

The Windows Computer Program BetaRV2.EXE

The Windows program BetaRV2 can be used to determine the correlation to use between two normal random variables in order to generate two correlated beta variables using the methods described by Tadeu dos Santos Dias *et al.* (2008) with the correlation wanted for the beta random variables.

Program Input

When the program is started it first asks for the mean and standard deviation required for beta variable 1, and then for the mean and standard deviation for beta variable 2. The program then asks how many pairs of random beta variables should be generated with these means and standard deviations in order to determine the relationship between the normal correlation used to generate the beta variables and the correlation between the beta variables that this leads to. In general about 5000 sets of generated data seems a reasonable choice.

Following this input to the screen, the program generates pairs of standard normal random variables with correlations from -0.99 to + 0.99 in steps of 0.01, converts these to beta random variables with the required means and standard deviations, and finds the correlation generated between the beta random variables.

Program Output

Some sample output from the program is shown below, with comments in italics on the right-hand side. In this case the beta correlations were estimated from 5000 simulated sets of data. The last part of the output shows, for example, that if data are generated with a normal correlation of -0.99 then the generated beta data will have a correlation of -0.92. This table makes it possible to decide which normal correlation is needed in order to produce the beta correlation that is required. In general, this depends on the means and standard deviations chosen for the beta random variables.

```
#####
#                               BetaRV2                               #
#                               #                                     #
# Program to find the beta distribution correlation that             #
# arises when two variables are generated by transforming           #
# correlated normal variables. The beta variables are               #
# defined by their means and standard deviations, which are        #
# input to the program.                                             #
#                               #                                     #
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#                               Version 1.0 (March, 2007)           #
#####
```

Date: 23/ 2/2008 Time: 18:10

Number of sets of data generated for estimating each beta
correlation = 5000 *Input choice*

Random number seed = 12345 *Input choice*

Beta Means and Standard Deviations

Dist	Mean	SD	<i>Input choice</i>
1	0.200	0.200	
2	0.500	0.100	

Negative Beta Correlations Generated from Normal Correlations
(a five point moving average is used for smoothing)

Norm	Beta	Norm	Beta	Norm	Beta	Norm	Beta	Norm	Beta
-0.99	-0.92	-0.98	-0.91	-0.97	-0.91	-0.96	-0.90	-0.95	-0.88
-0.94	-0.87	-0.93	-0.86	-0.92	-0.86	-0.91	-0.85	-0.90	-0.83
-0.89	-0.83	-0.88	-0.82	-0.87	-0.81	-0.86	-0.81	-0.85	-0.79
-0.84	-0.78	-0.83	-0.77	-0.82	-0.76	-0.81	-0.75	-0.80	-0.74
-0.79	-0.73	-0.78	-0.73	-0.77	-0.73	-0.76	-0.71	-0.75	-0.69
-0.74	-0.70	-0.73	-0.69	-0.72	-0.67	-0.71	-0.66	-0.70	-0.64
-0.69	-0.64	-0.68	-0.62	-0.67	-0.62	-0.66	-0.61	-0.65	-0.61
-0.64	-0.58	-0.63	-0.57	-0.62	-0.59	-0.61	-0.58	-0.60	-0.54
-0.59	-0.55	-0.58	-0.55	-0.57	-0.54	-0.56	-0.53	-0.55	-0.51
-0.54	-0.50	-0.53	-0.48	-0.52	-0.50	-0.51	-0.50	-0.50	-0.47
-0.49	-0.47	-0.48	-0.46	-0.47	-0.44	-0.46	-0.43	-0.45	-0.43
-0.44	-0.40	-0.43	-0.42	-0.42	-0.40	-0.41	-0.40	-0.40	-0.36
-0.39	-0.36	-0.38	-0.34	-0.37	-0.34	-0.36	-0.34	-0.35	-0.32
-0.34	-0.32	-0.33	-0.33	-0.32	-0.30	-0.31	-0.29	-0.30	-0.27
-0.29	-0.27	-0.28	-0.26	-0.27	-0.27	-0.26	-0.24	-0.25	-0.25
-0.24	-0.20	-0.23	-0.21	-0.22	-0.21	-0.21	-0.19	-0.20	-0.19
-0.19	-0.16	-0.18	-0.17	-0.17	-0.17	-0.16	-0.15	-0.15	-0.16
-0.14	-0.13	-0.13	-0.13	-0.12	-0.13	-0.11	-0.09	-0.10	-0.09

-0.09	-0.09	-0.08	-0.06	-0.07	-0.06	-0.06	-0.07	-0.05	-0.04
-0.04	-0.06	-0.03	-0.01	-0.02	-0.01	-0.01	-0.03	0.00	0.01
0.01	0.00	0.02	0.00	0.03	0.04	0.04	0.03	0.05	0.04
0.06	0.08	0.07	0.07	0.08	0.06	0.09	0.08	0.10	0.09
0.11	0.10	0.12	0.10	0.13	0.11	0.14	0.14	0.15	0.13
0.16	0.15	0.17	0.17	0.18	0.17	0.19	0.19	0.20	0.16
0.21	0.19	0.22	0.20	0.23	0.21	0.24	0.24	0.25	0.22
0.26	0.23	0.27	0.27	0.28	0.26	0.29	0.26	0.30	0.29
0.31	0.29	0.32	0.32	0.33	0.29	0.34	0.29	0.35	0.30
0.36	0.34	0.37	0.36	0.38	0.34	0.39	0.39	0.40	0.38
0.41	0.37	0.42	0.40	0.43	0.40	0.44	0.41	0.45	0.42
0.46	0.44	0.47	0.43	0.48	0.43	0.49	0.46	0.50	0.46
0.51	0.48	0.52	0.47	0.53	0.51	0.54	0.50	0.55	0.51
0.56	0.50	0.57	0.50	0.58	0.55	0.59	0.54	0.60	0.56
0.61	0.56	0.62	0.57	0.63	0.58	0.64	0.60	0.65	0.60
0.66	0.62	0.67	0.63	0.68	0.65	0.69	0.64	0.70	0.66
0.71	0.65	0.72	0.68	0.73	0.68	0.74	0.70	0.75	0.70
0.76	0.71	0.77	0.72	0.78	0.73	0.79	0.73	0.80	0.75
0.81	0.75	0.82	0.76	0.83	0.77	0.84	0.78	0.85	0.79
0.86	0.80	0.87	0.81	0.88	0.82	0.89	0.83	0.90	0.84
0.91	0.85	0.92	0.86	0.93	0.86	0.94	0.87	0.95	0.89
0.96	0.90	0.97	0.90	0.98	0.91	0.99	0.92		

Reference

Tadeu dos Santos Dias, C., Samaranayaka, A. and Manly, B.F.J. (2008). On the use of correlated beta random variables with animal population modelling. *Ecological Modelling* (accepted for publication).