function [res,fit\_param\_factor\_chosen,i\_chosen, Factor\_tag, fit\_param\_sorted] = CAT\_Prediction(Coefficients,param)

% clear all

% close all

% clc

% format long e

% DataSheet=xlsread('NSamples\_Factors\_Fits',1,'B2:T21');

Factor\_tag={'II', 'V', 'VII' , 'IX', 'x', 'VIII', 'ATIII', 'PC' ,'Fib'};

% k0=DataSheet(:,10);

% k1=DataSheet(:,11);

% k2=DataSheet(:,12);

% kn=DataSheet(:,13);

% kd=DataSheet(:,14);

NumFac=size(Coefficients,2);

options = optimset('MaxFunEvals',1e6,'MaxIter',1e6,'TolFun',1e-9,'TolX',1e-9);

% Choose fitting parameter

% param= kd;

%GENERAL

%first factor

i\_chosen=0;

for i=1:NumFac %!!

if min((i ~= i\_chosen)) == 1

param\_0 = ones(2,1);

Chosen\_factor=Coefficients(:,i);

[fit\_param\_factors ,res\_fit\_param] = lsqcurvefit(@fit\_param\_model,param\_0,[Chosen\_factor],param,[],[],options) ;

res\_fit\_param\_norm(i)=res\_fit\_param ;

fit\_param\_factors\_all(:,i)=fit\_param\_factors;

end

end

[res(1), i\_t]=min(res\_fit\_param\_norm);

fit\_param\_factor\_chosen=fit\_param\_factors\_all(:,i\_t);

i\_chosen=i\_t;

for j=1:NumFac-1 %!!

clear fit\_param\_factors\_all

for i=1:NumFac %!!

if min((i ~= i\_chosen)) == 1

param\_0 = [fit\_param\_factor\_chosen;1];

Chosen\_factor=Coefficients(:,i);

[fit\_param\_factors ,res\_fit\_param] = lsqcurvefit(@fit\_param\_model,param\_0,[Coefficients(:,i\_chosen), Chosen\_factor],param,[],[],options) ;

res\_fit\_param\_norm(i)=res\_fit\_param ;

fit\_param\_factors\_all(:,i)=fit\_param\_factors;

end

end

[res(j+1), i\_t]=min(res\_fit\_param\_norm);

fit\_param\_factor\_chosen=fit\_param\_factors\_all(:,i\_t);

i\_chosen=[i\_chosen i\_t];

end

res=res' ;

% fit\_param\_factor\_chosen=fit\_param\_factor\_chosen

% i\_chosen=i\_chosen

% Factor\_tag

for i=1:NumFac %!!

fit\_param\_sorted(i\_chosen(i),1)=fit\_param\_factor\_chosen(i+1); %sorts the 9 factor coeff based on the factor\_tag

end

return

%%

function fit\_k\_estimate = fit\_param\_model(m,factordata)

x=m(2:end);

fit\_k\_estimate = m(1) + factordata\*x ;

return