
Problem 2

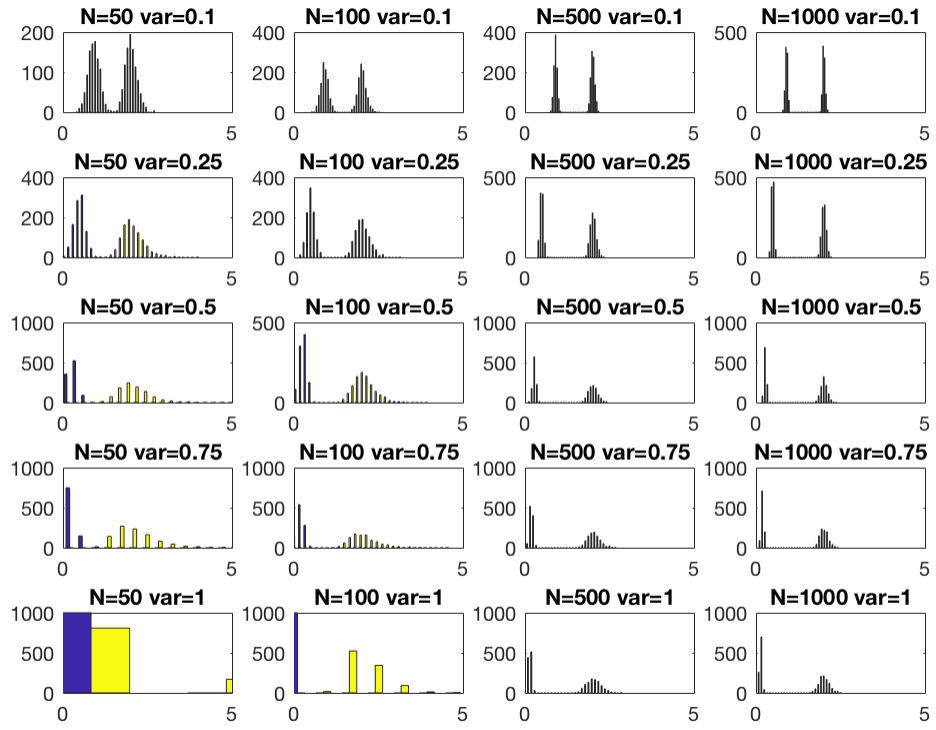
partial least squares done using plsregres in matlab and total least squares done using SVD (algorithm taken from wikipedia)

```
clear; clc;
nums = [50, 100, 500, 1000];
sigs = [0.1, 0.25, 0.5, 0.75, 1];
for i = 1:length(nums);
    for j = 1:length(sigs);
        run = totvspar(nums(i),sigs(j));
        subplot(5, 4,sub2ind([4, 5], i, j));
        hist(run,30);
        title('N='+string(nums(i))+ ' var='+string(sigs(j)));
        xlim([0,5]);
    end
end

function slopes = totvspar(n,sig)
slopes = zeros(1000, 2);
for i = 1:1000;
    x = rand(n,1);
    y = 2*x;
    xnos = normrnd (0, sqrt(sig), n, 1);
    ynos = normrnd (0, sqrt(sig), n, 1);
    xplus = x + xnos;
    yplus = y + ynos;

    [XL, YL,~,~,b] = plsregress(xplus,yplus,1);
    slopes(i,1) = b(2);
    slopes(i,2) = tls(xplus,yplus);
end
end

% total least square algorithm using SVD from wikipedia
function B = tls(X,Y)
[m n] = size(X); % n is the width of X (X is m by n)
Z = [X Y]; % Z is X augmented with Y.
[U S V] = svd(Z,0); % find the SVD of Z.
VXY = V(1:n,1+n:end); % Take the block of V consisting of the
    first n rows and the n+1 to last column
VYY = V(1+n:end,1+n:end); % Take the bottom-right block of V.
B = -VXY/VYY;
end
```



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