

Regression (i.e., Linear, Power and Saturation growth rate models)

What Is Regression?

Regression is a statistical method used in finance, investing, and other disciplines that attempts to determine the strength and character of the relationship between one dependent variable (usually denoted by Y) and a series of other variables (known as independent variables).

What is the task about?

I. Writing a MATLAB function that accepts n values of x and y, perform Linear Regression and returns values of r₂ and, the model parameters a and ao.

The function should accept 2 parameters AND It should return 3 values.

II. Writing another MATLAB function that accepts n values of x and y (provided as arrays), checks for Linear, Power and Saturation growth rate models, and estimate the values of parameters α and α 0 (or α and β , whichever is applicable).

The technique & code

The mechanism of the Regression functions:

In all three methods,

- The 2nd function should use the 1st function developed in part (I) to perform the linear regression part.
- The 2nd function should plot the given data and the three models (one linear and two non-linear) on the same graph (use distinct colors/shades of lines to differentiate).
- The 2nd function should return a number from 1-3 indicating the model with the best fit, its r2, and the estimated values of parameters.

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The code

Pseudocode of a MATLAB function that calculates the Regression Parameters:

function[RANK,r2,a0,a1]=regression(x,y) [rlin2,alin0,alin1]=LinearRegression2(x,y);%%firstly for linear EQ1=@(X) alin0+X*alin1;

[rpow2,a00pow,a1pow]=LinearRegression2(log10(x),log10(y));%% for nonlinear (Power) a0pow=10^(a00pow); EQ2=@(x) a0pow*x.^(a1pow);

[rsat,a0sat,a1sat]=LinearRegression2(1./x,1./y);%% for nonlinear (saturation) alpha=1/a1sat; beta=alpha*a0sat;

EQ3=@(x) alpha*x./(beta+x);

XALL=linspace(min(x),max(x)); plot(XALL,EQ1(XALL),XALL,EQ2(XALL),':',XALL,EQ3(XALL),'--',x,y,'o'); legend('Linear','Power','Saturation','data points');

if (rlin2>rpow2)

RANK=1;

r2=rllin2;

a0=alin0;

a1=alin1;

end

if (rpow2>rsat)

RANK=2;

r2=rsat;

a0=a0sat;

a1=a1sat; end

if (rsat>rpow2) RANK=3;

r2=rsat;

a0=alpha;

a1=beta;

end end

function [r2,a0,a1]=LinearRegression2(x,y)

n = length(x);

 $a0 = (mean(y)*sum(x.^2)-mean(x)*sum(x.*y))/(sum(x.^2)-n*mean(x)^2);$

a1 = $(sum(x.*y)-mean(x)*sum(y))/(sum(x.^2)-n*mean(x)^2);$

 $st=sum((y - mean(y)).^2);$

 $sr=sum((y-a0-x*a1).^2);$

r2=(st-sr)/st;

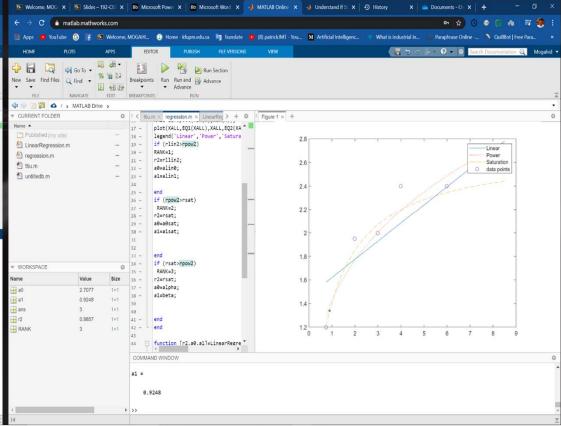
end

03 The output samples

1st part (linear regression function) output

15 Welcome, MOGAHID - Blackboo: X S Upload Assignment: Programmi: X S Microsoft Word - CISE-301-CHW X S My Grades − 192-ISE-205-01(En: X → MATLAB Online R2020a X + 🔡 Apps 🔹 YouTube 🜀 🧗 😘 Welcome, MOGAHL. 🐧 Home - klupm.edu.sa 🧃 Translate 🔸 (8) patrick/MT - You. . 🕅 Artificial Intelligenc... 💎 What is industrial in. . — Paraphrase Online _ 🔊 Quilliot I free Para... Run Section New Save Find Files Q Find - % 22 3 Breakpoints Run Run and Q Advance FILE NAVIGATE EDIT BREAKPOINTS 0 | untitledb.m × ttiu.m × LinearRegression.m × Regression.m × + ▼ CURRENT FOLDER 1 🖯 function [r2,a0,a1]=LinearRegression(x,y) M LinearRegression,m Regression.m 5 - n = length(x); $6 - \qquad \text{a0 = } (\text{mean}(y) \text{"sum}(x.^2) - \text{mean}(x) \text{"sum}(x.^y)) / (\text{sum}(x.^2) - \text{n*mean}(x)^2);$ 1 untitledb.m 7 - a1 = (sum(x.*y)-mean(x)*sum(y))/(sum(x.^2)-n*mean(x)^2); 8 - st=sum((y - mean(y)).^2); 0 - srmsum((v-a0-x*a1).^2): r2=(st-sr)/st; WORKSPACE 0.8028 Value 1.4653 ⊞ a1 0.1548 0.0533 1×1 0.8028 1.4653 0.1548

2nd part (one linear and two nonlinear)output



THANK YOU





You are Welcome To Contact Me







in Mojahed nour



➤ Mojahednour@email.com