

Program Title *CURVE FITTING*Contributor's Name *LUIS E. QUINTANILLA*Address *INTERNATIONAL POTATO CENTER, APARTADO 5969*City *LIMA 100*State *PERU S.A.*

Zip Code

Program Description, Equations, Variables

PROGRAM SIMULTANEOUSLY FITS A SET OF DATA POINTS TO:
 STRAIGHT LINES; DOUBLE-LOG; SEMILOG; RECIPROCAL; LOGARITHMIC
 RECIPROCAL TRANSFORMATIONS. VALUES OF COEFFICIENTS a , b ,
 r^2 , $\hat{\sigma}_u$, F AND CONFIDENCE LIMITS OF b MAY BE CALCULA-
 TED.

EQUATIONS USED ARE:

LINEAR REGRESSION

$$y = a + b x$$

DOUBLE-LOG TRANSFORMATION

$$\ln y = a + b \ln x$$

SEMILOG TRANSFORMATION

$$y = a + b \ln x$$

RECIPROCAL TRANSFORMATION

$$y = a + b/x$$

LOGARITHMIC RECIPROCAL TRANSFORMATION

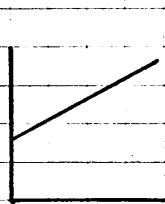
$$\ln y = a + b/x$$

Operating Limits and Warnings *PROGRAM DOES NOT ACCEPT ZERO VALUES*
YOU CAN CHANGE IT WITH A MINIMUM VALUE

This program has been verified only with respect to the numerical example given in *Program Description II*. User accepts and uses this program material AT HIS OWN RISK, in reliance solely upon his own inspection of the program material and without reliance upon any representation or description concerning the program material.

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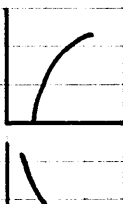
Sketch(es)



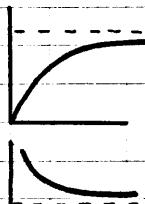
STRAIGHT



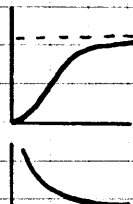
DOUBLE LOG



SEMILOG



RECIPROCAL



LOG RECIPROCAL

Sample Problem(s) ROAD CASUALTIES AND LICENSED VEHICLES IN THE UNITED KINGDOM. WHAT IS THE BEST FORM OF CURVE THAT FIT TO THIS SET OF DATA?

YEAR	ROAD CASUALTIES	LICENSED VEHICLES
1947	166	352
1948	(000)	373
1949	177	411
1950	201	441
1951	216	462
1952	208	490
1953	227	529
1954	238	577
1955	268	641
1956	268	692
1957	274	743

Solution(s) KEYSTROKES

[F] [E]

→ 0.0000

352 ↑ 166 [A] 373 ↑ 153 [A] 411 ↑ 177 [A] 441 ↑ 201 [A] 462 ↑ 216 [A] 490 ↑ 208 [A]

→ 6.0000

529 ↑ 227 [A] 577 ↑ 238 [A] 641 ↑ 268 [A] 692 ↑ 268 [A] 743 ↑ 274 [A]

→ 11.0000

STRAIGHT: [B]

→ 55.8527 (a)

[R/S]

→ 0.3120 (b)

[R/S]

→ 0.9362 (r²)

[R/S]

→ 11.1762 (Σu)

[R/S]

→ 132.0614 (F)

~~2.262~~ 2.262 [R/S] (2.262 = t_{0.025} FOR 9 DEGREES OF FREEDOM, 95%) → 0.373A (HIGH b)

[R/S]

→ 0.2506 (LOW)

DOUBLE LOG [C]

→ 0.5444 (a)

[R/S]

→ 0.7747 (b)

[R/S]

→ 0.9370 (r²)

Sketch(es)

SOLUTION (CONT.)

Sample Problem(s)

[R/S]

→ 0.0526 ($\hat{\sigma}_u$)

[R/S]

→ 133.8087 (F)

2.262 [R/S]

→ 0.9262 (HIGH 6 CONF. LIM)

[R/S]

→ 0.6232 (LOW 6 CONF. LIM)

SEMILOG:

[D]

→ -812.1552 (a)

[R/S]

→ 165.4818 (b)

[R/S]

→ 0.9568 (r^2)

[R/S]

→ 8.9984 ($\hat{\sigma}_u$)

[R/S]

→ 208.6033 (F)

2.262 [R/S]

→ 191.3987 (HIGH 6 CONF. LIM)

[R/S]

→ 139.5650 (LOW 6 CONF. LIM)

RECIPROCAL:

[E]

→ 386.6545 (a)

[R/S]

→ -82901.9503 (b)

[R/S]

→ 0.9582 (r^2)

Solution(s)

[R/S]

→ 9.0438 ($\hat{\sigma}_u$)

[R/S]

→ 206.4265 (F)

2.262 [R/S]

→ -69850.0234 (HIGH 6 CONF. LIM)

[R/S]

→ -45953.8773 (LOW 6 CONF. LIM)

LOG RECIPROCAL [F] [a]

→ 6.1629 (a)

[R/S]

→ -391.2245 (b)

[R/S]

→ 0.9517 (r^2)

[R/S]

→ 0.0460 ($\hat{\sigma}_u$)

[R/S]

→ 177.4079 (F)

Reference(s)

2.262 [R/S]

→ -324.7841 (HIGH 6 CONF. LIM)

[R/S]

→ -457.6649 (LOW 6 CONF. LIM)

THEN THE BEST FORM OF CURVE IS SEMILOG BECAUSE THE r^2 AND F VALUES ARE HIGHREFERENCE: JHONSTON, J. ECONOMETRIC METHODS 2nd. CHAPTERS 2, 3.

MC GRAW HOGAN - TOKYO 1972.

CURVE FITTING

LOG RECIPROCAL START

X_i $Y_i(t)$ LINEAR DOUBLE LOG SEMILOG RECIPROCAL

START

$X_i, Y_i(t)$ - LINEAR - DOUBLE LOG - SEMILOG - RECIPROCAL

[illegible]

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
00	FBLA	31 25 11			X	71	
	n x y	35 52			chs	42	
	E +	21			RCL 6	34 06	2. CALCULATE AND DISPLAY α
	h LST X	35 82		060	+	61	
	f LN	31 52			RCL 9	34 09	
	h x z y	35 52			$\div$	81	
	f LN	31 52			STO A	33 11	
	h x z y	35 52			R/S	84	
	f PZS	31 42			RCL B	34 12	3. DISPLAY b
010	E +	21			R/S	84	
	h LST X	35 82			h x z y	35 52	
	g c^x	32 52			h R v	35 53	4. CALCULATE AND DISPLAY γ^2
	h y x	35 62			X	71	
	X	71		070	RCL 7	34 07	
	STO + 3	33 61 03			RCL 6	34 06	
	h LST X	35 82			g x^2	32 54	
	STO + 0	33 61 00			RCL 9	34 09	
	g x^2	32 54			$\div$	81	
	STO + 1	33 61 01			-	51	
020	f v x	31 54			$\div$	81	
	$\div$	81			R/S	84	
	h LST X	35 82			RCL B	34 08	
	h x z y	35 52			RCL 6	34 06	
	g c^x	32 52		080	RCL 4	34 04	
	X	71			RCL 9	34 09	
	STO + 2	33 61 02			$\div$	81	
	h LST X	35 82			X	71	
	$\div$	81			-	51	
	h LST X	35 82			RCL B	34 12	
030	h x z y	35 52			X	71	
	h y x	35 62			STO C	33 13	
	f LN	31 52			RCL 7	34 07	
	X	71			RCL 6	34 06	
	f PZS	31 42			g x^2	32 54	
	STO + 0	33 61 00		090	RCL 9	34 09	
	RCL 9	34 09			$\div$	81	
	h RTN	35 22			-	51	
	f LBL B	31 25 12			h x z y	35 52	
	f PZS	31 42			-	51	
040	f LBL 3	31 25 03			RCL 9	34 09	
	RCL B	34 08			2	02	
	RCL 4	34 04			-	51	
	RCL 6	34 06			$\div$	81	
	X	71			f v x	31 54	
	RCL 9	34 09		100	STO D	33 14	
	$\div$	81			R/S	84	
	-	51			g x^2	32 54	
	RCL 5	34 05			RCL C	34 13	
	RCL 4	34 04			h x z y	35 52	
050	g x^2	32 54			$\div$	81	
	RCL 9	34 09			R/S	84	
	$\div$	81			STO E	33 15	
	-	51			RCL D	34 14	
	-	81		110	X	71	
	STO B	33 12			RCL 5	34 05	
	RCL 4	34 04			RCL 4	34 04	

INPUT AND
TRANSFORMATION
X; Y; DATA

STRAIGHT:
SUBRTINE FOR:
1. CALCULATE b

2. CALCULATE
AND DISPLAY
 α

3. DISPLAY b

4. CALCULATE
AND DISPLAY
 γ^2

5. CALCULATE
AND DISPLAY
 $\hat{\sigma}_\mu$

6. CALCULATE
AND DISPLAY
F. VALUE
INPUT t VALUE

REGISTERS

0 USED	1 USED	2 USED	3 USED	4 USED	5 USED	6 USED	7 USED	8 USED	9 USED
S0 USED	S1 USED	S2 USED	S3 USED	S4 USED	S5 USED	S6 USED	S7 USED	S8 USED	S9 USED
A USED	B USED	C USED	D USED	E USED	I USED				

STEP	KEY ENTRY	KEY CODE		EP	KEY ENTRY	KEY CODE	COMMENTS
	g x ²	32 54	7. CALC AND DISPLAY HIGH b CONFIDENCE LIMIT		RCL 3	34 03	CALCULATE COEFFICIENT INITIALIZE
	RCL 9	34 09		170	STO 8	33 08	
	-	81			GTO 3	22 03	
	-	51			g LBL f e	32 25 15	
	HSTI	35 33			f CL REG	31 43	
	f Vx	31 54			f PZS	31 42	
	÷	81			f CL REG	31 43	
120	ENTER ↑	41			CLX	44	
	ENTER ↑	41			h RTN	35 22	
	RCL 8	34 12					
	+	61	8. CALCULATE AND DISPLAY LOW b CONFIDENCE LIMIT				
	R/S	84		180			
	h R ↓	35 53					
	RCL 8	34 12					
	h x2y	35 52					
	-	51					
	h RTN	35 22					
130	f LBL C	31 25 13					
	f PZS	31 42					
	GTO 3	22 03					
	f LBL D	31 25 14	DOUBLE LOG: SET DATA CALCULATE COEFFICIENTS SEMI LOG: SET DATA				
	f PZS	31 42		190			
	RCL 6	34 06					
	RCL 7	34 07					
	f PZS	31 42					
	STO 9	33 09					
	h R ↓	35 53					
140	STO 8	33 08					
	RCL 4	34 04					
	RCL 5	34 05					
	RCL 0	34 00	CALCULATE COEFFICIENTS RECIPROCAL: SET DATA				
	f PZS	31 42		200			
	STO 8	33 08					
	h R ↓	35 53					
	STO 5	33 05					
	h R ↓	35 53					
	STO 4	33 04					
150	GTO 3	22 03					
	f LBL E	31 25 15		210			
	RCL 0	34 00					
	RCL 1	34 01	CALCULATE COEFFICIENTS LOG RECIPROCAL: SET DATA				
	RCL 2	34 02					
	STO 8	33 08					
	h R ↓	35 53					
	STO 5	33 05					
	h R ↓	35 53					
	STO 4	33 04					
160	GTO 3	22 03					
	g LBL f a	32 25 11		220			
	f PZS	31 42					
	RCL 6	34 06					
	RCL 7	34 07					
	f PZS	31 42					
	STO 7	33 07					
	h R ↓	35 53					
	STO 6	33 06					

LABELS					FLAGS		SET STATUS		
A	B	C	D	E	0	1	FLAGS	TRIG	DISP
X: 4. (+)	LINEAR	DOUBLE LOG	SEMI LOG	RECIPROCAL			ON OFF		
a LOG RECIPROCAL	b	c	d	e	1		0 ☐ - ☐	DEG ☒	FIX ☒
0	1	2	3 USED	4	2		1 ☐ ☐	GRAD ☐	SCI ☐
5	6	7		8	3		2 ☐ ☐	RAD ☐	ENG ☐
				9			3 ☐ ☐		n 4