zCOSMOS STATISTICAL WEIGHTS

The previous version of this page in an ASCII file: weights.README

In green the the description of the new computation of weights as a function also of redshift.

1. Definitions

The starting catalogues are

BRIGHT_zcosmos_spectroscopy_one_v3.3 (10644 objects)
BRIGHT_zcosmos_catalogue_v2.8 (56295 objects)

Basic steps:

a) I compute the weight w as

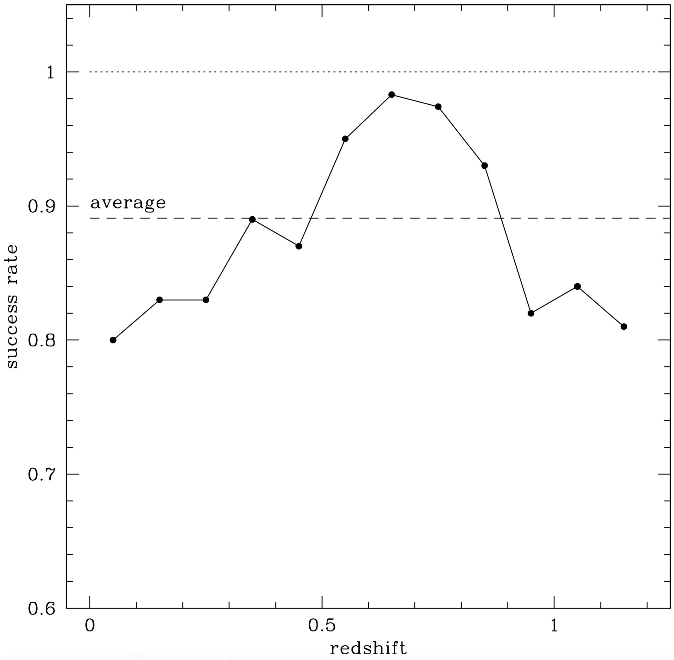
w = 1/TSR * 1/SSR

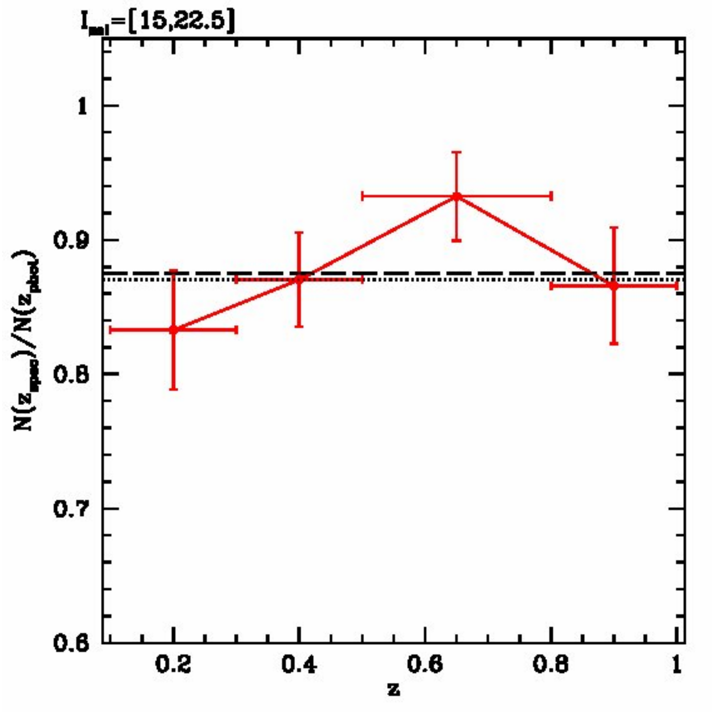
The Target Sampling Rate (TSR) should not depend on the size of objects, due to the procedure chosen preparing the masks.

The TSR can eventually depend on the coordinates of the objects, since there are regions with a different number of passes. For LFs and MFs it should be statistically the same if we consider the average over the whole area.

The Spectroscopic Success Rate (SSR) depends only on the selection magnitude, and therefore I assumed that the weights too are only functions of the selection magnitude.

NOTE: as shown in Lilly et al. 2007 Fig. 9 this is not completely true, as the success rate depends on the features entering into the observed wavelength range. Therefore we estimated also the weights considering this dependence.
Fig 9 (left) and its analogous updated with the last spectroscopic catalogue and photometric redshifts (right):





where in the right plot I used the same redshift bins used for Luminosity and Mass Functions.

b) TSR = N_{spec}/N_{phot}

Since the selection of the zCOSMOS targets is not random over the whole photometric catalogue, I excluded from the N_spec and N_phot the following types of objects:

- ID<7* (objects considered in the P75 period, but no more included)

- Flag for mask design different from -8 (star), -7 and -5 (objects removed after visual check), -6 (i_select<15).

Moreover I always considered the objects in this magnitude range: $15 \leq i_{sel} \leq 22.5$

Obviously, the photometric catalogue I used is not the original one, but the sub-catalogue extracted in the same region of the
spectroscopic observations (taking into account the observed pointings and the exact design of the 4 VIMOS quadrants), containing 42153 objects.

c) SSR = N_{spec}(success)/N_{spec}(tot)

To have output values of SSR in the interval [0,1] we decided to adopt the same strategy we used in the VVDS, i.e. considering only galaxies (no QSOs, no stars, that are not part of the statistical sample for LFs and MFs) both in the numerator and the denominator of the ratio. Therefore I used:

SSR = $[N_{spec} - N_{star} - N_{QSO} - N_{failed}] / [N_{spec} - N_{star} - N_{QSO}]$

where N_{spec} is the same used in b).

We considered failures the objects with spectroscopic flags different from:

4.5, 4.4, 4.1, 3.5, 3.4, 3.1, 2.5, 2.4, 2.1, 1.5, 9.5, 9.4, 9.3,9.1,
24.5, 24.4, 24.1, 23.5, 23.4, 23.1, 22.5, 22.4, 22.1, 21.5, 29.5, 29.4, 29.3, 29.1.

In each magnitude bin the SSR has been computed in redshift bins]0.0,0.2],]0.2,0.4], etc.

2. Computation

Actually I divided the spectroscopic sample in 3 subsamples, because of significant differences in TSR or SSR: for instance, compulsory objects have a much higher TSR than the whole catalogue, whereas secondary targets have a much lower SSR than the primary ones.

Therefore the 3 classes are
1. random primary targets
2. random secondary targets (only their SSR is treated separately)
3. compulsory targets (only their TSR is treated separately)

I computed SSR, TSR and weights for the three classes in fixed or adaptive (i.e. with more or less the same number of spectroscopic objetcs in each bin) magnitudes bins.

In these files:

weights_n500.dat
weights_dm05.dat

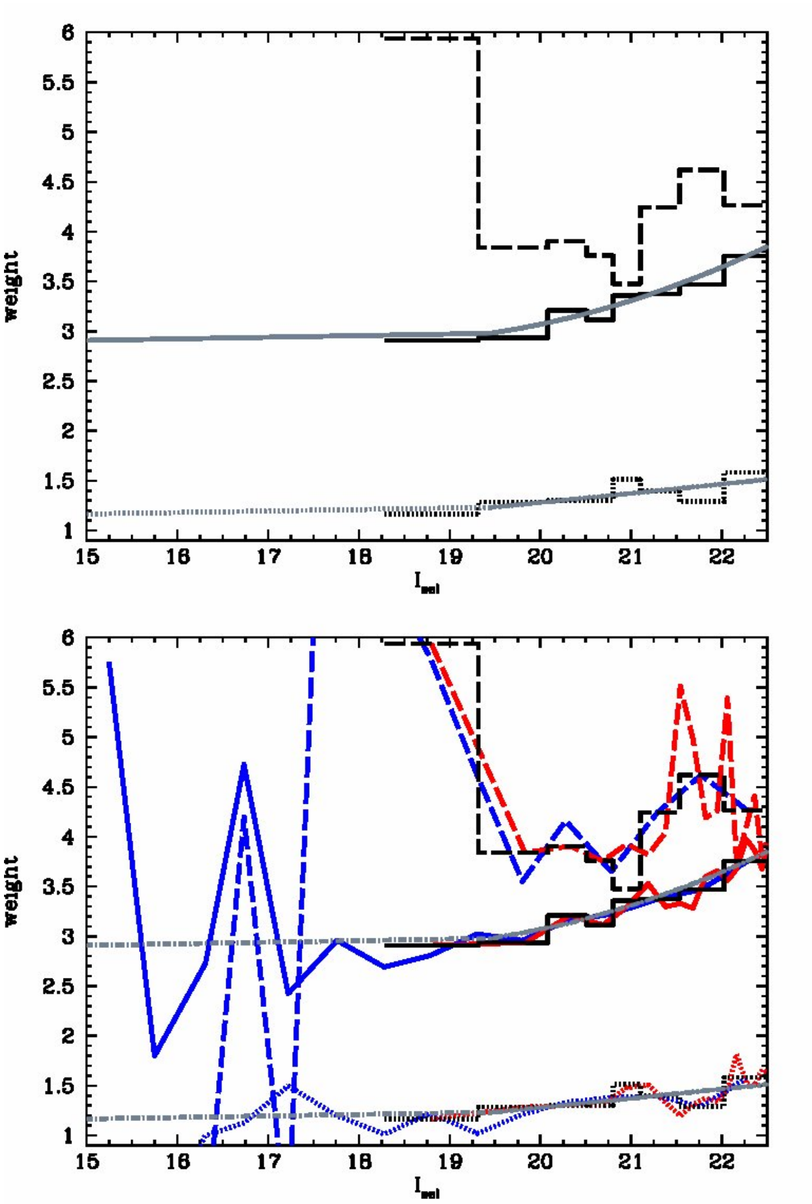
you can see the output of my programme and in the header a detailed description of the numbers you can find inside them.

And these are the same output files considering SSR as a function also of the redshift:

weightsz_n500.dat
weightsz_dm05.dat

We decided to smooth the weight function where possible, i.e. for samples 1. and 3., with a parabolic function.

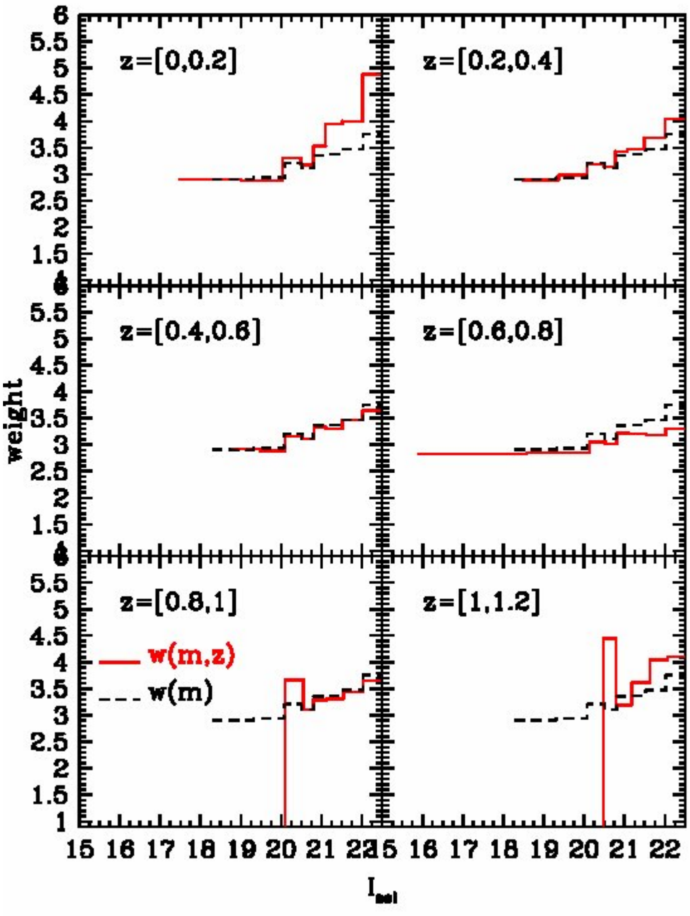
Here there is a plot showing the weight functions vs the selection magnitude:

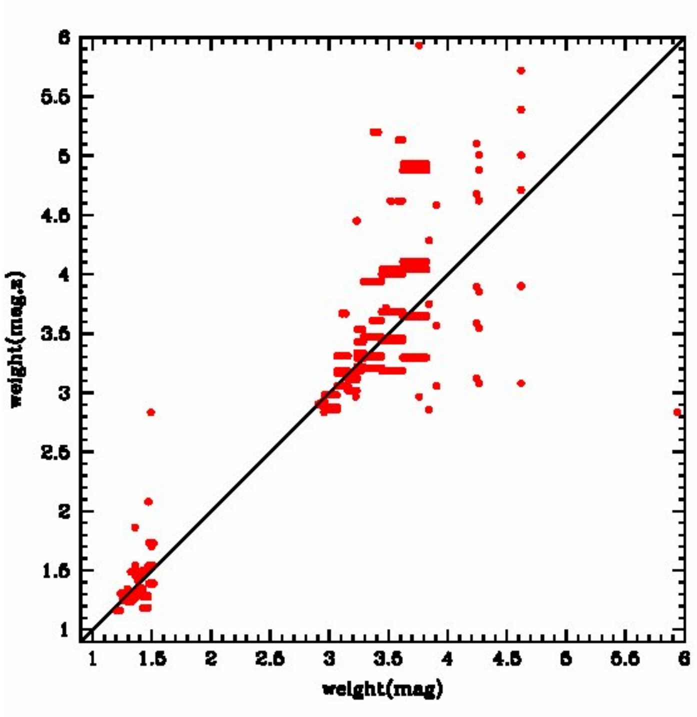


Left: from top to bottom: the weights for classes 2. (dashed lines), 1. (solid lines) and 3. (dotted lines). The gray lines are the smooth functions for random primary and compulsory objects. It is not possible to compute a smooth function for class 2. objects due to the scantiness of the sample. In black the combination of the two (dm variable at I_{sel}<21 and dm=0.5 mag at Isel>21, see weights_comb.dat file), which is the weight I used for random seconday target and for interpolation of the other 2 classes.

Right: the same of previous plot, but also with the binned weights. In blue the weights computed with a fixed bin in magnitude (0.5 magnitudes) and in red the weights with a constant number of objects per bin (~500 spectroscopic objetcs).

The comparison between the weights without and with the dependence on redshift for the class 1 objects (random primary targets) is shown in these plots:





Even if the differences in few redshift and magnitude bins are not negligeable, the effect on statistical computations like Luminosity functions is very small, with the results well inside 1 sigma uncertainties.
TO BE DONE: I still have to produce a smooth version of the weights as a function of magnitude and z.

Then, I assigned a weight to each object: objects not considered in the weighting procedure (like the ID=7*) have weight -99. Class 1 and 3 have smooth weights, whereas class 2 have binned weights.

The results are in this file:

BRIGHT_zcosmos_spectroscopy_one_v3.3.weight_smooth2

In the file

BRIGHT_zcosmos_spectroscopy_one_v3.3.weight_smooth7qso

I assigned also to QSOs and ID=7* a weight, following their magnitude and class.

I discourage the use of these weights for objects not considered in the computation, nonetheless I think that the differences of the weights including or excluding them are of the order of few %.

I provide also the analogous files with the weights as a function of redshift. Due to the lack of statistics, to avoid to increase the noise for secondary targets, I considered the weights in the files above, i.e. without the dependence on z for class 2 objects (therefore they will have their SSR, but computed only in magnitude bins).
Compulsory target were considered to share the same SSR than primary targets, and this has been preserved also in this version.

All the weights are binned, when I will have time to compute the smooth version I will update the page with the new ones.

BRIGHT_zcosmos_spectroscopy_one_v3.3.weightz2

BRIGHT_zcosmos_spectroscopy_one_v3.3.weightz2_7qso

Bologna zCOSMOS home page

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