

1M

a)

$Li - Li+1$	$hi = \frac{ti}{ai}$	fi	ni	Ni
150 - 165	0'004	0'06	9	9
165 - 170	0'02	0'10	15	24
170 - 175	0'04	0'20	30	54
175 - 180	0'08	0'40	60	114
180 - 190	0'016	0'16	24	138
190 - 210	0'004	0'08	12	150
			150	

b) $Me = 175 + 5 \frac{75-54}{60} = 176'75$; $Mo = 175 + 5 \frac{0'08-0'04}{(0'08-0'04)+(0'08-0'016)} =$

c) $D_2 = 170 + 5 \frac{30-24}{30} = 171$ $= 176'92$

$D_8 = 180 + 10 \frac{120-114}{24} = 182'5$

2M

u	t	$t-1$	$\ln(t-1)$	$n \ln(t-1)$	n^2	t^2	nt	t^*	$t-t^*$	$(t-t^*)^2$
1	2	1	0	0	1	4	2	2'307	-0'307	0'0943
2	2	1	0	0	4	4	4	2'308	-0'7085	0'5019
3	3	2	0'693	2'079	9	9	9	3'1998	-0'1999	0'0399
5	5	4	1'386	6'931	25	25	25	4'721	0'279	0'0778
7	9	8	2'079	14'556	49	81	63	7'518	1'482	2'1957
18	21			23'567	88	123	103		0'5456	2'9096

a) $\bar{u} = 18/5 = 3'6$; $\sigma_n^2 = \frac{88}{5} - 3'6^2 = 4'64$ $Cov(n,t) = \frac{103}{5} - 3'6 \cdot 4'2 = 5'48$
 $\bar{t} = 21/5 = 4'2$; $\sigma_t^2 = \frac{123}{5} - 4'2^2 = 6'96$

Recta t/u : $t - 4'2 = \frac{5'48}{4'64} (u - 3'6) \Rightarrow t^* = 1'181u - 0'0917$

c) $r = \frac{5'48}{\sqrt{4'64} \sqrt{6'96}} = 0'9643 \Rightarrow r^2 = 0'929895$

$\sigma_e^2 = \sigma_t^2 (1 - r^2) = 6'96 (1 - 0'9298) = 0'488$ Para la recta.

$\sigma_e^2 = \frac{2'9096}{5} - \left(\frac{0'5456}{5} \right)^2 = 0'57$ Para la función

Ligeramente mas fiable, la recta.

b)

$$t = 1 + e^{bn} \Rightarrow t-1 = e^{bn} \Rightarrow \ln(t-1) = bn$$

Ec. Norme

$$F(b) = \sum_i [\ln(t_i-1) - bn_i]^2 = \min.$$

$$F'(b) = 2 \sum [\ln(t_i-1) - bn_i](-n_i) \Rightarrow \sum n_i \ln(t_i-1) = b \sum n_i^2$$

$$b = \frac{23'567}{88} = 0'2678 \Rightarrow t = 1 + e^{0'2678u}$$

(3M)

a)				b)			
Año	Precio	I 1980	\bar{X}_3	Año	IPC 77	IPC 75	Precio real (base 1975)
1975	10	35'71	-	1975	96	100	10
6	14	50	13'3	6	98	102'8	13'62
7	16	57'14	16	7	100	104'16	15'36
8	18	64'28	19'3	8	108	112'5	16
9	24	85'71	23'3	9	110	114'58	20'94
0	28	100	27'3	0	115	119'79	23'37
1	30	107'14	-	1	120	125	24

d)

$t' = t - 1978$	-3	-2	-1	0	1	2	3	
Y	10	14	16	18	24	28	30	140
$t_i'^2$	9	4	1	0	1	4	9	28
$t_i'^3$	-27	-8	-1	0	1	8	27	0
$Y_i t_i'$	-30	-28	-16	0	24	56	90	96

$$\sum Y_i = aN \Rightarrow 140 = 7a \quad a = 20$$

$$\sum Y_i t_i' = b \sum t_i'^2 \Rightarrow 96 = 28b \quad b = 3'428$$

$$Y = 20 + 3'428(t - 1978)$$

Para 1985 $\Rightarrow Y = 20 + 3'428 \cdot 7 = 44$