

APPENDIX 10

Heteroscedasticity Tests for the Tobit OLS Regressions

1. White's General heteroscedasticity test for the first period (2002-2005)

1.1. For the first DEA model

Heteroscedasticity White Test: for the case of CRSTE

F-statistic	1.098068	Prob. F(7,83)	0.3721
Obs*R-squared	7.713052	Prob. Chi-Square(7)	0.3586

Test Equation:

Dependent Variable: RESID²

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.058471	0.070326	0.831428	0.4081
CAPITAL ²	-0.015006	0.043093	-0.348232	0.7285
D1 ²	-0.055177	0.069969	-0.788587	0.4326
D2 ²	0.011504	0.009761	1.178608	0.2419
ETA ²	0.043856	0.022321	1.964777	0.0528
LK ²	0.302695	0.451733	0.670075	0.5047
LK2 ²	-0.104145	0.148000	-0.703683	0.4836
TOTALASSETS ²	-0.022729	0.086160	-0.263795	0.7926

R-squared	0.084759	Mean dependent var	0.017644
Adjusted R-squared	0.007570	S.D. dependent var	0.040257
S.E. of regression	0.040104	Akaike info criterion	-3.510860
Sum squared resid	0.133494	Schwarz criterion	-3.290125
Log likelihood	167.7441	Hannan-Quinn criter.	-3.421807
F-statistic	1.098068	Durbin-Watson stat	2.149818
Prob(F-statistic)	0.372131		

The heteroscedasticity White test for the case of CRSTE mentioned above suggests accepting the null hypothesis of no heteroscedasticity.

Heteroscedasticity White Test: for the case of VRSTE

F-statistic	0.982116	Prob. F(7,83)	0.4499
Obs*R-squared	6.960880	Prob. Chi-Square(7)	0.4330

Test Equation:

Dependent Variable: RESID²

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000125	0.059285	-0.002117	0.9983
CAPITAL ²	0.015979	0.036328	0.439857	0.6612
D1 ²	0.002265	0.058984	0.038402	0.9695
D2 ²	0.010006	0.008229	1.216016	0.2274
ETA ²	0.037972	0.018817	2.017986	0.0468
LK ²	0.188366	0.380813	0.494642	0.6222

LK2^2	-0.062877	0.124765	-0.503968	0.6156
TOTALASSETS^2	0.006742	0.072633	0.092824	0.9263
R-squared	0.076493	Mean dependent var	0.013472	
Adjusted R-squared	-0.001393	S.D. dependent var	0.033785	
S.E. of regression	0.033808	Akaike info criterion	-3.852427	
Sum squared resid	0.094868	Schwarz criterion	-3.631692	
Log likelihood	183.2854	Hannan-Quinn criter.	-3.763374	
F-statistic	0.982116	Durbin-Watson stat	2.128333	
Prob(F-statistic)	0.449914			

The heteroscedasticity White test for the case of VRSTE mentioned above suggests accepting the null hypothesis of no heteroscedasticity.

Heteroscedasticity White Test: for the case of SCALE

F-statistic	2.427094	Prob. F(7,83)	0.0259
Obs*R-squared	15.46219	Prob. Chi-Square(7)	0.0305

Test Equation:

Dependent Variable: RESID^2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.047474	0.020128	2.358548	0.0207
CAPITAL^2	-0.030772	0.012334	-2.494902	0.0146
D1^2	-0.045037	0.020026	-2.248894	0.0272
D2^2	-0.000878	0.002794	-0.314198	0.7542
ETA^2	0.003468	0.006389	0.542799	0.5887
LK^2	0.087085	0.129294	0.673541	0.5025
LK2^2	-0.032071	0.042360	-0.757093	0.4511
TOTALASSETS^2	-0.019096	0.024660	-0.774371	0.4409
R-squared	0.169914	Mean dependent var	0.003332	
Adjusted R-squared	0.099907	S.D. dependent var	0.012099	
S.E. of regression	0.011479	Akaike info criterion	-6.012868	
Sum squared resid	0.010936	Schwarz criterion	-5.792133	
Log likelihood	281.5855	Hannan-Quinn criter.	-5.923816	
F-statistic	2.427094	Durbin-Watson stat	1.973970	
Prob(F-statistic)	0.025942			

The heteroscedasticity White test for the case of SCALE mentioned above suggests rejecting the null hypothesis of no heteroscedasticity.

1.2. For the second DEA model

Heteroscedasticity White Test: for the case of CRSTE

F-statistic	0.618124	Prob. F(7,78)	0.7394
Obs*R-squared	4.519920	Prob. Chi-Square(7)	0.7183

Test Equation:

Dependent Variable: RESID^2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.085129	0.136310	-0.624530	0.5341
CAPITAL^2	0.009400	0.083497	0.112577	0.9107
D1^2	0.131317	0.135711	0.967622	0.3362
D2^2	-0.001626	0.019654	-0.082734	0.9343
ETA^2	0.016776	0.043381	0.386710	0.7000
LK^2	1.341206	0.880334	1.523521	0.1317
LK2^2	-0.445020	0.288428	-1.542918	0.1269
TOTALASSETS^2	0.114745	0.166954	0.687286	0.4939
R-squared	0.052557	Mean dependent var	0.054104	
Adjusted R-squared	-0.032470	S.D. dependent var	0.076463	
S.E. of regression	0.077695	Akaike info criterion	-2.183649	
Sum squared resid	0.470845	Schwarz criterion	-1.955338	
Log likelihood	101.8969	Hannan-Quinn criter.	-2.091765	
F-statistic	0.618124	Durbin-Watson stat	2.044523	
Prob(F-statistic)	0.739385			

The heteroscedasticity White test for the case of CRSTE mentioned above suggests accepting the null hypothesis of no heteroscedasticity.

Heteroscedasticity White Test: for the case of VRSTE

F-statistic	0.355091	Prob. F(7,78)	0.9253
Obs*R-squared	2.655935	Prob. Chi-Square(7)	0.9149

Test Equation:
Dependent Variable: RESID^2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.047073	0.151266	-0.311194	0.7565
CAPITAL^2	0.007680	0.092659	0.082888	0.9342
D1^2	0.106956	0.150601	0.710192	0.4797
D2^2	-0.012963	0.021811	-0.594337	0.5540
ETA^2	-0.014151	0.048141	-0.293944	0.7696
LK^2	1.056532	0.976924	1.081488	0.2828
LK2^2	-0.352302	0.320074	-1.100689	0.2744
TOTALASSETS^2	0.085858	0.185272	0.463416	0.6444
R-squared	0.030883	Mean dependent var	0.056639	
Adjusted R-squared	-0.056089	S.D. dependent var	0.083899	
S.E. of regression	0.086219	Akaike info criterion	-1.975434	
Sum squared resid	0.579836	Schwarz criterion	-1.747122	
Log likelihood	92.94365	Hannan-Quinn criter.	-1.883549	
F-statistic	0.355091	Durbin-Watson stat	2.178083	
Prob(F-statistic)	0.925253			

The heteroscedasticity White test for the case of VRSTE mentioned above suggests accepting the null hypothesis of no heteroscedasticity.

Heteroscedasticity White Test: for the case of SCALE

F-statistic	0.142185	Prob. F(7,78)	0.9945
Obs*R-squared	1.083549	Prob. Chi-Square(7)	0.9934

Test Equation:
Dependent Variable: RESID^2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.004917	0.119961	-0.040984	0.9674
CAPITAL^2	-0.012412	0.073483	-0.168904	0.8663
D1^2	0.037033	0.119434	0.310071	0.7573
D2^2	-0.013448	0.017297	-0.777497	0.4392
ETA^2	-0.000470	0.038178	-0.012312	0.9902
LK^2	0.016967	0.774750	0.021901	0.9826
LK2^2	-0.008218	0.253835	-0.032374	0.9743
TOTALASSETS^2	0.032155	0.146930	0.218845	0.8273
R-squared	0.012599	Mean dependent var	0.021921	
Adjusted R-squared	-0.076013	S.D. dependent var	0.065917	
S.E. of regression	0.068376	Akaike info criterion	-2.439171	
Sum squared resid	0.364675	Schwarz criterion	-2.210860	
Log likelihood	112.8844	Hannan-Quinn criter.	-2.347287	
F-statistic	0.142185	Durbin-Watson stat	2.072553	
Prob(F-statistic)	0.994493			

The heteroscedasticity White test for the case of SCALE mentioned above suggests accepting the null hypothesis of no heteroscedasticity.

2. White's General heteroscedasticity test for the second period (2006-2012)

2.1. For the first DEA model

Heteroscedasticity White Test: for the case of CRSTE

F-statistic	1.884792	Prob. F(7,173)	0.0747
Obs*R-squared	12.82553	Prob. Chi-Square(7)	0.0765

Test Equation:
Dependent Variable: RESID^2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.078281	0.009116	8.587436	0.0000
CAPITAL^2	-0.058057	0.057957	-1.001720	0.3179
D1^2	-0.045078	0.024729	-1.822882	0.0700
D2^2	0.006602	0.012638	0.522388	0.6021
ETA^2	0.134437	0.068584	1.960192	0.0516
PK^2	0.338698	0.609690	0.555526	0.5793
PK2^2	-0.316853	2.636755	-0.120168	0.9045
TOTALASSET^2	0.048228	0.072619	0.664122	0.5075
R-squared	0.070859	Mean dependent var	0.080908	
Adjusted R-squared	0.033264	S.D. dependent var	0.080918	

S.E. of regression	0.079561	Akaike info criterion	-2.181398
Sum squared resid	1.095077	Schwarz criterion	-2.040028
Log likelihood	205.4165	Hannan-Quinn criter.	-2.124083
F-statistic	1.884792	Durbin-Watson stat	1.843692
Prob(F-statistic)	0.074671		

The heteroscedasticity White test for the case of CRSTE mentioned above suggests rejecting the null hypothesis of no heteroscedasticity.

Heteroscedasticity White Test: for the case of VRSTE

F-statistic	2.676874	Prob. F(7,173)	0.0118
Obs*R-squared	17.68871	Prob. Chi-Square(7)	0.0135

Test Equation:
Dependent Variable: RESID^2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.087686	0.009132	9.602147	0.0000
CAPITAL^2	-0.002391	0.058060	-0.041181	0.9672
D1^2	-0.077281	0.024773	-3.119612	0.0021
D2^2	-0.007115	0.012661	-0.561981	0.5749
ETA^2	-0.051465	0.068706	-0.749064	0.4548
PK^2	0.929332	0.610772	1.521569	0.1299
PK2^2	-4.042372	2.641437	-1.530369	0.1278
TOTALASSET^2	-0.025178	0.072748	-0.346106	0.7297

R-squared	0.097728	Mean dependent var	0.076399
Adjusted R-squared	0.061220	S.D. dependent var	0.082260
S.E. of regression	0.079702	Akaike info criterion	-2.177850
Sum squared resid	1.098969	Schwarz criterion	-2.036480
Log likelihood	205.0954	Hannan-Quinn criter.	-2.120535
F-statistic	2.676874	Durbin-Watson stat	1.901996
Prob(F-statistic)	0.011769		

The heteroscedasticity White test for the case of VRSTE mentioned above suggests rejecting the null hypothesis of no heteroscedasticity.

Heteroscedasticity White Test: for the case of SCALE

F-statistic	2.011450	Prob. F(7,173)	0.0562
Obs*R-squared	13.62254	Prob. Chi-Square(7)	0.0583

Test Equation:
Dependent Variable: RESID^2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.045393	0.009159	4.956387	0.0000
CAPITAL^2	-0.039282	0.058229	-0.674615	0.5008
D1^2	-0.024074	0.024845	-0.968962	0.3339
D2^2	-0.021099	0.012698	-1.661633	0.0984

ETA^2	0.195027	0.068906	2.830346	0.0052
PK^2	0.428034	0.612552	0.698772	0.4856
PK2^2	-1.419021	2.649133	-0.535655	0.5929
TOTALASSET^2	0.008431	0.072960	0.115550	0.9081
R-squared	0.075263	Mean dependent var	0.041402	
Adjusted R-squared	0.037846	S.D. dependent var	0.081491	
S.E. of regression	0.079934	Akaike info criterion	-2.172031	
Sum squared resid	1.105383	Schwarz criterion	-2.030661	
Log likelihood	204.5688	Hannan-Quinn criter.	-2.114716	
F-statistic	2.011450	Durbin-Watson stat	1.947222	
Prob(F-statistic)	0.056198			

The heteroscedasticity White test for the case of SCALE mentioned above suggests rejecting the null hypothesis of no heteroscedasticity.

2.2. For the second DEA model

Heteroscedasticity White Test: for the case of CRSTE

F-statistic	2.040593	Prob. F(7,174)	0.0526
Obs*R-squared	13.80741	Prob. Chi-Square(7)	0.0547

Test Equation:
Dependent Variable: RESID^2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.086896	0.010169	8.545049	0.0000
CAPITAL^2	-0.068856	0.063844	-1.078508	0.2823
D1^2	-0.028610	0.027254	-1.049755	0.2953
D2^2	-0.023550	0.013842	-1.701405	0.0907
ETA^2	0.069905	0.075688	0.923587	0.3570
PK^2	1.919233	0.624049	3.075455	0.0024
PK2^2	-7.116372	2.759134	-2.579205	0.0107
TOTALASSET^2	0.036389	0.079816	0.455914	0.6490

R-squared	0.075865	Mean dependent var	0.086292
Adjusted R-squared	0.038687	S.D. dependent var	0.089454
S.E. of regression	0.087706	Akaike info criterion	-1.986686
Sum squared resid	1.338475	Schwarz criterion	-1.845851
Log likelihood	188.7885	Hannan-Quinn criter.	-1.929594
F-statistic	2.040593	Durbin-Watson stat	1.903589
Prob(F-statistic)	0.052565		

The heteroscedasticity White test for the case of CRSTE mentioned above suggests rejecting the null hypothesis of no heteroscedasticity.

Heteroscedasticity White Test: for the case of VRSTE

F-statistic	2.588148	Prob. F(7,174)	0.0146
Obs*R-squared	17.16298	Prob. Chi-Square(7)	0.0164

Test Equation:

Dependent Variable: RESID^2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.077578	0.008750	8.865748	0.0000
CAPITAL^2	-0.057989	0.054936	-1.055578	0.2926
D1^2	-0.034652	0.023452	-1.477582	0.1413
D2^2	0.001082	0.011910	0.090847	0.9277
ETA^2	-0.095831	0.065128	-1.471432	0.1430
PK^2	1.593616	0.536978	2.967748	0.0034
PK2^2	-5.393131	2.374165	-2.271591	0.0243
TOTALASSET^2	0.076725	0.068680	1.117144	0.2655
R-squared	0.094302	Mean dependent var	0.081820	
Adjusted R-squared	0.057866	S.D. dependent var	0.077752	
S.E. of regression	0.075469	Akaike info criterion	-2.287229	
Sum squared resid	0.991029	Schwarz criterion	-2.146393	
Log likelihood	216.1378	Hannan-Quinn criter.	-2.230136	
F-statistic	2.588148	Durbin-Watson stat	1.706275	
Prob(F-statistic)	0.014555			

The heteroscedasticity White test for the case of VRSTE mentioned above suggests rejecting the null hypothesis of no heteroscedasticity.

Heteroscedasticity White Test: for the case of SCALE

F-statistic	0.790916	Prob. F(7,174)	0.5958
Obs*R-squared	5.612383	Prob. Chi-Square(7)	0.5857

Test Equation:

Dependent Variable: RESID^2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.050910	0.009422	5.403192	0.0000
CAPITAL^2	-0.026942	0.059155	-0.455449	0.6494
D1^2	0.023378	0.025253	0.925765	0.3559
D2^2	-0.016170	0.012825	-1.260821	0.2091
ETA^2	0.092881	0.070129	1.324429	0.1871
PK^2	0.402028	0.578213	0.695294	0.4878
PK2^2	-1.987718	2.556481	-0.777521	0.4379
TOTALASSET^2	-0.033767	0.073954	-0.456598	0.6485
R-squared	0.030837	Mean dependent var	0.048886	
Adjusted R-squared	-0.008152	S.D. dependent var	0.080935	
S.E. of regression	0.081264	Akaike info criterion	-2.139257	
Sum squared resid	1.149079	Schwarz criterion	-1.998422	
Log likelihood	202.6724	Hannan-Quinn criter.	-2.082164	
F-statistic	0.790916	Durbin-Watson stat	1.997937	
Prob(F-statistic)	0.595817			

The heteroscedasticity White test for the case of VRSTE mentioned above suggests accepting the null hypothesis of no heteroscedasticity.