%%

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% Example 4.6 %

% Copulas in Portfolio Loss Computation %

% 20 Sectors %

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

ptfgran=dataset('XLSFile','Chap4copula20.xlsx');

ptfgran=ptfgran(:,{'SECTOR','ID','EXPOSURE','PD','LGD'});

% 2. Parameter set-up

%state1=1234567;

randn('state', 1234567);

ncustomer=size(ptfgran,1);

nsim=10000;

nsec=20;

corr=0.10;

for i=1:nsec

 for j=1:nsec

 if i==j

 corrgran(i,j)=1;

 else

 corrgran(i,j)=corr;

 end

 end

end

% 3. Copula random simulation

rndgran = copularnd('Gaussian',corrgran, nsim)';

% 4. Database enrichement with copula simulations

ssgran=(1:1:nsec)';

rndgran1 = dataset({ssgran, 'SECTOR'},...

 {rndgran(:,:),'NameRnd'});

joindbgran = join(ptfgran,rndgran1);

ptfcopulagran = double(joindbgran);

% 5. Default simulation and portfolio evaluation

simdefaultgran = NaN(ncustomer,nsim);

for i=1:ncustomer

 for j=1:nsim

 verif= ptfcopulagran(i,4)- ptfcopulagran(i,5+j);

 if(verif>=0)

 simdefaultgran(i,j)= (1-ptfcopulagran(i,5))\*...

 ptfcopulagran(i,3); % 1-LGD

 else

 simdefaultgran(i,j)= 1\*ptfcopulagran(i,3);

 end

 end

end

ptfvaluegran =sum(simdefaultgran);

% 6. Loss computation

percen=0.999;

lossgran=sum(ptfcopulagran(:,3)) - ptfvaluegran;

ELgran=sum(ptfcopulagran(:,3).\*ptfcopulagran(:,4)...

 .\*ptfcopulagran(:,5));

biasloss=(mean(lossgran)-ELgran)/ELgran;

qcopulagran=quantile(lossgran,percen);

ULcopulagran= qcopulagran - mean(lossgran);

ULcopulagran/sum(ptfcopulagran(:,3));

sortlossgran=sort(lossgran);

ES=mean(sortlossgran(1,percen\*nsim:end));

% Graph

figure; spessore=15; hold('on');

hist(lossgran, 80)

set(gca,'XLim',[100000 2000000])

title('Low correlation 20 sectors','Fontsize',spessore);

xlabel('Loss','Fontsize',spessore), ylabel('Frequency','Fontsize',spessore)

FontSizeAxes=spessore;

set(gca,'FontSize',FontSizeAxes)

set(gcf, 'PaperPositionMode', 'manual');

set(gcf, 'PaperUnits', 'centimeters');

set(gcf, 'PaperPosition', [0.5 0.5 28 20]); %left bottom width heigh

set(gcf, 'PaperOrientation', 'landscape');