

# Re: Gamma distribution & Markov chain Monte Carlo

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  - *Date:* Fri, 18 Jul 2008 09:23:00 -0700 (PDT)
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On Jul 18, 2:59 am, Maniaoh <n.hoai...@xxxxxxxxxx> wrote:

Hi Lucas,

Just as you say, a proposal of normal distribution does nothing harmful to the target distribution if it generates value less than zero. It can be confirmed through explicit expression of alpha. Nevertheless, when I allow normal distribution to generate less-than-zero values, the target distribution does not seem right. When I draw histogram, on the negative side of axis, some values of y (target) are generated.

You exactly state what I did, even the code :), I took a guard and therefore the proposal normal distribution became a truncated one. In this case, the result is better, i.e., histogram. Do you have any comment on this?

If you are still seeing negative values of y then there is something wrong in your code. I'm sure truncating y to be positive does improve the histograms, but that doesn't mean it's correct. :)

I implemented your code myself as follows. It appears to work fine --- no negative y values and a histogram of 10,000 samples is a pretty good looking gamma. Use this as a reference to check your own code.

```
function s = gamma_mcmc(n)

s = zeros(1,n);

gampdf = @(x,a,b) x.^(a-1) * exp(-b*x) .* (x>=0);
normpdf = @(x,mu,sig) exp(-0.5*((x-mu)/sig).^2);

a = 1;
b = 1;
sig = 1;

% Initialize chain at the mean of the gamma distribution
```

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```
x = a * b;

for i = 1:n,

% Generate a proposal from a normal distribution
x_star = x + sig .* randn;

% Calculate the M-H acceptance
q_x_given_x_star = normpdf( x, x_star, sig );
q_x_star_given_x = normpdf( x_star, x, sig );
p_x = gampdf( x, a, b );
p_x_star = gampdf( x_star, a, b );

alpha = (p_x_star * q_x_given_x_star) / (p_x * q_x_star_given_x );

if rand <= alpha
x = x_star;
end

s(i) = x;
end

.
```