Exercício 1

Regression

Descriptive Statistics

	Mean	Std. Deviation	N
I (intensidade de corrente)	1,5460	,72807	5
V (dif. Potencial)	1,3600	,61074	5

Correlations

		I (intensidade de corrente)	V (dif. Potencial)
Pearson Correlation	I (intensidade de corrente)	1,000	,994
	V (dif. Potencial)	,994	1,000
Sig. (1-tailed)	I (intensidade de corrente)	.	,000
	V (dif. Potencial)	,000	.
N	I (intensidade de corrente)	5	5
	V (dif. Potencial)	5	5

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	V (dif. Potencial)[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: I (intensidade de corrente)

Indica qual a variável dependente (I) e independente (V)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,994[a]	,987	,983	,09515

a. Predictors: (Constant), V (dif. Potencial)

b. Dependent Variable: I (intensidade de corrente)

Coeficiente de determinação, indica que 98,7% da variável dependente pode ser explicada pela variação da variável independente

Nesta tabela ANOVA é testada a H0: O modelo em estudo não é válido

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2,093	1	2,093	231,210	,001[a]
	Residual	,027	3	,009		
	Total	2,120	4			

a. Predictors: (Constant), V (dif. Potencial)

b. Dependent Variable: I (intensidade de corrente)

Leva à rejeição de H0, pelo que o modelo é estatisticamente significativo

b0=-0.065, representa a estimativa pontual para a ordenada na origem

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-,065	,114		-,568	,610
	V (dif. Potencial)	1,184	,078	,994	15,206	,001

a. Dependent Variable: I (intensidade de corrente)

b1=1.184, representa estimativa pontual do declive = (1/R)

Coefficients[a]

Model		95,0% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	-,428	,298
	V (dif. Potencial)	,937	1,432

a. Dependent Variable: I (intensidade de corrente)

Gráfico de dispersão com recta ajustada

Graph

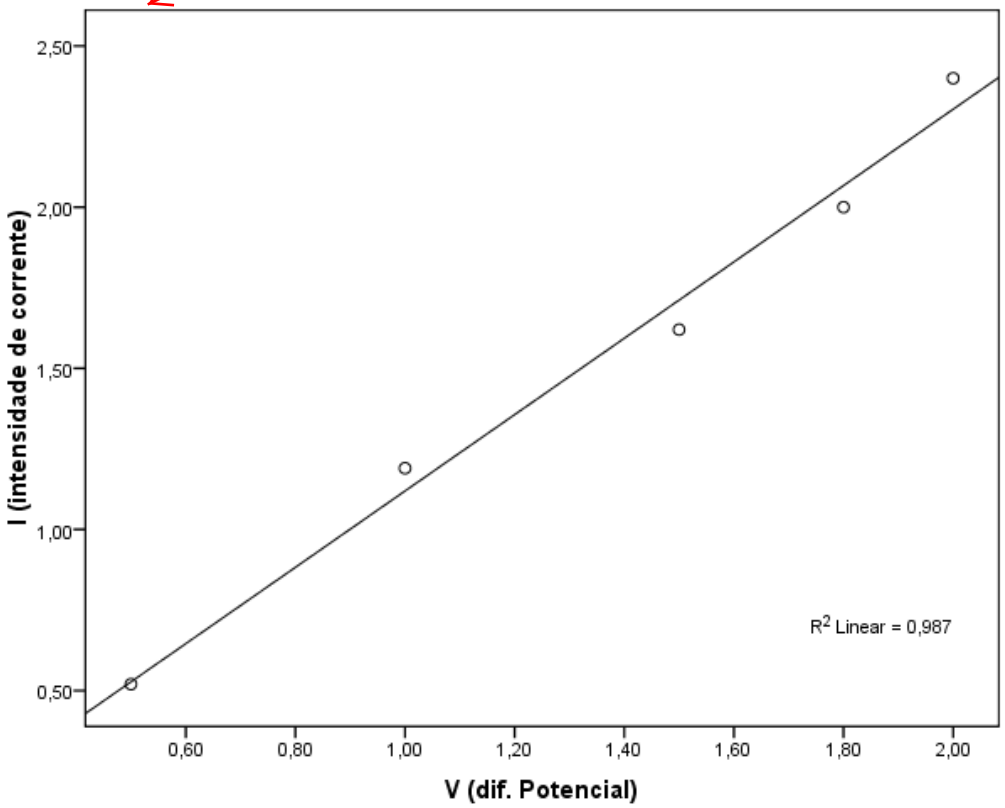
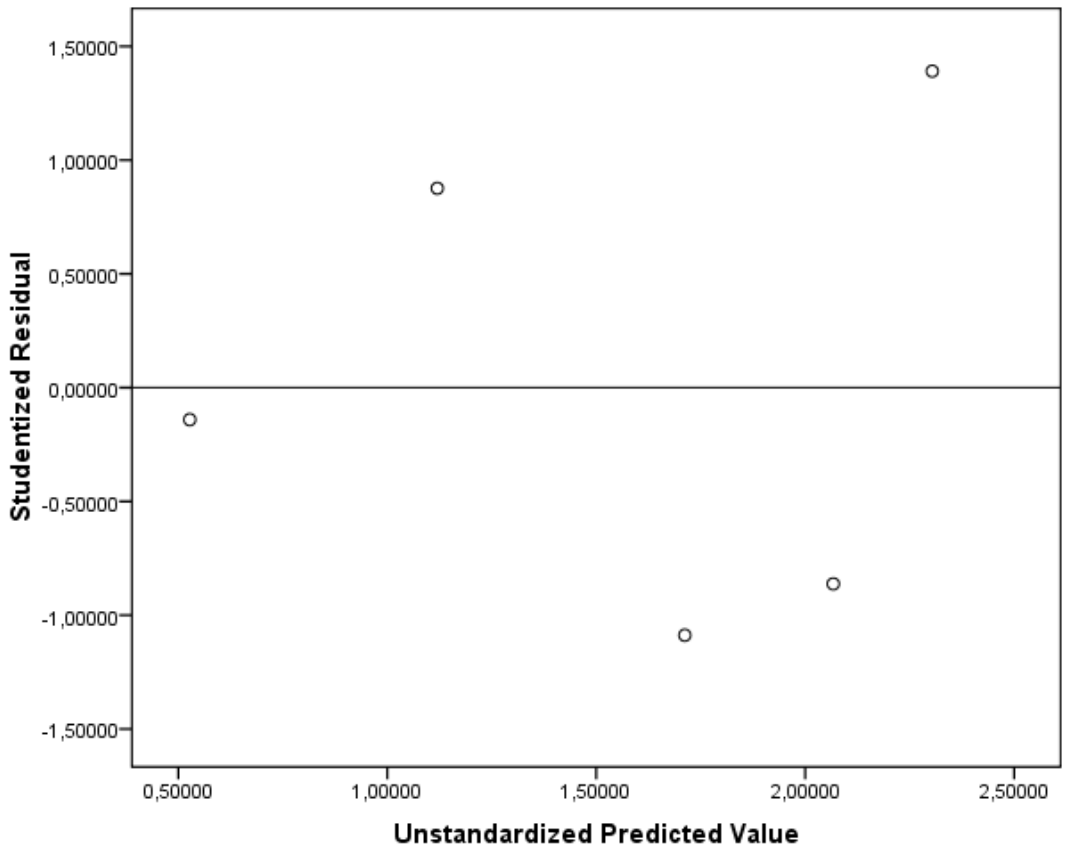
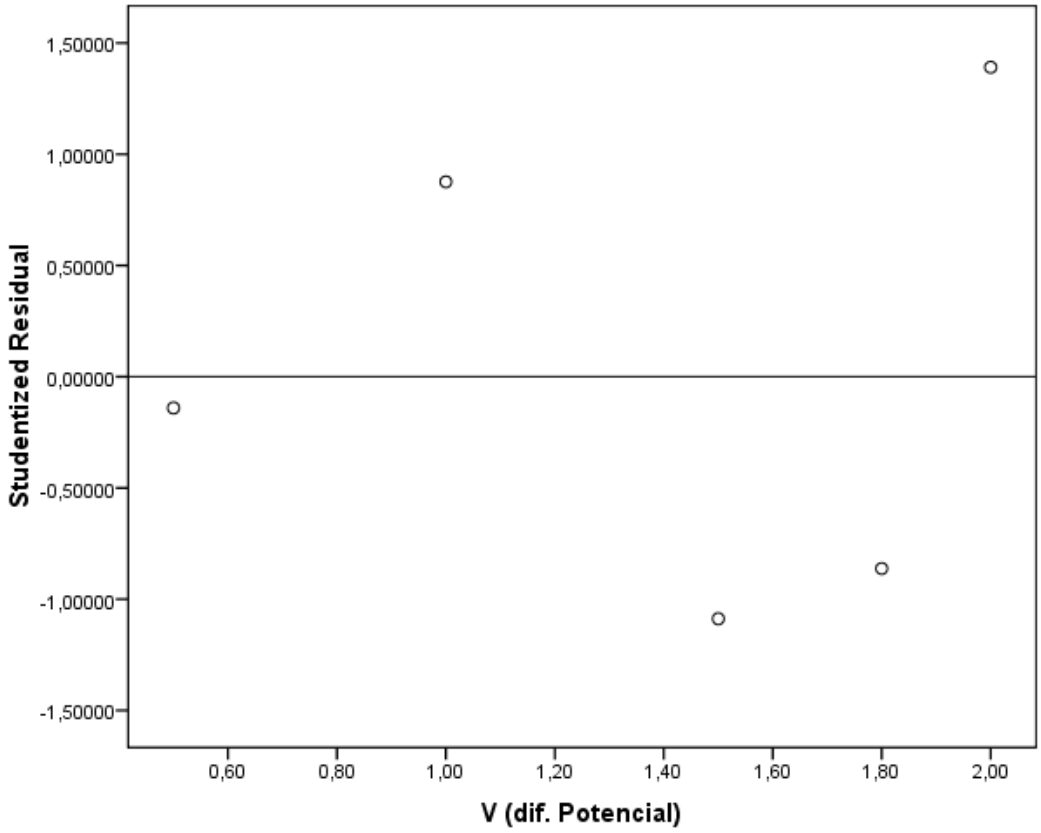


Gráfico de resíduos (permite avaliar o pressuposto da homogeneidade da variância)

Graph



Graph



Explore

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Studentized Residual	5	100,0%	0	,0%	5	100,0%

Descriptives

			Statistic	Std. Error
Studentized Residual	Mean		,0353615	,48184425
	95% Confidence Interval for Mean	Lower Bound	-1,3024526	
		Upper Bound	1,3731756	
	5% Trimmed Mean		,0224441	
	Median		-,1404695	
	Variance		1,161	
	Std. Deviation		1,07743649	
	Minimum		-1,08794	
	Maximum		1,39117	
	Range		2,47911	
	Interquartile Range		2,10873	
	Skewness		,313	,913
	Kurtosis		-2,322	2,000

NPar Tests

Testa a H0: Os resíduos seguem uma distribuição Normal (teste KS para a Normal com a correção de Lilliefors).

One-Sample Kolmogorov-Smirnov Test

		Studentized Residual
	N	*5*
Normal Parameters[a,,b]	Mean	*,0353615*
	Std. Deviation	*1,07743649*
Most Extreme Differences	Absolute	*,198*
	Positive	*,198*
	Negative	*-,182*
	Kolmogorov-Smirnov Z	*,442*
	Asymp. Sig. (2-tailed)	*,990*

a. Test distribution is Normal.

b. Calculated from data.

Exercício 2

Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	X2, X1[a]	.	Enter

a. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,990[a]	,979	,973	2,433

a. Predictors: (Constant), X2, X1

b. Dependent Variable: Y

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1953,076	2	976,538	165,021	,000[a]
	Residual	41,424	7	5,918		
	Total	1994,500	9			

a. Predictors: (Constant), X2, X1

b. Dependent Variable: Y

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	51,720	2,624		19,707	,000
	X1	1,515	,130	,639	11,651	,000
	X2	,669	,053	,688	12,553	,000

a. Dependent Variable: Y

Coefficients[a]

Model		95,0% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	45,514	57,926
	X1	1,207	1,822
	X2	,543	,794

a. Dependent Variable: Y

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Studentized Residual	10	100,0%	0	,0%	10	100,0%

Descriptives

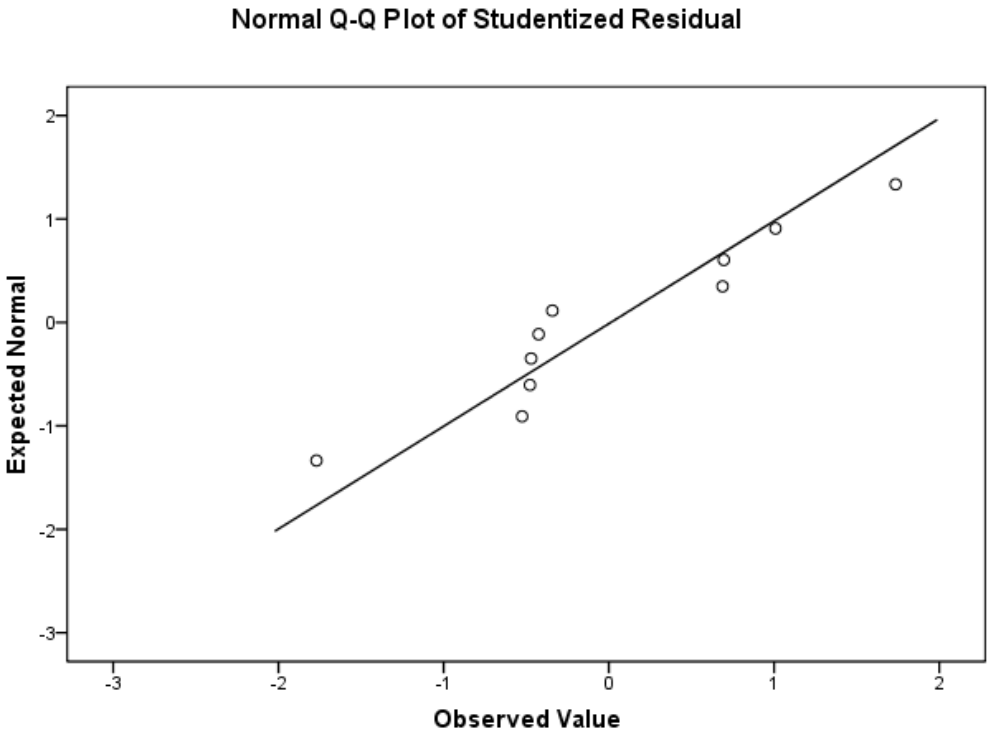
			Statistic	Std. Error
Studentized Residual		Mean	,0116925	,31869746
	95% Confidence Interval for Mean	Lower Bound	-,7092513	
		Upper Bound	,7326362	
		5% Trimmed Mean	,0149189	
		Median	-,3835987	
		Variance	1,016	
		Std. Deviation	1,00780986	
		Minimum	-1,77009	
		Maximum	1,73540	
		Range	3,50550	
		Interquartile Range	1,26311	
		Skewness	,078	,687
		Kurtosis	,013	1,334

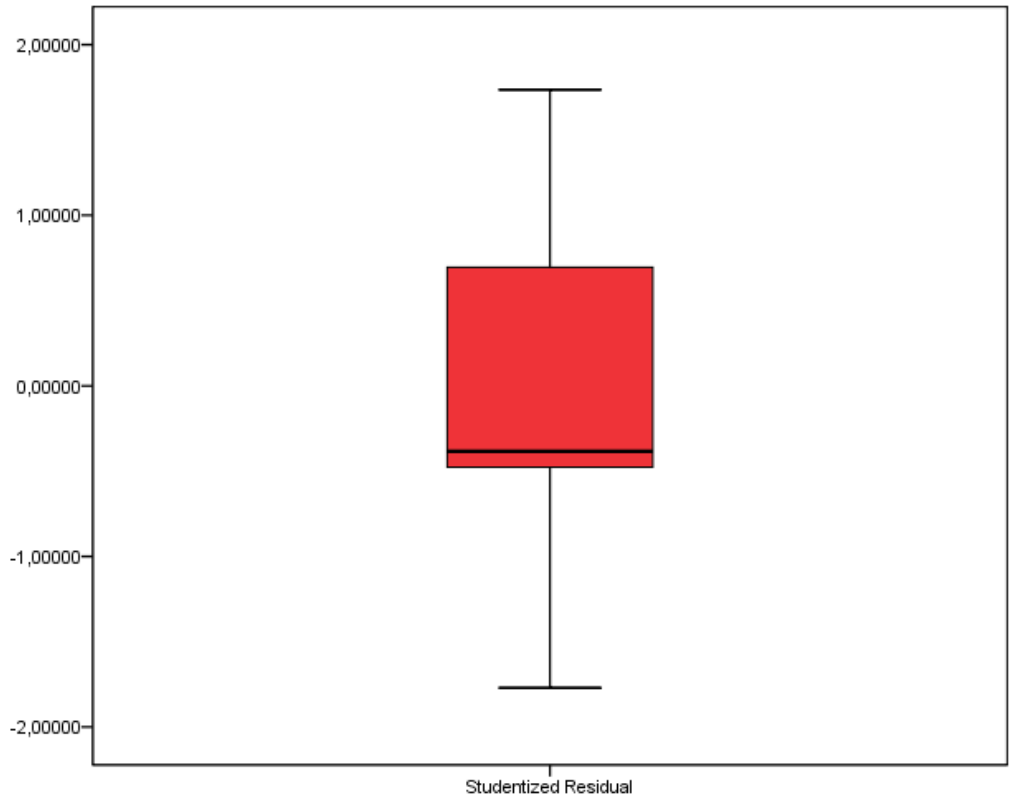
Tests of Normality

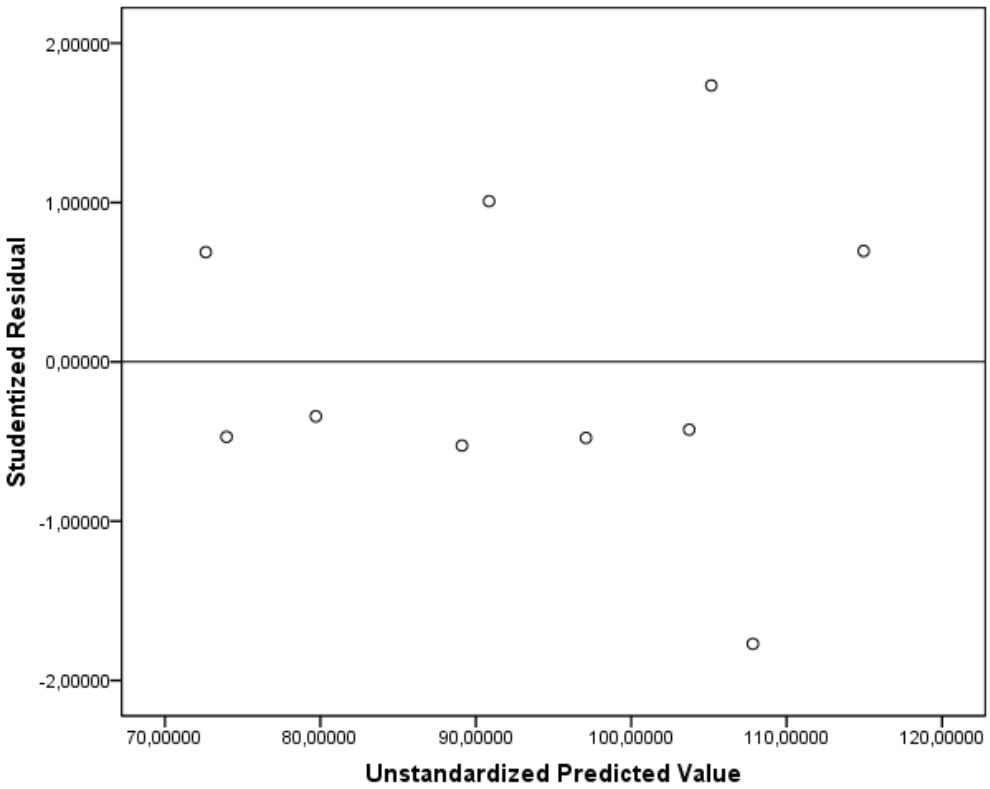
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Studentized Residual	,237	10	,117	,928	10	,430

a. Lilliefors Significance Correction

Studentized Residual




2,00000
1,00000
0,00000
-1,00000
-2,00000
Studentized Residual


2,00000
1,00000
0,00000
-1,00000
-2,00000
Studentized Residual
70,00000
80,00000
90,00000
100,00000
110,00000
120,00000
Unstandardized Predicted Value

Exercício 3

Warnings

The Cubic model could not be fitted due to near-collinearity among model terms.

Model Description

	Model Name	MOD_3
Dependent Variable	1	Percentagem
Equation	1	Linear
	2	Quadratic
	3	Cubic
	Independent Variable	Temperatura
	Constant	Included
	Variable Whose Values Label Observations in Plots	Unspecified
	Tolerance for Entering Terms in Equations	,0001

Case Processing Summary

	N
Total Cases	10
Excluded Cases[a]	0
Forecasted Cases	0
Newly Created Cases	0

a. Cases with a missing value in any variable are excluded from the analysis.

Variable Processing Summary

		Variables	
		Dependent	Independent
		Percentagem	Temperatura
	Number of Positive Values	10	10
	Number of Zeros	0	0
	Number of Negative Values	0	0
Number of Missing Values	User-Missing	0	0
	System-Missing	0	0

Model Summary and Parameter Estimates

Dependent Variable:Percentagem

Equation	Model Summary				
	R Square	F	df1	df2	Sig.
Linear	,149	1,401	1	8	,271
Quadratic	,673	7,189	2	7	,020
Cubic	,742	10,065	2	7	,009

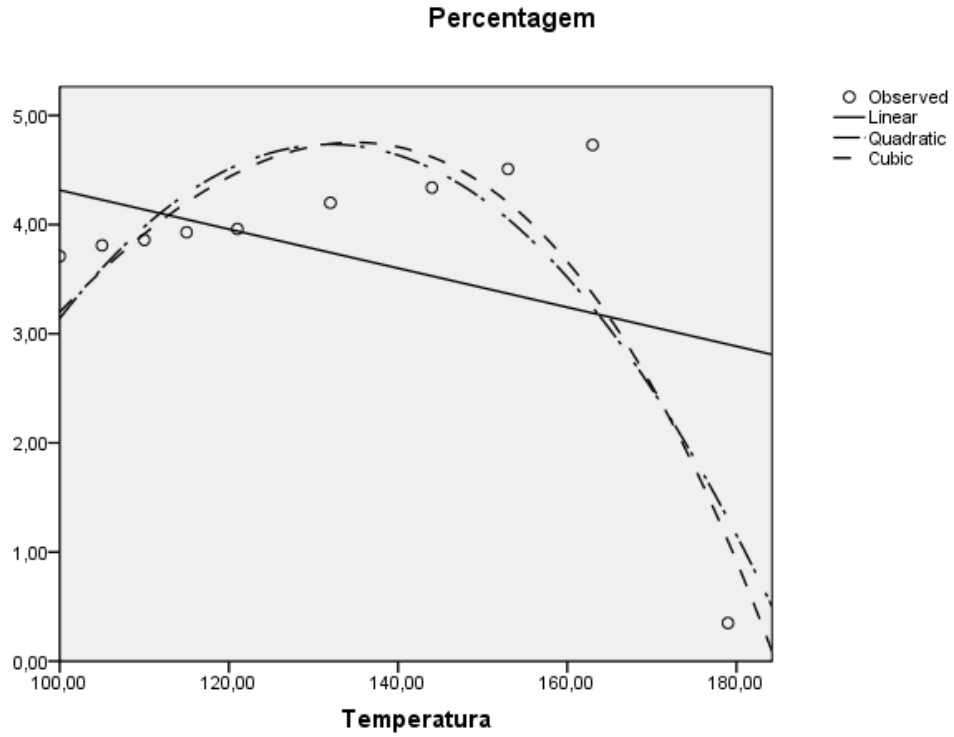
The independent variable is Temperatura.

Model Summary and Parameter Estimates

Dependent Variable:Percentagem

Equation	Parameter Estimates			
	Constant	b1	b2	b3
Linear	6,104	-,018		
Quadratic	-22,360	,410	-,002	
Cubic	-4,599	,000	,002	-7,619E-6

The independent variable is Temperatura.



Exercício 4

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	log10d[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: log10h

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,994[a]	,988	,985	,01544

a. Predictors: (Constant), log10d

b. Dependent Variable: log10h

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	,079	1	,079	333,302	,000[a]
	Residual	,001	4	,000		
	Total	,080	5			

a. Predictors: (Constant), log10d

b. Dependent Variable: log10h

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	4,968	,141		35,305	,000
	log10d	-1,865	,102	-,994	-18,257	,000

a. Dependent Variable: log10h

Coefficients[a]

Model		95,0% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	4,577	5,358
	log10d	-2,149	-1,582

a. Dependent Variable: log10h

Explore

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Studentized Residual	6	100,0%	0	,0%	6	100,0%

Descriptives

			Statistic	Std. Error
Studentized Residual		Mean	-,0567132	,45801918
	95% Confidence Interval for Mean	Lower Bound	-1,2340890	
		Upper Bound	1,1206626	
		5% Trimmed Mean	-,0242651	
		Median	-,1038435	
		Variance	1,259	
		Std. Deviation	1,12191328	
		Minimum	-1,91378	
		Maximum	1,21629	
		Range	3,13007	
		Interquartile Range	1,79655	
		Skewness	-,710	,845
		Kurtosis	,642	1,741

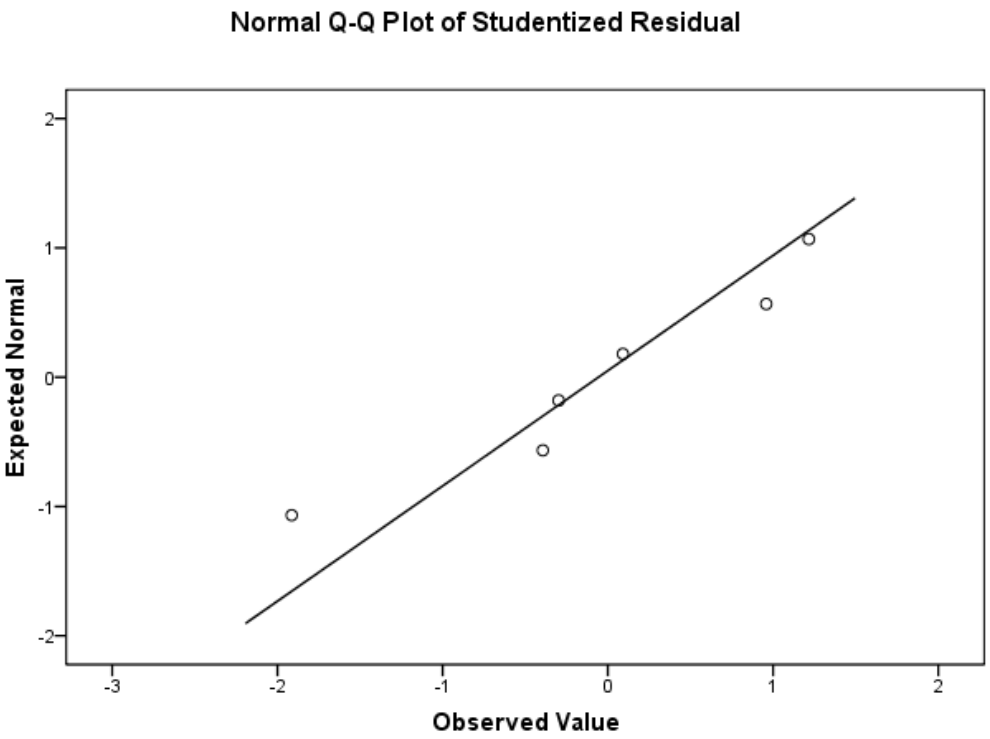
Tests of Normality

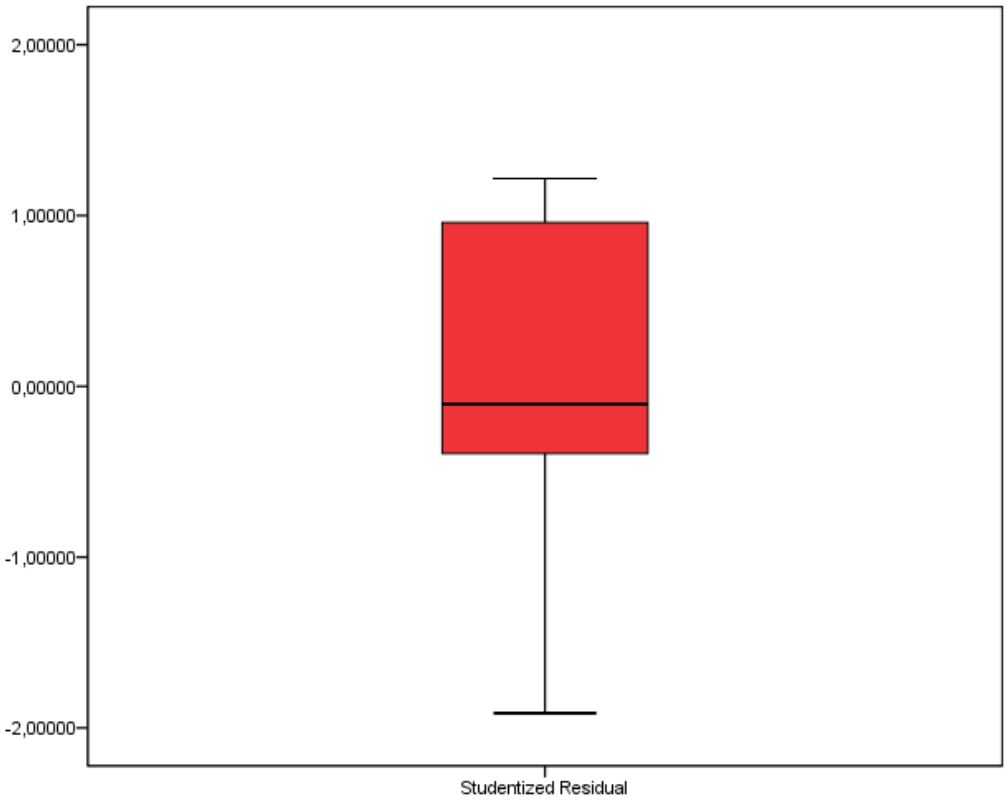
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Studentized Residual	,215	6	,200*	,935	6	,623

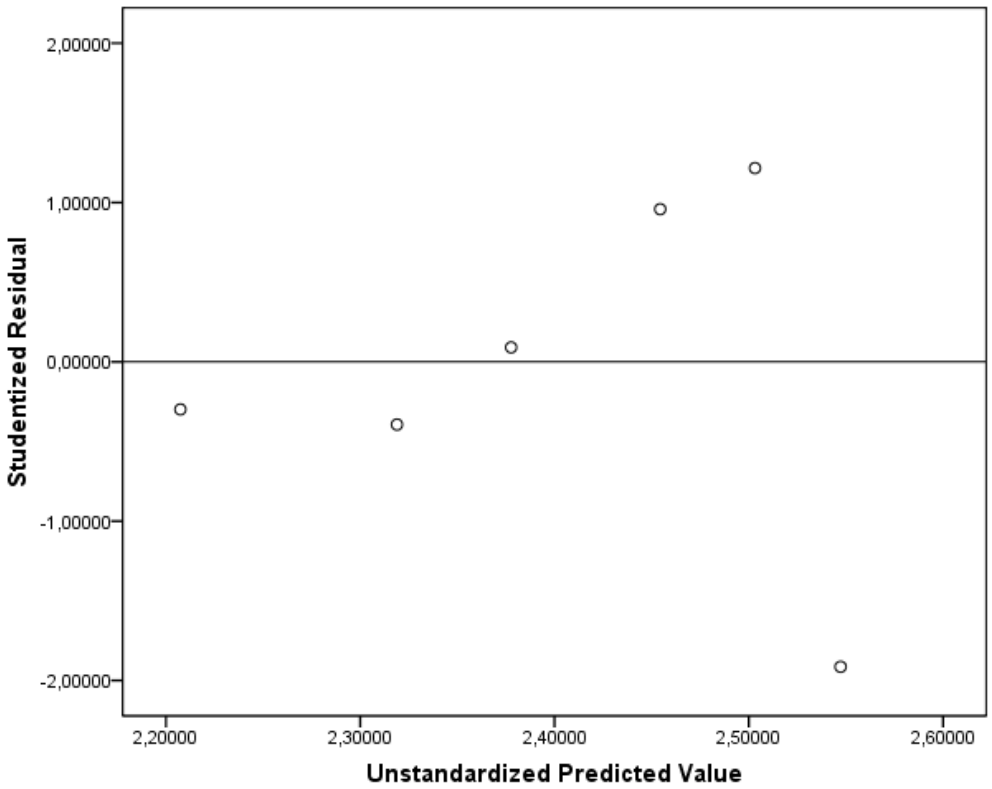
a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

Studentized Residual




2,00000
1,00000
0,00000
-1,00000
-2,00000
Studentized Residual


2,00000
1,00000
0,00000
-1,00000
-2,00000
Studentized Residual
2,20000
2,30000
2,40000
2,50000
2,60000
Unstandardized Predicted Value

Exercício 5

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	temperatura[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: oxigénio

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,990[a]	,981	,978	,16825

a. Predictors: (Constant), temperatura

b. Dependent Variable: oxigénio

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8,745	1	8,745	308,933	,000[a]
	Residual	,170	6	,028		
	Total	8,915	7			

a. Predictors: (Constant), temperatura

b. Dependent Variable: oxigénio

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	3,471	,060		57,738	,000
	temperatura	-,088	,005	-,990	-17,576	,000

a. Dependent Variable: oxigénio

Coefficients[a]

Model		95,0% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	3,324	3,619
	temperatura	-,100	-,076

a. Dependent Variable: oxigénio

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Studentized Residual	8	100,0%	0	,0%	8	100,0%

Descriptives

			Statistic	Std. Error
Studentized Residual		Mean	,0223358	,36441898
	95% Confidence Interval for Mean	Lower Bound	-,8393782	
		Upper Bound	,8840497	
		5% Trimmed Mean	,0735599	
		Median	,2022084	
		Variance	1,062	
		Std. Deviation	1,03073253	
		Minimum	-1,98166	
		Maximum	1,10430	
		Range	3,08595	
		Interquartile Range	1,50204	
		Skewness	-1,011	,752
		Kurtosis	,836	1,481

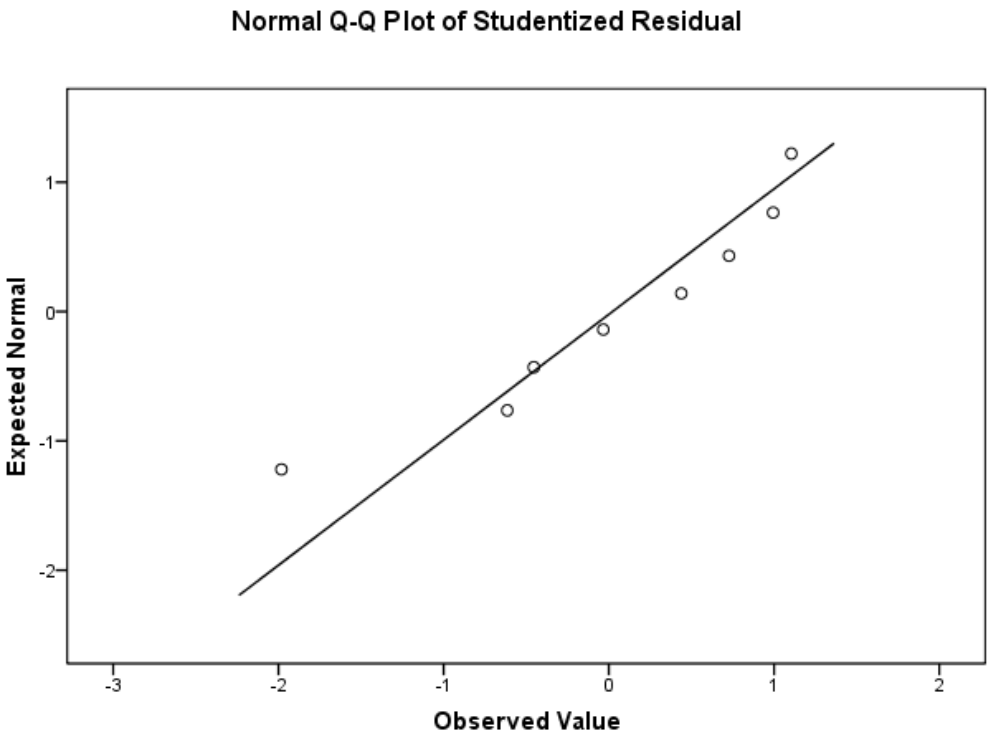
Tests of Normality

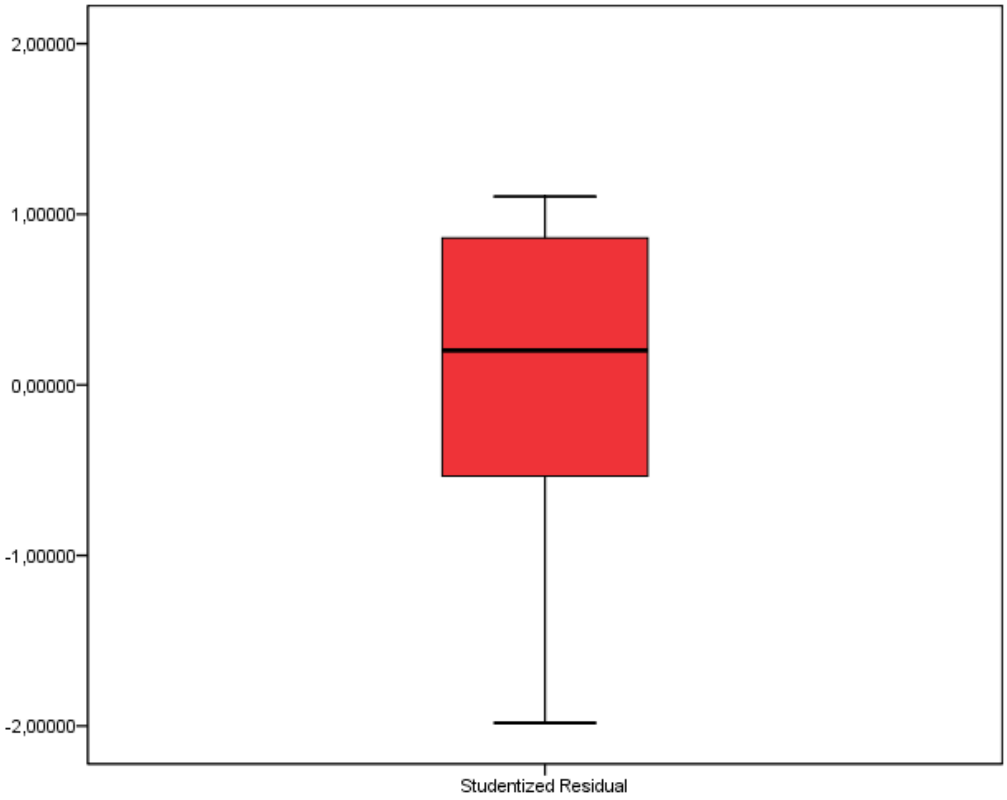
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Studentized Residual	,157	8	,200*	,916	8	,396

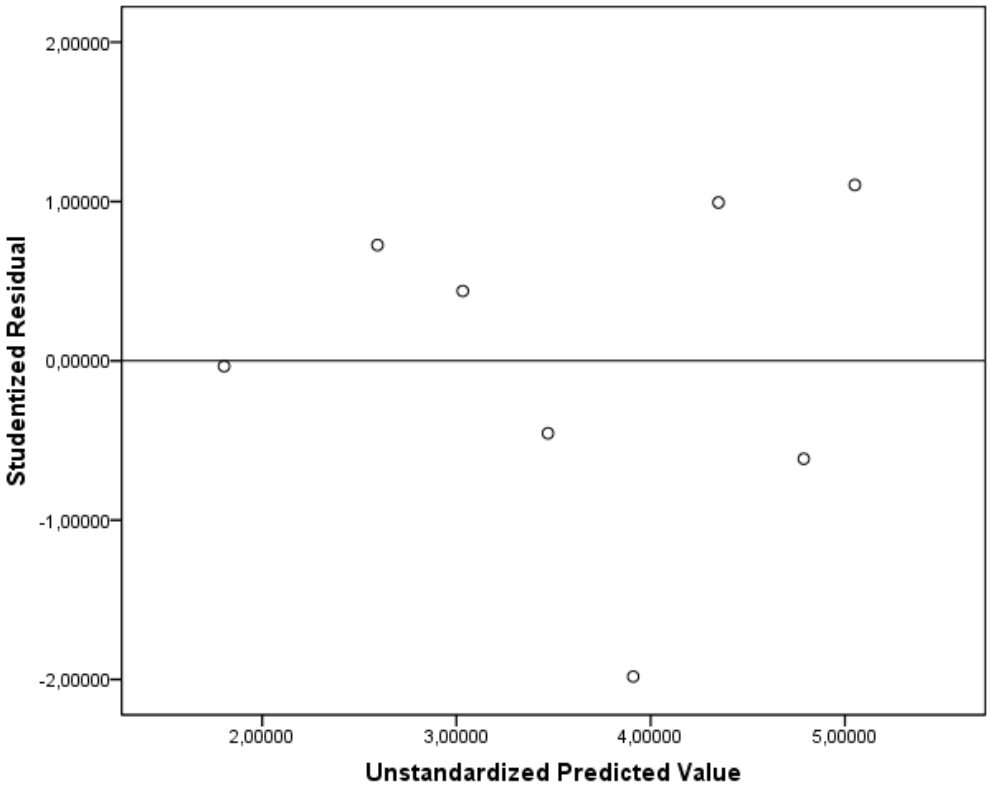
a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

Studentized Residual


Normal Q-Q Plot of Studentized Residual
Expected Normal
Observed Value
1
0
-1
-2
-3
-2
-1
0
1
2


2,00000
1,00000
0,00000
-1,00000
-2,00000
Studentized Residual


2,00000
1,00000
0,00000
-1,00000
-2,00000
Studentized Residual
2,00000
3,00000
4,00000
5,00000
Unstandardized Predicted Value

Exercício 6

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	% S2[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Decrescimento

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,925[a]	,855	,819	66,4186

a. Predictors: (Constant), % S2

b. Dependent Variable: Decrescimento

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	104404,290	1	104404,290	23,667	,008[a]
	Residual	17645,710	4	4411,428		
	Total	122050,000	5			

a. Predictors: (Constant), % S2

b. Dependent Variable: Decrescimento

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	374,534	45,784		8,181	,001
	% S2	474,988	97,637	,925	4,865	,008

a. Dependent Variable: Decrescimento

Coefficients[a]

Model		95,0% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	247,418	501,649
	% S2	203,905	746,071

a. Dependent Variable: Decrescimento

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Studentized Residual	6	100,0%	0	,0%	6	100,0%

Descriptives

			Statistic	Std. Error
Studentized Residual		Mean	-,0949053	,45070076
	95% Confidence Interval for Mean	Lower Bound	-1,2534685	
		Upper Bound	1,0636579	
		5% Trimmed Mean	-,0814108	
		Median	-,0811354	
		Variance	1,219	
		Std. Deviation	1,10398690	
		Minimum	-1,63763	
		Maximum	1,20492	
		Range	2,84255	
		Interquartile Range	2,17538	
		Skewness	-,190	,845
		Kurtosis	-1,314	1,741

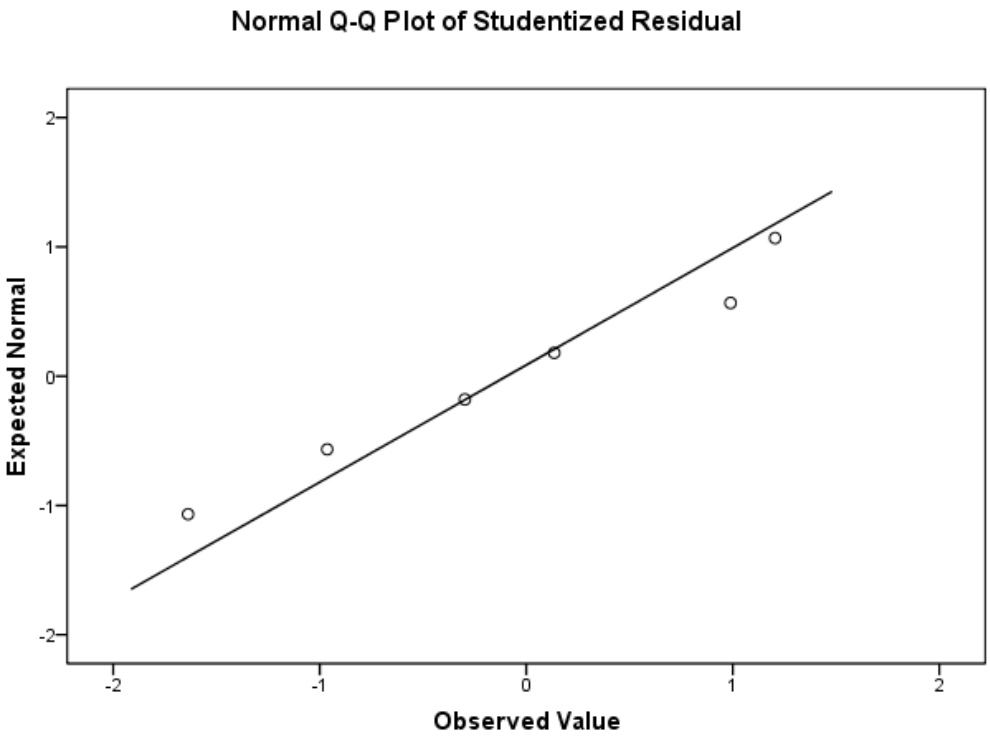
Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Studentized Residual	,170	6	,200*	,956	6	,791

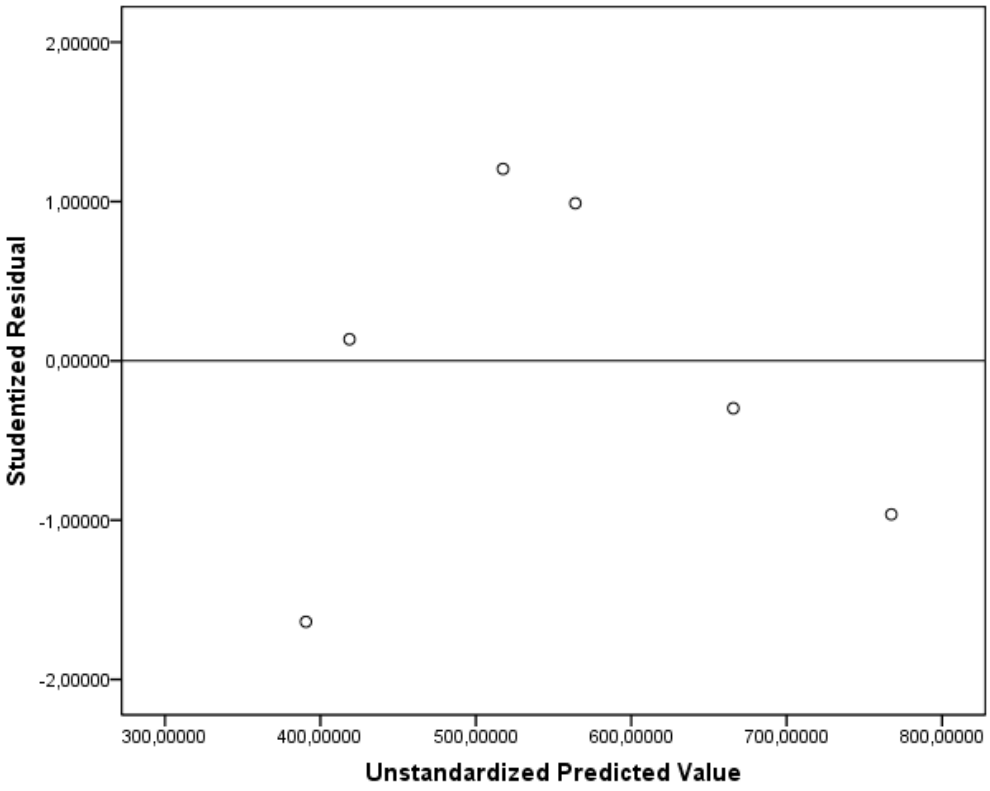
a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

Studentized Residual


Normal Q-Q Plot of Studentized Residual
Expected Normal
Observed Value
2
1
0
-1
-2
-2
-1
0
1
2


2,00000
1,00000
0,00000
-1,00000
-2,00000
Studentized Residual



Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	lnx[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Decrescimento

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,996[a]	,992	,990	15,6077

a. Predictors: (Constant), lnx

b. Dependent Variable: Decrescimento

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	121075,594	1	121075,594	497,023	,000[a]
	Residual	974,406	4	243,602		
	Total	122050,000	5			

a. Predictors: (Constant), lnx

b. Dependent Variable: Decrescimento

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	735,928	10,353		71,081	,000
	lnx	127,589	5,723	,996	22,294	,000

a. Dependent Variable: Decrescimento

Coefficients[a]

Model		95,0% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	707,182	764,673
	lnx	111,699	143,479

a. Dependent Variable: Decrescimento

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Studentized Residual	6	100,0%	0	,0%	6	100,0%

Descriptives

			Statistic	Std. Error
Studentized Residual		Mean	,0248247	,43991670
	95% Confidence Interval for Mean	Lower Bound	-1,1060172	
		Upper Bound	1,1556666	
		5% Trimmed Mean	,0618698	
		Median	,3885030	
		Variance	1,161	
		Std. Deviation	1,07757144	
		Minimum	-1,85487	
		Maximum	1,23770	

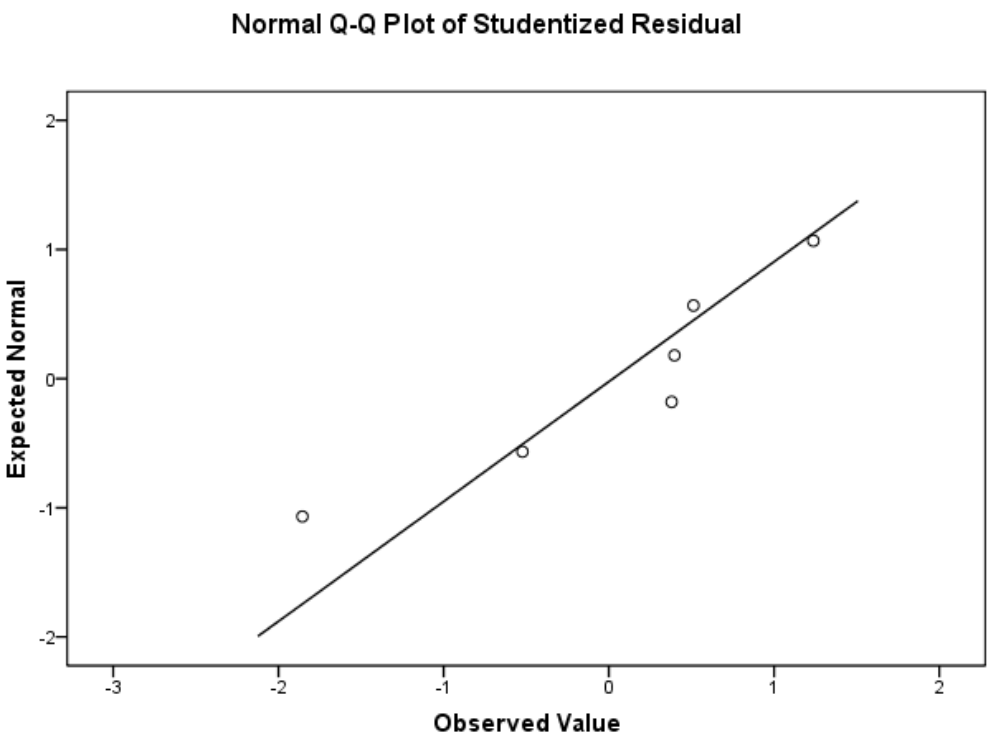
	Range	3,09257	
	Interquartile Range	1,54894	
	Skewness	-1,153	,845
	Kurtosis	1,449	1,741

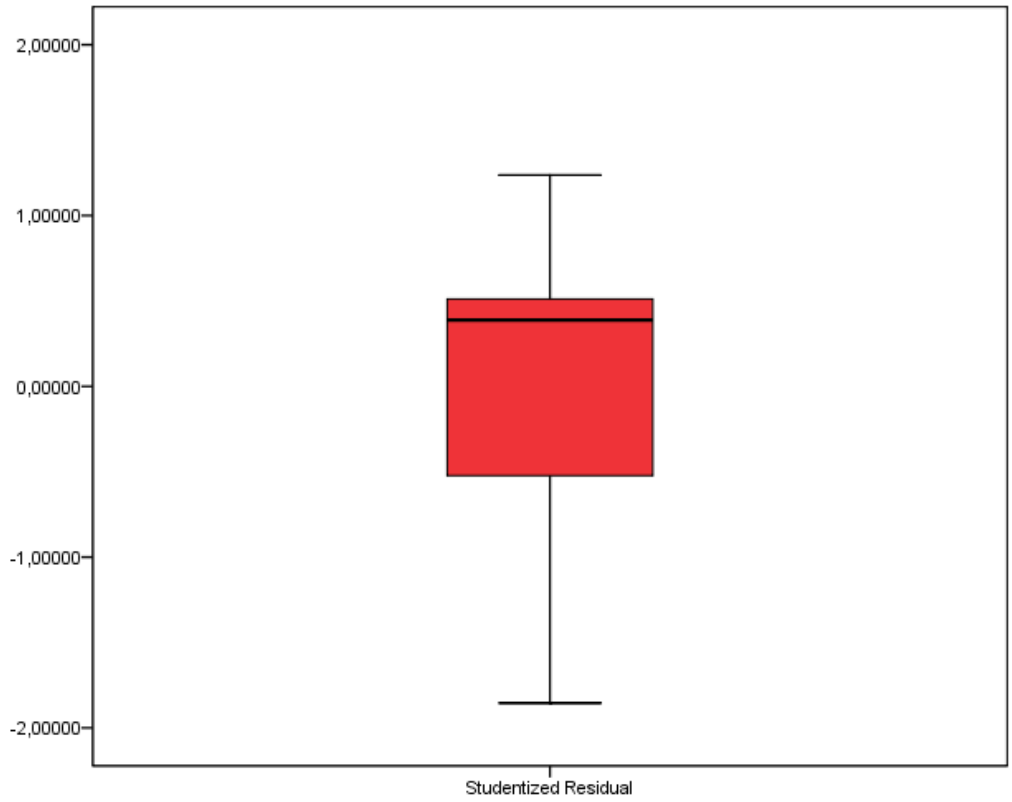
Tests of Normality

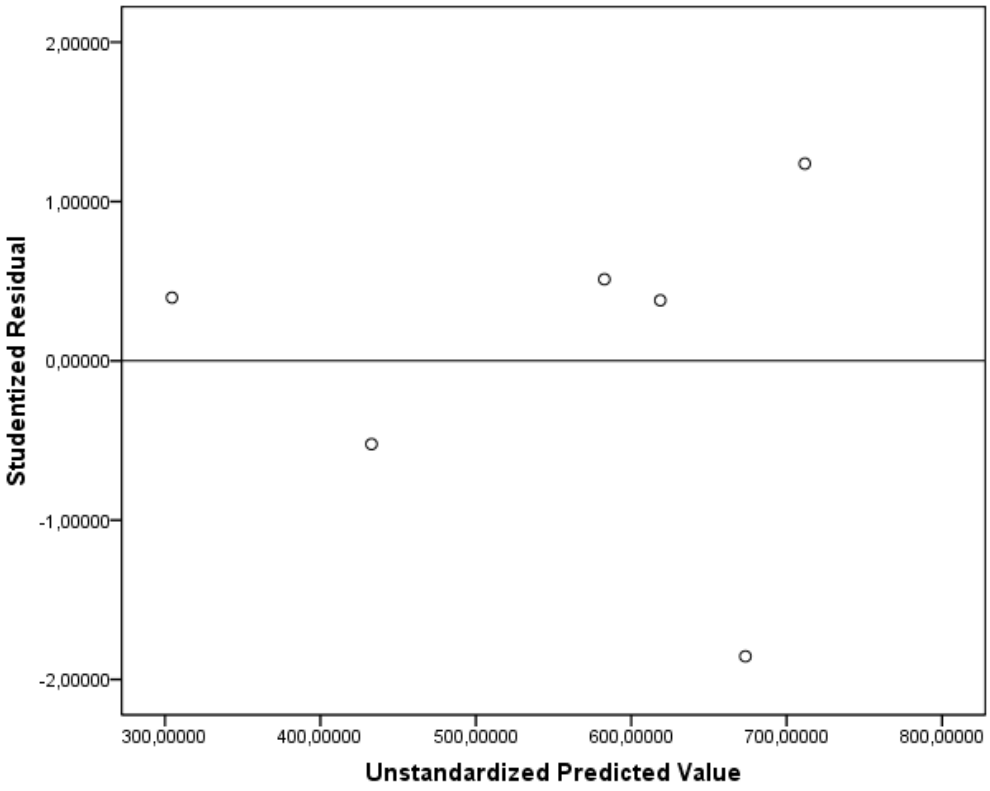
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Studentized Residual	,296	6	,110	,896	6	,349

a. Lilliefors Significance Correction

Studentized Residual




2,00000
1,00000
0,00000
-1,00000
-2,00000
Studentized Residual


2,00000
1,00000
0,00000
-1,00000
-2,00000
Studentized Residual
300,00000
400,00000
500,00000
600,00000
700,00000
800,00000
Unstandardized Predicted Value

Exercício 7

Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	Horas, QI[a]	.	Enter

a. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,884[a]	,782	,719	10,096

a. Predictors: (Constant), Horas, QI

b. Dependent Variable: Resultado

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2554,156	2	1277,078	12,530	,005[a]
	Residual	713,444	7	101,921		
	Total	3267,600	9			

a. Predictors: (Constant), Horas, QI

b. Dependent Variable: Resultado

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-124,568	47,874		-2,602	,035
	QI	1,659	,446	,733	3,719	,007
	Horas	1,439	1,067	,266	1,349	,219

a. Dependent Variable: Resultado

Coefficients[a]

Model		95,0% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	-237,773	-11,364
	QI	,604	2,714
	Horas	-1,083	3,962

a. Dependent Variable: Resultado

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Studentized Residual	10	100,0%	0	,0%	10	100,0%

Descriptives

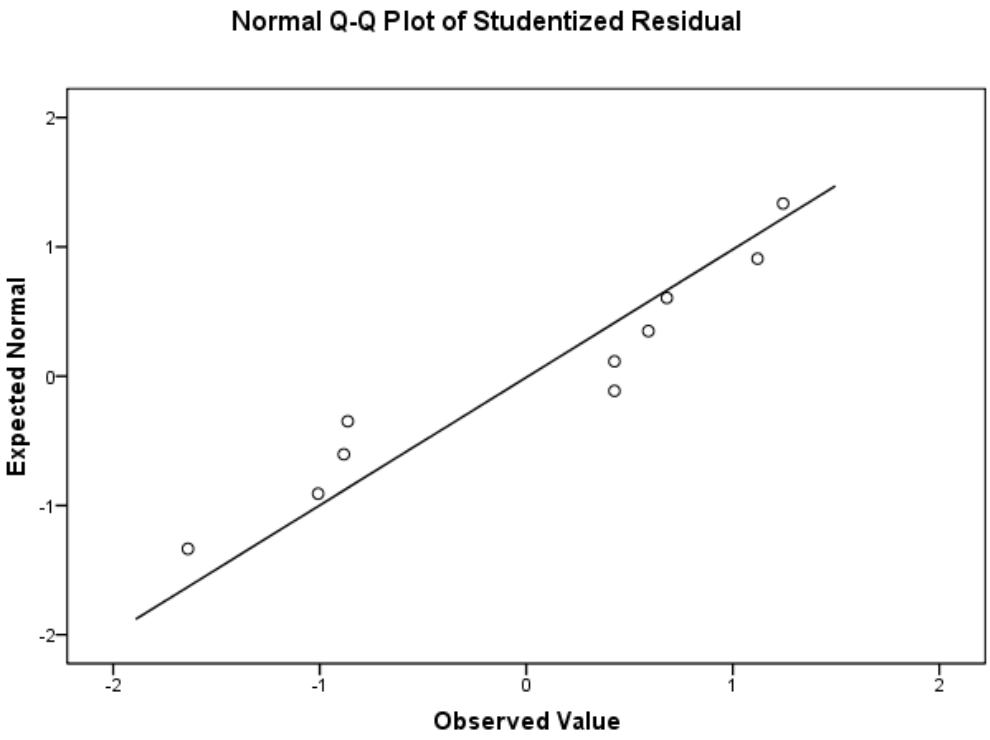
			Statistic	Std. Error
Studentized Residual		Mean	,0095740	,31978363
	95% Confidence Interval for Mean	Lower Bound	-,7138268	
		Upper Bound	,7329748	
		5% Trimmed Mean	,0325599	
		Median	,4270071	
		Variance	1,023	
		Std. Deviation	1,01124464	
		Minimum	-1,63807	
		Maximum	1,24347	
		Range	2,88154	
		Interquartile Range	1,70487	
		Skewness	-,405	,687
		Kurtosis	-1,443	1,334

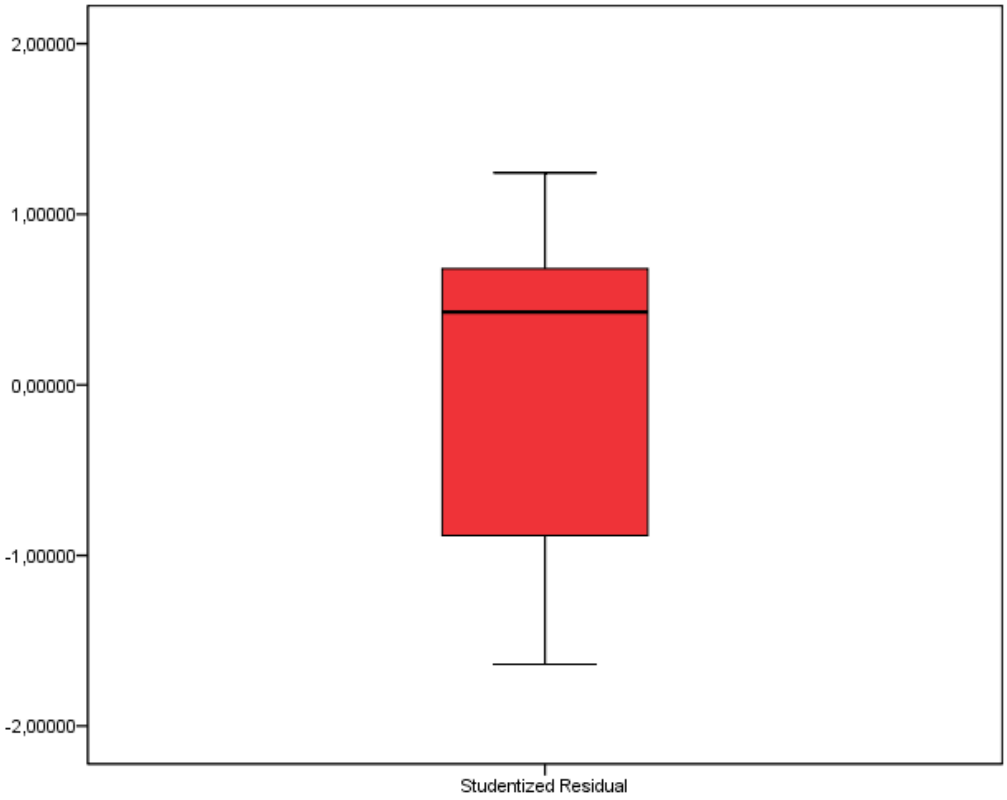
Tests of Normality

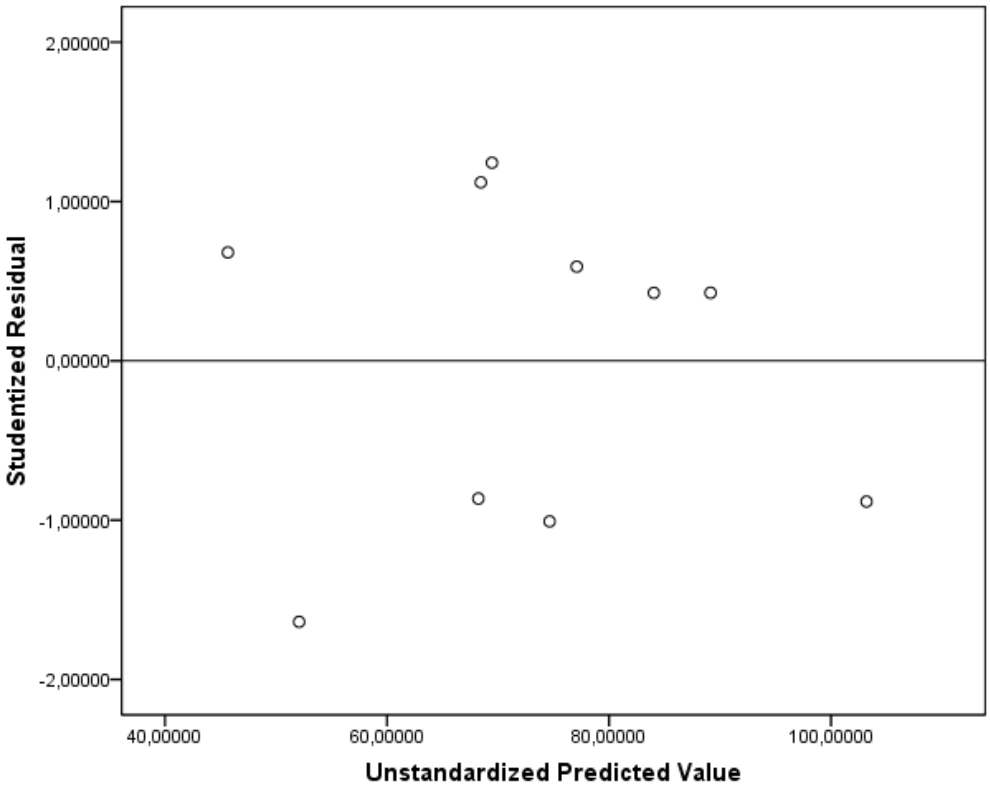
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Studentized Residual	,260	10	,054	,893	10	,184

a. Lilliefors Significance Correction

Studentized Residual


Normal Q-Q Plot of Studentized Residual
Expected Normal
Observed Value
2
1
0
-1
-2
-2
-1
0
1
2


2,00000
1,00000
0,00000
-1,00000
-2,00000
Studentized Residual


2,00000
1,00000
0,00000
-1,00000
-2,00000
Studentized Residual
40,00000
60,00000
80,00000
100,00000
Unstandardized Predicted Value

Exercício 8

NPar Tests

One-Sample Kolmogorov-Smirnov Test

		motor	intelectual
	N	9	9
Normal Parameters[a,,b]	Mean	87,0000	97,0000
	Std. Deviation	10,18577	12,39960
Most Extreme Differences	Absolute	,128	,151
	Positive	,128	,146
	Negative	-,121	-,151
	Kolmogorov-Smirnov Z	,383	,453
	Asymp. Sig. (2-tailed)	,999	,986

a. Test distribution is Normal.

b. Calculated from data.

Correlations

Correlations

		motor	intelectual
motor	Pearson Correlation	1	,743*
	Sig. (2-tailed)		,022
	N	9	9
intelectual	Pearson Correlation	,743*	1
	Sig. (2-tailed)	,022	
	N	9	9

*. Correlation is significant at the 0.05 level (2-tailed).

Exercício 9

Explore

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
QI	30	100,0%	0	,0%	30	100,0%
CM	30	100,0%	0	,0%	30	100,0%

Descriptives

			Statistic	Std. Error
QI		Mean	97,2667	2,42446
	95% Confidence Interval for Mean	Lower Bound	92,3081	
		Upper Bound	102,2252	
		5% Trimmed Mean	96,6111	
		Median	95,0000	
		Variance	176,340	
		Std. Deviation	13,27932	
		Minimum	79,00	
		Maximum	131,00	
		Range	52,00	
		Interquartile Range	23,25	
CM		Mean	2,5663	,15423
	95% Confidence Interval for Mean	Lower Bound	2,2509	
		Upper Bound	2,8818	
		5% Trimmed Mean	2,5859	
		Median	2,5850	
		Variance	,714	
		Std. Deviation	,84476	
		Minimum	,67	
		Maximum	4,00	
		Range	3,33	
		Interquartile Range	1,00	

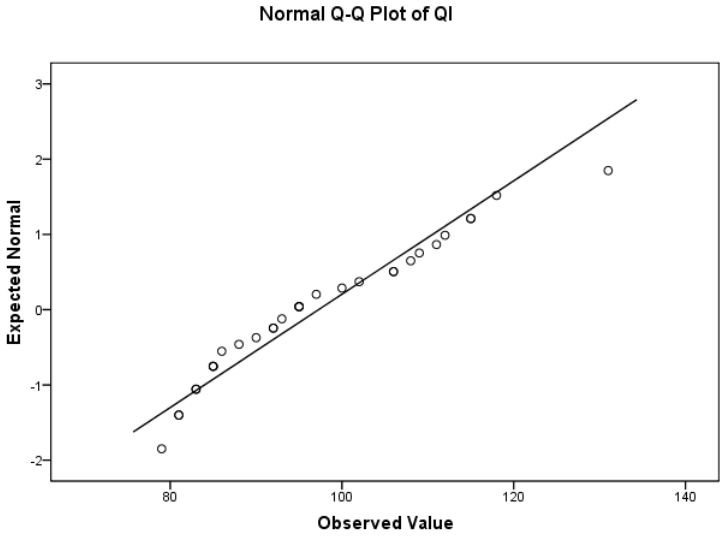
Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
QI	,134	30	,175	,942	30	,101
CM	,114	30	,200*	,967	30	,470

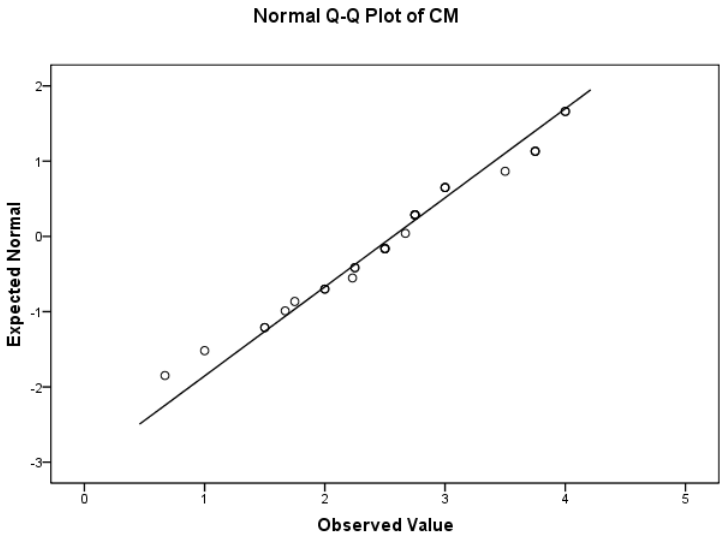
a. Lilliefors Significance Correction

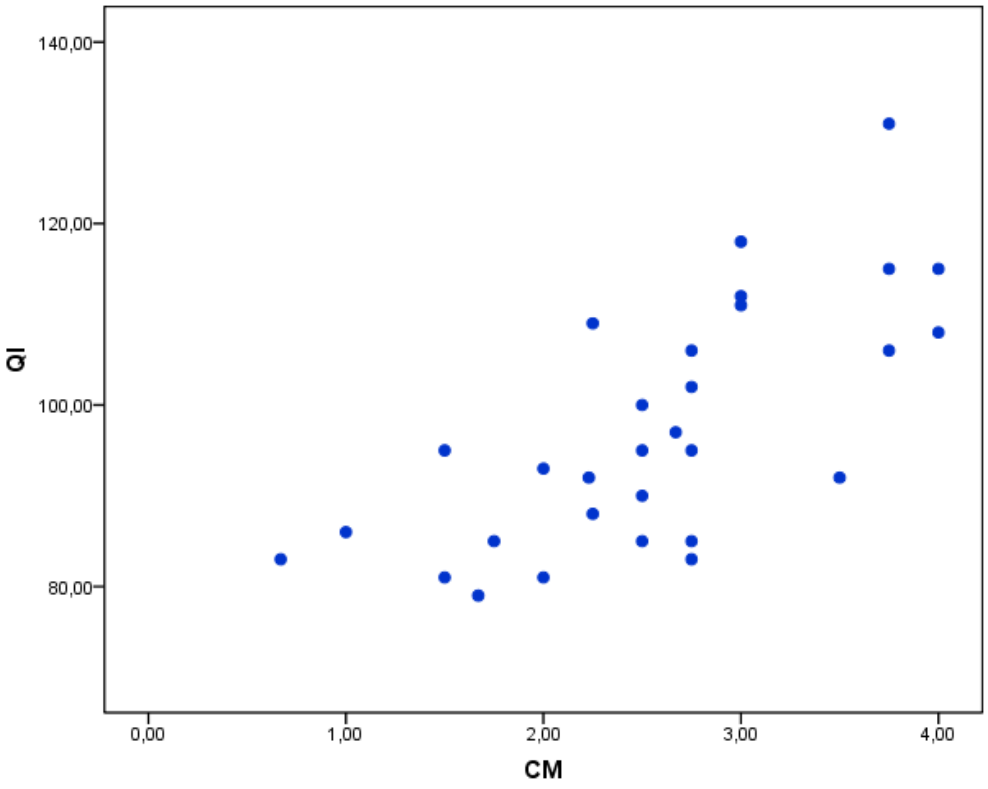
*. This is a lower bound of the true significance.

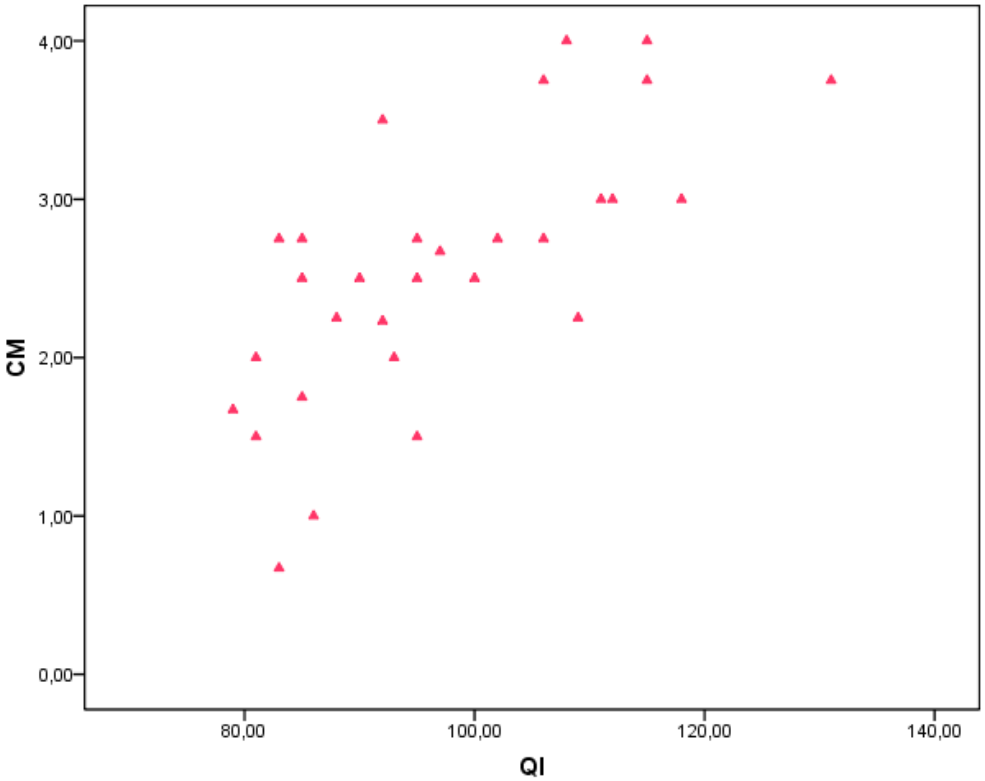
QI



CM




140,00
120,00
100,00
80,00
QI
0,00
1,00
2,00
3,00
4,00
CM


4,00
3,00
2,00
1,00
0,00
CM
80,00
100,00
120,00
140,00
QI

Correlations

Correlations

		QI	CM
QI	Pearson Correlation	1	,708**
	Sig. (2-tailed)		,000
	N	30	30
CM	Pearson Correlation	,708**	1
	Sig. (2-tailed)	,000	
	N	30	30

**. Correlation is significant at the 0.01 level (2-tailed).

Exercício 10

Correlations

		X	Y
X	Pearson Correlation	1	-,334
	Sig. (2-tailed)		,071
	N	30	30
Y	Pearson Correlation	-,334	1
	Sig. (2-tailed)	,071	
	N	30	30

NPar Tests

One-Sample Kolmogorov-Smirnov Test

		X	Y
	N	30	30
Normal Parameters[a,,b]	Mean	3,8977	8,6683
	Std. Deviation	2,83786	6,99143
Most Extreme Differences	Absolute	,140	,140
	Positive	,140	,140
	Negative	-,114	-,108
	Kolmogorov-Smirnov Z	,769	,769
	Asymp. Sig. (2-tailed)	,595	,595

a. Test distribution is Normal.

b. Calculated from data.