

Re: Generating a Matrix of Random values with a specified Correlation

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- *From:* James Waldby <no@xxxxx>
 - *Date:* Thu, 25 Sep 2008 18:01:56 -0500
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On Thu, 25 Sep 2008 11:30:06 -0700, willgarrison wrote:

On Sep 25, 12:17 pm, Robert Israel... wrote:

willgarri...@xxxxxxxxxx writes:

I'm trying to generate two columns of random values where each value is between 1 and 5 where the matrix as a whole has a specified correlation.

Ideally this is what I'm looking for:

Example algorithm:

1. Generate 20 random values between 1 and 5 in array A. 2. Generate 20 random values between 1 and 5 in array B. 3. Create a 3rd array (array C), where array B is sorted so that array A and array C have a correlation of X.

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Start with your two arrays A and B. Let $a = \text{Var}(A)$, $b = \text{Var}(B)$, $c = \text{Cov}(A, B)$, so the (Pearson) correlation of A and B is $\rho = c / \sqrt{a b}$. Let's suppose the desired correlation $x > \rho$ (where of course $x \leq 1$). Consider $C = tA + (1-t)B$, where $0 \leq t \leq 1$. We have $\text{Cov}(A, C) = ta + (1-t)c$ and $\text{Var}(C) = t^2 a + 2t(1-t)c + (1-t)^2 b$ so the correlation of A and C

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is $(ta + (1-t)c)/\sqrt{a^2 + 2t(1-t)c + (1-t)^2 b}$). Set this equal to x and solve for t : there should be exactly one solution in the interval $0 \leq t \leq 1$.

On the other hand, if $-1 \leq x < \rho$,
try $C = tR + (1-t)B$ where each $R_j = \rho - A_j$. --
Robert Israel

....

I think this is not only over my head but perhaps not the exact answer I'm looking for. However, it being over my head, it's impossible for me to know.

Let me phrase this as a simpler question with hopes of improving my chances of understanding your response.

[snip restatement]

R.I. has given you a method of generating two vectors A and C with $\text{corr}(A,C)$ equal to a given value X .

In my earlier response, I misinterpreted your first post, and thought you wanted to reorder the elements of a given matrix B to form C to approximate a specified correlation, as opposed to just generating a vector C with given correlation with A .

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jiw

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