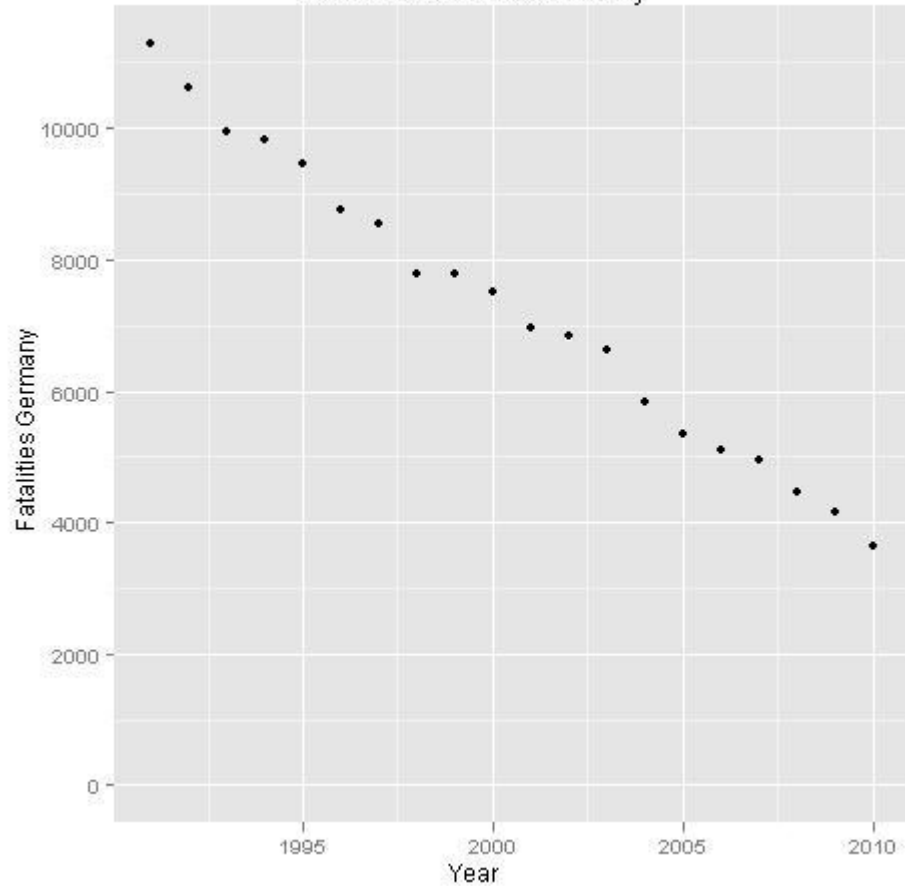


Germany

Fatalities

Plot of fatalities in Germany



Since 1990, the fatalities have been decreasing 4.6% per year

- The development of the number of fatalities from 1991 is almost a linear decrease from more than 1100 fatalities in 1991 to less than 4000 in 2010.
- On average this amounts to an annual decrease of 4.6%.

Registration of fatalities

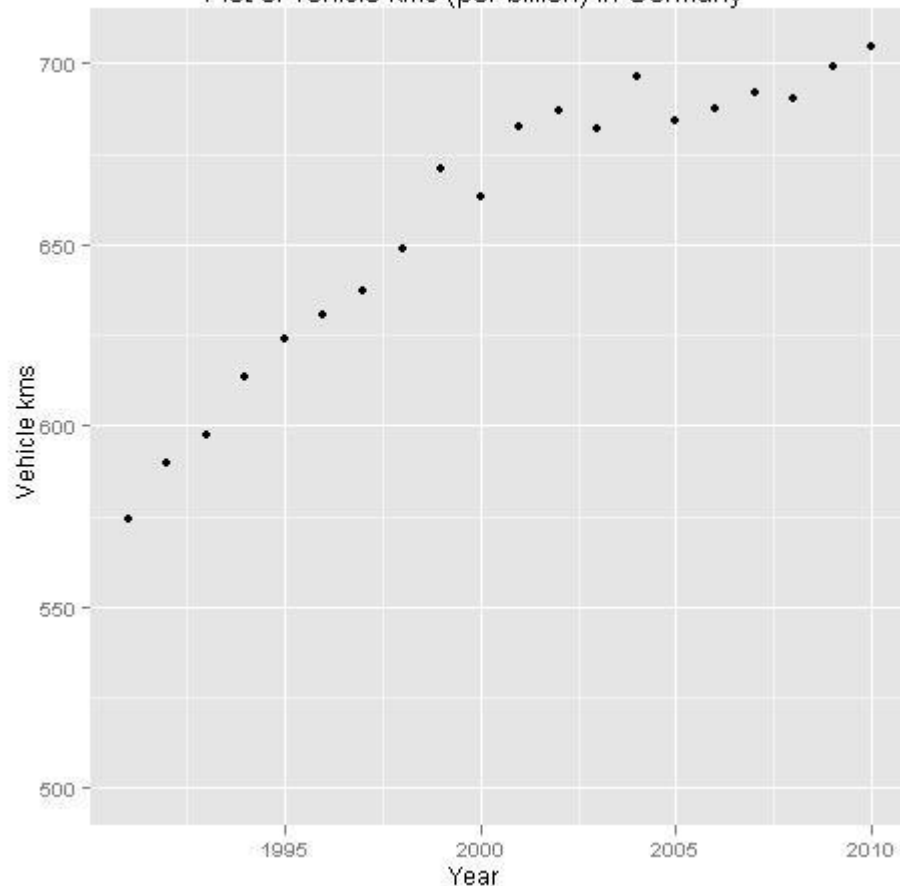
- In October 1990, the German Democratic Republic (GDR/East Germany) and the Federal Republic of Germany (FRG/West Germany) were joined.
- Separate fatality data for East and West Germany exist from 1965 to 1998.
 - o It is however suspected that the East German data before 1991 were subject to under registration.



Road Safety Development - Germany

Traffic Volume

Plot of vehicle kms (per billion) in Germany



In the 90s mobility increased by 2.5% annually. Now it is only 0.5%.

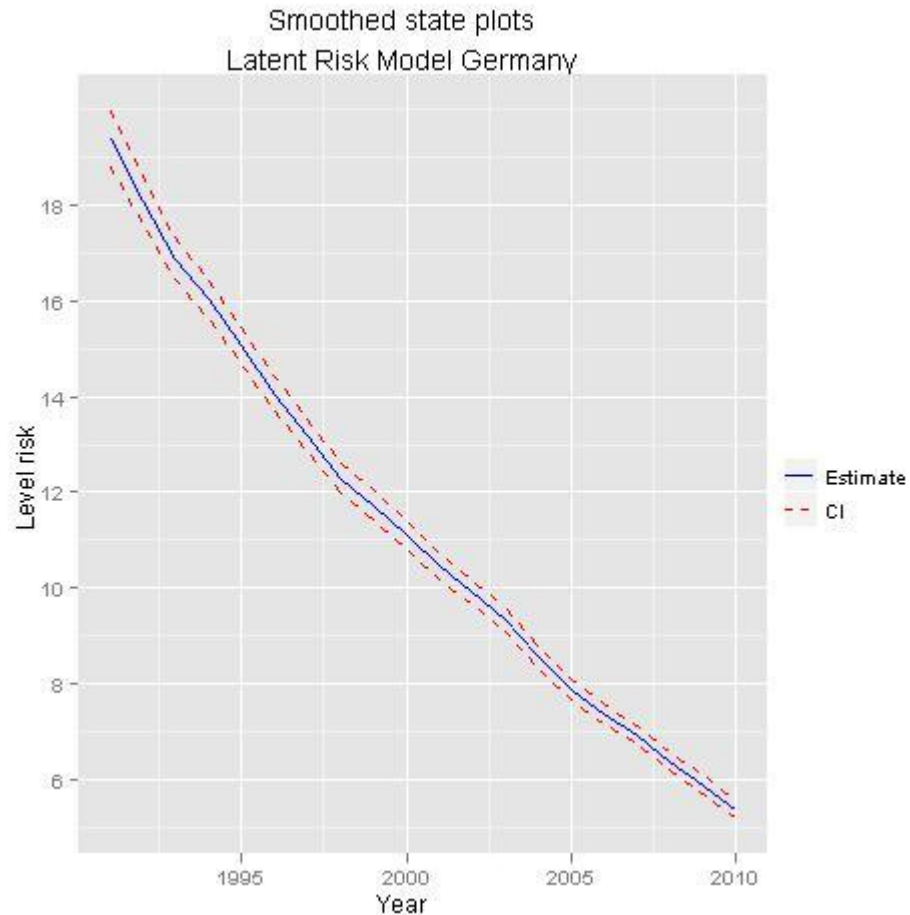
- The number of fatalities depends strongly on the amount of traffic. To forecast the fatalities, the traffic volume (measured in vehicle kilometres) has to be forecasted first.
- The selected measure for traffic volume is the vehicle kilometres (in billions) per annum, which are considered from 1991 onwards.
- Development:
 - o 1991 and 1998: increase by +/- 2.5% per annum.
 - o 1999 to 2005: fluctuations.
 - o 2005 to 2010: increase by +/- 0.5% per annum.
- Relation between traffic volume and fatalities:
 - o Non-significant for post 1991 data for reunified Germany
 - o Significance could be established on a longer series based on West German data.
 - o Relation is assumed to be present.



Road Safety Development - Germany

Fatality Risk

- The fatality risk is the number of fatalities per billion (10^9) vehicle kilometres.
- Estimation model – technical definition:
 - o Latent Risk Model [1,2]
 - o Fixed level exposure, fixed slope risk.
- CI: 68% confidence interval



The fatality risk has been decreasing by 6.6% yearly

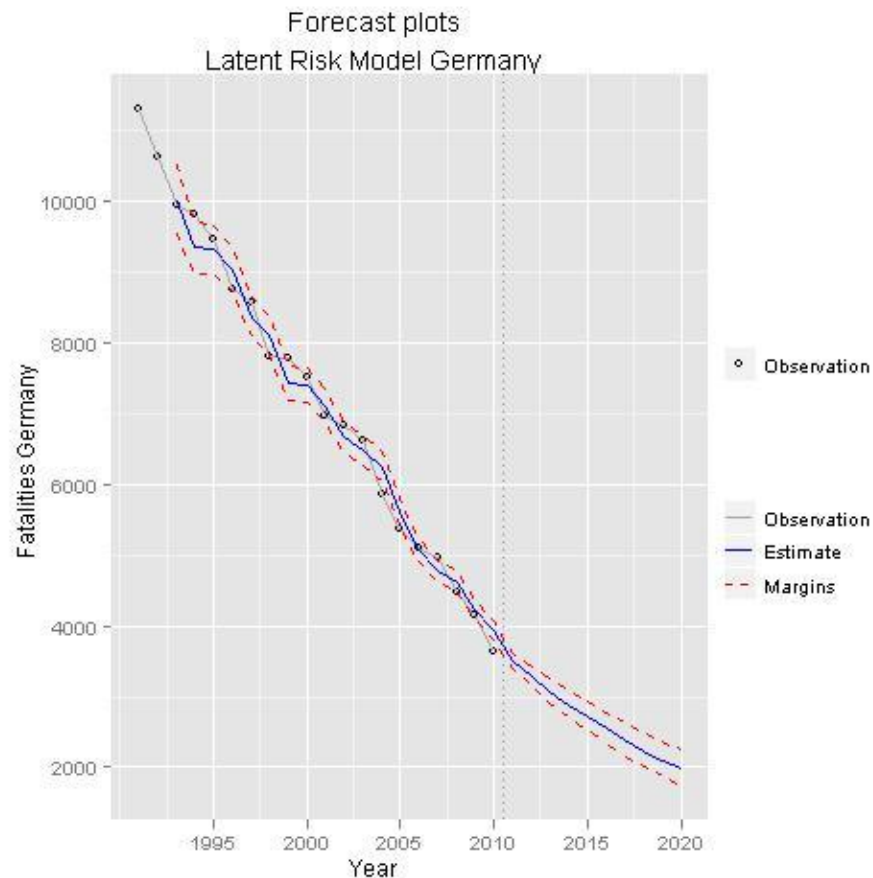
- The risk for fatalities in Germany has reduced from almost 20 per billion vehicle kilometres in 1991 to less than 6 per billion vehicle kilometres in 2010.
- This amounts to a mean decrease of 6.6% per year.



Road Safety Development - Germany

Forecasts to 2020

- If road safety is improved at the same rate as previously and the past development of mobility continues, the following forecasts can be made for the number of fatalities in 2020:



If RS efforts continue at the same level, the expected number of fatalities in 2020 is 1973.

Forecast of road-traffic fatalities in Germany up to 2020

Year	Prediction	Lower CI	Upper CI
2011	3497	3273	3735
2012	3281	3004	3585
2013	3079	2761	3434
2014	2889	2539	3287
2015	2711	2336	3147
2016	2544	2148	3014
2017	2388	1974	2887
2018	2240	1814	2767
2019	2102	1665	2654
2020	1973	1528	2547

Disclaimer

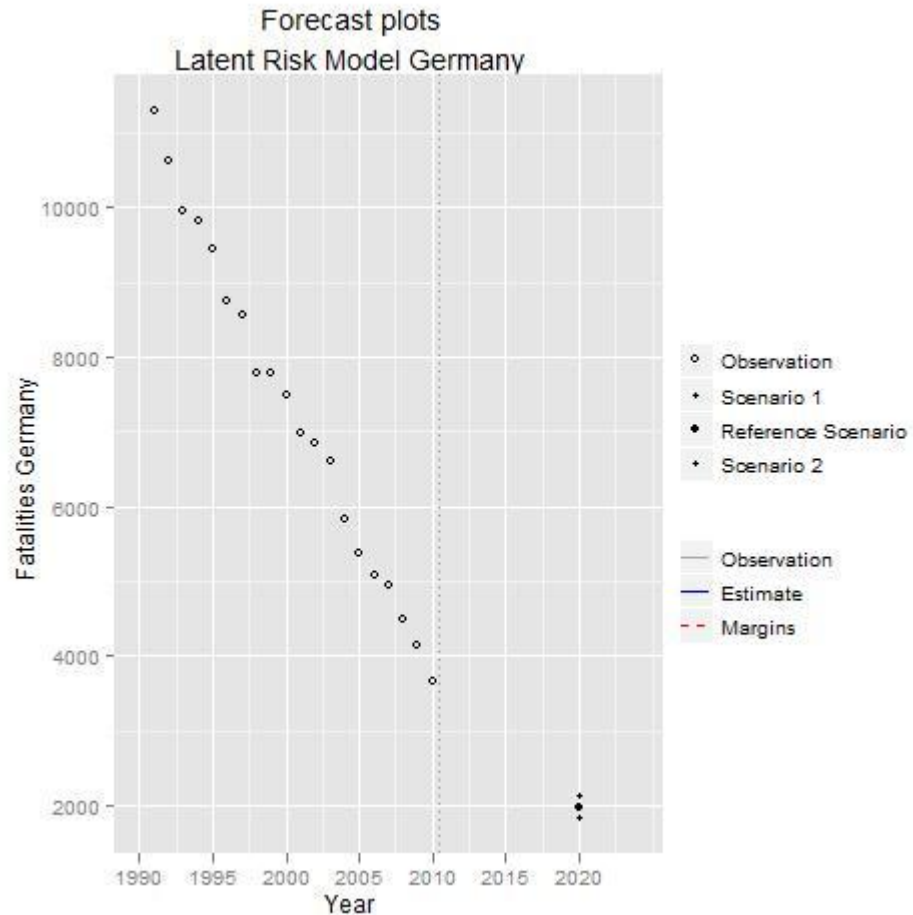
- Statistical forecasting does not offer a definite prediction of what is *actually* going to happen in the future.
- The estimates are based on the “business as usual” assumption: no *principal* changes between past and future development.
- Even in these conditions future outcomes are uncertain. This uncertainty is represented in the confidence intervals (plotted in the red margins: 68%; printed in table: 95%).



Road Safety Development - Germany

Scenarios

- There is some uncertainty about the development of the fatalities in Germany, for a good part due the development in traffic volume.
- To illustrate that, three point-estimates for fatalities in Germany 2020 are plotted assuming three different **scenarios for traffic volume**.
 - o Reference: Growth in vehicle kilometers (vkm): (forecasted value)
 - o Scenario 1: Strong growth in vkm (forecast+ 1 standard deviation)
 - o Scenario 2: Decrease of vkm (forecast - 1 standard deviation)



Scenarios for Traffic Volume

	<i>Vehicle kilometers (billions)</i>	<i>Road traffic fatalities</i>
Situation 2010:	705	3648
Prediction 2020 according to mobility scenarios:		
- Continuation of development (growth)	737	1973
- Strong growth	798	2129
- Decrease	680	1828



References

[1] Dupont & Martensen (Eds.) 2012. Forecasting road traffic fatalities in European countries. Deliverable 4.4 of the EC FP7 project DaCoTA.

[2] Bijleveld F., Commandeur J., Gould P., Koopman S. J. (2008). Model-based measurement of latent risk in time series with applications. Journal of the Royal Statistical Society, Series A, 2008.

[3] EC National Expert for road accident statistics and road safety performance indicators.

[4] Martensen & Dupont (Eds.) 2010. Forecasting road traffic fatalities in European countries: model and first results. Deliverable 4.2 of the EC FP7 project DaCoTA.

[5] Commandeur, J. & Koopman, S.J. (2007) An Introduction to State Space Time Series Analysis. Oxford University Press.

