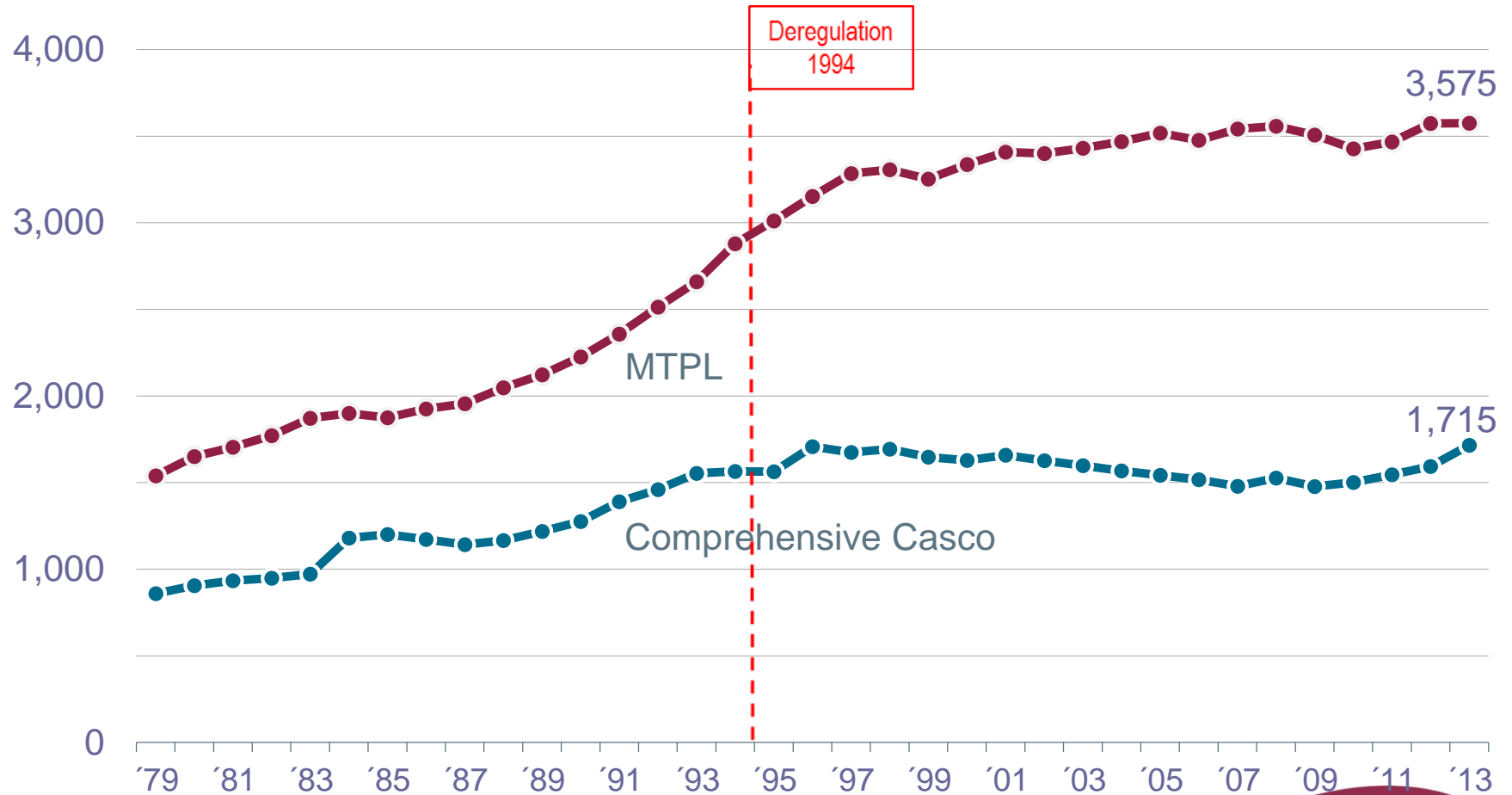
## MTPL and comprehensive casco, permille



\* Preliminary result (status 26/02/2015)

# Development of average amount of German motor claims

MTPL and comprehensive casco, in EUR



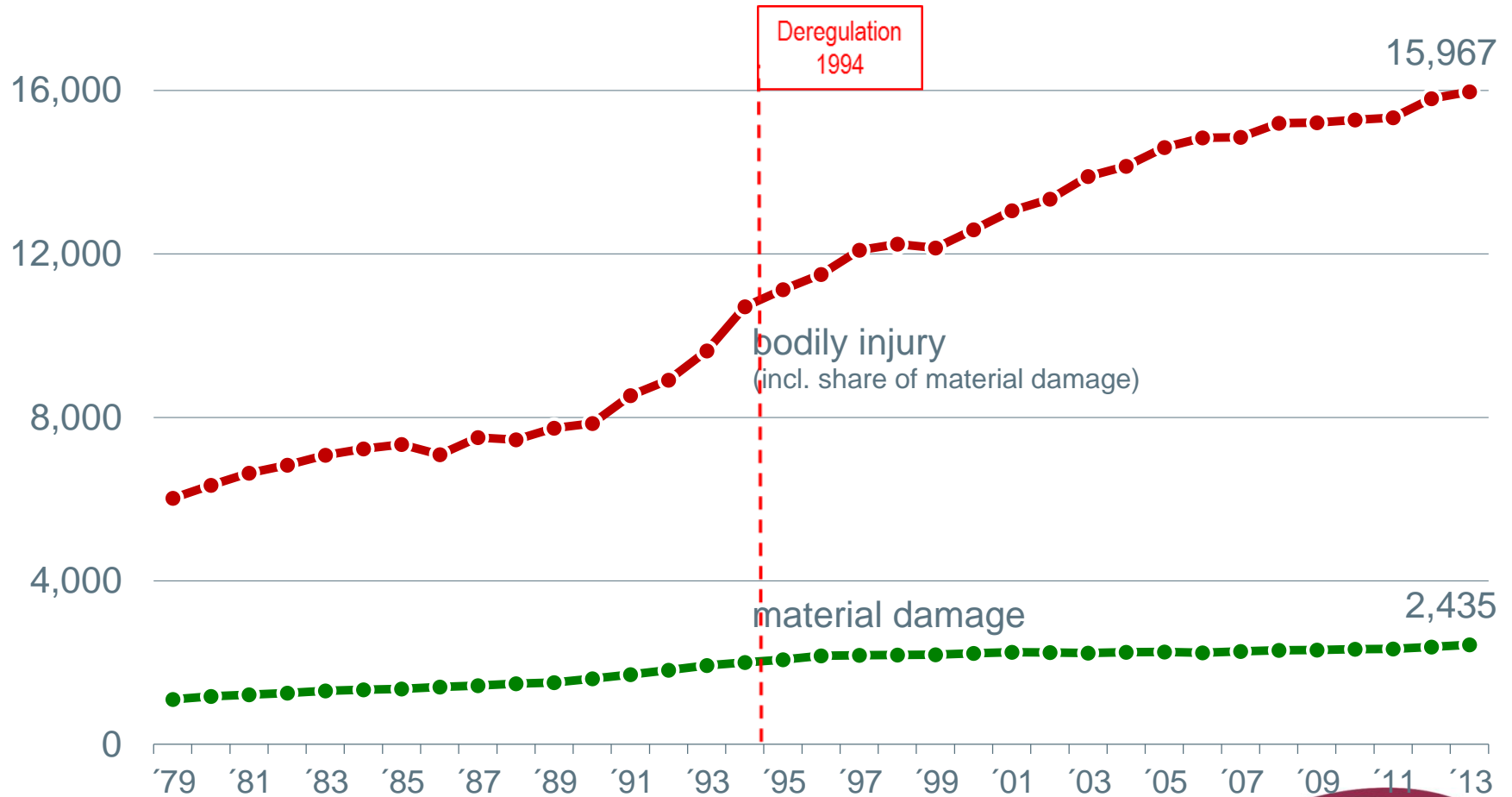
\* Preliminary result (status 26/02/2015)

04/06/2015



# Development of average amount of German motor claims

For bodily injury and material damage, MTPL, in EUR



\* Preliminary result (status 26/02/2015)

04/06/2015

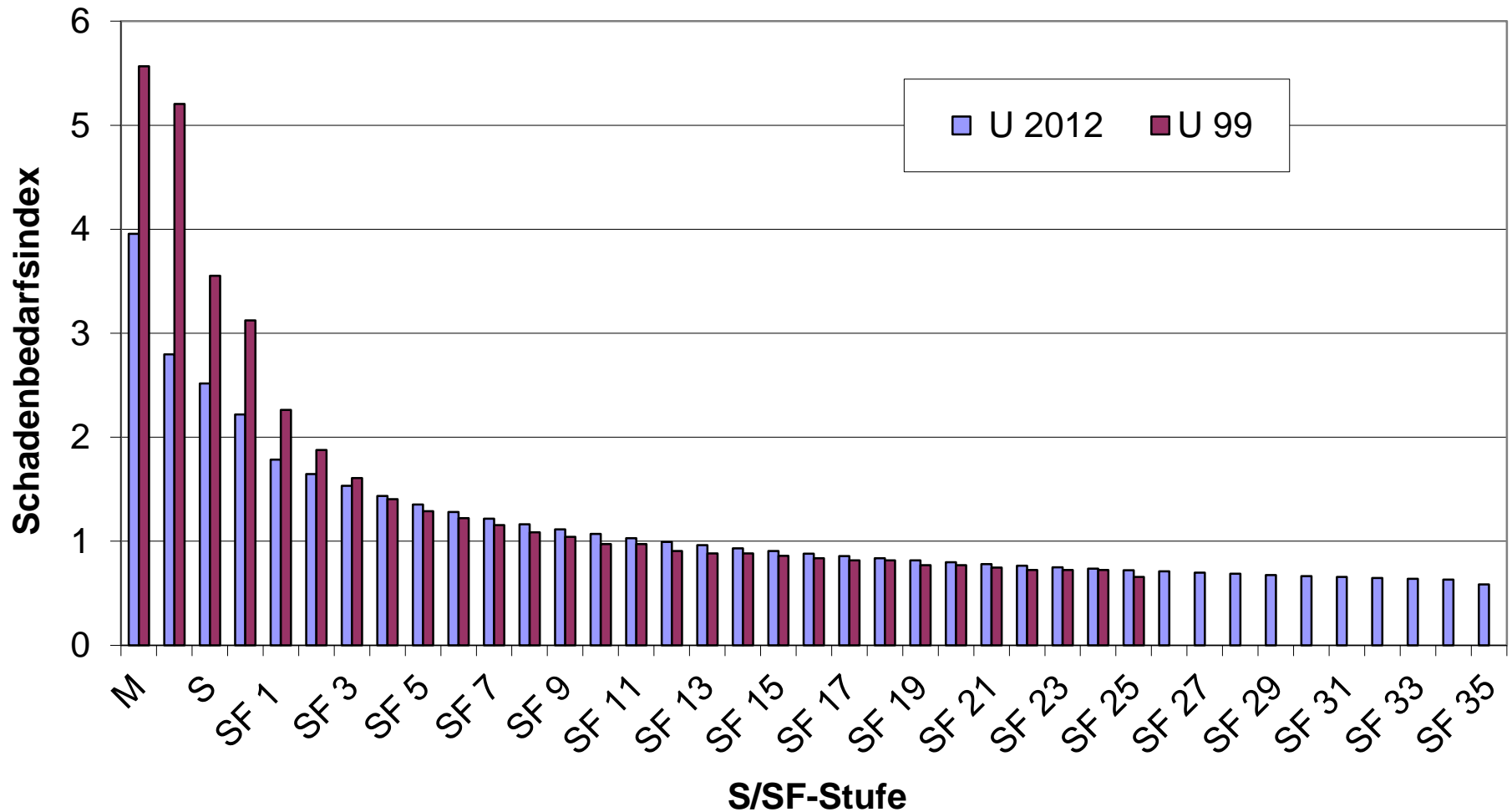
## Some selected Rating Factors

# Rating factors in MTPL insurance/passenger cars

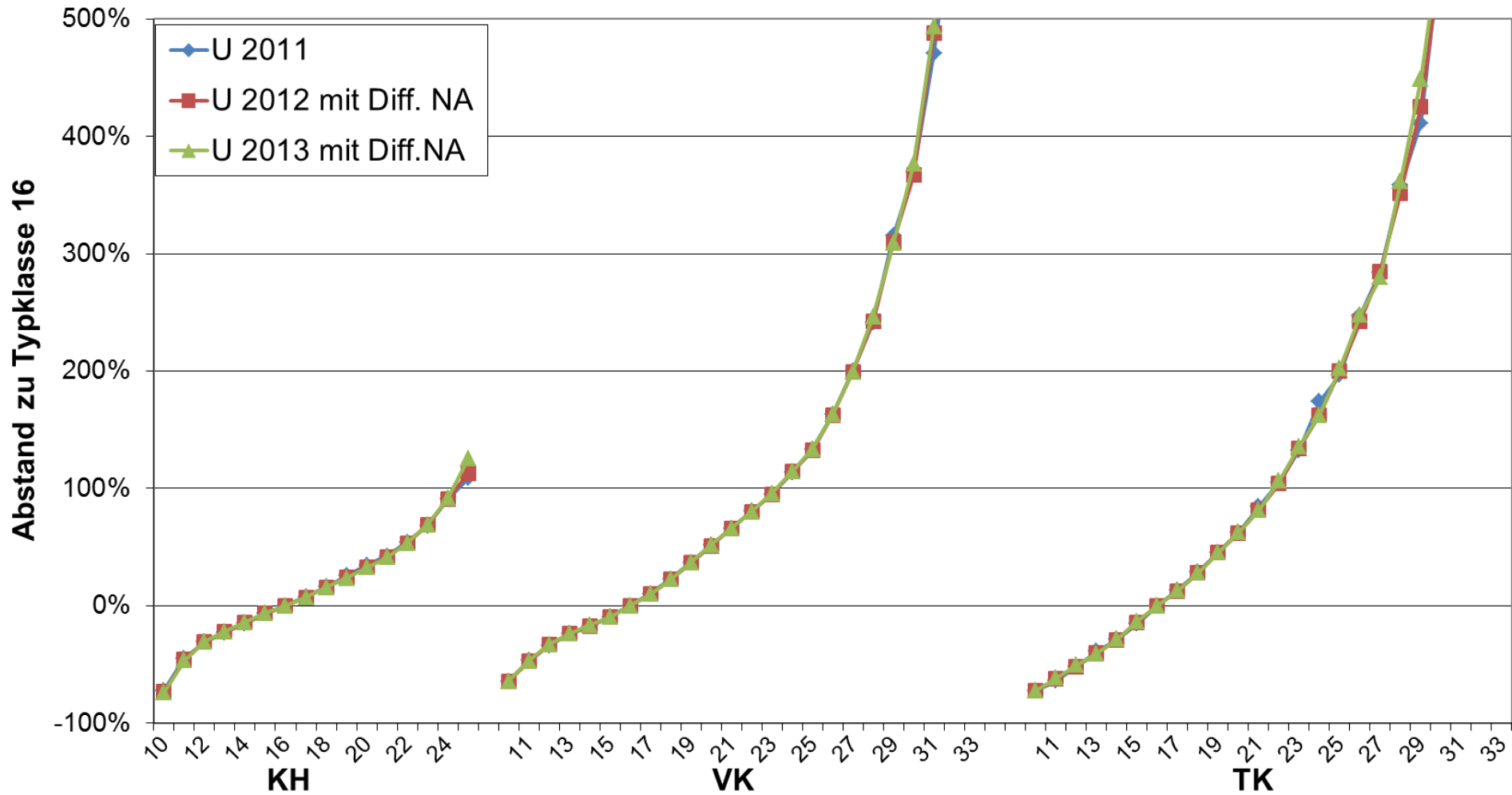
## Rating criteria used by nearly all market participants (standard criteria)

- Claim / No-claim class (bonus / malus)
- Type class
- Differentiated age of users
- Mileage per year in 1000 km
- Age of the motor vehicle when acquired
- Regional class
- Deductibles
- Group of users
- Profession (civil servant, farmer, other)
- Ownership of residential property

# MTPL – Claim / No-claim class (bonus / malus)



# Type class



# Typklassenverzeichnis zum 01.07.2014, Auszug für Dacia

KW	PS	CCM	Typ-/Verkaufsbezeichnung	HSN	TSN	Klasse					WFS	Pb	Pe
						KH	VK	TK	VKN	TKN			
<b>DACIA PITESTI (R)</b>													
040	054	1280	DACIA 1300 (LIM.)	8201	901	14	12	10	12	10		1969	
040	054	1280	DACIA 1300 (KOMBI)	8201	902	14	12	10	12	10		1969	
040	054	1289	DACIA 1300 KOMBI	3004	680	14	12	10	12	10		1969	
040	054	1289	DACIA 1300	8202	300	14	12	10	12	10		1969	
040	054	1289	DACIA 1310	8202	301	14	12	10	12	10			
040	054	1289	DACIA 1330 KOMBI	8202	302	14	12	10	12	10		1969	
046	063	2495	M-461-C	8203	301	13	24	24	23	17			
050	068	1461	SD (LOGAN 1.5 D)	8212	AAC	18			15	15	W	2006	2010
050	068	1461	SD (LOGAN KOMBI 1.5 D)	8212	AAF	20			17	17	W	2006	

Abkürzungen: WFS = Wegfahrsperrre, Pb = Produktionsbeginn, Pe = Produktionsende;

Klasse VK bzw. TK: Typklasse nach dem bis 2002 üblichen Vorgehen;

Klasse VKN bzw. TKN: Typklasse nach dem aktuellen Vorgehen

Unter Dacia werden in diesem Verzeichnis 70 Fahrzeugtypen geführt.



## Move of Objective Criteria for Motor Tariffs:

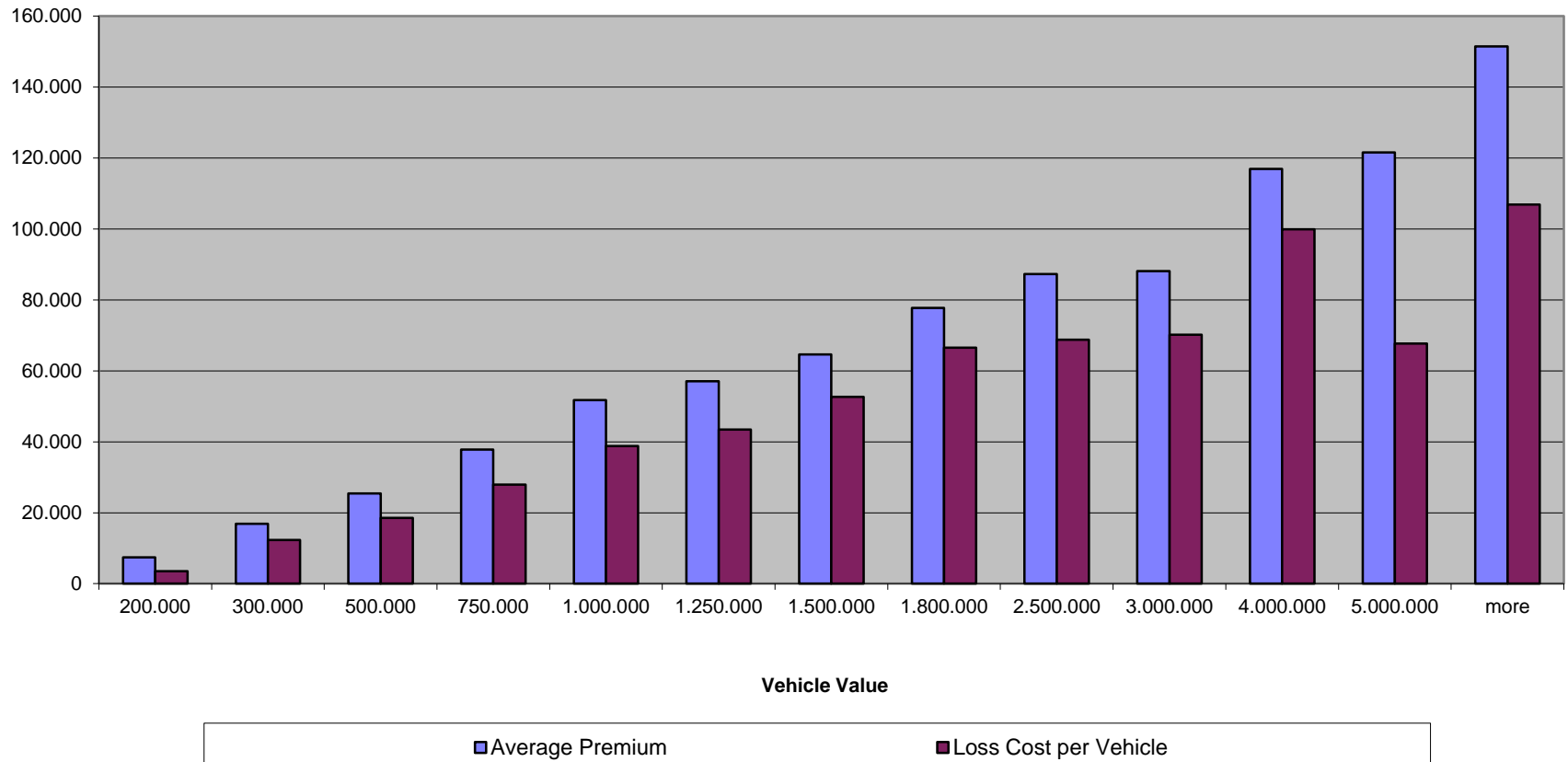
From: Value (MOD), Kw, ccm (MTPL)

To: Type class of vehicle

# Vehicle Value , Average Premium and Loss Costs correlate



Average Premium vs. Loss Cost per Vehicle, UY 2012

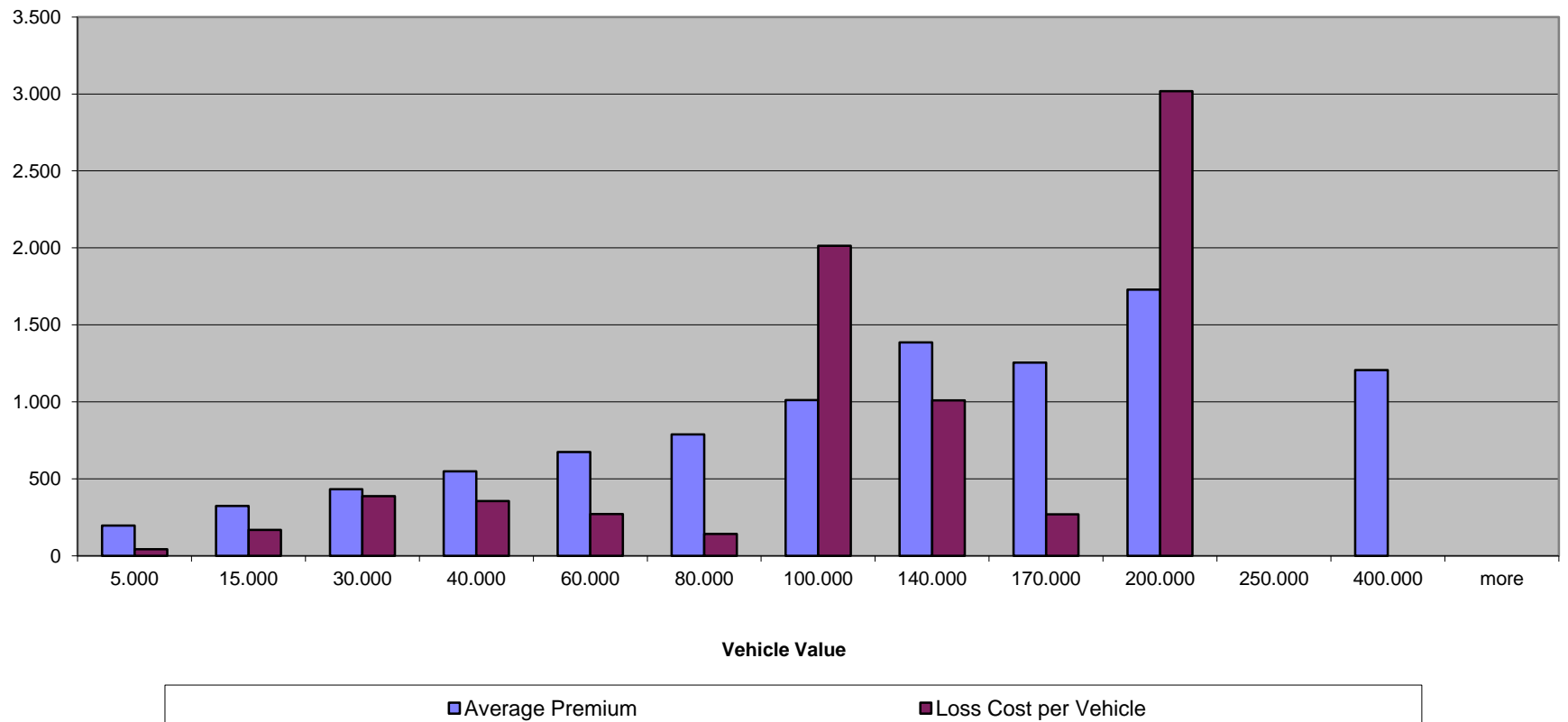




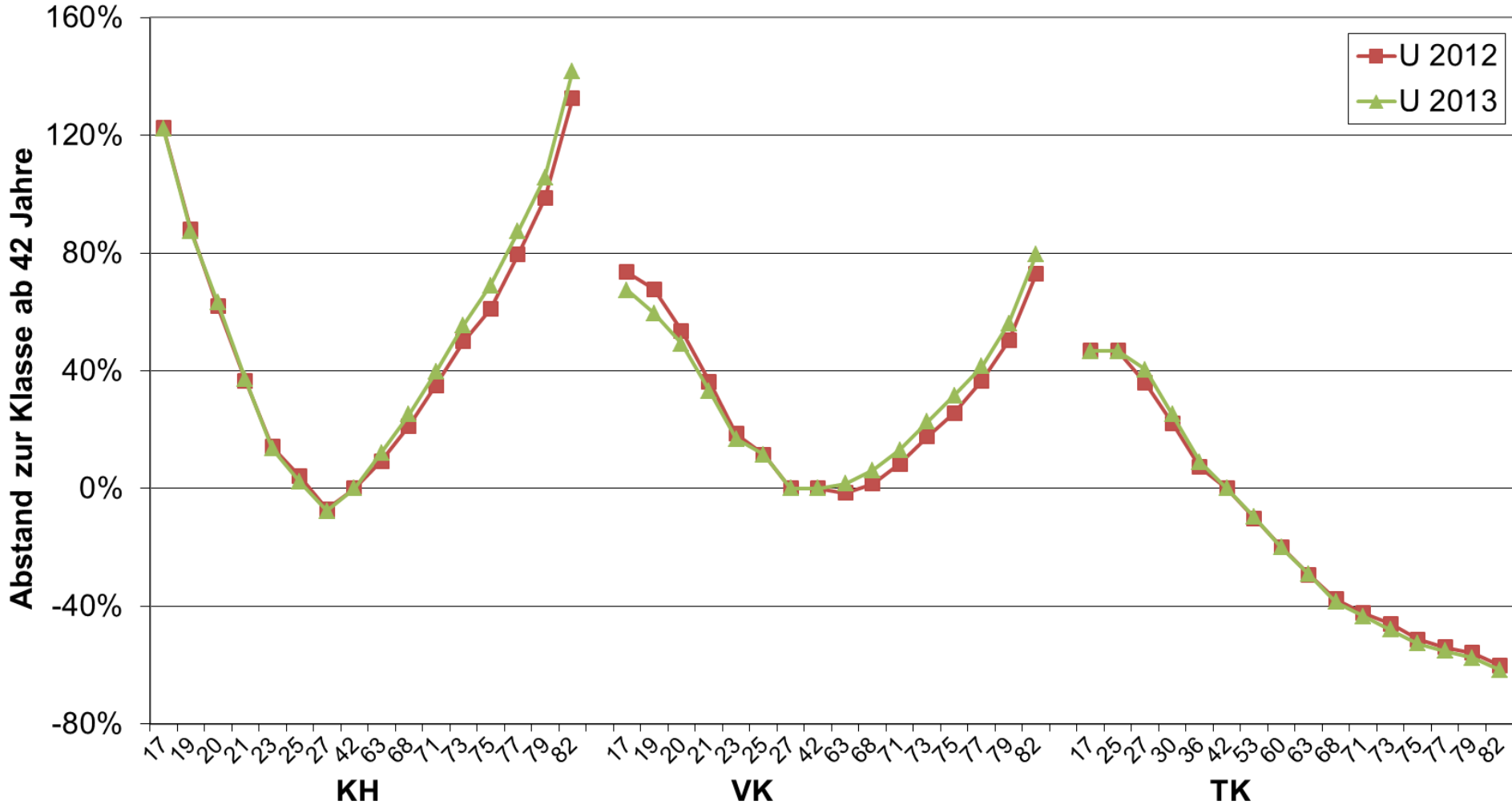
# Vehicle Value, Average Premium correlate .... but not Loss Costs



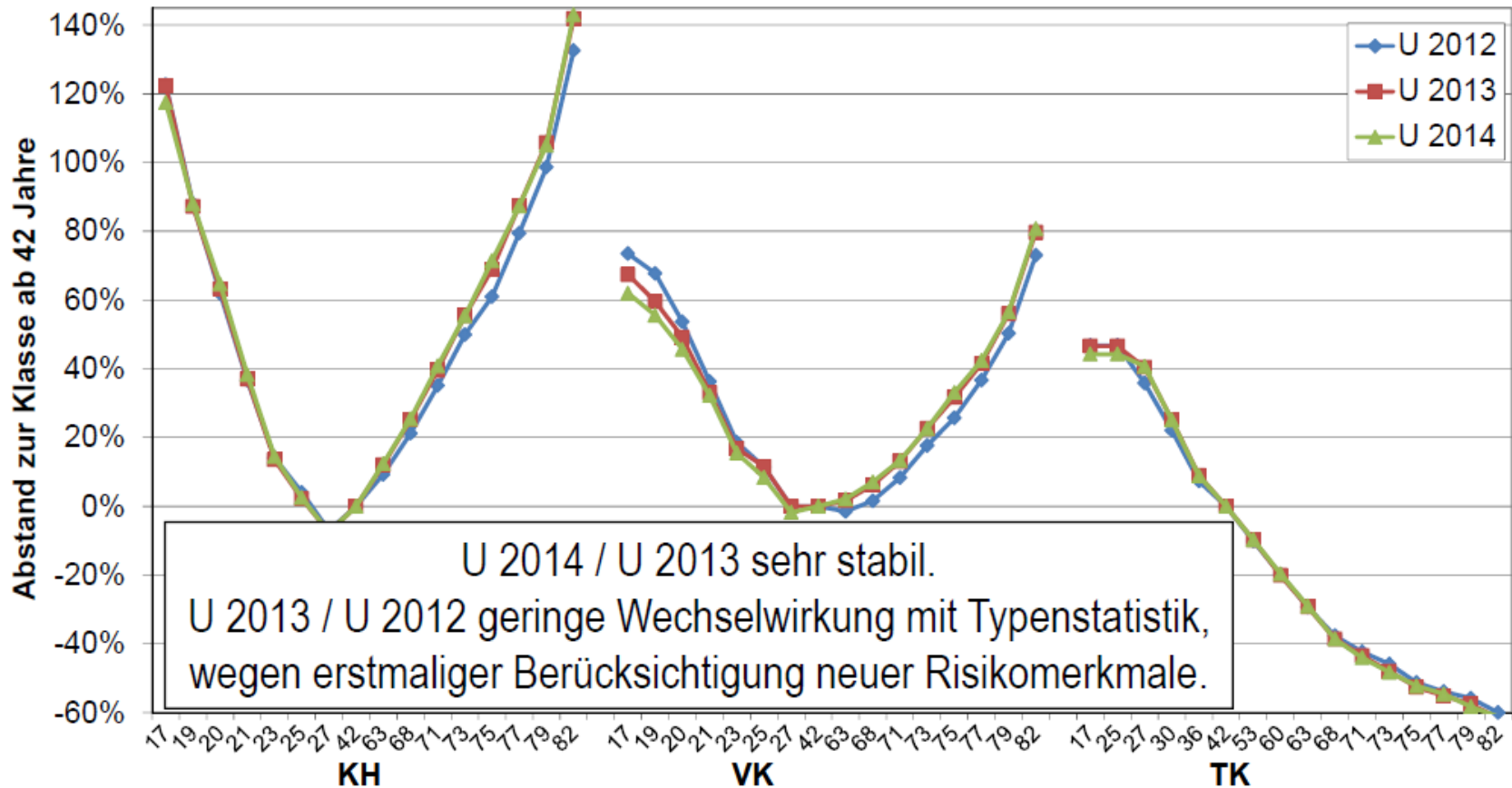
Average Premium vs. Loss Cost per Vehicle, UY 2013



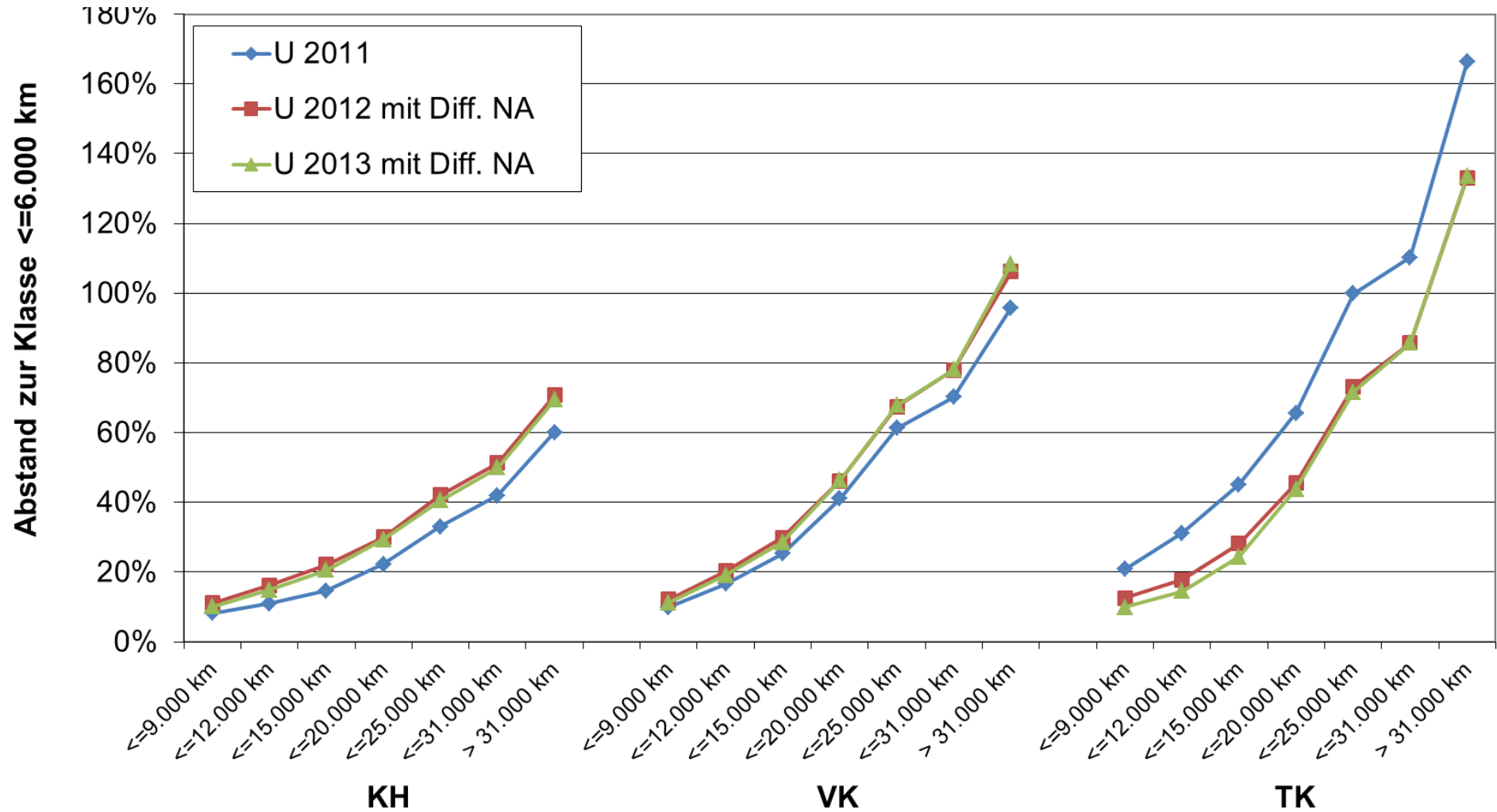
# Differentiated age of users



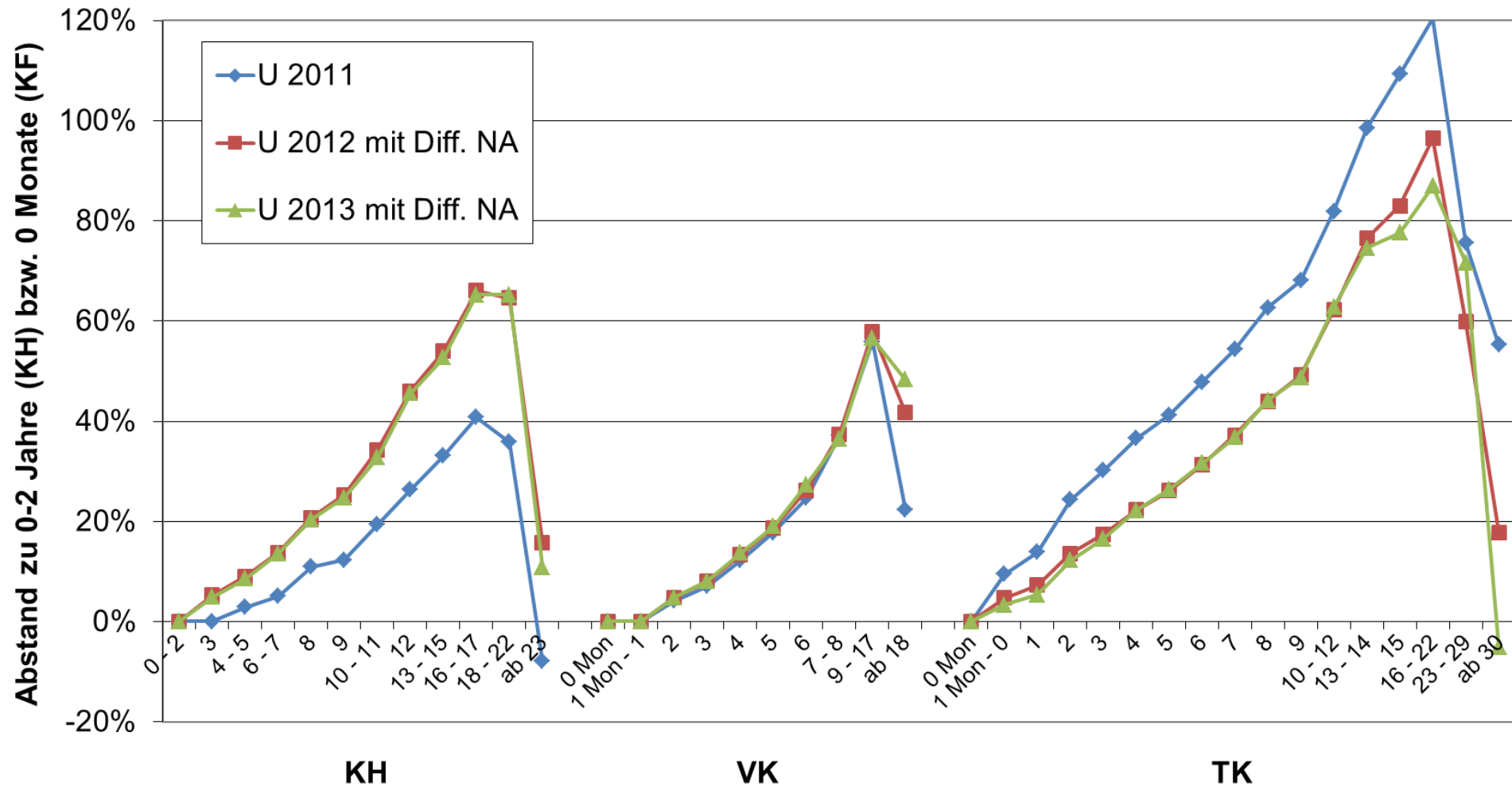
### Kraftfahrtversicherung – Pkw: Differenziertes Nutzeralter Schadenbedarfsabstände



# Mileage per year in 1000 km

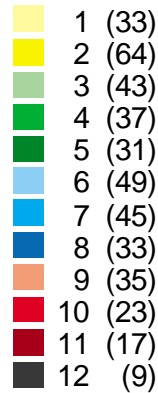


# Age of the motor vehicle when acquired

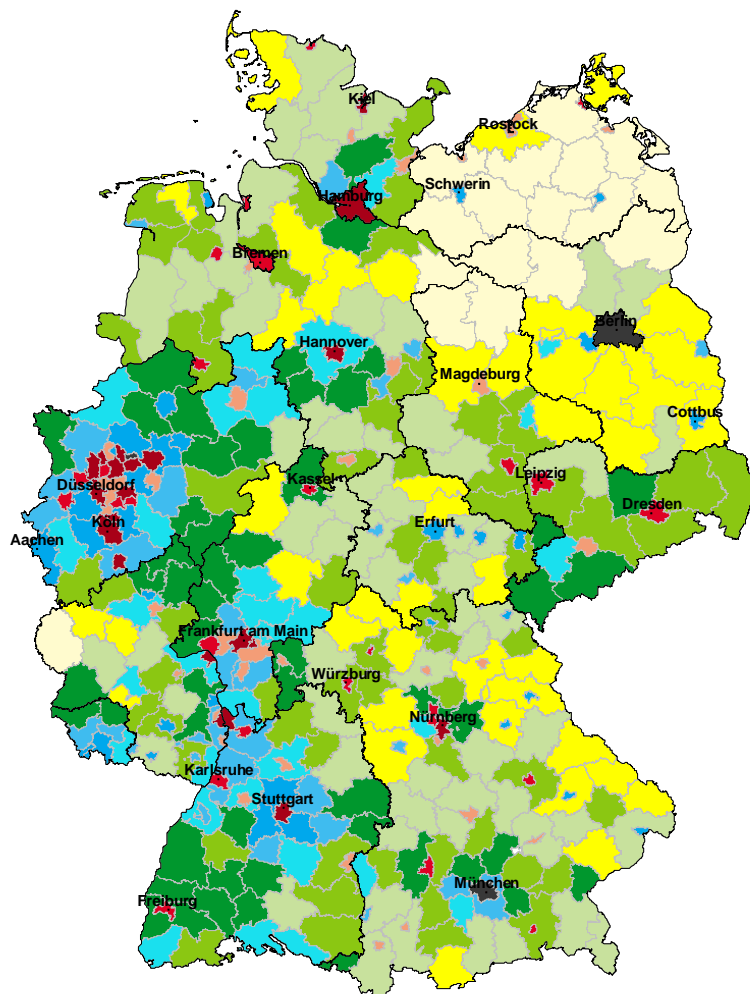
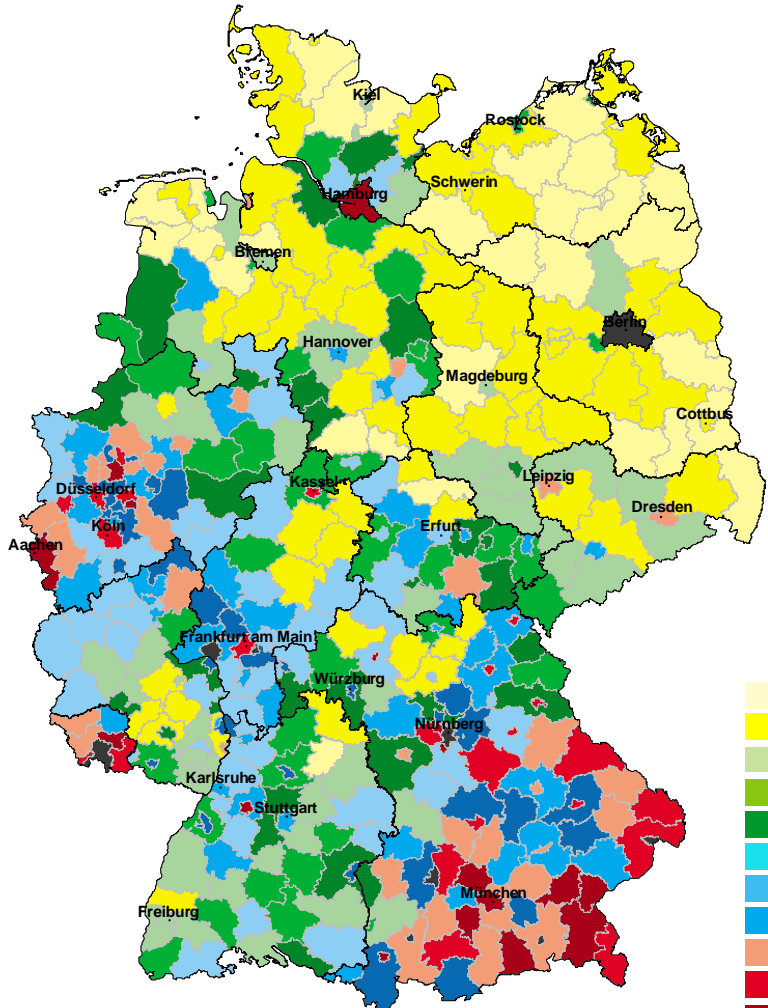
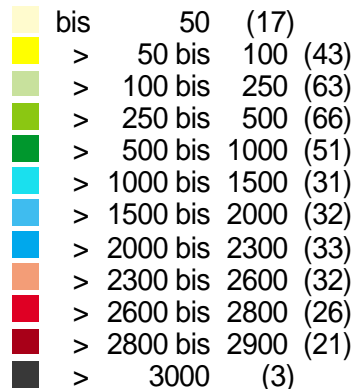


# MTPL – Regional class and population density

Klassen\*

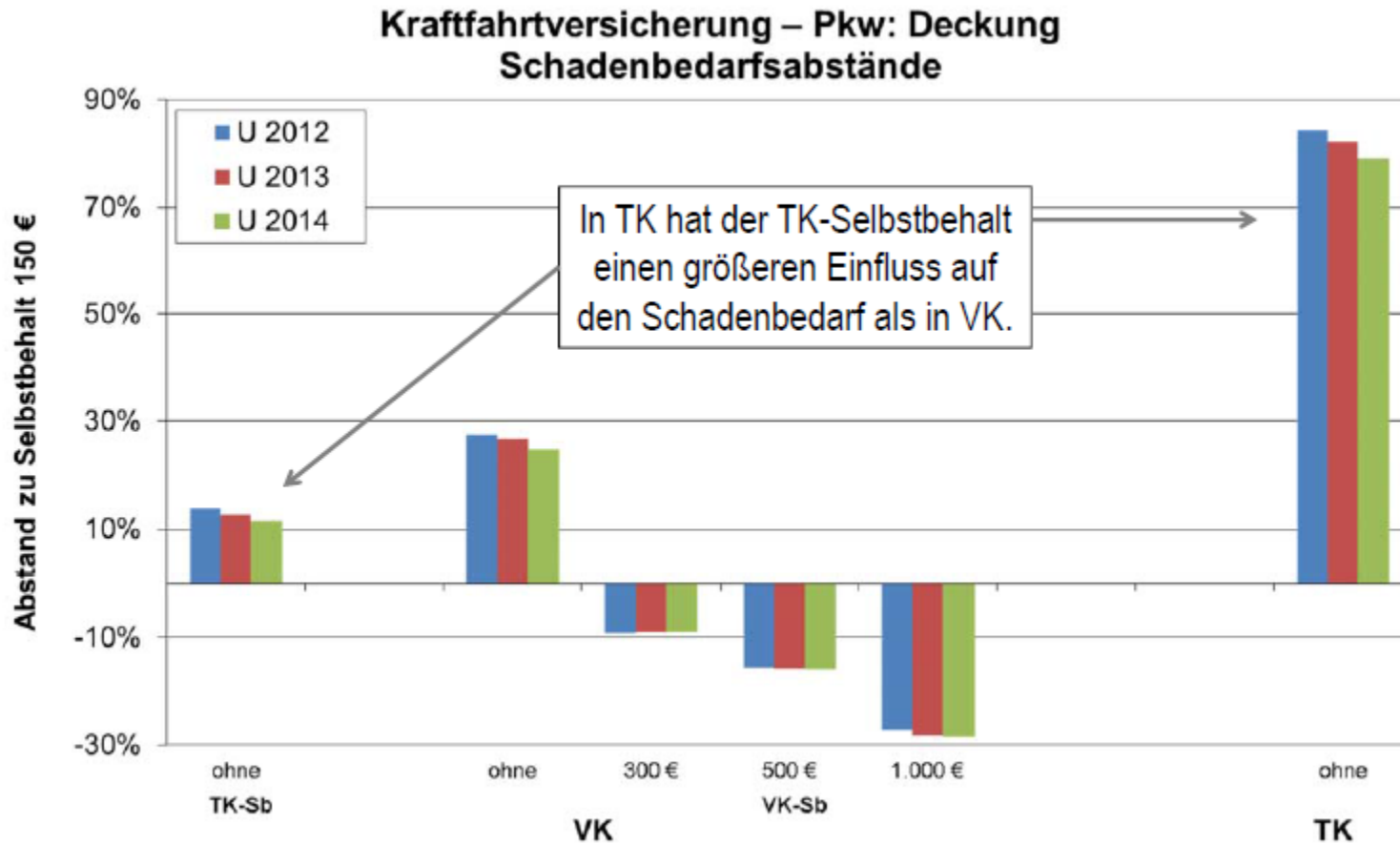


Einwohnerdichte

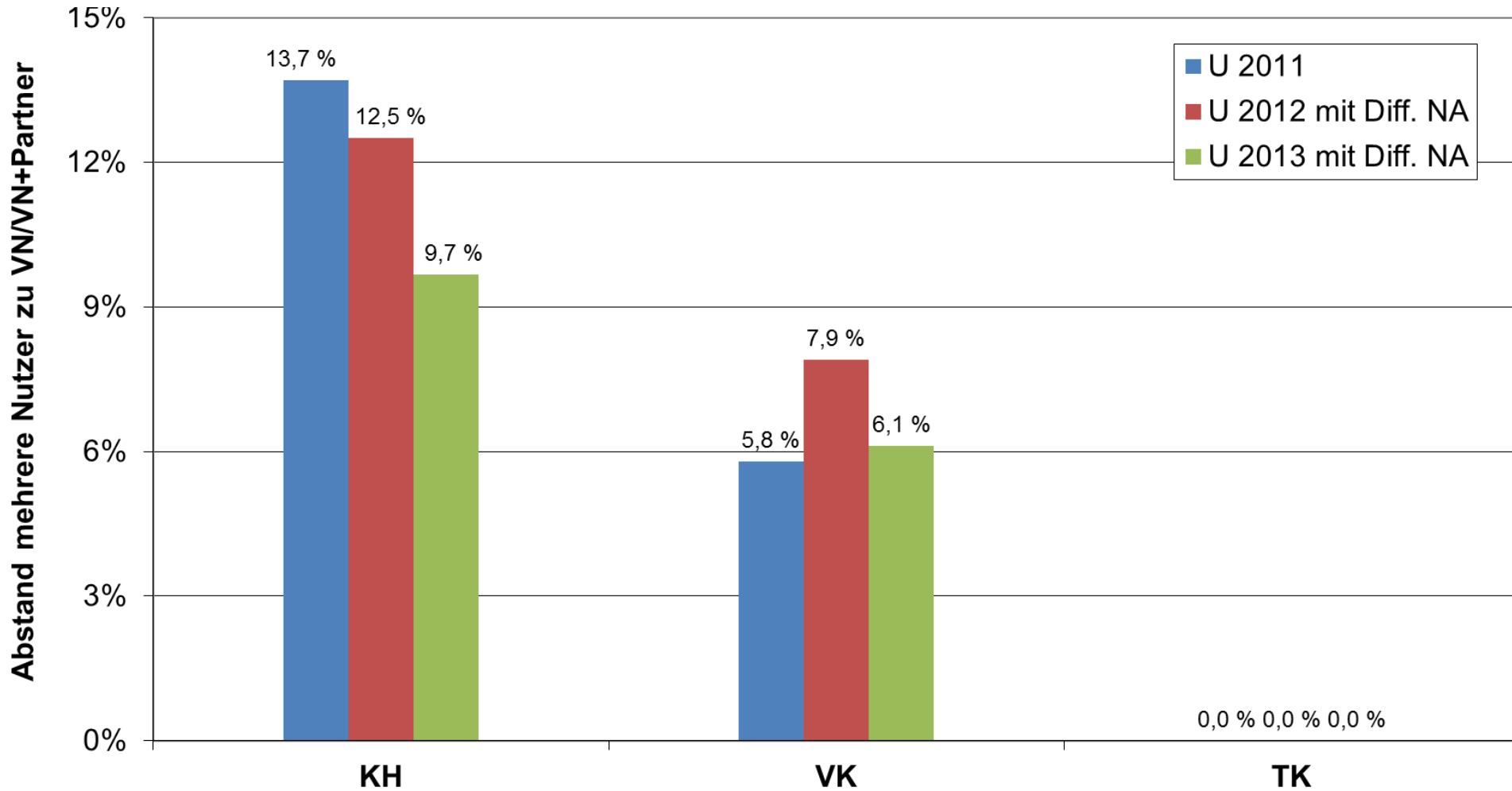


\* Klassengrenzen nach unverbindlicher Bekanntgabe des GDV

# Deductible; difference compared to 150€

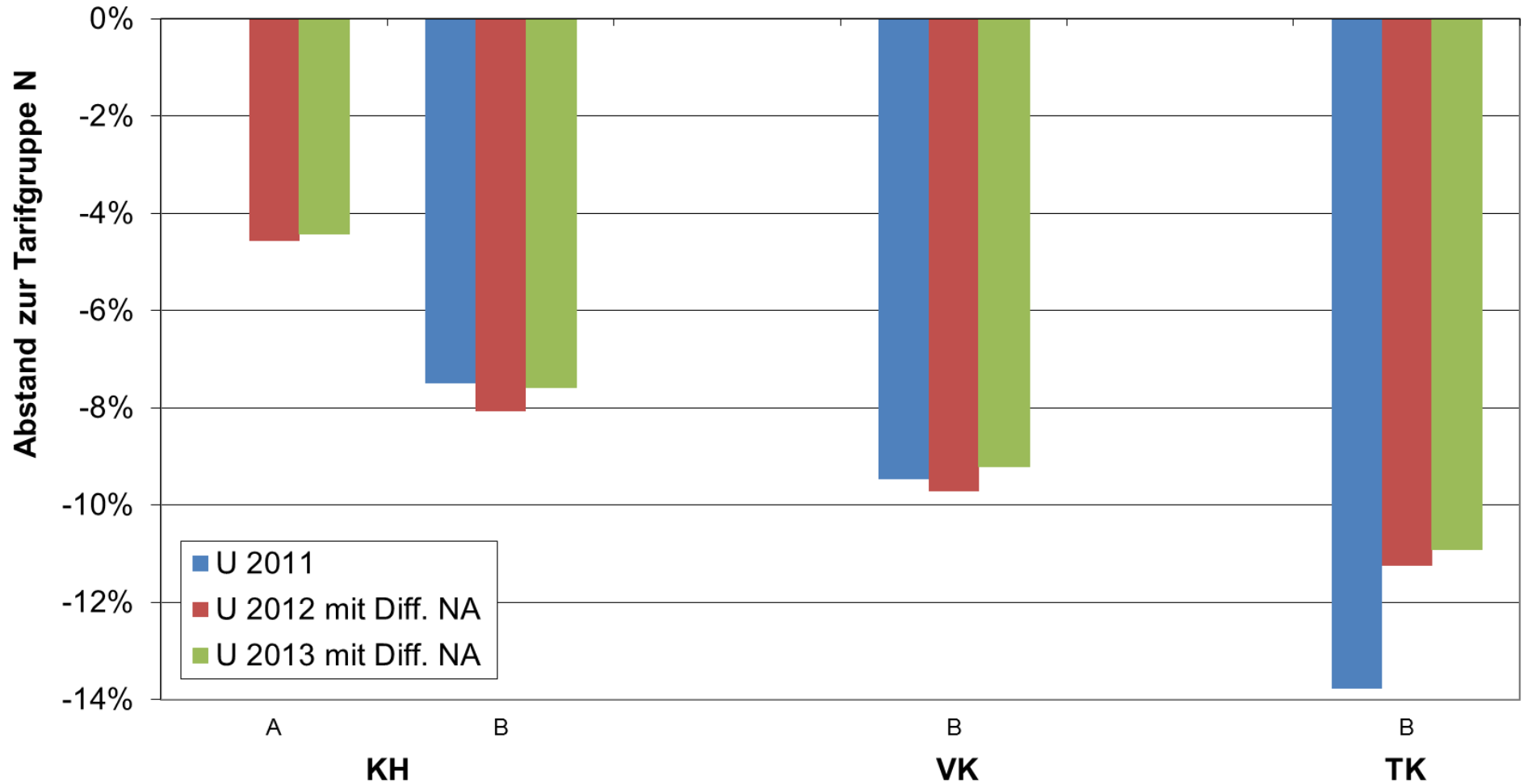


# Group of users

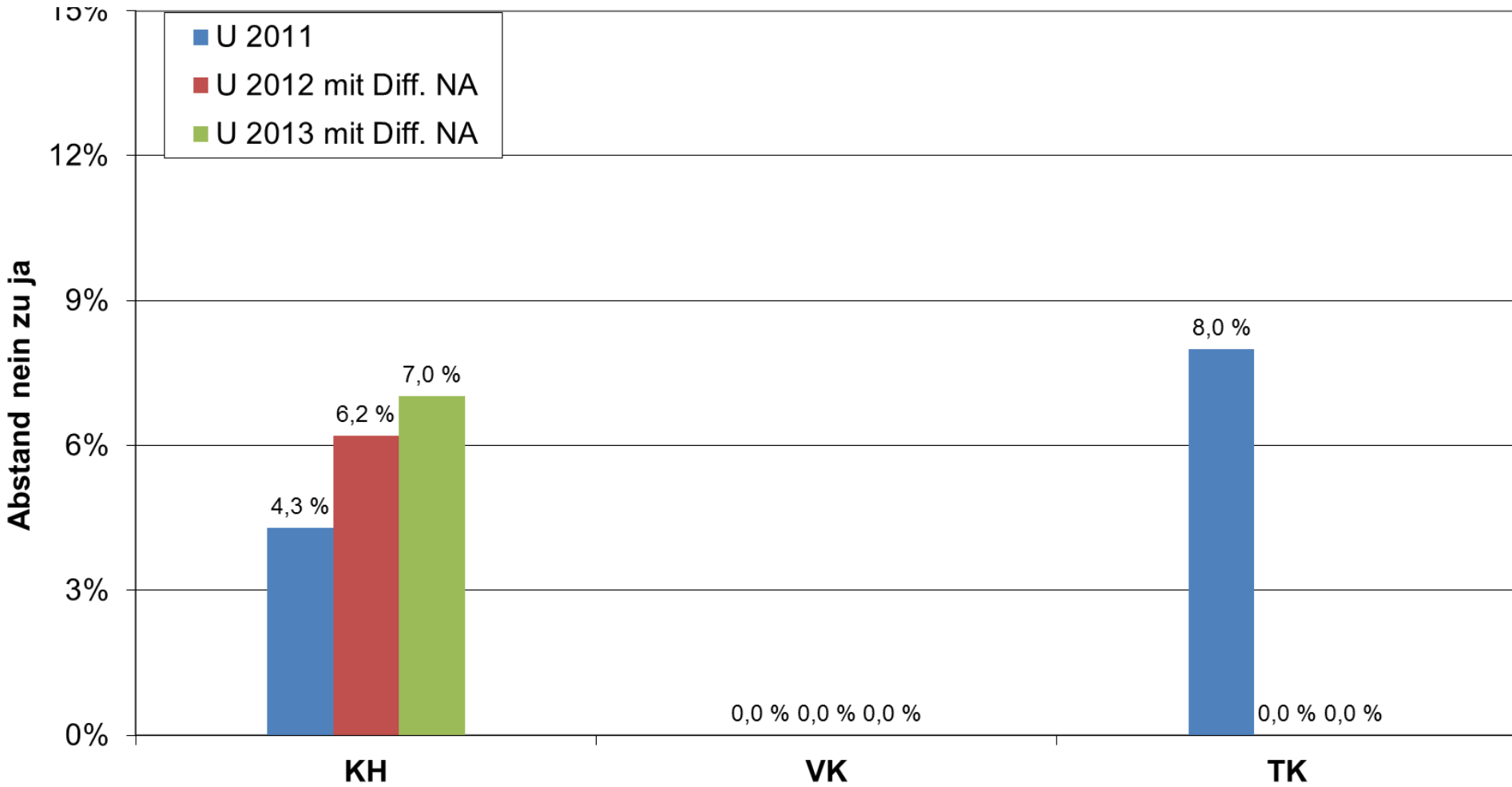




# Profession (civil servant, farmer, other)



# Ownership of residential property



## Additional rating criteria

- Bonus / Malus rules in respect of second cars
- Categories of occupation groups in the case of non-civil-servants
- Loyalty discount
- Young family
- ...

## CAT events in MOD

- Hail as a significant peril
- Sophisticated modelling quite challenging
- Market modell for Germany with limited (but realistic) parameters developed by GDV
- Basis: 152 events (1984 – 2013)
- Spreadsheet for company modell supplied

Gesamtverband der Deutschen Versicherungswirtschaft e.V.

Fahrzeugversicherung

Ereignis-Modell für Kumulschäden  
durch Elementarereignisse

Unverbindliche Studie  
Nur zur internen Verwendung

Berlin, im Mai 2015

## CAT events in MOD; market modell data results

- Average loss costs per vehicle year 1984-2013: around € 16
- 1 in 200 years: € 84; VaR  
1 in 50 years: €55 (TVaR: €79)

Tabelle 2: Jährlichkeiten für den Schadenbedarf

Jährlichkeit J [Jahre]	Unterschreitungs- wahrscheinlichkeit $E(c) = 1 - 1/J$ [No Title]	gesamt	
		SB* EUR	SB EUR
2	50,00	13,7	14,1
3	66,67	17,7	18,0
4	75,00	20,5	20,8
5	80,00	22,8	23,1
10	90,00	30,3	30,8
20	95,00	39,1	39,8
30	96,67	45,0	45,9
40	97,50	49,6	50,5
50	98,00	53,5	54,4
60	98,33	56,9	57,8
70	98,57	59,9	60,7
80	98,75	62,7	63,4
90	98,89	65,2	65,8
100	99,00	67,7	68,0
150	99,33	77,2	77,2
200	99,50	84,8	84,3

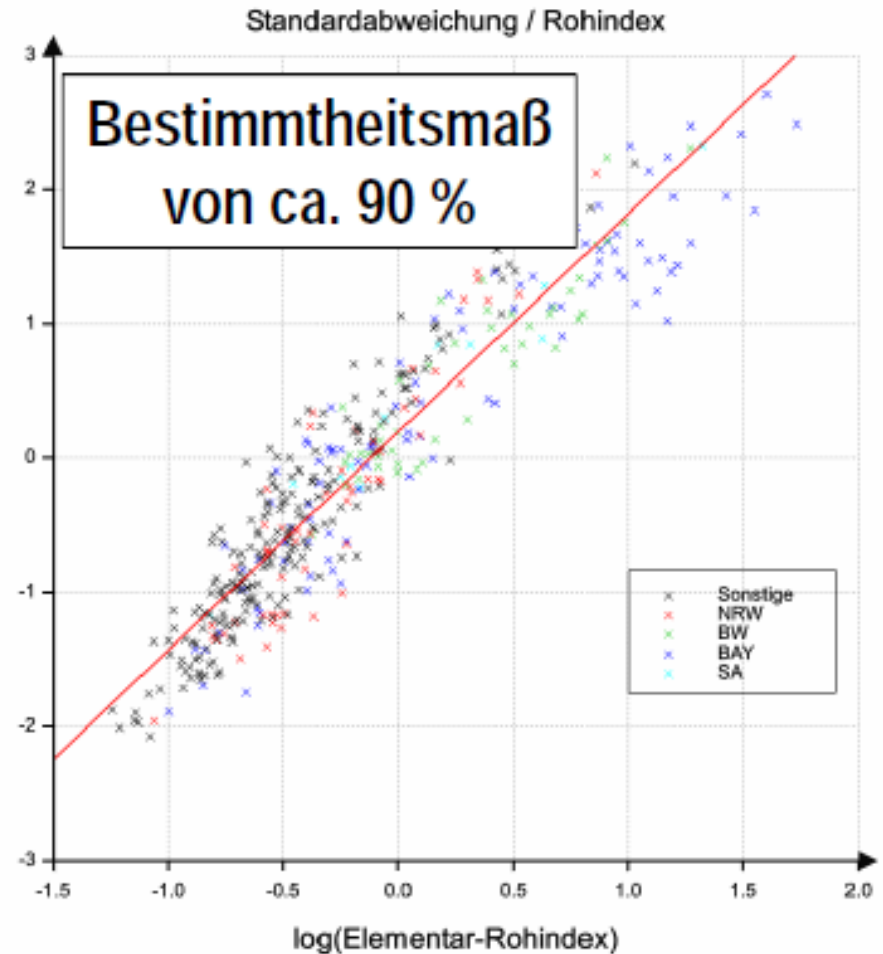
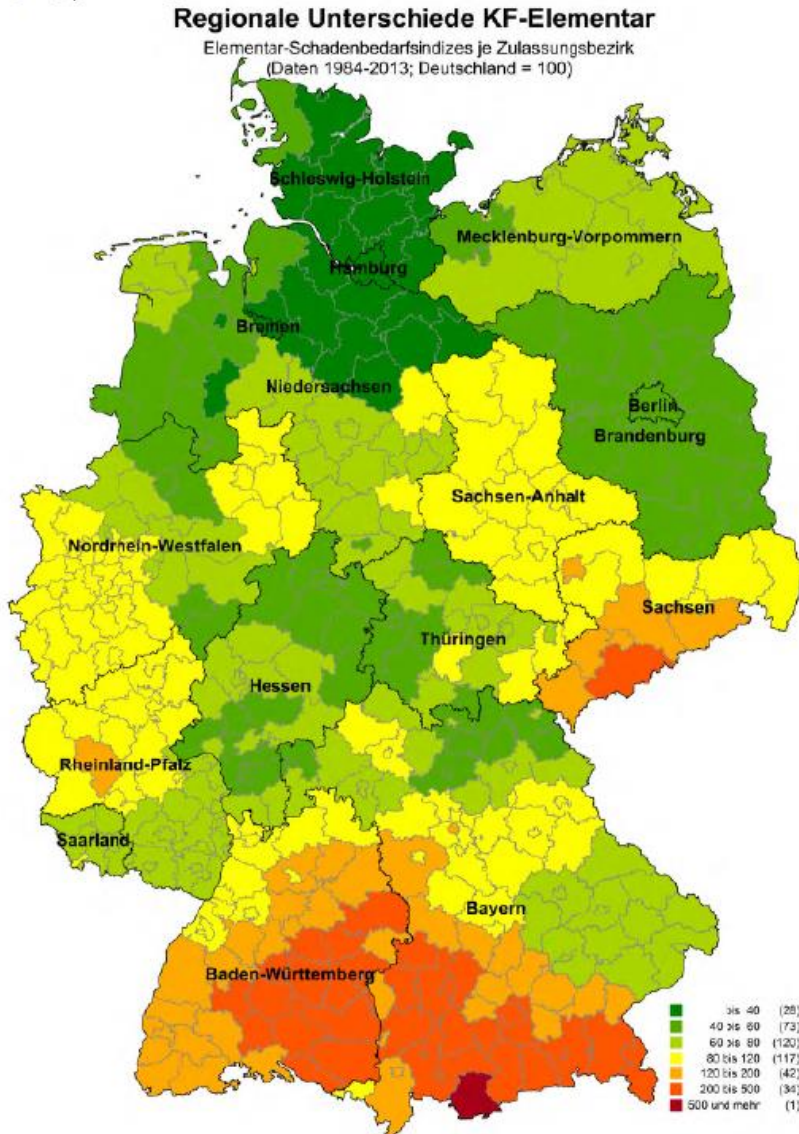
(\*) Monte Carlo Simulation mit 2 Mio. Jahren

# CAT events in MOD; market modell data results

- 2013 event(s) Andreas and Bernd: € 20.20 = about 1 in 18 years
- Munich 1984: € 49.80 at 2013 prices; modell says about 1 in 120 years; but different loss adjusting today

Wie oft wird c oder mehr erreicht		Schadenbedarfs-grenze	Mittlerer Bedarf bei Kupierung an der Grenze c	Mittlerer Bedarf für Jahre oberhalb der Grenze c	Mittelwert des oberhalb c wegekupierten Bedarfs
Jährlichkeit	Unterschreitungs-wahrscheinlichkeit	Quantil	Beschränkter Erwartungswert	Fernerer Erwartungswert	Mittlerer Überschadenbedarf
Return period	Probability	Return level	Limited mean	Far Mean	Upper Mean
J	$F(c)=1-1/(5,5-J)$	c	$LM_0$	$FM_0=c+J*UM_0$	$UM_0=M-LM_0$
[Jahre]	[%]	[EUR]	[EUR]	[EUR]	[EUR]
2	90,91	5,39	1,85	6,65	0,63
3	93,94	7,14	1,98	8,65	0,50
4	95,45	8,62	2,06	10,32	0,43
5	96,36	9,92	2,11	11,78	0,37
10	98,18	14,90	2,24	17,34	0,24
20	99,09	21,60	2,33	24,76	0,16
30	99,39	26,49	2,36	30,14	0,12
40	99,55	30,46	2,39	34,49	0,10
50	99,64	33,85	2,40	38,20	0,09
60	99,70	36,83	2,41	41,46	0,08
70	99,74	39,52	2,42	44,39	0,07
80	99,77	41,97	2,42	47,08	0,06
90	99,80	44,23	2,43	49,52	0,06
100	99,82	46,33	2,43	51,81	0,05
150	99,88	55,19	2,44	61,43	0,04
200	99,91	62,27	2,45	69,10	0,03

# Cummulation Losses (mainly hail) 30%-500%



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@gdv\_de





# Appendix

# 1. Standardisation requirements for a uniform set of data

- (1) Central issue of the statistics manual
- (2) Each insurance company might use a different IT infrastructure but should deliver its data set in a fixed mandatory format
- (3) The structure of the uniform set of data is primarily based on the given tariff but should be open for extensions and refinements and other official sources (driving licence, registration-document, data from the vehicle registration office, ...)

- (4) The structure of the uniform data set should be well considered, e. g. it should
- give enough leeway for modifications and refinements without noteworthy effort.
  - include a lot of data fields which can be used by the companies for their own individual purposes.
  - In Germany the GDV standard record format is not only used by the association's member companies but also by others as brokers and consultancy firms.

- (5) The data on contracts on the one hand and on claims on the other hand are usually handled separately within the companies (frequently claims management is outsourced). That is why it might be helpful to distinguish between
- data records on contracts and
  - data records on claims

(6) Standard data record on contracts should include

- a code number for the insurance company
- a code number for the insured person

(both information are necessary to match the information on the contract with the corresponding information on claims)

- the date of start and expiration of the contract (to take into account how long the policyholder was insured within a year  
⇒ to calculate standardised contracts)
- all information on relevant tariff and risk criteria

- (7) Standard data records on claims should include
- a code number for the insurance company
  - a code number for the insured person  
(to match contract and claims data)
  - all information on relevant tariff and risk criteria
  - all information on claims
    - date when and where the claim has occurred
    - character of claim (material damage, bodily injury, ...)
    - claims payment
    - claims provisions
    - ...

- (8) The structure of both sort of records should be similar and consistent to each other.
  
- (9) There should be sufficient data fields in the standard data record for each tariff criteria, e. g. one data field for the distinction between the different sort of vehicles (passenger cars, lorries, busses etc.) and additive data fields for further characteristics (lorries less than 10 tons/more than 10 tons, busses less than 20 seats/more than 20 seats etc.)

(10) It is better to have detailed than aggregated information, e. g. :

It is better to record the postal code or the district where the policyholder is registered than to record only the regional class! On basis of these information modifications or refinements respectively can easily be done.

The same is true for the tariff criteria kW. Better to record the actual kW power than only the kW class to be armed for the case of modifications.



(11) Exception: bonus / malus system

Particularly for bonus/malus recording the complete claims history of each policyholder might be very elaborate and costly. Much easier it is to record the bonus/malus class only. Provided each company obeys the rules of the bonus/malus system this information is absolutely sufficient.

(12) Last but not least:

A statistics manual should define each data field as accurate as possible. E. g. what is exactly meant by claims payment and claims provision? What should be included?

## 2 Requirements on data management

Database containing summary information about each dataset reported from insurance companies:

- delivery date
- reported insurance year
- reported classes of insurance
- insurance company (code number)
- number of records, claims
- contact person(s) in insurance company
- remarks: errors and implausibilities

Database including the codes of the statistics manual, their groupings and relations to each other, e. g. regarding:

- sort of vehicle
- bonus-malus classes
- kW-classes
- postal code/district
- etc.

### 3. **Checking and evaluating the data**

Step 1: Checking the data (e. g. by means of a delivery programme service) within the insurance company

Step 2: Checking the data within the Institute of Risk by means of the same delivery programme service regarding

- “formal errors”, e. g. if in a data field a code is reported which is not existent or is not defined
- “can-be errors” (implausibilities), e. g. if the claims payment is untypically high or low (⇒ enquire call with the regarding company)

Step 3: In case of too many errors in the reported data set the reporting company should be requested to correct the data and re-deliver them to the Institute of Risk.

It is crucial to eliminate errors in the data set already in the company's own data management system. Otherwise one runs the risk that the same errors will be carried forward from year to year. Moreover the insurance company itself should have an interest in a valid data basis (for calculation purposes).

Step 4: The whole process of compiling market statistics should be understood as a process of controlling.

Are the resulting market statistics feasible and adequate for their purposes?

The results should be evaluated from different angles, e. g. with the focus on different risk/rating criteria.

Step 5: In MTPL it could be considered to let the supervisory authority take an appropriate part in the process of evaluating the statistics as an additional controlling instance.



Step 6: The insurance industry which has to deliver the data should be involved in the process of assessing the market statistics.

That could be done within a committee which includes experts and representatives of the insurance companies, actuaries from the Institute of Risk and maybe also representatives of the supervisory authority.