```
      name:  <unnamed>
       log:  H:\Documents and Settings\Lee\My Documents\Document\stata\hetero.smcl
  log type:  smcl
 opened on:   7 Apr 2010, 08:29:44

. do "H:\Documents and Settings\Lee\My Documents\Document\stata\heterosked.do"

. * This example is in Cameron and Trivedi, ch 5
. clear

. * Generated data for heteroskedasticity
. set seed 10101

. quietly set obs 500

. generate double x2 = 5 * rnormal(0)

. generate double x3 = 5 * rnormal(0)

. generate double e = 5 * rnormal(0)

. generate double u = sqrt(exp(-1.+0.2*x2))*e

. generate double y = 1 + 1*x2+1*x3+u

.
. summarize
```

Variable	Obs	Mean	Std. Dev.	Min	Max
x2	500	-.0357347	4.929534	-17.05808	15.1011
x3	500	.08222	5.001709	-14.89073	15.9748
e	500	-.04497	5.130303	-12.57444	18.65422
u	500	-.1564096	3.80155	-17.38211	16.09441
y	500	.8900757	7.709741	-21.65168	28.89449

```
.
. * OLS with default (inconsistent) std errors
. reg y x2 x3
```

Source	SS	df	MS		
Model	22566.6872	2	11283.3436	Number of obs =	500
Residual	7093.92492	497	14.2734908	F(2, 497) =	790.51
				Prob > F =	0.0000
				R-squared =	0.7608
				Adj R-squared =	0.7599
Total	29660.6122	499	59.4401046	Root MSE =	3.778

y	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
x2	.9271964	.0343585	26.99	0.000	.8596905	.9947023
x3	.9384295	.0338627	27.71	0.000	.8718977	1.004961
_cons	.8460511	.168987	5.01	0.000	.5140341	1.178068

```
.
. * OLS with robust std errors
. reg y x2 x3, vce(hc3)
```

Linear regression

Number of obs	**500**
F(2, 497)	**640.45**
Prob > F	**0.0000**
R-squared	**0.7608**
Root MSE	**3.778**

y	Coef.	Robust HC3 Std. Err.	t	P>|t|	[95% Conf.	Interval]
x2	**.9271964**	**.0458254**	**20.23**	**0.000**	**.8371611**	**1.017232**
x3	**.9384295**	**.040479**	**23.18**	**0.000**	**.8588983**	**1.017961**
_cons	**.8460511**	**.1713677**	**4.94**	**0.000**	**.5093566**	**1.182746**

```
.
. * Diagnostic plots
. quietly reg y x2 x3

. predict double uhat, resid

. generate double absu = abs(uhat)

. quietly twoway (scatter absu x2) (lowess absu x2, bw(0.4) lw(thick)),scale(1.2) xscale(titl
> (*5)) yscale(titleg(*5)) plotr(style(none)) name(gls1)

. quietly twoway (scatter absu x3) (lowess absu x3, bw(0.4) lw(thick)),scale(1.2) xscale(titl
> (*5)) yscale(titleg(*5)) plotr(style(none)) name(gls2)

. graph combine gls1 gls2

.
. * Breusch-Pagan test
. reg y x2 x3
```

Source	SS	df	MS
Model	**22566.6872**	**2**	**11283.3436**
Residual	**7093.92492**	**497**	**14.2734908**
Total	**29660.6122**	**499**	**59.4401046**

Number of obs	**500**
F(2, 497)	**790.51**
Prob > F	**0.0000**
R-squared	**0.7608**
Adj R-squared	**0.7599**
Root MSE	**3.778**

y	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
x2	**.9271964**	**.0343585**	**26.99**	**0.000**	**.8596905**	**.9947023**
x3	**.9384295**	**.0338627**	**27.71**	**0.000**	**.8718977**	**1.004961**
_cons	**.8460511**	**.168987**	**5.01**	**0.000**	**.5140341**	**1.178068**

```
. hettest x2, iid

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: x2

         chi2(1)      =    77.06
         Prob > chi2  =   0.0000
```

```
.
. * Manual Version
. quietly regress y x2 x3

. predict ehat, res

. gen ehat2=ehat*ehat

. quietly reg ehat2 x2

. scalar LM = e(N)*e(r2)

. scalar pvalue = chi2tail(1,LM)

. scalar list LM pvalue
        LM =  77.060987
    pvalue =  1.658e-18

.
. * Whites Test
. quietly reg y x2 x3

. estat imtest, white

White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(5)      =    110.97
         Prob > chi2  =    0.0000

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	**110.97**	**5**	**0.0000**
Skewness	**6.51**	**2**	**0.0386**
Kurtosis	**9.98**	**1**	**0.0016**
Total	**127.46**	**8**	**0.0000**

```
.
. * FGLS estimation
. drop uhat

. quietly reg y x2 x3

. predict double uhat, resid

. generate double uhatsq = uhat*uhat

. generate double one = 1

.  nl (uhatsq = exp({xb: x2 one})), nolog
(obs = 500)
```

Source	SS	df	MS
Model	**188726.865**	**2**	**94363.4324**
Residual	**384195.497**	**498**	**771.476902**
Total	**572922.362**	**500**	**1145.84472**

```
                                      Number of obs =       500
                                      R-squared     =    0.3294
                                      Adj R-squared =    0.3267
                                      Root MSE      =  27.77547
                                      Res. dev.     =  4741.088
```

uhatsq	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
/xb_x2	.1427541	.0128147	11.14	0.000	.1175766	.1679317
/xb_one	2.462675	.1119496	22.00	0.000	2.242723	2.682626

```
.  predict double varu, yhat

.
.  regress y x2 x3 [aweight=1/varu]
(sum of wgt is   5.4993e+01)
```

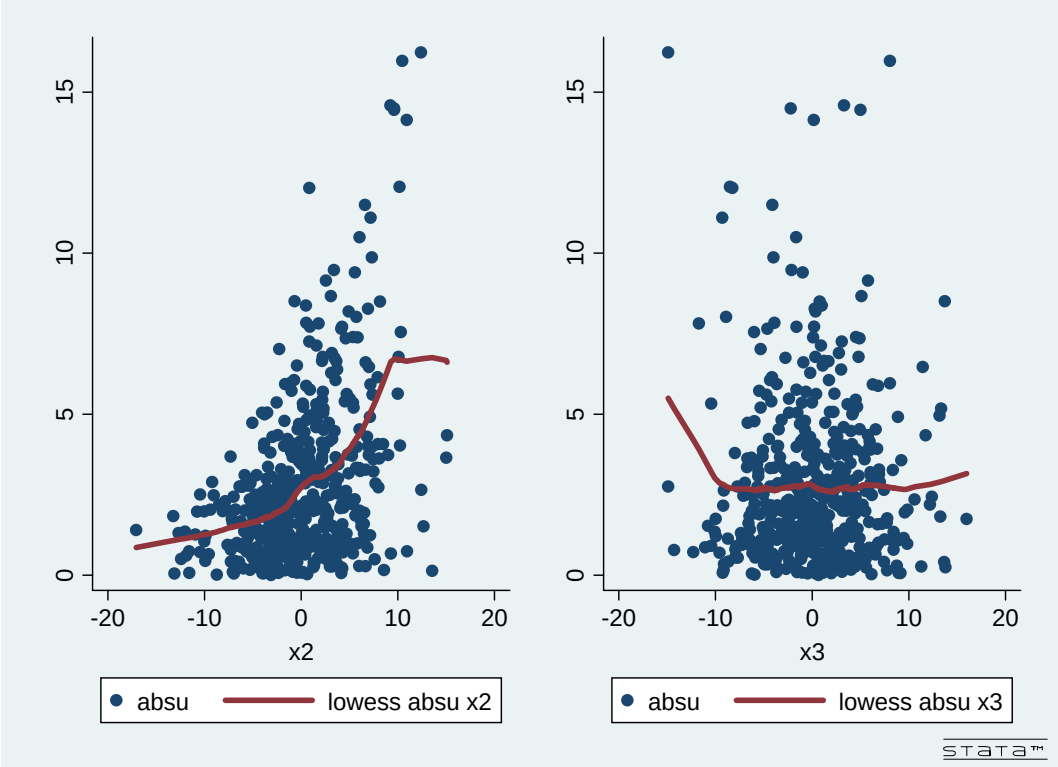
Source	SS	df	MS
Model	29055.2584	2	14527.6292
Residual	3818.72635	497	7.68355401
Total	32873.9847	499	65.8797289

Number of obs = 500
F(2, 497) = 1890.74
Prob > F = 0.0000
R-squared = 0.8838
Adj R-squared = 0.8834
Root MSE = 2.7719

y	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
x2	.9880644	.0246626	40.06	0.000	.9396087	1.03652
x3	.9783926	.025276	38.71	0.000	.9287315	1.028054
_cons	.9522962	.1516564	6.28	0.000	.6543296	1.250263

```
.
end of do-file

. log close
      name:  <unnamed>
       log:  H:\Documents and Settings\Lee\My Documents\Document\stata\hetero.smcl
  log type:  smcl
 closed on:   7 Apr 2010, 08:30:03
```


15
10
5
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lowess absu x2
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