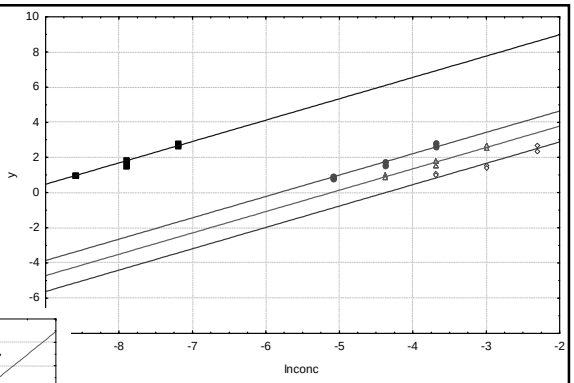
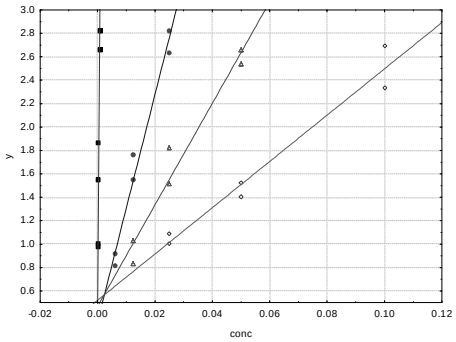
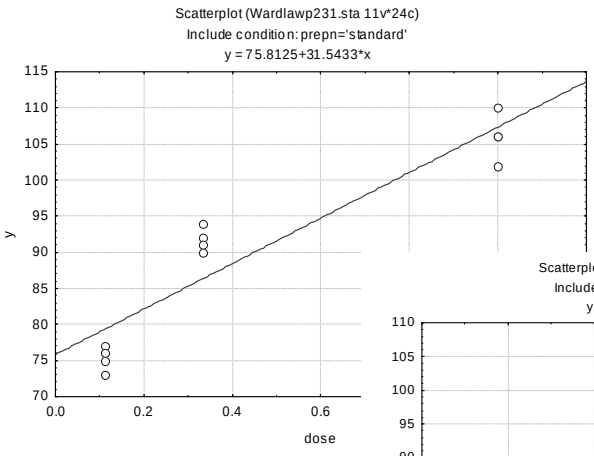
Parallel line assay





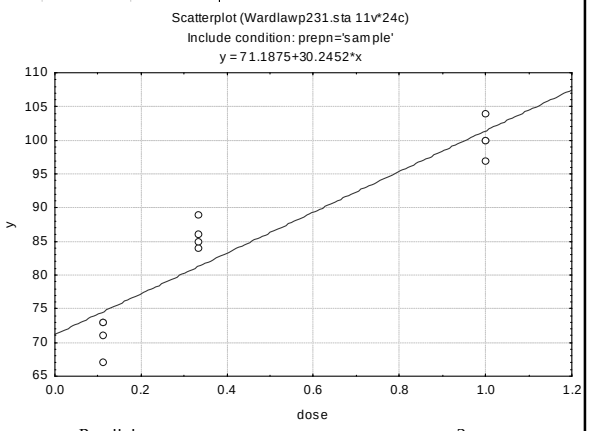
Slope ratio assay



Példa

A.C.Wardlaw: Practical statistics for experimental biologists, J.Wiley, 1985, p. 231

c_{std}=5NE/ml

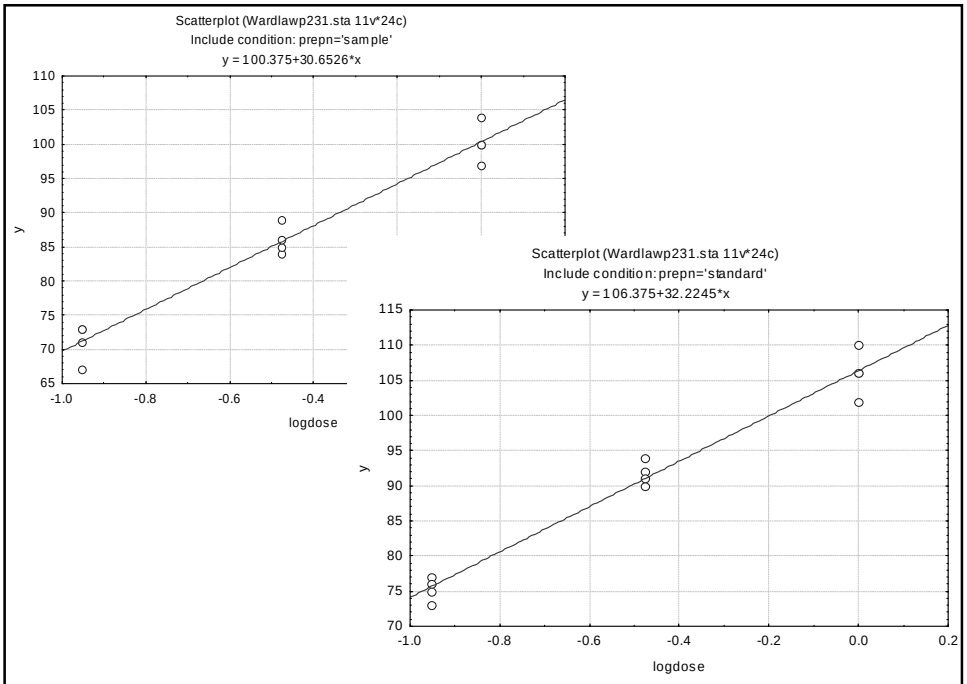


Parallel line assay a szándék

	1 prepn	2 dilution	3 dose	4 logdose	5 rept	6 y
1	standard	9	0.111	-0.95424	1	77
2	standard	9	0.111	-0.95424	2	75
3	standard	9	0.111	-0.95424	3	76
4	standard	9	0.111	-0.95424	4	73
5	standard	3	0.333	-0.47712	1	92
6	standard	3	0.333	-0.47712	2	94
7	standard	3	0.333	-0.47712	3	90
8	standard	3	0.333	-0.47712	4	91
9	standard	1	1.000	0	1	110
10	standard	1	1.000	0	2	102
11	standard	1	1.000	0	3	106
12	standard	1	1.000	0	4	106
13	sample	9	0.111	-0.95424	1	73
14	sample	9	0.111	-0.95424	2	71
15	sample	9	0.111	-0.95424	3	73
16	sample	9	0.111	-0.95424	4	67
17	sample	3	0.333	-0.47712	1	84
18	sample	3	0.333	-0.47712	2	85
19	sample	3	0.333	-0.47712	3	86
20	sample	3	0.333	-0.47712	4	89
21	sample	1	1.000	0	1	100
22	sample	1	1.000	0	2	104
23	sample	1	1.000	0	3	97
24	sample	1	1.000	0	4	100

Dependnt Variable	Test of Lack of Fit (Wardlawp231.sta) Include condition: prepn='standard' SS Pure Err	df Pure Err	MS Pure Err	SS Lack of Fit	df Lack of Fit	MS Lack of Fit	F	p
y	49.50000	9	5.500000	191.1635	1	191.1635	34.75699	0.000230

Dependnt Variable	Test of Lack of Fit (Wardlawp231.sta) Include condition: prepn='sample' SS Pure Err	df Pure Err	MS Pure Err	SS Lack of Fit	df Lack of Fit	MS Lack of Fit	F	p
y	62.75000	9	6.972222	145.4712	1	145.4712	20.86439	0.001351



Dependnt Variable	Test of Lack of Fit (Wardlawp231.sta) Include condition: prepn='sample' SS Pure Err	df Pure Err	MS Pure Err	SS Lack of Fit	df Lack of Fit	MS Lack of Fit	F	p
y	62.75000	9	6.972222	0.375000	1	0.375000	0.053785	0.821791

Effect	Parameter Estimates (Wardlawp231.sta) Sigma-restricted parameterization Include condition: prepn='sample' y Param.	y Std.Err	y t	y p
Intercept	100.3750	1.146780	87.52769	0.000000
logdose	30.6526	1.861774	16.46418	0.000000

Dependnt Variable	Test of Lack of Fit (Wardlawp231.sta) Include condition: prepn='standard' SS Pure Err	df Pure Err	MS Pure Err	SS Lack of Fit	df Lack of Fit	MS Lack of Fit	F	p
y	49.50000	9	5.500000	3.375000	1	3.375000	0.613636	0.453542

Effect	Parameter Estimates (Wardlawp231.sta) Sigma-restricted parameterization Include condition: prepn='standard' y Param.	y Std.Err	y t	y p
Intercept	106.3750	1.049553	101.3526	0.000000
logdose	32.2245	1.703929	18.9119	0.000000

Statistics>Advanced Linear/Nonlinear Models>
>General Linear Models>Separate slopes

$$y_{ijk} = \alpha_i + \beta_i x_{ij} + \varepsilon_{ijk}$$

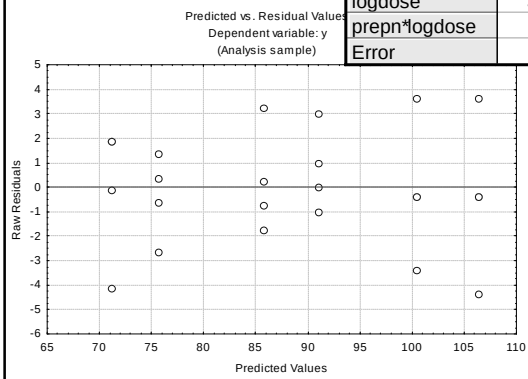
Effect	Univariate Tests of Significance fory (Wardlawp231.sta) Over-parameterized model Type III decomposition; Std. Error of Estimate: 2.408318 SS	Degr. of Freedom	MS	F	p
Intercept	102589.4	1	102589.35	17687.82	0.000000
prepn*logdose	3602.3	2	1801.13	310.54	0.000000
prepn	86.4	1	86.40	14.90	0.000977
Error	116.0	20	5.80		

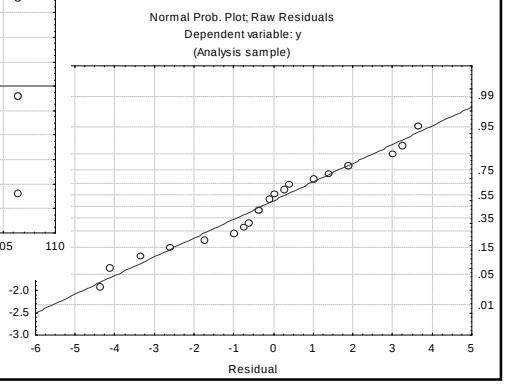
Dependent Variable	Test of Lack of Fit (Wardlawp231.sta) SS Pure Err	df Pure Err	MS Pure Err	SS Lack of Fit	df Lack of Fit	MS Lack of Fit	F	p
y	112.2500	18	6.236111	3.750000	2	1.875000	0.300668	0.743970

$$y_{ijk} = \mu + \alpha_i + \beta x_{ij} + (\alpha\beta)_i x_{ij} + \varepsilon_{ijk}$$

Statistics>Advanced Linear/Nonlinear Models>
>General Linear Models>
>Homogeneity-of-slopes

Effect	Univariate Tests of Significance for y Sigma-restricted parameterization Std. Error of Estimate: 2.408318 SS	Degr. of Freedom	MS	F	p
Intercept	102589.3	1	102589.3	17687.82	0.000000
prepn	86.4	1	86.4	14.90	0.000977
logdose	3600.0	1	3600.0	620.69	0.000000
prepn*logdose	2.3	1	2.3	0.39	0.540427
Error	116.0	20	5.8		





Effect	Univariate Tests of Significance fory (Wardlawp231.sta) Sigma-restricted parameterization Effective hypothesis decomposition SS	Degr. of Freedom	MS	F	p
Intercept	102589.3	1	102589.3	18218.83	0.000000
logdose	3600.0	1	3600.0	639.32	0.000000
prepn	165.4	1	165.4	29.37	0.000022
Error	118.2	21	5.6		

Statistics>Advanced Linear/Nonlinear Models>
>General Linear Models>
>Analysis of Covariance

$$y_{ijk} = \mu + \alpha_i + \beta x_{ij} + \varepsilon_{ijk}$$

Effect	Parameter Estimates (Wardlawp231.sta) Sigma-restricted parameterization Level of Effect	Column	y Param.	y Std.Err	y t	y p
Intercept		1	103.3750	0.765870	134.9771	0.000000
logdose		2	31.4385	1.243375	25.2848	0.000000
prepn	standard	3	2.6250	0.484379	5.4193	0.000022

Effect	Parameter Estimates (Wardlawp231.sta) (*Zeroed predictors failed tolerance check) Over-parameterized model Level of Effect	Column	Comment (B/Z/P)	y Param.	y Std.Err
Intercept		1		100.7500	0.906190
logdose		2		31.4385	1.243375
prepn	standard	3	Biased	5.2500	0.968758
prepn	sample	4	Zeroed*	0.0000	

$$y_{ijk} = \alpha + (\alpha_i - \alpha) + \beta x_{ij} + \varepsilon_{ijk}$$

α a vonatkozási egyenes tengelymetszete

$$\hat{Y} = a + b\ln c = a + b\lg\frac{c_0}{h} = a + b\lg c_0 - b\lg h = a + b\lg c_0 + b\lg x$$

b a meredekség,
x a dózis, lg*x* a dózis logaritmusa,
h a hígítás,
c_0 a készítmény hígítás előtti koncentrációja
a a tengelymetszet közös része,
$b\lg c_0$ a készítményre jellemző rész ($b\lg c_{0\text{minta}}$ ill. $b\lg c_{0\text{std}}$)
Ismert $c_{0\text{std}}$, kérdés $c_{0\text{minta}}$

$$\hat{Y}_{\text{minta}} - \hat{Y}_{\text{std}} = b(\lg c_{\text{minta}} - \lg c_{\text{std}})$$

$$\lg c_{0\text{minta}} = \frac{\hat{Y}_{\text{minta}} - \hat{Y}_{std}}{b} + \lg c_{0std} = \frac{a_{\text{minta}} - a_{std}}{b} + \lg c_{0std}$$

$$\lg c_{0\text{minta}} - \lg c_{0\text{std}} = \frac{a_{\text{minta}} - a_{\text{std}}}{b} \qquad \frac{c_{0\text{minta}}}{c_{0\text{std}}} = 10^{\frac{a_{\text{minta}} - a_{std}}{b}}$$

$$\frac{c_{0\text{minta}}}{c_{0\text{std}}} = 10^{\frac{a_{\text{minta}} - a_{\text{std}}}{b}} = 10^{\frac{-5.25}{31.4385}} = 0.68$$

$$c_{0\text{minta}} = 0.68 c_{0\text{std}} = 0.68 \cdot 5 = 3.4\text{NE/ml}$$

Példa

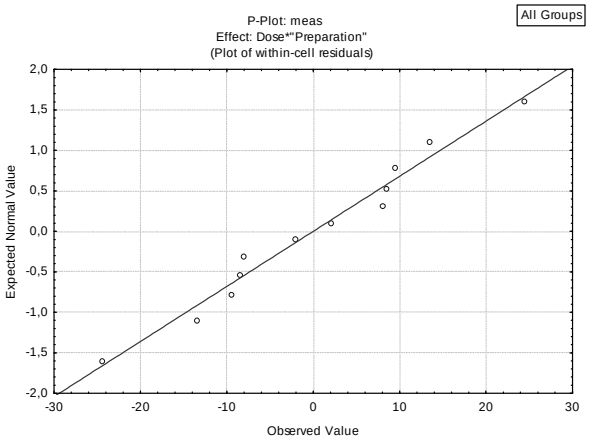
Biotechnológiai készítmény titerét kívánták meghatározni az ismert aktivitású nemzetközi standardhoz képest. Az analitikai jel a spektrofotometriás abszorbancia volt.

parall1.sta

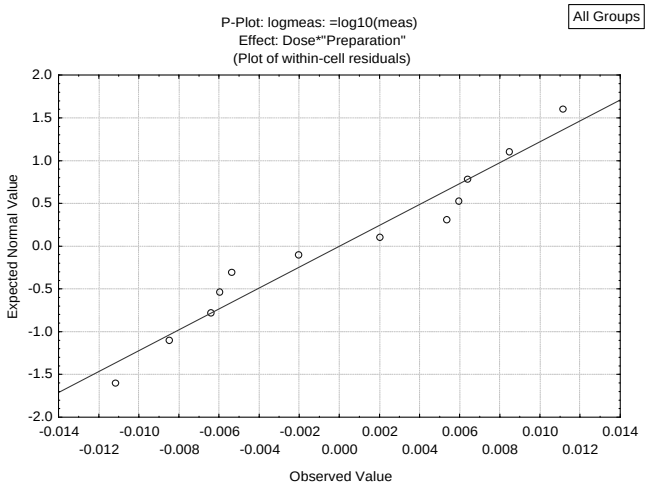
	1 Dose	2 Preparation	3 meas	4 logdose	5 logmeas
1	100	standard	929	2	2.968016
2	100	standard	978	2	2.990339
3	50	standard	636	1.69897	2.803457
4	50	standard	655	1.69897	2.816241
5	25	standard	428	1.39794	2.631444
6	25	standard	445	1.39794	2.64836
7	100	minta	972	2	2.987666
8	100	minta	999	2	2.999565
9	50	minta	638	1.69897	2.804821
10	50	minta	654	1.69897	2.815578
11	25	minta	428	1.39794	2.631444
12	25	minta	424	1.39794	2.627366

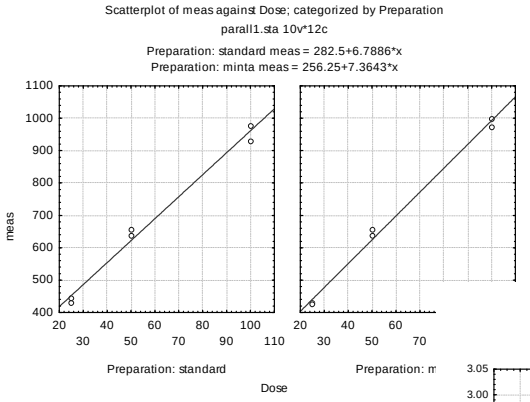
Az abszorbancia-adatok igényelnek-e valamilyen transzformációt?

	Tests of Homogeneity of Variances (parall1 Effect: Dose*"Preparation"				
	Hartley F-max	Cochran C	Bartlett Chi-Sqr.	df	p
meas	150.0625	0.592547	3.486854	5	0.625378

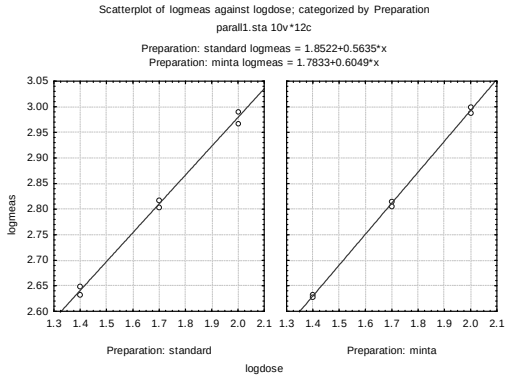


	Tests of Homogeneity of Variances (parall1.st Effect: Dose*"Preparation"				
	Hartley F-max	Cochran C	Bartlett Chi-Sqr.	df	p
logmeas	29.96642	0.407842	1.741484	5	0.883633





Az abszorbanciát ill. a dózist indokolt-e transzformálni a függvény linearitása szempontjából?



Statistics>Advanced Linear/Nonlinear Models>
>General Linear Models>Separate slopes

$$y_{ijk} = \alpha_i + \beta_i x_{ij} + \varepsilon_{ijk}$$

	Univariate Tests of Significance for logmeas (parall1.sta Over-parameterized model Type III decomposition; Std. Error of Estimate: .0087560				
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	0.812863	1	0.812863	10602.34	0.000000
Preparation*logdose	0.247757	2	0.123879	1615.78	0.000000
Preparation	0.000292	1	0.000292	3.81	0.086663
Error	0.000613	8	0.000077		

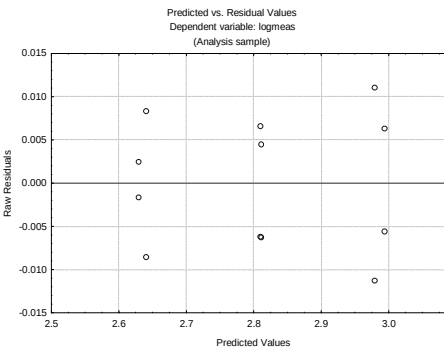
	Test of Lack of Fit (parall1.sta)							
Dependent Variable	SS Pure Err	df Pure Err	MS Pure Err	SS Lack of Fit	df Lack of Fit	MS Lack of Fit	F	p
logmeas	0.000611	6	0.000102	0.000002	2	0.000001	0.011883	0.988210

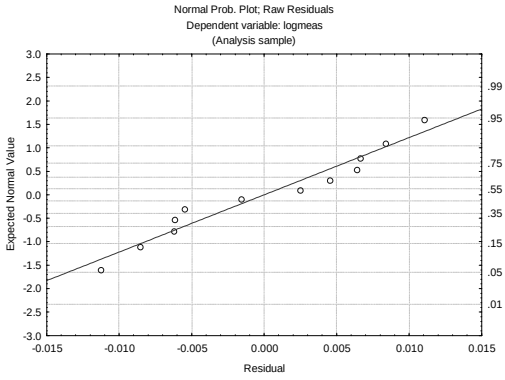
$$y_{ijk} = \mu + \alpha_i + \beta x_{ij} + (\alpha\beta)_i x_{ij} + \varepsilon_{ijk}$$

Statistics>Advanced Linear/Nonlinear Models>
>General Linear Models>
>Homogeneity-of-slopes

Univariate Tests of Significance for logmeas
Sigma-restricted parameterization
Std. Error of Estimate: .0087560

Effect	SS	Degr. of Freedom	MS	F	p
Intercept	0.8129	1	0.8129	10602.34	0.00000
Preparation	0.0003	1	0.0003	3.81	0.08666
logdose	0.2474	1	0.2474	3227.50	0.00000
Preparation*logdose	0.0003	1	0.0003	4.06	0.07882
Error	0.0006	8	0.0001		





Univariate Tests of Significance for logmeas
Sigma-restricted parameterization
Effective hypothesis decomposition;

Effect	SS	Degr. of Freedom	MS	F	p
Intercept	0.812863	1	0.812863	7915.4	0.0000
logdose	0.247447	1	0.247447	2409.6	0.0000
Preparation	0.000006	1	0.000006	0.1	0.8123
Error	0.000924	9	0.000103		

Statistics>Advanced Linear/Nonlinear Models>
>General Linear Models>
>Analysis of Covariance

$$y_{ijk} = \mu + \alpha_i + \beta x_{ij} + \varepsilon_{ijk}$$

Parameter Estimates (parall1.sta)
Sigma-restricted parameterization

Effect	Level of Effect	Column	logmeas Param.	logmeas Std.Err	logmeas t	logmeas p
Intercept		1	1.817764	0.020431	88.96876	0.000000
logdose		2	0.584233	0.011902	49.08735	0.000000
Preparation	standard	3	-0.000715	0.002925	-0.24450	0.812326

α a vonatkozási egyenes tengelymetszete

Parameter Estimates (parall1.sta)
(*Zeroed predictors failed tolerance check)
Over-parameterized model

Effect	Level of Effect	Column	Comment (B/Z/P)	logmeas Param.	logmeas Std.Err
Intercept		1		1.818479	0.020640
logdose		2		0.584233	0.011902
Preparation	standard	3	Biased	-0.001431	0.005851
Preparation	minta	4	Zeroed*	0.000000	

$$y_{ijk} = \alpha + (\alpha_i - \alpha) + \beta x_{ij} + \varepsilon_{ijk}$$

Test of Lack of Fit (parall1.sta)

Dependent Variable	SS Pure Err	df Pure Err	MS Pure Err	SS Lack of Fit	df Lack of Fit	MS Lack of Fit	F	p
logmeas	0.000611	6	0.000102	0.000313	3	0.000104	1.025700	0.445230

A minta aktivitásának számítása

$$\hat{Y} = a + b\ln c = a + b\lg\frac{c_0}{h} = a + b\lg c_0 - b\lg h = a + b\lg c_0 + b\lg x$$

Ismert a standard hígítás előtti c_0 koncentrációja, kérdés a vizsgálandó készítmény hígítás előtti c_x koncentrációja

$$\hat{Y}_{\text{minta}} - \hat{Y}_{\text{std}} = b\left(\lg c_{\text{minta}} - \lg c_{\text{std}}\right)$$

$$\lg c_{0\text{minta}} - \lg c_{0\text{std}} = \frac{a_{\text{minta}} - a_{\text{std}}}{b}$$

Az azonos hatást (abszorbanciát) adó log dózis értékek közötti különbség.

$$x_{\text{std}} - x_{\text{minta}} = \frac{a_{\text{minta}} - a_{\text{std}}}{b} = \frac{1.8184 - 1.8170}{0.5842} = 0.00245$$

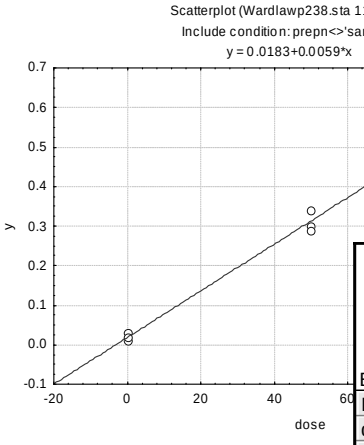
Az aktivitás (relative potency) ennek antilogaritmusa: 1.0056.

Példa

A.C. Wardlaw: Practical statistics for experimental biologists, J. Wiley, 1985, p. 238

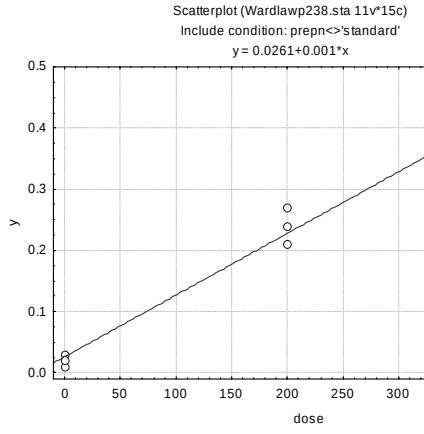
Wardlawp238.sta

	1 prepn	2 dose	3 rept	4 y
1	standard	50	1	0.3
2	standard	50	2	0.34
3	standard	50	3	0.29
4	standard	100	1	0.59
5	standard	100	2	0.61
6	standard	100	3	0.63
7	sample	200	1	0.27
8	sample	200	2	0.24
9	sample	200	3	0.21
10	sample	400	1	0.43
11	sample	400	2	0.39
12	sample	400	3	0.45
13	blank	0	1	0.03
14	blank	0	2	0.01
15	blank	0	3	0.02



Univariate Tests of Significance for y (Wardlawp238.sta) Over-parameterized model Type III decomposition Include condition: prepn<>'sample'					
Effect	SS	Degr. of Freedom	MS	F	p
Intercept	0.001210	1	0.001210	3.457	0.105314
dose	0.522150	1	0.522150	1491.857	0.000000
Error	0.002450	7	0.000350		

	Test of Lack of Fit (Wardlawp238.sta) Include condition: prepn<>'sample'							
Dependnt Variable	SS Pure Err	df Pure Err	MS Pure Err	SS Lack of Fit	df Lack of Fit	MS Lack of Fit	F	p
y	0.002400	6	0.000400	0.000050	1	0.000050	0.125000	0.735765



Slope ratio assay a szándék

Parameter Estimates (Wardlawp238.sta) Over-parameterized model Include condition: prepn<>'standard'				
Effect	y Param.	y Std.Err	y t	y p
Intercept	0.026111	0.013421	1.94559	0.092768
dose	0.001008	0.000052	19.39921	0.000000

	Test of Lack of Fit (Wardlawp238.sta) Include condition: prepn<>'standard'							
Dependnt Variable	SS Pure Err	df Pure Err	MS Pure Err	SS Lack of Fit	df Lack of Fit	MS Lack of Fit	F	p
y	0.003867	6	0.000644	0.000672	1	0.000672	1.043103	0.346502

Effect	Univariate Tests of Significance for y (Wardlawp238.sta) Over-parameterized model Type III decomposition SS	Degr. of Freedom	MS	F	p
Intercept	0.002381	1	0.002381	4.1574	0.064106
dosestd	0.558451	1	0.558451	975.1215	0.000000
dosesampl	0.270561	1	0.270561	472.4318	0.000000
Error	0.006872	12	0.000573		

Dependent Variable	Test of Lack of Fit (Wardlawp238.sta) SS Pure Err	df Pure Err	MS Pure Err	SS Lack of Fit	df Lack of Fit	MS Lack of Fit	F	p
y	0.006067	10	0.000607	0.000806	2	0.000403	0.664050	0.536061

	1 prepn	2 dose	3 rept	4 y	5 dosestd	6 dosesampl
1	standard	50	1	0.3	50	0
2	standard	50	2	0.34	50	0
3	standard	50	3	0.29	50	0
4	standard	100	1	0.59	100	0
5	standard	100	2	0.61	100	0
6	standard	100	3	0.63	100	0
7	sample	200	1	0.27	0	200
8	sample	200	2	0.24	0	200
9	sample	200	3	0.21	0	200
10	sample	400	1	0.43	0	400
11	sample	400	2	0.39	0	400
12	sample	400	3	0.45	0	400
13	blank	0	1	0.03	0	0
14	blank	0	2	0.01	0	0
15	blank	0	3	0.02	0	0

$$\hat{Y} = a + b_{\text{minta}} x_{\text{minta}} \qquad \hat{Y} = a + b_{\text{std}} x_{\text{std}}$$

Effect	Parameter Estimates (Wardlawp238.sta) Over-parameterized model			
	y Param.	y Std.Err	y t	y p
dosestd	0.006120	0.000138	44.42113	0.000000
dosesampl	0.001087	0.000034	31.54965	0.000000

Dependnt Variable	Test of Lack of Fit (Wardlawp238.sta)							
	SS Pure Err	df Pure Err	MS Pure Err	SS Lack of Fit	df Lack of Fit	MS Lack of Fit	F	p
y	0.006067	10	0.000607	0.003187	3	0.001062	1.750916	0.219806

$$\hat{Y} = a + b_{\text{std}} x_{\text{std}}$$

$$\hat{Y} = a + b_{\text{minta}} x_{\text{minta}}$$

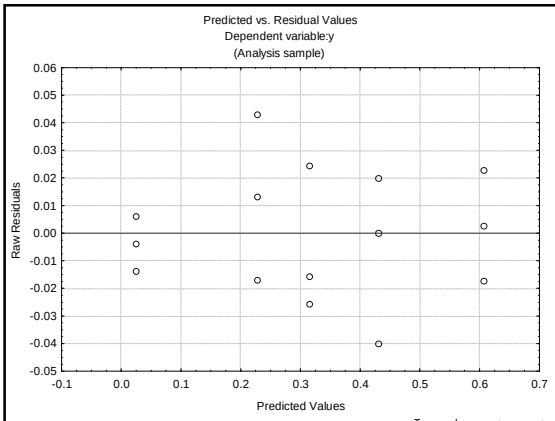
$\hat{Y}_{\text{std}} = \hat{Y}_{\text{minta}}$ helyen $\quad b_{\text{minta}} x_{\text{minta}} = b_{\text{std}} x_{\text{std}}$

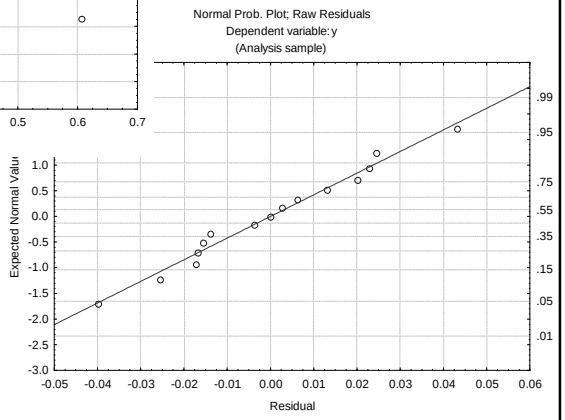
Effect	Parameter Estimates (Wardlawp238.sta) Sigma-restricted parameterization			
	y Param.	y Std.Err	y t	y p
Intercept	0.023810	0.011677	2.03898	0.064106
dosestd	0.005834	0.000187	31.22694	0.000000
dosesampl	0.001015	0.000047	21.73550	0.000000

$$b_{\text{sample}} x_{\text{sample}} = b_{\text{std}} x_{\text{std}}$$

$$x_{\text{sample}} = \frac{b_{\text{std}} x_{\text{std}}}{b_{\text{sample}}} = \frac{0.005834 \cdot 100}{0.001015} = 5.75\,\mu\text{l}/\text{ng}$$

$$c_{\text{sample}} = \frac{1}{5.75} = 0.174\,\text{ng}/\mu\text{l} = 174\,\text{ng}/\text{ml}$$





Példa

3 készítmény standardhoz viszonyított titerét kívánták meghatározni. Az analitikai jel a spektrofotometriás abszorbancia volt. parall2.sta

	1 prepn	2 dose	3 rept	4 y
1	standard	50	1	0.3
2	standard	50	2	0.34
3	standard	50	3	0.29
4	standard	100	1	0.59
5	standard	100	2	0.61
6	standard	100	3	0.63
7	sample	200	1	0.27
8	sample	200	2	0.24
9	sample	200	3	0.21
10	sample	400	1	0.43
11	sample	400	2	0.39
12	sample	400	3	0.45
13	blank	0	1	0.03
14	blank	0	2	0.01
15	blank	0	3	0.02

Slope ratio assay a szándék

	1 Prepn	2 Dilut	3 dose	4 lndose	5 Absorb
1	1	10	0.1	-2.30259	2.691
2	1	10	0.1	-2.30259	2.334
3	1	20	0.05	-2.99573	1.524
4	1	20	0.05	-2.99573	1.402
5	1	40	0.025	-3.68888	1.089
6	1	40	0.025	-3.68888	1.001
7	2	20	0.05	-2.99573	2.536
8	2	20	0.05	-2.99573	2.659
9	2	40	0.025	-3.68888	1.513
10	2	40	0.025	-3.68888	1.819
11	2	80	0.0125	-4.38203	1.03
12	2	80	0.0125	-4.38203	0.837
13	3	40	0.025	-3.68888	2.633
14	3	40	0.025	-3.68888	2.819
15	3	80	0.0125	-4.38203	1.551
16	3	80	0.0125	-4.38203	1.759
17	3	160	0.00625	-5.07517	0.82
18	3	160	0.00625	-5.07517	0.918
19	std	1350	0.000741	-7.20786	2.82
20	std	1350	0.000741	-7.20786	2.663
21	std	2700	0.00037	-7.90101	1.863
22	std	2700	0.00037	-7.90101	1.554
23	std	5400	0.000185	-8.59415	1.006
24	std	5400	0.000185	-8.59415	0.976

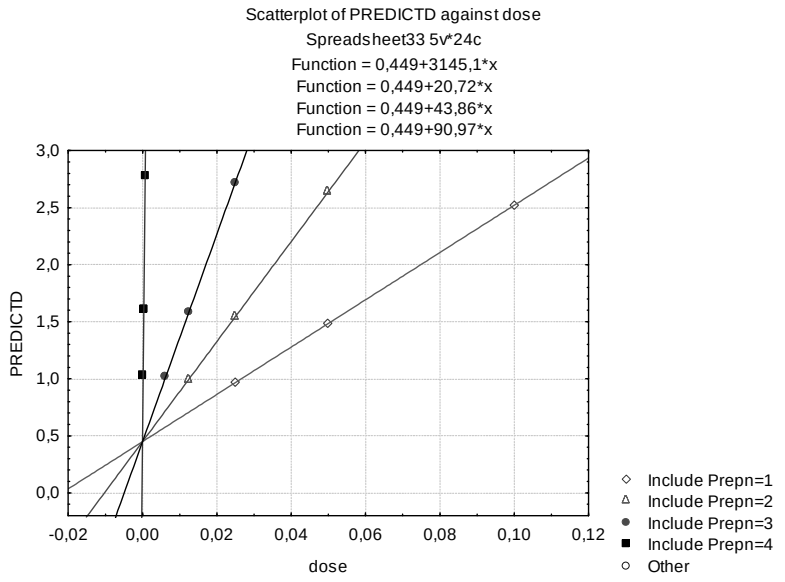
	Parameter Estimates (parall2.sta) (*Zeroed predictors failed tolerance check) Over-parameterized model								
Effect	Level of Effect	Column	Comment (B/Z/P)	Absorb Param.	Absorb Std.Err	Absorb t	Absorb p	-95.00% Cnf.Lmt	+95.00% Cnf.Lmt
Intercept		1		0.475	0.1296	3.661	0.0021	0.200	0.749
Prepn*dose	1	2		19.770	1.9596	10.089	0.0000	15.616	23.924
Prepn*dose	2	3		43.357	3.9192	11.063	0.0000	35.049	51.666
Prepn*dose	3	4		97.131	7.8385	12.392	0.0000	80.515	113.748
Prepn*dose	4	5		3099.214	264.5479	11.715	0.0000	2538.398	3660.031
Prepn	1	6	Biased	0.046	0.1833	0.250	0.8061	-0.343	0.434
Prepn	2	7	Biased	-0.007	0.1833	-0.037	0.9711	-0.395	0.382
Prepn	3	8	Biased	-0.141	0.1833	-0.769	0.4530	-0.530	0.248
Prepn	std	9	Zeroed*	0.000					

	Test of Lack of Fit (parall2.sta)							
Dependnt Variable	SS Pure Err	df Pure Err	MS Pure Err	SS Lack of Fit	df Lack of Fit	MS Lack of Fit	F	p
Absorb	0.252293	12	0.021024	0.106116	4	0.026529	1.261817	0.337791

	1 Prepn	2 Dilut	3 dose	4 ldose	5 Absorb	6 ve1	7 ve2	8 ve3	9 ve4	10 ve1d	11 ve2d
1	1	10	0.1	-2.30259	2.691	1	0	0	0	0.1	0
2	1	10	0.1	-2.30259	2.334	1	0	0	0	0.1	0
3	1	20	0.05	-2.99573	1.524	1	0	0	0	0.05	0
4	1	20	0.05	-2.99573	1.402	1	0	0	0	0.05	0
5	1	40	0.025	-3.68888	1.089	1	0	0	0	0.025	0
6	1	40	0.025	-3.68888	1.001	1	0	0	0	0.025	0
7	2	20	0.05	-2.99573	2.536	0	1	0	0	0	0.05
8	2	20	0.05	-2.99573	2.659	0	1	0	0	0	0.05
9	2	40	0.025	-3.68888	1.513	0	1	0	0	0	0.025
10	2	40	0.025	-3.68888	1.819	0	1	0	0	0	0.025
11	2	80	0.0125	-4.38203	1.03	0	1	0	0	0	0.0125
12	2	80	0.0125	-4.38203	0.837	0	1	0	0	0	0.0125
13	3	40	0.025	-3.68888	2.633	0	0	1	0	0	0
14	3	40	0.025	-3.68888	2.819	0	0	1	0	0	0
15	3	80	0.0125	-4.38203	1.551	0	0	1	0	0	0
16	3	80	0.0125	-4.38203	1.759	0	0	1	0	0	0
17	3	160	0.00625	-5.07517	0.82	0	0	1	0	0	0
18	3	160	0.00625	-5.07517	0.918	0	0	1	0	0	0
19	std	1350	0.000741	-7.20786	2.82	0	0	0	1	0	0
20	std	1350	0.000741	-7.20786	2.663	0	0	0	1	0	0
21	std	2700	0.00037	-7.90101	1.863	0	0	0	1	0	0
22	std	2700	0.00037	-7.90101	1.554	0	0	0	1	0	0
23	std	5400	0.000185	-8.59415	1.006	0	0	0	1	0	0
24	std	5400	0.000185	-8.59415	0.976	0	0	0	1	0	0

Statistics>Advanced Linear/Nonlinear Models>
Nonlinear Estimation>>User-specified regression, custom loss function
Function to be estimated, loss function:
v5=a+(bstd*v9+b1*v6+b2*v7+b3*v8)*v3

	Model: v5=a+(bstd*v9+b1*v6+b2*v7+b3*v8)*v3 (parall2_ve.sta Dep. var: Absorb Loss: (OBS-PRED)**2 Final loss: .384299643 R= .98379 Variance explained: 96.785				
N=24	a	bstd	b1	b2	b3
Estimate	0.449000	3145.114	20.72000	43.85714	90.97143
Std.Err.	0.061583	162.266	1.20197	2.40394	4.80789
t(19)	7.291007	19.382	17.23835	18.24384	18.92129
p-level	0.000001	0.000	0.00000	0.00000	0.00000



Statistics>Advanced Linear/Nonlinear Models>
General Regression Models>Multiple regression

Effect	Parameter Estimates (parall2_ve.sta) Sigma-restricted parameterization					
	Absorb Param.	Absorb Std.Err	Absorb t	Absorb p	-95.00% Cnf.Lmt	+95.00% Cnf.Lmt
Intercept	0.449	0.0616	7.29101	0.000001	0.320	0.578
ve1d	20.720	1.202(	17.2383!	0.000000	18.204	23.236
"ve2d"	43.857	2.403!	18.2438!	0.000000	38.826	48.889
"ve3d"	90.971	4.807!	18.9212!	0.000000	80.908	101.034
"ve4d"	3145.11!	162.266!	19.3824!	0.000000	2805.48!	3484.741

A minta aktivitásának számítása

$$\hat{Y} = a' + b_{\text{std}} x_{\text{std}}$$

A nem hígított standard 25NE/ml koncentrációjú, az 1 nagyságú dózis jelentené ugyanezt a koncentrációt, a 0.1-es dózis 2.5NE/ml koncentrációnak felelne meg.

$$\hat{Y} = a' + b_{\text{minta}} x_{\text{minta}}$$

Vegyünk a standardból és a készítményből olyan dózisokat, hogy az *y* abszorbancia egyenlő legyen

$$b_{\text{minta}} x_{\text{minta}} = b_{\text{std}} x_{\text{std}} \qquad \frac{x_{\text{std}}}{x_{\text{minta}}} = \frac{b_{\text{minta}}}{b_{\text{std}}}$$