

```

% C. Petersen, H. Werkle, Dynamik der Baukonstruktionen
% 2. Auflage, Springer Vieweg, Wiesbaden, 2018
%
% ML_03_01_Log_Dekr_Exponentielle_Regression: Bestimmung des
% logarithmischen Dekrements mittels exponentieller Regression
%
% Version 1.0, April 2018
% Softwareentwicklung:
% Andrei Firus, M.Eng (andrei.firus@gmail.com)

% Aufbau Eingabedateien:
% Inputdatei_1: Messwerte
% ANMERKUNG: Dezimaltrennzeichen '.'

% Ausgabedateien:
% Outputdatei_1: Eingaben- und Ergebnisübersicht

%----- EINGABEBLOCK -----
% Einlesen der Eingabedatei und Generierung der entsprechenden Variablen
% und Vektoren
eingabe=dlmread('Inputdatei_1_Messwerte.txt');

% Anzahl der Messwerte
n=length(eingabe);

% Indexvektor der Messwerte
x=linspace(1,n,n);

% Vektor der Messwerte
y=zeros(1,n);
for i=1:n
    y(i) = eingabe(i,1);
end
%-----

%----- BERECHNUNGSBLOCK -----
% Ermittlung der Koeffizienten für die exponentielle Regression
v=log(y); u=x; g=y.^2;
a=sum(g); b=sum(g.*u); c=sum(g.*u.^2);
d=sum(g.*v); e=sum(g.*u.*v); f=sum(g.*v.^2);
a0=(c*d-b*e)/(a*c-b^2); c0=exp(a0);
a1=(a*e-b*d)/(a*c-b^2); c1=a1;
Lambda=-c1;

% Standardabweichungen
a2=f-2*a0*d-2*a1*e+2*a0*a1*b+a0^2*a+a1^2*c;
a3=(n-2)*(a*c-b^2);
s_a0=sqrt(a2*c/a3);
s_a1=sqrt(a2*a/a3);

% Definition der Regressionsfunktion
exp_funktion=@(x) c0*exp(c1*x);
x_anp=1:0.01:n;
y_anp=exp_funktion(x_anp);

% ANMERKUNG: Für die Ermittlung der Regressionskoeffizienten steht auch der

```

```

% in Matlab vordefinierte Befehl "fit" zur Verfügung.
%-----

%----- DARSTELLUNGSBLOCK -----
% Grafische Gegenüberstellung der exponentiellen Regressionskurve
% mit den eingegebenen Messwerten
name_fig1 = 'Regressionskurve';
fig1=figure('Name',name_fig1,'NumberTitle','off');
plot(x,y,'.r',x_anp,y_anp,'LineWidth', 1, 'MarkerSize', 12); grid on;
set(fig1,'Position',[1000 300 700 500]);
legend({'Gemessene Werte','Regressionskurve'});
xlabel('x');
ylabel('y');
%-----

%----- AUSGABEBLOCK -----
% Ausgabe der Ergebnisse in eine Datei
fid = fopen('Outputdatei_1_Allgemein.txt', 'w');
fprintf(fid,...
    '%s\n','C. Petersen, H. Werkle, Dynamik der Baukonstruktionen');
fprintf(fid,...
    '%s\n','2. Auflage, Springer Vieweg, Wiesbaden, 2018');
fprintf(fid,...
    '%s\n','Softwareentwicklung: Andrei Firus (andrei.firus@gmail.com)');
fprintf(fid,'%s\n','Programm ML_03_1: Eingaben- und Ergebnisuebersicht');
fprintf(fid, '%s\n', ' ');
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
fprintf(fid,...
    '%s\n','-----');
fprintf(fid, '%s\n', ' ');
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
fprintf(fid,...
    '%s\n','EINGABEDATEN:');
fprintf(fid, '%s\n', ' ');
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
fprintf(fid,'%s\n','Anzahl der Messwerte:');
fprintf(fid,'%d\n',n);
fprintf(fid, '%s\n', ' ');
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
fprintf(fid,'%s\n','Eingegebene Messwerte: s. Dateiende');
fprintf(fid, '%s\n', ' ');
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
fprintf(fid,'%s\n','Regressionsansatz:');
fprintf(fid,'%s\n','y=c0*exp(c1*x)');
fprintf(fid, '%s\n', ' ');
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
fprintf(fid,...
    '%s\n','-----');
fprintf(fid, '%s\n', ' ');
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
fprintf(fid,...
    '%s\n','ERGEBNISSE:');
fprintf(fid, '%s\n', ' ');
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
fprintf(fid,'%s\n','Koeffizienten der exponentiellen Regression:');
fprintf(fid,'%s \t %.3f\n','c0=',c0);
fprintf(fid,'%s \t %.3f\n','c1=',c1);
fprintf(fid, '%s\n', ' ');

```

```

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
fprintf(fid, '%s\n', 'Standardabweichungen:');
fprintf(fid, '%s \t %.3f\n', 's_a0=', s_a0);
fprintf(fid, '%s \t %.3f\n', 's_a1=', s_a1);
fprintf(fid, '%s\n', ' ');
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
fprintf(fid, '%s\n', 'Logarithmisches Dekrement:');
fprintf(fid, '%d\n', Lambda);
fprintf(fid, '%s\n', ' ');
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
fprintf(fid, '%s \t %s\n', 'Eingabewerte', 'Angepasste Werte');
for ii=1:1:n
    fprintf(fid, '%.3f \t %.3f\n', y(ii), exp_funktion(ii));
end
fprintf(fid, '%s\n', ' ');
%-----

```