Road Safety PIN

Methodological note (Flash6): Regression estimation of average annual percentage reduction in deaths from a time series of number of deaths

The average yearly reduction can be calculated from any two years figures if assuming a uniform annual percentage reduction over the period considered as follows:

$P(A)= 1-(Y_{t2}/Y_{t1})^{1/(t2-t1)}$ x100%

where Y_t stands for the number of deaths in any year *t* and *P(A)* stands for the average yearly reduction over the period considered.

<u>Example:</u>
(halving the number of deaths in the EU)

Y_{t1}=50,000 (1), Y_{t2}=25,000 (0.5) over the period 2001-2010 (2010-2001=(t_2-t_1)=9)

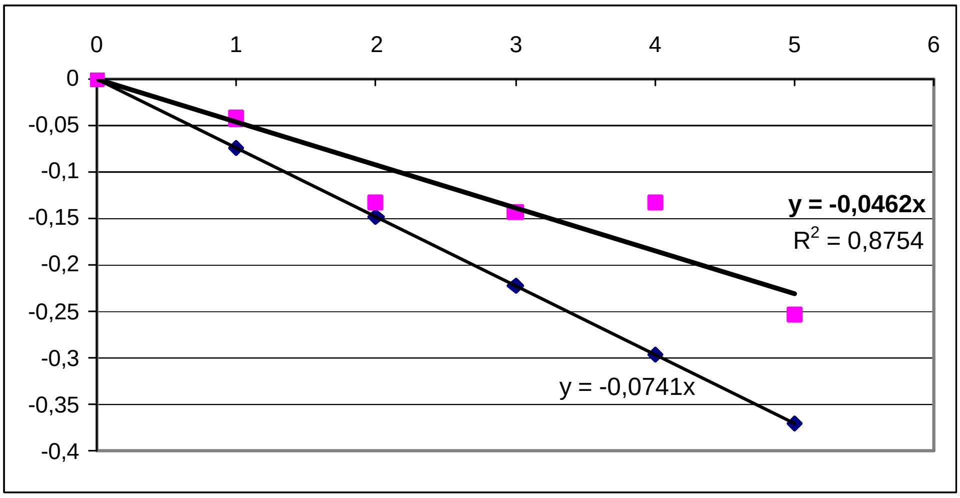
$P(A)=1-(0.5)^{1/9}$=0.07413=7,4% (rounded for practical purposes)

Halving over 9 years requires a uniform annual percentage reduction of 7.413 per cent (7.4 per cent for practical purposes).

For estimating the average annual percentage reduction in deaths achieved by a country between year 0 and year *N* (*e.g.* between 2001 and 2006 with *N* = 5 for comparison with the required 7.4 per cent) one should make use of the whole time series of numbers of deaths, not just the numbers in years 0 and *N*.

Let the average reduction per year as a percentage of the previous year be *p*. If Y_n is the number of deaths in year *n*, then we wish to fit a model $Y_n = Y_0(1 – p/100)^n$.

This is equivalent to $\ln(Y_n/Y_0) = n\ln(1–p/100)$ so if we fit $\ln(Y_n/Y_0) = an$ by linear regression, then *a* is the estimate of $\ln(1 – p/100)$ and *p* is estimated by $100(1 – e^a)$.



In this figure illustrating the use of the method and constructed for Finland, the function $\ln(Y_n/Y_0) = an$ corresponds to the function *y=ax.* The targeted reduction curve is shown together with the fitted (linear regression) line.