5.1 The Kolmogorov-Smirnov test

The data given for the example are shown in the histograms of Figure 1.

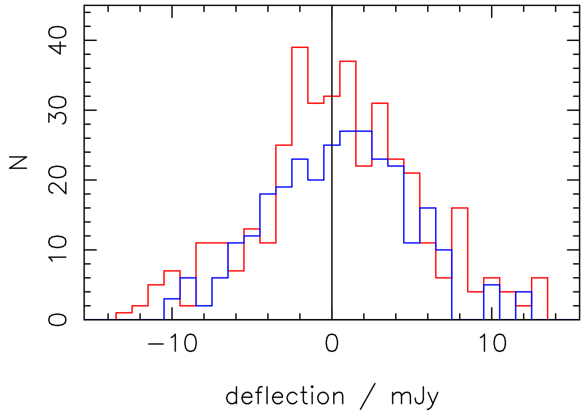

Figure 1: Radio flux-density measurements giving rise to the smaller (m=290) sample were at random sky positions and are represented by the blue histogram; those of the larger sample (n=386, red histogram) were taken at the positions of optical galaxies. Noise gives rise to both positive and negative measurements.

The eye is a good guide. There appears to be a slight preference for larger flux densities for the red (galaxy-position) sample over the control sample, but it does not look very convincing.

It isn't statistically. The Kolmogorov-Smirnov two-sample test looks for the largest difference in the normalized integral distributions (equation 5.12), and this turns out to be 0.067 at +7.0 mJy. We are looking at a one-tail test here - we are examining the hypothesis that the red-histogram deflections are on average larger than the blue-histogram (random sky) deflections. Calculating the corresponding statistic χ^2 via equation 5.19 (m=290, n=386) yields a value of 3.01. Consulting our table of χ^2 for 2 degrees of freedom yields a 'significance level' of about 0.25. We're in no-man's land. There is an indication that the alternative hypothesis, that the flux densities at galaxy positions are larger, is true. However, the test result is far from rejecting the null hypothesis, that the distributions are not different and that the deflections are drawn from the same population.