

```

set obs 10
g x = 1 in 1
replace x=6 in 2
replace x=15 in 3
replace x=3 in 4
replace x=7 in 5
replace x=9 in 6
replace x=12 in 7
replace x=27 in 8
replace x=21 in 9
replace x=35 in 10
g s2=0.6*x^2+rnormal(0,1)
g u=rnormal(0,s2)
g y=40+20*x+u

```

```
. reg y x
```

Source	SS	df	MS	Number of obs	=	10
-----+-----				F(1, 8)	=	46.66
Model	539896.584	1	539896.584	Prob > F	=	0.0001
Residual	92567.9106	8	11570.9888	R-squared	=	0.8536
-----+-----				Adj R-squared	=	0.8353
Total	632464.494	9	70273.8327	Root MSE	=	107.57

y	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
-----+-----						
x	22.25166	3.257559	6.83	0.000	14.73971	29.7636
_cons	30.69441	55.8555	0.55	0.598	-98.10861	159.4974

```
. predict uhat, resid
```

```
. g x2=x^2
```

```
. g uhat2=uhat^2
```

```
. reg uhat2 x2, nocon
```

Source	SS	df	MS	Number of obs	=	10
-----+-----				F(1, 9)	=	10.12
Model	1.3828e+09	1	1.3828e+09	Prob > F	=	0.0112
Residual	1.2301e+09	9	136679568	R-squared	=	0.5292
-----+-----				Adj R-squared	=	0.4769
Total	2.6129e+09	10	261293990	Root MSE	=	11691

uhat2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
-----+-----						
x2	24.4761	7.695034	3.18	0.011	7.068721	41.88348

```
. predict s2hat, xb
```

```
. g shat=sqrt(s2hat)
```

```
. vwls y x, sd(shat)
```

```

Variance-weighted least-squares regression      Number of obs      =      10
Goodness-of-fit chi2(8)      =      9.09      Model chi2(1)      =      125.22
Prob > chi2      =      0.3351      Prob > chi2      =      0.0000

```

y	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
-----+-----						
x	21.59293	1.929643	11.19	0.000	17.8109	25.37496
_cons	40.13	5.599671	7.17	0.000	29.15485	51.10516

```
. mkmat one x, mat(X)
```

```
. mat list X
```

```
X[10,2]
      one   x
r1     1    1
r2     1    6
r3     1   15
r4     1    3
r5     1    7
r6     1    9
r7     1   12
r8     1   27
r9     1   21
r10    1   35
```

```
. mkmat y, mat(Y)
```

```
. mat list Y
```

```
Y[10,1]
      y
r1  61.274441
r2  178.66545
r3  252.27271
r4  106.49401
r5  222.79659
r6  196.90622
r7  319.83072
r8   428.3548
r9   657.7085
r10 908.86615
```

```
. mat b=inv(X'*X)*(X'*Y)
```

```
. mat list b
```

```
b[2,1]
      y
one  30.694414
x    22.251658
```

```
. mat Uhat=Y-X*b
```

```
. mat list Uhat
```

```
Uhat[10,1]
      y
r1   8.3283689
r2  14.461091
r3 -112.19657
r4   9.0446239
r5  36.340568
r6 -34.053113
r7  22.116414
r8 -203.13437
r9  159.72927
r10  99.36372
```

```
. mkmat uhat2, mat(Uhat2)
```

```
. mkmat x2, mat(X2)
```

```
. mat bs=inv(X2'*X2)*X2'*Uhat2
```

```
. mat list bs
```

. reg y x	
Source	SS
Model	539896.584
Residual	92567.9106
Total	632464.494

y	Coef.
x	22.25166
_cons	30.69441

```

symmetric bs[1,1]
      uhat2
x2 24.476098

. mat S2hat=X2*bs

. mat S=diag(S2hat)

. mat list S

symmetric S[10,10]
      r1      r2      r3      r4      r5      r6      r7
r8      r9      r10
r1 24.476098
r2      0 881.13953
r3      0      0 5507.1221
r4      0      0      0 220.28488
r5      0      0      0      0 1199.3288
r6      0      0      0      0      0 1982.564
r7      0      0      0      0      0      0 3524.5581
r8      0      0      0      0      0      0      0
17843.076
r9      0      0      0      0      0      0      0
0 10793.959
r10     0      0      0      0      0      0      0
0      0 29983.22

```

```
. mat bglS=inv(X'*inv(S)*X)*X'*inv(S)*Y
```

```
. mat list bglS
```

```
bglS[2,1]
```

```

      y
one 40.130004
x 21.592929

```

```

. vwls y x, sd(shat)
Variance-weighted least-squ
Goodness-of-fit chi2(8)
Prob > chi2
-----
      y |      Coef.
-----+-----
      x | 21.59293
   _cons | 40.13
-----

```

