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Regression

[WhiteTestData] D:\DATA ANALYSIS\B Normality and Assumption Tests\White Test\SPSS_Output\sav\White-Test-data.sav

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	age, studytime, absences, G2, failures, G1[b]	.	Enter

a. Dependent Variable: G3

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.922[a]	.851	.849	1.254

a. Predictors: (Constant), age, studytime, absences, G2, failures, G1

b. Dependent Variable: G3

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5753.053	6	958.842	609.353	.000[b]
	Residual	1010.214	642	1.574		
	Total	6763.267	648			

a. Dependent Variable: G3

b. Predictors: (Constant), age, studytime, absences, G2, failures, G1

Base regression for White test residuals

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-.545	.763		-.715	.475
	G1	.142	.037	.121	3.886	.000
	G2	.883	.034	.797	25.823	.000
	studytime	.095	.062	.024	1.526	.127
	failures	-.233	.095	-.043	-2.456	.014
	absences	.023	.011	.033	2.086	.037
	age	.024	.043	.009	.544	.587

a. Dependent Variable: G3

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.31	19.58	11.91	2.980	649
Residual	-9.045	5.817	.000	1.249	649
Std. Predicted Value	-3.892	2.575	.000	1.000	649
Std. Residual	-7.210	4.637	.000	.995	649

a. Dependent Variable: G3

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>Warning # 2004.  Command name: SUBTITLE
>The subtitle given exceeds 60 characters in length.  The first 60 characters
>will be used.
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White test auxiliary regression
Squared residuals regressed on predictors, squares, and cros

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	age_sq, studytime, absences_sq, G2_sq, failures_sq, absences, G1, failures, G2, studytime_sq, G1_sq, age[b]	.	Enter
2	G2_x_absences, G2_x_failures, G1_x_failures, G2_x_studytime, G1_x_absences, G1_x_studytime, G1_x_age, G1_x_G2, G2_x_age[b]	.	Enter
3	failures_x_absences, studytime_x_absences, studytime_x_failures, studytime_x_age, absences_x_age, failures_x_age[b]	.	Enter

a. Dependent Variable: resid_sq

b. All requested variables entered.

White test auxiliary regression
Squared residuals regressed on predictors, squares, and cros

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.264[a]	.070	.052	6.86825
2	.319[b]	.102	.072	6.79826
3	.341[c]	.116	.078	6.77486

a. Predictors: (Constant), age_sq, studytime, absences_sq, G2_sq, failures_sq, absences, G1, failures, G2, studytime_sq, G1_sq, age

b. Predictors: (Constant), age_sq, studytime, absences_sq, G2_sq, failures_sq, absences, G1, failures, G2, studytime_sq, G1_sq, age, G2_x_absences, G2_x_failures, G1_x_failures, G2_x_studytime, G1_x_absences, G1_x_studytime, G1_x_age, G1_x_G2, G2_x_age

c. Predictors: (Constant), age_sq, studytime, absences_sq, G2_sq, failures_sq, absences, G1, failures, G2, studytime_sq, G1_sq, age, G2_x_absences, G2_x_failures, G1_x_failures, G2_x_studytime, G1_x_absences, G1_x_studytime, G1_x_age, G1_x_G2, G2_x_age, failures_x_absences, studytime_x_absences, studytime_x_failures, studytime_x_age, absences_x_age, failures_x_age

White test auxiliary regression
Squared residuals regressed on predictors, squares, and cros

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2256.164	12	188.014	3.986	.000[b]
	Residual	30001.956	636	47.173		
	Total	32258.119	648			
2	Regression	3280.460	21	156.212	3.380	.000[c]
	Residual	28977.660	627	46.216		
	Total	32258.119	648			
3	Regression	3755.036	27	139.075	3.030	.000[d]
	Residual	28503.084	621	45.899		
	Total	32258.119	648			

a. Dependent Variable: resid_sq

b. Predictors: (Constant), age_sq, studytime, absences_sq, G2_sq, failures_sq, absences, G1, failures, G2, studytime_sq, G1_sq, age

c. Predictors: (Constant), age_sq, studytime, absences_sq, G2_sq, failures_sq, absences, G1, failures, G2, studytime_sq, G1_sq, age, G2_x_absences, G2_x_failures, G1_x_failures, G2_x_studytime, G1_x_absences, G1_x_studytime, G1_x_age, G1_x_G2, G2_x_age

d. Predictors: (Constant), age_sq, studytime, absences_sq, G2_sq, failures_sq, absences, G1, failures, G2, studytime_sq, G1_sq, age, G2_x_absences, G2_x_failures, G1_x_failures, G2_x_studytime, G1_x_absences, G1_x_studytime, G1_x_age, G1_x_G2, G2_x_age, failures_x_absences, studytime_x_absences, studytime_x_failures, studytime_x_age, absences_x_age, failures_x_age

White test auxiliary regression
Squared residuals regressed on predictors, squares, and cros

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-31.835	39.560		-.805	.421
	G1	-1.171	.709	-.456	-1.652	.099
	G2	.328	.471	.136	.697	.486
	studytime	-.863	1.462	-.101	-.590	.555
	failures	3.122	1.381	.262	2.261	.024
	absences	-.447	.127	-.294	-3.515	.000
	age	4.623	4.626	.798	.999	.318
	G1_sq	.055	.033	.494	1.638	.102
	G2_sq	-.033	.024	-.308	-1.373	.170
	studytime_sq	.100	.319	.054	.315	.753
	failures_sq	-1.032	.532	-.212	-1.942	.053
	absences_sq	.014	.007	.179	2.174	.030
	age_sq	-.125	.136	-.735	-.918	.359
2	(Constant)	-55.544	51.160		-1.086	.278
	G1	2.649	3.424	1.031	.774	.439
	G2	-2.693	3.323	-1.112	-.810	.418
	studytime	-2.061	1.859	-.242	-1.109	.268
	failures	-1.589	3.275	-.134	-.485	.628
	absences	-1.214	.290	-.798	-4.192	.000
	age	7.390	5.396	1.276	1.370	.171
	G1_sq	-.048	.057	-.428	-.830	.407
	G2_sq	-.162	.052	-1.519	-3.099	.002
	studytime_sq	-.209	.334	-.112	-.627	.531
	failures_sq	-.814	.551	-.167	-1.477	.140
	absences_sq	.012	.007	.152	1.836	.067
	age_sq	-.156	.146	-.917	-1.065	.287
	G1_x_G2	.279	.104	2.533	2.687	.007
	G1_x_studytime	.107	.277	.189	.387	.699
	G1_x_failures	.849	.342	.618	2.482	.013
	G1_x_absences	.052	.050	.383	1.038	.300
	G1_x_age	-.318	.194	-2.091	-1.637	.102

White test auxiliary regression
Squared residuals regressed on predictors, squares, and cros

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	G2_x_studytime	.124	.268	.223	.463	.643
	G2_x_failures	-.380	.299	-.283	-1.269	.205
	G2_x_absences	.021	.048	.154	.437	.662
	G2_x_age	.156	.188	1.116	.832	.406
3	(Constant)	-80.103	56.198		-1.425	.155
	G1	3.033	3.428	1.180	.885	.377

White test auxiliary regression
Squared residuals regressed on predictors, squares, and cros

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
	G2	-3.616	3.374	-1.493	-1.072	.284
	studytime	3.958	5.240	.465	.755	.450
	failures	-4.945	8.324	-.416	-.594	.553
	absences	-.855	.984	-.563	-.869	.385
	age	9.975	6.384	1.722	1.562	.119
	G1_sq	-.052	.057	-.468	-.907	.365
	G2_sq	-.178	.053	-1.676	-3.376	.001
	studytime_sq	-.275	.338	-.147	-.813	.417
	failures_sq	-1.169	.594	-.240	-1.968	.049
	absences_sq	.016	.007	.196	2.248	.025
	age_sq	-.231	.189	-1.357	-1.221	.223
	G1_x_G2	.302	.105	2.741	2.885	.004
	G1_x_studytime	-.007	.283	-.012	-.023	.981
	G1_x_failures	.893	.344	.650	2.599	.010
	G1_x_absences	.028	.052	.206	.532	.595
	G1_x_age	-.334	.195	-2.195	-1.715	.087
	G2_x_studytime	.156	.274	.280	.568	.570
	G2_x_failures	-.493	.305	-.367	-1.614	.107
	G2_x_absences	.027	.048	.203	.567	.571
	G2_x_age	.215	.191	1.537	1.127	.260
	studytime_x_failures	-1.422	.833	-.202	-1.708	.088
	studytime_x_absences	.109	.088	.137	1.239	.216
	studytime_x_age	-.297	.294	-.589	-1.007	.314
	failures_x_absences	-.149	.108	-.095	-1.373	.170
	failures_x_age	.441	.470	.666	.938	.349
	absences_x_age	-.022	.056	-.246	-.391	.696

a. Dependent Variable: resid_sq

White test auxiliary regression
Squared residuals regressed on predictors, squares, and cros

Excluded Variables[a]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	G1_x_G2	1.389[b]	1.663	.097	.066	.002
	G1_x_studytime	.292[b]	1.290	.198	.051	.029
	G1_x_failures	.292[b]	1.499	.134	.059	.039
	G1_x_absences	.467[b]	2.689	.007	.106	.048
	G1_x_age	-.626[b]	-1.029	.304	-.041	.004
	G2_x_studytime	.334[b]	1.501	.134	.059	.030
	G2_x_failures	.057[b]	.344	.731	.014	.053
	G2_x_absences	.392[b]	2.370	.018	.094	.053
	G2_x_age	-.597[b]	-.944	.345	-.037	.004
	studytime_x_failures	-.258[b]	-2.445	.015	-.097	.130
	studytime_x_absences	.165[b]	1.530	.127	.061	.126
	studytime_x_age	-.970[b]	-1.837	.067	-.073	.005
	failures_x_absences	-.118[b]	-1.989	.047	-.079	.413
	failures_x_age	.303[b]	.461	.645	.018	.003
	absences_x_age	-.673[b]	-1.199	.231	-.048	.005
2	studytime_x_failures	-.216[c]	-1.930	.054	-.077	.114
	studytime_x_absences	.147[c]	1.341	.181	.054	.119
	studytime_x_age	-.929[c]	-1.676	.094	-.067	.005
	failures_x_absences	-.097[c]	-1.538	.125	-.061	.357
	failures_x_age	.499[c]	.712	.477	.028	.003
	absences_x_age	-.494[c]	-.845	.398	-.034	.004

a. Dependent Variable: resid_sq

b. Predictors in the Model: (Constant), age_sq, studytime, absences_sq, G2_sq, failures_sq, absences, G1, failures, G2, studytime_sq, G1_sq, age

c. Predictors in the Model: (Constant), age_sq, studytime, absences_sq, G2_sq, failures_sq, absences, G1, failures, G2, studytime_sq, G1_sq, age, G2_x_absences, G2_x_failures, G1_x_failures, G2_x_studytime, G1_x_absences, G1_x_studytime, G1_x_age, G1_x_G2, G2_x_age

White test residual diagnostic descriptives

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
pred_G3	649	.31032	19.57851	11.9060092	2.97962542
resid_G3	649	-9.04462	5.81680	.0000000	1.24858805
resid_sq	649	.00	81.81	1.5566	7.05557
Valid N (listwise)	649				

Explore

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
resid_G3	649	100.0%	0	0.0%	649	100.0%
resid_sq	649	100.0%	0	0.0%	649	100.0%

Descriptives

			Statistic	Std. Error
resid_G3	Mean		.0000000	.04901137
	95% Confidence Interval for Mean	Lower Bound	-.0962403	
		Upper Bound	.0962403	
	5% Trimmed Mean		.0701572	
	Median		-.0682603	
	Variance		1.559	
	Std. Deviation		1.24858805	
	Minimum		-9.04462	
	Maximum		5.81680	
	Range		14.86142	
	Interquartile Range		1.08233	
	Skewness		-2.864	.096
	Kurtosis		18.667	.192
resid_sq	Mean		1.5566	.27696
	95% Confidence Interval for Mean	Lower Bound	1.0127	
		Upper Bound	2.1004	
	5% Trimmed Mean		.5841	
	Median		.2880	
	Variance		49.781	
	Std. Deviation		7.05557	
	Minimum		.00	
	Maximum		81.81	
	Range		81.81	
	Interquartile Range		.63	

Residual normality and spread context

Descriptives

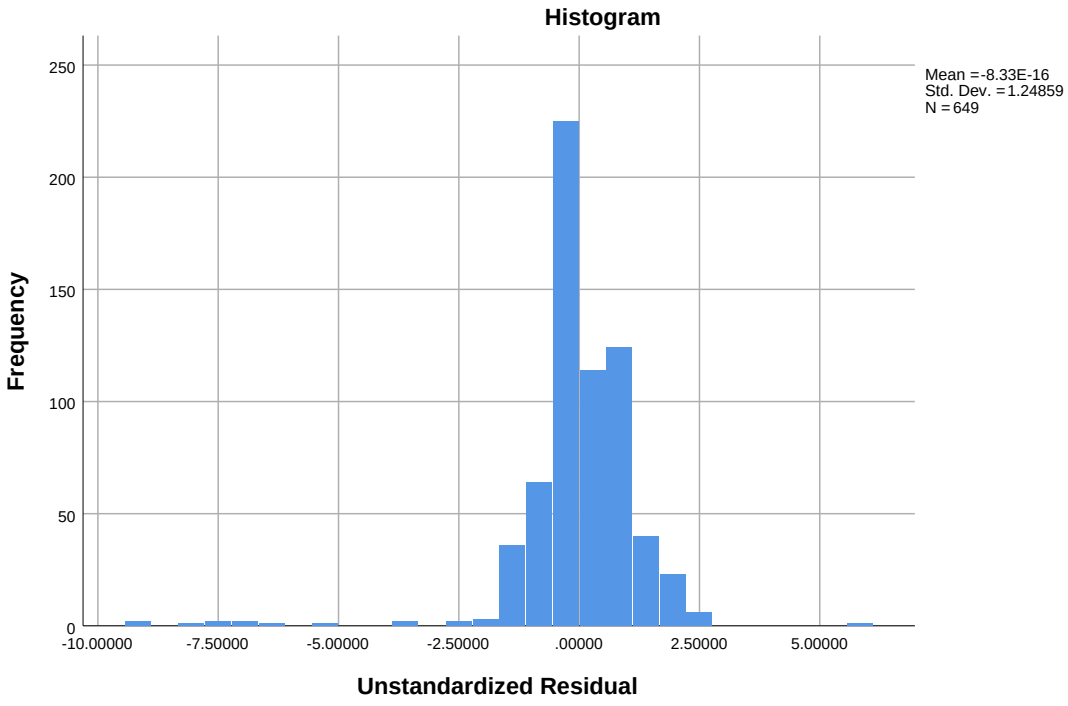
		Statistic	Std. Error
	Skewness	8.651	.096
	Kurtosis	80.487	.192

Tests of Normality

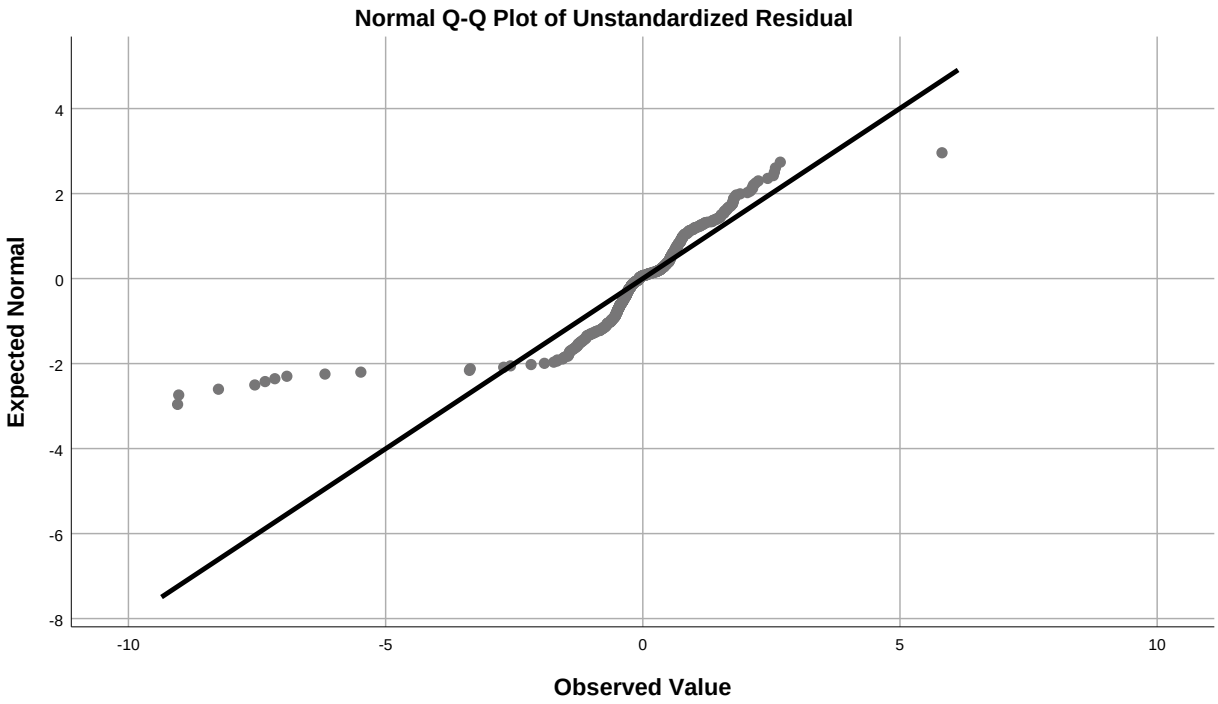
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
resid_G3	.155	649	.000	.755	649	.000
resid_sq	.413	649	.000	.180	649	.000

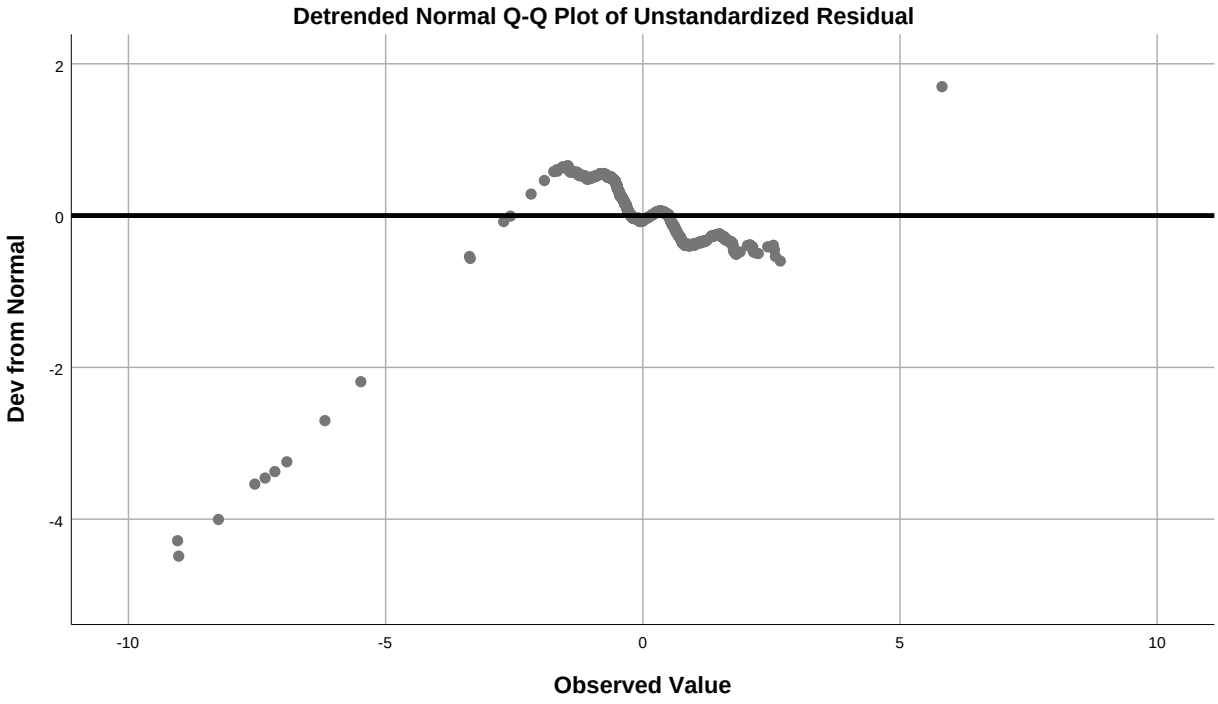
a. Lilliefors Significance Correction

Unstandardized Residual

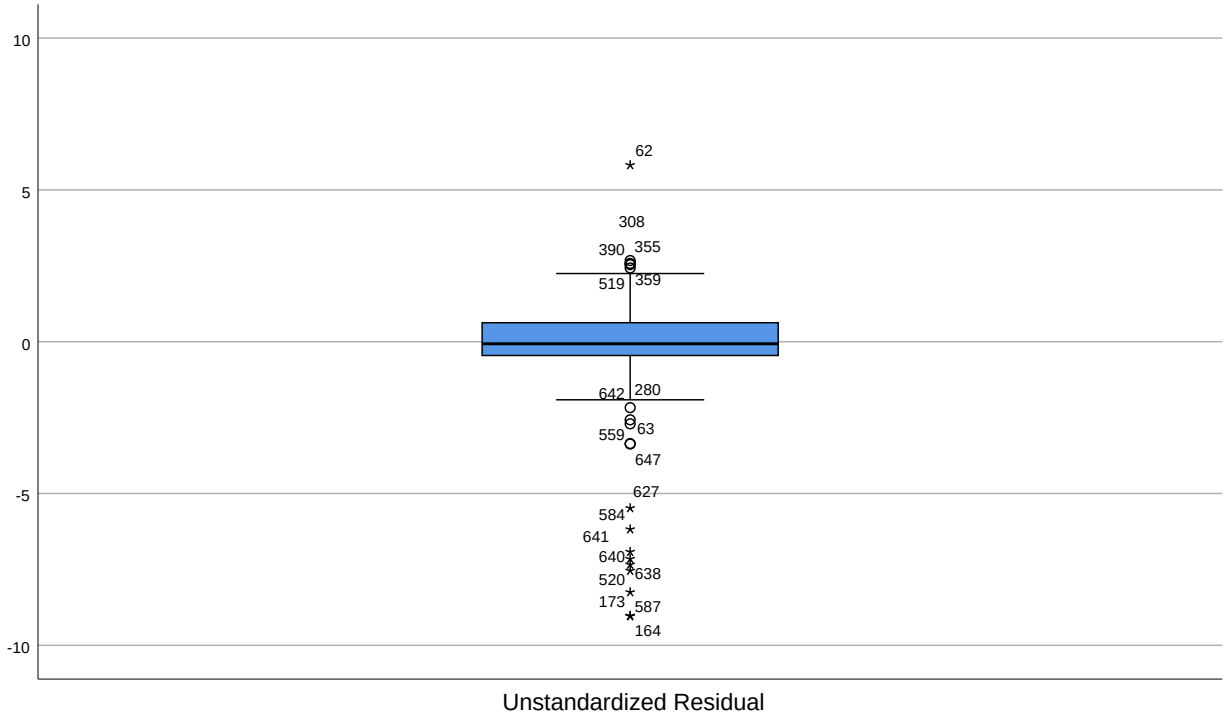


Residual normality and spread context

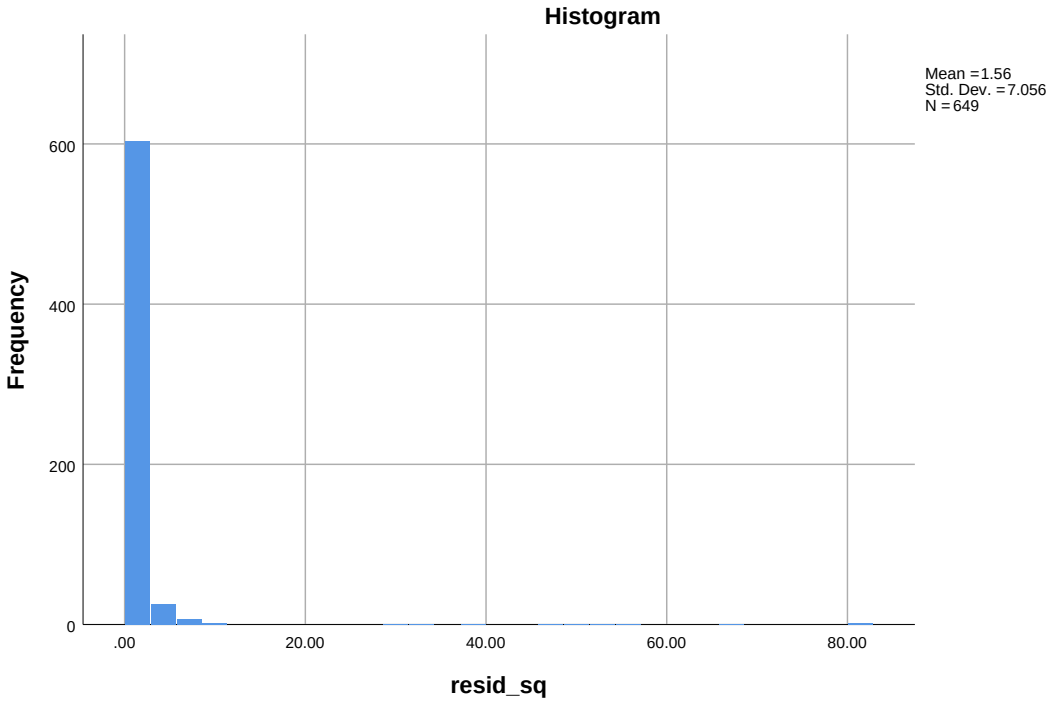




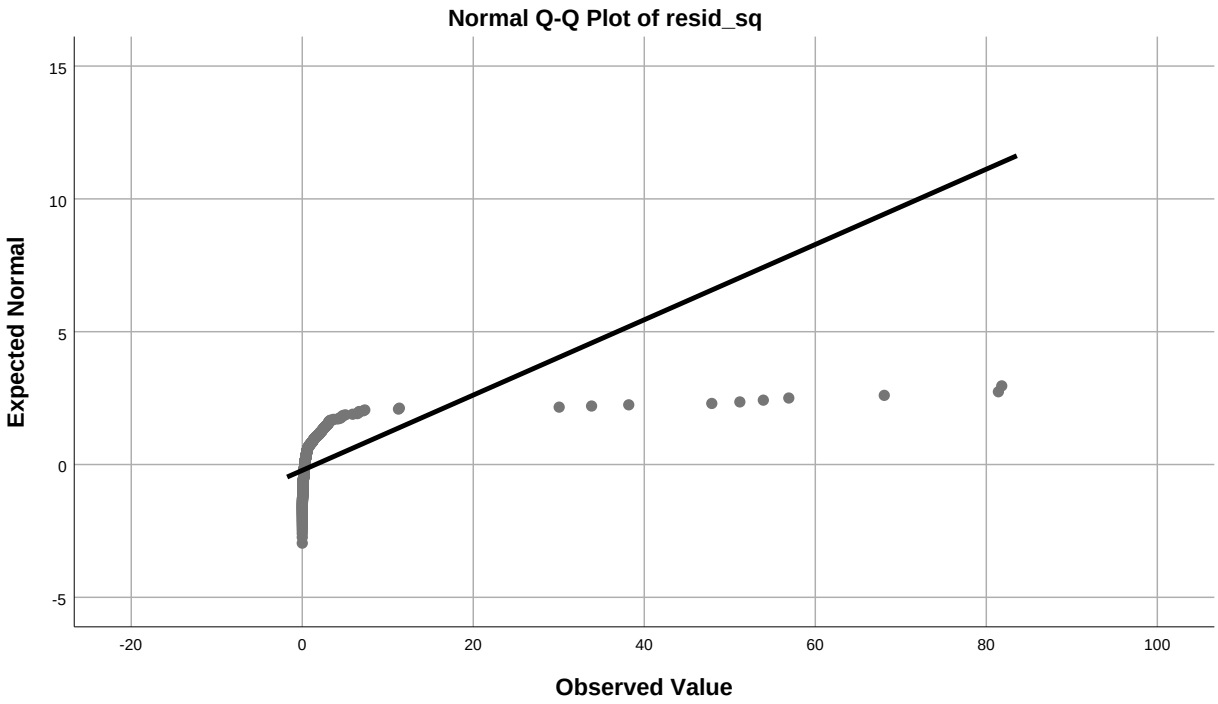
Residual normality and spread context

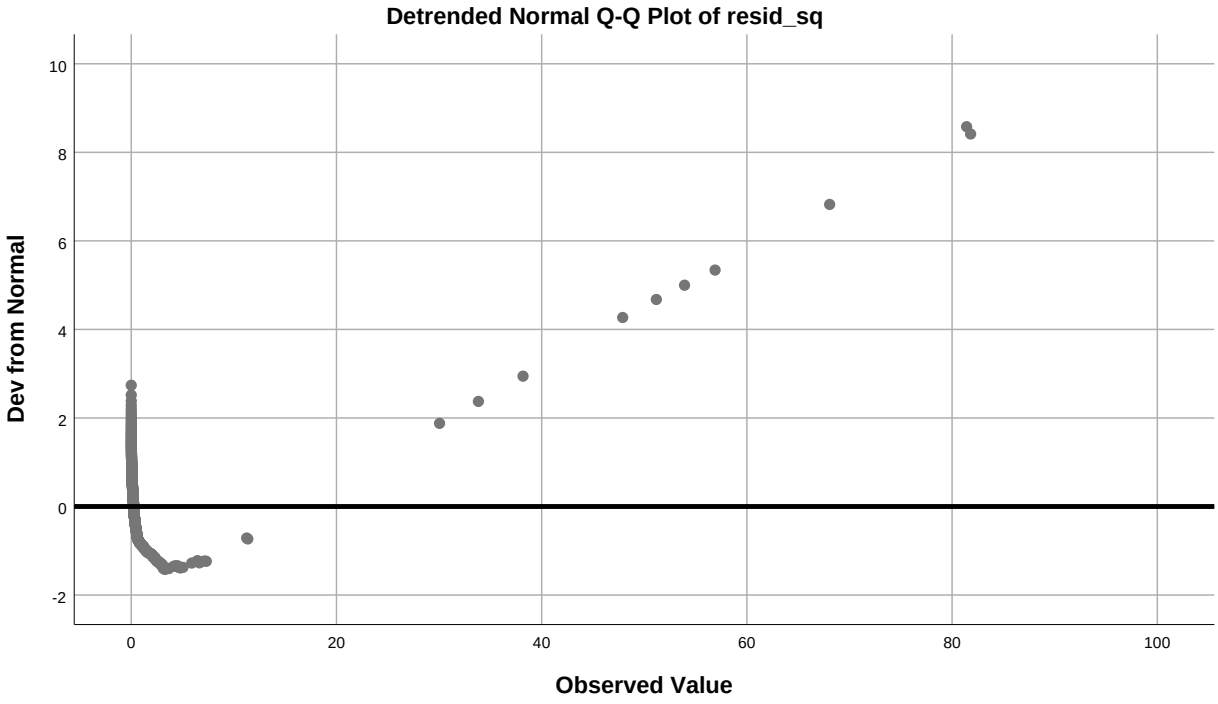


resid_sq



Residual normality and spread context





Residual normality and spread context