

```

1 *****;
2 *** Data from Freund & Wilson (1993) ***;
3 *** TABLE 8.24 : ESTIMATING TREE WEIGHTS ***;
4 *****;
5 options ps=256 ls=80 nocenter nodate nonumber;
6
7 ODS HTML
7 ! file='C:\Geaghan\EXST\EXST7015New\Fall2002\SAS\01-Slr-Trees.html';
NOTE: Writing HTML Body file:
C:\Geaghan\EXST\EXST7015New\Fall2002\SAS\01-Slr-Trees.html

```

```

8
9 data one; infile cards missover;
10 TITLE1 'EXST7015: Estimating tree weights from morphometric variables';
11 input ObsNo Dbh Height Age Grav Weight ObsID $;
12 ***** label ObsNo = 'Original observation number'
13 Dbh = 'Diameter at breast height (inches)'
14 Height = 'Height of the tree (feet)'
15 Age = 'Age of the tree (years)'
16 Grav = 'Specific gravity of the wood'
17 Weight = 'Harvest weight of the tree (lbs)'
18 ObsId = 'Identification letter added to dataset';
19 lweight = log(weight);
20 ldbh = log(DBH);
21 cards;

```

NOTE: The data set WORK.ONE has 47 observations and 9 variables.

NOTE: DATA statement used:

```

real time          1.24 seconds
cpu time           0.20 seconds

```

```

21 ! run;

```

```

69 ;

```

```

70 proc print data=one; TITLE2 'Raw data print'; run;

```

NOTE: There were 47 observations read from the data set WORK.ONE.

NOTE: The PROCEDURE PRINT printed page 1.

NOTE: PROCEDURE PRINT used:

```

real time          0.97 seconds
cpu time           0.17 seconds

```

EXST7015: Estimating tree weights from other morphometric variables

Raw data print

Obs	Obs	Dbh	Height	Age	Grav	Weight	Obs	lweight	ldbh
1	1	5.7	34	10	0.409	174	a	5.15906	1.74047
2	2	8.1	68	17	0.501	745	b	6.61338	2.09186
3	3	8.3	70	17	0.445	814	c	6.70196	2.11626
4	4	7.0	54	17	0.442	408	d	6.01127	1.94591
5	5	6.2	37	12	0.353	226	e	5.42053	1.82455
6	6	11.4	79	27	0.429	1675	f	7.42357	2.43361
7	7	11.6	70	26	0.497	1491	g	7.30720	2.45101
8	8	4.5	37	12	0.380	121	h	4.79579	1.50408
...									
44	44	4.0	38	13	0.407	76	R	4.33073	1.38629
45	45	8.0	61	13	0.508	614	S	6.41999	2.07944
46	46	5.2	47	13	0.432	194	T	5.26786	1.64866
47	47	3.7	33	13	0.389	66	U	4.18965	1.30833

```

72 options ls=111 ps=61; proc plot data=one; plot weight*Dbh=obsid;

```

```

73 TITLE2 'Scatter plot'; run;

```

```

74 options ps=256 ls=132;

```

NOTE: There were 47 observations read from the data set WORK.ONE.

NOTE: The PROCEDURE PLOT printed page 2.

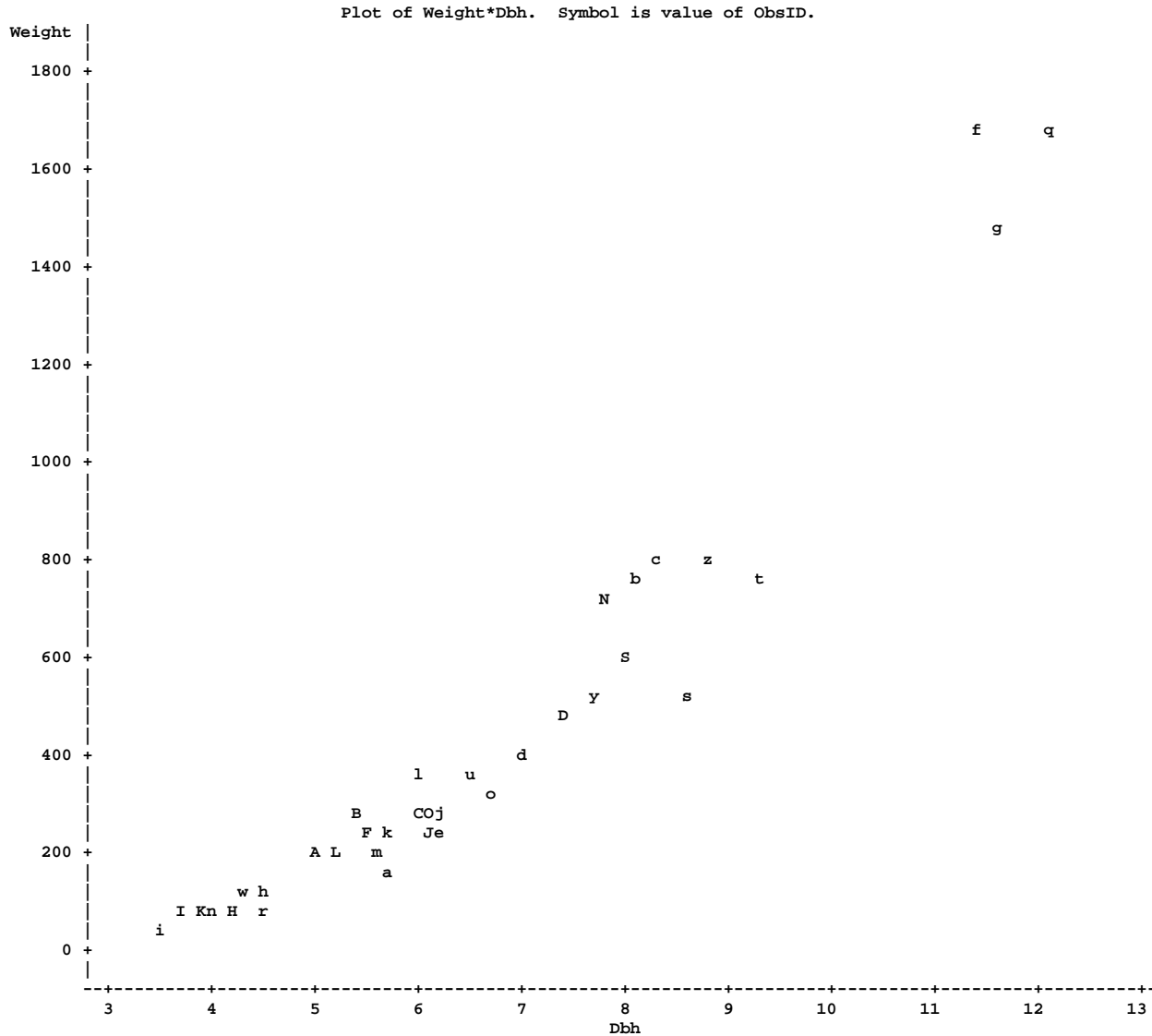
NOTE: PROCEDURE PLOT used:

```

real time          0.22 seconds
cpu time           0.02 seconds

```

**EXST7015: Estimating tree weights from other morphometric variables**  
**Scatter plot**



NOTE: 11 obs hidden.

```
76      proc means data=one n mean max min var std stderr;
77          TITLE2 'Raw data means';
78          var Dbh Height Age Grav Weight; run;
```

NOTE: There were 47 observations read from the data set WORK.ONE.

NOTE: The PROCEDURE MEANS printed page 3.

NOTE: PROCEDURE MEANS used:

```
real time      0.25 seconds
cpu time       0.04 seconds
```

**EXST7015: Estimating tree weights from other morphometric variables**

**Raw data means**

**The MEANS Procedure**

Variable	N	Mean	Maximum	Minimum	Variance	Std Dev	Std Error
Dbh	47	6.1531915	12.1000000	3.5000000	4.4016744	2.0980168	0.3060272
Height	47	49.5957447	79.0000000	27.0000000	167.6808511	12.9491641	1.8888297
Age	47	16.9574468	27.0000000	10.0000000	26.9111933	5.1876000	0.7566892
Grav	47	0.4452979	0.5080000	0.3530000	0.0014853	0.0385402	0.0056217
Weight	47	369.3404255	1692.00	58.0000000	154916.75	393.5946534	57.4116808

```

80      proc univariate data=one normal plot;
81          TITLE2 'Raw data Univariate analysis';
82          var Weight Dbh; run;

```

NOTE: The PROCEDURE UNIVARIATE printed pages 4-5.

NOTE: PROCEDURE UNIVARIATE used:

```

      real time          0.53 seconds
      cpu time           0.06 seconds

```

EXST7015: Estimating tree weights from other morphometric variables  
Raw data Univariate analysis

The UNIVARIATE Procedure

Variable: Weight

		Moments	
N	47	Sum Weights	47
Mean	369.340426	Sum Observations	17359
Std Deviation	393.594653	Variance	154916.751
Skewness	2.20870748	Kurtosis	4.83581557
Uncorrected SS	13537551	Corrected SS	7126170.55
Coeff Variation	106.566903	Std Error Mean	57.4116808

Basic Statistical Measures			
Location		Variability	
Mean	369.3404	Std Deviation	393.59465
Median	224.0000	Variance	154917
Mode	84.0000	Range	1634
		Interquartile Range	341.00000

NOTE: The mode displayed is the smallest of 3 modes with a count of 2.

Tests for Location: Mu0=0				
Test	-Statistic-	-----p Value-----		
Student's t	t 6.433193	Pr >  t	<.0001	
Sign	M 23.5	Pr >=  M	<.0001	
Signed Rank	S 564	Pr >=  S	<.0001	

Tests for Normality				
Test	--Statistic--	-----p Value-----		
Shapiro-Wilk	W 0.710878	Pr < W	<0.0001	
Kolmogorov-Smirnov	D 0.24806	Pr > D	<0.0100	
Cramer-von Mises	W-Sq 0.77793	Pr > W-Sq	<0.0050	
Anderson-Darling	A-Sq 4.435579	Pr > A-Sq	<0.0050	

Quantiles (Definition 5)

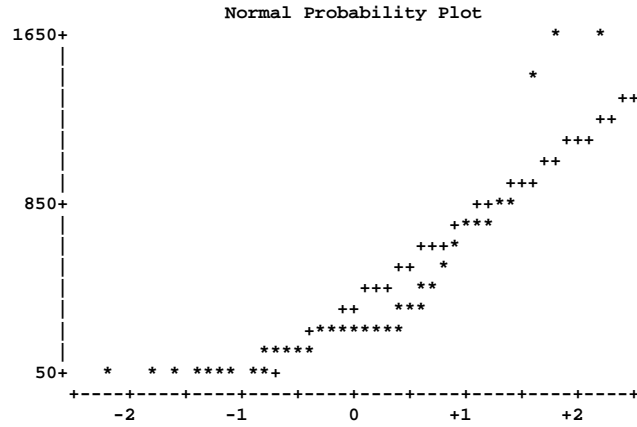
Quantile	Estimate
100% Max	1692
99%	1692
95%	1491
90%	814
75% Q3	462
50% Median	224
25% Q1	121
10%	74
5%	66
1%	58
0% Min	58

**Extreme Observations**

----Lowest----		----Highest----	
Value	Obs	Value	Obs
58	9	814	3
60	16	815	26
66	47	1491	7
70	35	1675	6
74	18	1692	17

Stem Leaf	#	Boxplot
16 89	2	*
15		
14 9	1	*
13		
12		
11		
10		
9		
8 12	2	
7 147	3	
6 1	1	
5 24	2	
4 16	2	+-----+
3 00144	5	+
2 001112233488	12	*-----*
1 00222799	8	+-----+
0 667778889	9	

-----+-----+  
Multiply Stem.Leaf by 10\*\*+2



**EXST7015: Estimating tree weights from other morphometric variables**  
Raw data Univariate analysis

The UNIVARIATE Procedure  
Variable: Dbh

Moments			
N	47	Sum Weights	47
Mean	6.15319149	Sum Observations	289.2
Std Deviation	2.09801677	Variance	4.40167438
Skewness	1.17285986	Kurtosis	1.18369068
Uncorrected SS	1981.98	Corrected SS	202.477021
Coeff Variation	34.0963998	Std Error Mean	0.3060272

Basic Statistical Measures			
Location		Variability	
Mean	6.153191	Std Deviation	2.09802
Median	5.700000	Variance	4.40167
Mode	4.000000	Range	8.60000
		Interquartile Range	2.90000

NOTE: The mode displayed is the smallest of 2 modes with a count of 4.

Tests for Location: Mu0=0				
Test	-Statistic-	-----p Value-----		
Student's t	t 20.10668	Pr >  t	<.0001	
Sign	M 23.5	Pr >=  M	<.0001	
Signed Rank	S 564	Pr >=  S	<.0001	

Tests for Normality				
Test	--Statistic--	-----p Value-----		
Shapiro-Wilk	W 0.89407	Pr < W	0.0005	
Kolmogorov-Smirnov	D 0.171951	Pr > D	<0.0100	
Cramer-von Mises	W-Sq 0.214712	Pr > W-Sq	<0.0050	
Anderson-Darling	A-Sq 1.387777	Pr > A-Sq	<0.0050	

Quantiles (Definition 5)

Quantile	Estimate
100% Max	12.1
99%	12.1
95%	11.4
90%	8.8
75% Q3	7.4
50% Median	5.7
25% Q1	4.5
10%	4.0
5%	3.7
1%	3.5
0% Min	3.5

## Extreme Observations

----Lowest----		----Highest----	
Value	Obs	Value	Obs
3.5	9	8.8	26
3.7	47	9.3	20
3.7	35	11.4	6
3.9	37	11.6	7
4.0	44	12.1	17

```

Stem Leaf
12 1
11 6
11 4
10
10
9
9 3
8 68
8 013
7 78
7 04
6 57
6 0011122
5 5666677
5 0224
4 555
4 0000233
3 5779

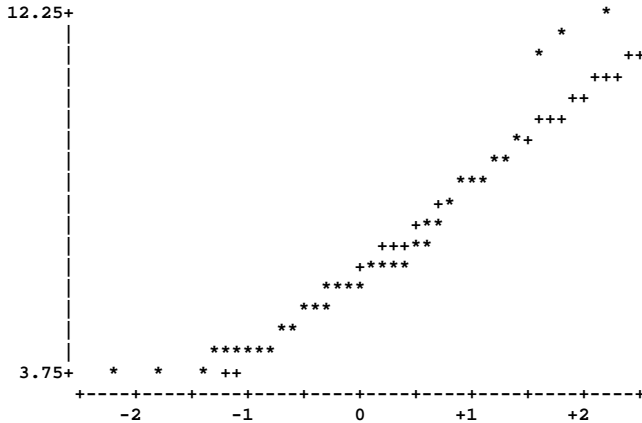
```

```

# Boxplot
1 0 12.25+
1
1
1
1
1
2
2
2
2 +-----+
2 | |
6 57 | + |
7 0011122 | |
5 5666677 | *-----*
5 0224 | |
4 555 | +-----+
4 0000233 | |
3 5779 | |
4

```

## Normal Probability Plot



```

84      proc reg data=one LINEPRINTER; ID ObsID DBH;
85          TITLE2 'Simple linear regression';
86          model Weight = Dbh / p xpx i influence clb alpha=0.01; *** CLI CLM;
87              Slope:Test DBH = 200;
88              Joint:TEST intercept = 0, DBH = 200;
89      run;

```

NOTE: 47 observations read.

NOTE: 47 observations used in computations.

```

89      !          options ls=78 ps=45;
90          plot residual.*predicted.=obsid; run;
91          OUTPUT OUT=NEXT1 P=YHat R=E STUDENT=student rstudent
92              lcl=lcl lclm=lclm ucl=ucl uclm=uclm;
93      run;
94          options ps=61 ls=132;

```

NOTE: The data set WORK.NEXT1 has 47 observations and 17 variables.

NOTE: The PROCEDURE REG printed pages 6-11.

NOTE: PROCEDURE REG used:

real time	1.09 seconds
cpu time	0.17 seconds

EXST7015: Estimating tree weights from other morphometric variables  
Simple linear regression

The REG Procedure

Model: MODEL1

Variable	Model Crossproducts X'X X'Y Y'Y		
	Intercept	Dbh	Weight
Intercept	47	289.2	17359
Dbh	289.2	1981.98	142968.3
Weight	17359	142968.3	13537551

Variable	X'X Inverse, Parameter Estimates, and SSE		
	Intercept	Dbh	Weight
Intercept	0.2082694963	-0.030389579	-729.3963003
Dbh	-0.030389579	0.004938832	178.56371409
Weight	-729.3963003	178.56371409	670190.7322

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	6455980	6455980	433.49	<.0001
Error	45	670191	14893		
Corrected Total	46	7126171			

Root MSE	122.03740	R-Square	0.9060
Dependent Mean	369.34043	Adj R-Sq	0.9039
Coeff Var	33.04198		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr >  t	99% Confidence Limits	
Intercept	1	-729.39630	55.69366	-13.10	<.0001	-879.18914	-579.60346
Dbh	1	178.56371	8.57640	20.82	<.0001	155.49675	201.63067

EXST7015: Estimating tree weights from other morphometric variables  
Simple linear regression

The REG Procedure

Model: MODEL1

Test Slope Results for Dependent Variable Weight

Source	DF	Mean Square	F Value	Pr > F
Numerator	1	93041	6.25	0.0162
Denominator	45	14893		

Test Joint Results for Dependent Variable Weight

Source	DF	Mean Square	F Value	Pr > F
Numerator	2	17479620	1173.67	<.0001
Denominator	45	14893		

EXST7015: Estimating tree weights from other morphometric variables  
Simple linear regression

The REG Procedure

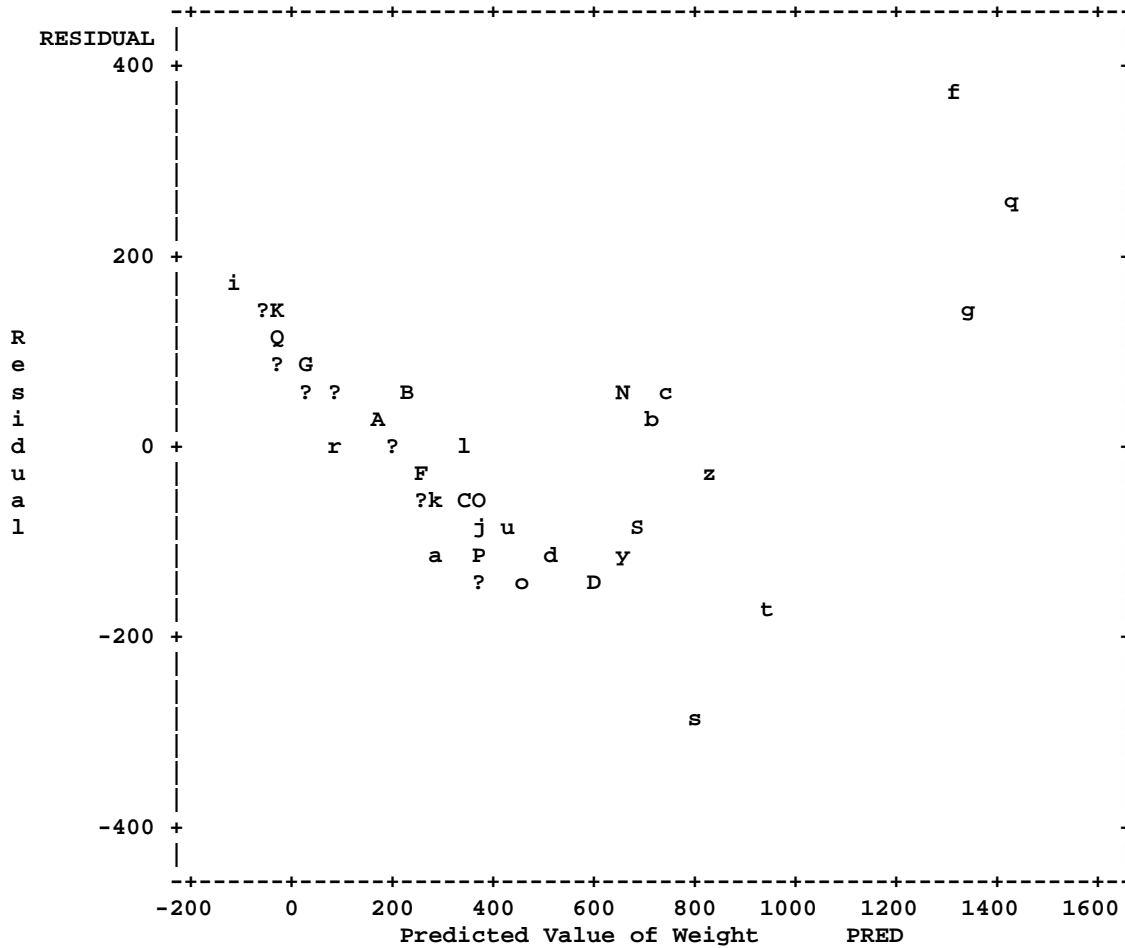
Model: MODEL1

Dependent Variable: Weight

		Output Statistics									
Obs	ObsID	Dep Var	Predicted		Hat	Diag	Cov		-----DFBETAS-----		
		Dbh	Weight	Value	Residual	RStudent	H	Ratio	DFFITS	Intercept	Dbh
1	a	5.7	174.0000	288.4169	-114.4169	-0.9471	0.0223	1.0275	-0.1430	-0.0736	0.0305
2	b	8.1	745.0000	716.9698	28.0302	0.2319	0.0400	1.0869	0.0473	-0.0197	0.0324
3	c	8.3	814.0000	752.6825	61.3175	0.5096	0.0440	1.0814	0.1094	-0.0502	0.0786
4	d	7	408.0000	520.5497	-112.5497	-0.9326	0.0248	1.0314	-0.1488	0.0092	-0.0562
5	e	6.2	226.0000	377.6987	-151.6987	-1.2648	0.0213	0.9950	-0.1865	-0.0556	-0.0042
6	f	11.4	1675	1306	368.7700	3.7355	0.1572	0.7154	1.6135	-1.2320	1.5004
7	g	11.6	1491	1342	149.0572	1.3511	0.1678	1.1587	0.6067	-0.4681	0.5669
8	h	4.5	121.0000	74.1404	46.8596	0.3871	0.0348	1.0763	0.0735	0.0617	-0.0458
9	i	3.5	58.0000	-104.4233	162.4233	1.3837	0.0560	1.0176	0.3372	0.3180	-0.2656
10	j	6.2	278.0000	377.6987	-99.6987	-0.8228	0.0213	1.0366	-0.1213	-0.0362	-0.0027
11	k	5.7	220.0000	288.4169	-68.4169	-0.5627	0.0223	1.0546	-0.0850	-0.0437	0.0181
12	l	6	342.0000	341.9860	0.0140	0.000115	0.0214	1.0688	0.0000	0.0000	-0.0000
13	m	5.6	209.0000	270.5605	-61.5605	-0.5061	0.0228	1.0580	-0.0773	-0.0427	0.0199
14	n	4	84.0000	-15.1414	99.1414	0.8280	0.0442	1.0610	0.1780	0.1609	-0.1282
15	o	6.7	313.0000	466.9806	-153.9806	-1.2856	0.0228	0.9942	-0.1962	-0.0133	-0.0500
16	p	4	60.0000	-15.1414	75.1414	0.6255	0.0442	1.0751	0.1345	0.1216	-0.0968
17	q	12.1	1692	1431	260.7754	2.5208	0.1959	0.9932	1.2444	-0.9822	1.1749
18	r	4.5	74.0000	74.1404	-0.1404	-0.001158	0.0348	1.0837	-0.0002	-0.0002	0.0001
19	s	8.6	515.0000	806.2516	-291.2516	-2.6020	0.0508	0.8277	-0.6022	0.3106	-0.4592
20	t	9.3	766.0000	931.2462	-165.2462	-1.4200	0.0702	1.0285	-0.3901	0.2399	-0.3257
21	u	6.5	345.0000	431.2678	-86.2678	-0.7108	0.0219	1.0452	-0.1063	-0.0169	-0.0175
22	v	5.6	210.0000	270.5605	-60.5605	-0.4978	0.0228	1.0584	-0.0760	-0.0420	0.0196
23	w	4.3	100.0000	38.4277	61.5723	0.5102	0.0382	1.0748	0.1017	0.0885	-0.0678
24	x	4.5	122.0000	74.1404	47.8596	0.3954	0.0348	1.0760	0.0751	0.0631	-0.0468
25	y	7.7	539.0000	645.5443	-106.5443	-0.8857	0.0331	1.0442	-0.1639	0.0508	-0.0979
26	z	8.8	815.0000	841.9644	-26.9644	-0.2250	0.0559	1.1053	-0.0547	0.0300	-0.0431
27	A	5	194.0000	163.4223	30.5777	0.2515	0.0278	1.0728	0.0426	0.0315	-0.0207
28	B	5.4	280.0000	234.8478	45.1522	0.3709	0.0241	1.0651	0.0583	0.0363	-0.0199
29	C	6	296.0000	341.9860	-45.9860	-0.3773	0.0214	1.0620	-0.0558	-0.0217	0.0041
30	D	7.4	462.0000	591.9752	-129.9752	-1.0829	0.0290	1.0220	-0.1870	0.0400	-0.0963
31	E	5.6	200.0000	270.5605	-70.5605	-0.5806	0.0228	1.0542	-0.0887	-0.0490	0.0228
32	F	5.5	229.0000	252.7041	-23.7041	-0.1944	0.0234	1.0692	-0.0301	-0.0177	0.0090
33	G	4.3	125.0000	38.4277	86.5723	0.7195	0.0382	1.0624	0.1435	0.1247	-0.0955
34	H	4.2	84.0000	20.5713	63.4287	0.5262	0.0401	1.0761	0.1076	0.0949	-0.0737
35	I	3.7	70.0000	-68.7106	138.7106	1.1716	0.0510	1.0365	0.2716	0.2525	-0.2073
36	J	6.1	224.0000	359.8424	-135.8424	-1.1286	0.0213	1.0094	-0.1665	-0.0572	0.0043
37	K	3.9	99.0000	-32.9978	131.9978	1.1105	0.0464	1.0378	0.2448	0.2236	-0.1801
38	L	5.2	200.0000	199.1350	0.8650	0.007101	0.0258	1.0736	0.0012	0.0008	-0.0005
39	M	5.6	214.0000	270.5605	-56.5605	-0.4647	0.0228	1.0599	-0.0710	-0.0392	0.0183
40	N	7.8	712.0000	663.4007	48.5993	0.4015	0.0347	1.0756	0.0761	-0.0258	0.0473
41	O	6.1	297.0000	359.8424	-62.8424	-0.5163	0.0213	1.0559	-0.0761	-0.0262	0.0020
42	P	6.1	238.0000	359.8424	-121.8424	-1.0094	0.0213	1.0209	-0.1489	-0.0512	0.0038
43	Q	4	89.0000	-15.1414	104.1414	0.8705	0.0442	1.0576	0.1871	0.1692	-0.1347
44	R	4	76.0000	-15.1414	91.1414	0.7603	0.0442	1.0661	0.1634	0.1478	-0.1177
45	S	8	614.0000	699.1134	-85.1134	-0.7072	0.0381	1.0631	-0.1408	0.0551	-0.0936
46	T	5.2	194.0000	199.1350	-5.1350	-0.0422	0.0258	1.0735	-0.0069	-0.0047	0.0029
47	U	3.7	66.0000	-68.7106	134.7106	1.1368	0.0510	1.0402	0.2635	0.2450	-0.2012

Sum of Residuals 0  
Sum of Squared Residuals 670191  
Predicted Residual SS (PRESS) 810382  
EXST7015: Estimating tree weights from other morphometric variables  
Simple linear regression

The REG Procedure  
Model: MODEL1  
Dependent Variable: Weight



```
95      proc print data=next1;
96          TITLE3 'Listing of observation diagnostics';
97          var ObsId DBH Weight YHat E student rstudent lcl lclm ucl uclm;
run;
NOTE: There were 47 observations read from the data set WORK.NEXT1.
NOTE: The PROCEDURE PRINT printed page 12.
NOTE: PROCEDURE PRINT used:
      real time          0.21 seconds
      cpu time           0.04 seconds
98      options ps=256 ls=80;
```



EXST7015: Estimating tree weights from other morphometric variables  
Simple linear regression  
Listing of observation diagnostics

Obs	ID	Dbh	Weight	YHat	E	student	rstudent	lcl	lclm	ucl	uclm
1	a	5.7	174	288.42	-114.417	-0.94818	-0.94710	-43.45	239.41	620.28	337.42
2	b	8.1	745	716.97	28.030	0.23442	0.23194	382.24	651.33	1051.70	782.61
3	c	8.3	814	752.68	61.317	0.51389	0.50965	417.30	683.80	1088.06	821.56
4	d	7.0	408	520.55	-112.550	-0.93392	-0.93256	188.27	468.84	852.83	572.26
5	e	6.2	226	377.70	-151.699	-1.25650	-1.26484	45.99	329.81	709.40	425.59
6	f	11.4	1675	1306.23	368.770	3.29162	3.73546	953.14	1176.08	1659.32	1436.38
7	g	11.6	1491	1341.94	149.057	1.33889	1.35112	987.24	1207.49	1696.64	1476.40
8	h	4.5	121	74.14	46.860	0.39083	0.38712	-259.75	12.93	408.03	135.35
9	i	3.5	58	-104.42	162.423	1.36987	1.38372	-441.73	-182.13	232.88	-26.72
10	j	6.2	278	377.70	-99.699	-0.82579	-0.82282	45.99	329.81	709.40	425.59
11	k	5.7	220	288.42	-68.417	-0.56698	-0.56266	-43.45	239.41	620.28	337.42
12	l	6.0	342	341.99	0.014	0.00012	0.00011	10.26	293.98	673.71	389.99
13	m	5.6	209	270.56	-61.560	-0.51029	-0.50605	-61.39	221.01	602.51	320.11
14	n	4.0	84	-15.14	99.141	0.83095	0.82804	-350.54	-84.13	320.26	53.84
15	o	6.7	313	466.98	-153.981	-1.27635	-1.28558	135.04	417.47	798.92	516.49
16	p	4.0	60	-15.14	75.141	0.62979	0.62552	-350.54	-84.13	320.26	53.84
17	q	12.1	1692	1431.22	260.775	2.38302	2.52082	1072.28	1285.93	1790.17	1576.51
18	r	4.5	74	74.14	-0.140	-0.00117	-0.00116	-259.75	12.93	408.03	135.35
19	s	8.6	515	806.25	-291.252	-2.44967	-2.60199	469.78	732.24	1142.72	880.26
20	t	9.3	766	931.25	-165.246	-1.40424	-1.42001	591.69	844.29	1270.80	1018.20
21	u	6.5	345	431.27	-86.268	-0.71476	-0.71082	99.47	382.73	763.07	479.81
22	v	5.6	210	270.56	-60.560	-0.50200	-0.49778	-61.39	221.01	602.51	320.11
23	w	4.3	100	38.43	61.572	0.51447	0.51022	-296.02	-25.76	372.87	102.61
24	x	4.5	122	74.14	47.860	0.39917	0.39541	-259.75	12.93	408.03	135.35
25	y	7.7	539	645.54	-106.544	-0.88786	-0.88573	311.93	585.83	979.16	705.25
26	z	8.8	815	841.96	-26.964	-0.22740	-0.22498	504.69	764.38	1179.24	919.55
27	A	5.0	194	163.42	30.578	0.25412	0.25146	-169.35	108.65	496.19	218.19
28	B	5.4	280	234.85	45.152	0.37452	0.37092	-97.31	183.92	567.01	285.78
29	C	6.0	296	341.99	-45.986	-0.38092	-0.37727	10.26	293.98	673.71	389.99
30	D	7.4	462	591.98	-129.975	-1.08081	-1.08288	259.03	536.12	924.92	647.83
31	E	5.6	200	270.56	-70.560	-0.58489	-0.58057	-61.39	221.01	602.51	320.11
32	F	5.5	229	252.70	-23.704	-0.19655	-0.19444	-79.34	202.51	584.75	302.90
33	G	4.3	125	38.43	86.572	0.72336	0.71947	-296.02	-25.76	372.87	102.61
34	H	4.2	84	20.57	63.429	0.53050	0.52622	-314.18	-45.17	355.32	86.31
35	I	3.7	70	-68.71	138.711	1.16676	1.17159	-405.21	-142.83	267.79	5.41
36	J	6.1	224	359.84	-135.842	-1.12516	-1.12858	28.14	311.95	691.55	407.74
37	K	3.9	99	-33.00	131.998	1.10759	1.11046	-368.75	-103.66	302.75	37.67
38	L	5.2	200	199.14	0.865	0.00718	0.00710	-133.30	146.45	531.57	251.82
39	M	5.6	214	270.56	-56.560	-0.46884	-0.46474	-61.39	221.01	602.51	320.11
40	N	7.8	712	663.40	48.599	0.40532	0.40153	329.53	602.28	997.27	724.52
41	O	6.1	297	359.84	-62.842	-0.52051	-0.51625	28.14	311.95	691.55	407.74
42	P	6.1	238	359.84	-121.842	-1.00920	-1.00941	28.14	311.95	691.55	407.74
43	Q	4.0	89	-15.14	104.141	0.87285	0.87050	-350.54	-84.13	320.26	53.84
44	R	4.0	76	-15.14	91.141	0.76389	0.76031	-350.54	-84.13	320.26	53.84
45	S	8.0	614	699.11	-85.113	-0.71112	-0.70716	364.69	635.03	1033.54	763.20
46	T	5.2	194	199.14	-5.135	-0.04263	-0.04215	-133.30	146.45	531.57	251.82
47	U	3.7	66	-68.71	134.711	1.13312	1.13679	-405.21	-142.83	267.79	5.41



```
100      proc univariate data=next1 normal plot; var e;
101          TITLE3 'Residual analysis'; run;
```

NOTE: The PROCEDURE UNIVARIATE printed page 13.

NOTE: PROCEDURE UNIVARIATE used:

```
real time      0.11 seconds
cpu time       0.03 seconds
```

EXST7015: Estimating tree weights from other morphometric variables  
 Simple linear regression  
 Residual analysis

The UNIVARIATE Procedure  
 Variable: E (Residual)

Moments			
N	47	Sum Weights	47
Mean	0	Sum Observations	0
Std Deviation	120.703619	Variance	14569.3637
Skewness	0.47869472	Kurtosis	1.04153074
Uncorrected SS	670190.732	Corrected SS	670190.732
Coeff Variation	.	Std Error Mean	17.6064324

Basic Statistical Measures			
Location		Variability	
Mean	0.00000	Std Deviation	120.70362
Median	-0.14041	Variance	14569
Mode	.	Range	660.02160
		Interquartile Range	161.40929

Tests for Location: Mu0=0				
Test	-Statistic-		-----p Value-----	
Student's t	t	0	Pr >  t	1.0000
Sign	M	-0.5	Pr >=  M	1.0000
Signed Rank	S	-25	Pr >=  S	0.7946

Tests for Normality				
Test	--Statistic--		-----p Value-----	
Shapiro-Wilk	W	0.973389	Pr < W	0.3544
Kolmogorov-Smirnov	D	0.084574	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.044081	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.354877	Pr > A-Sq	>0.2500

Quantiles (Definition 5)	
Quantile	Estimate
100% Max	368.769960
99%	368.769960
95%	162.423301
90%	138.710558
75% Q3	75.141444
50% Median	-0.140413
25% Q1	-86.267841
10%	-135.842356
5%	-153.980584
1%	-291.251641
0% Min	-291.251641

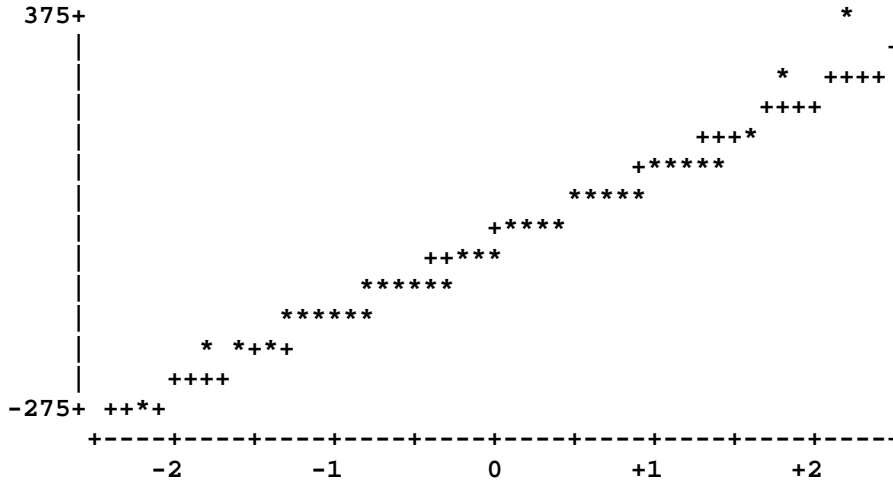
Extreme Observations

-----Lowest-----		-----Highest-----	
Value	Obs	Value	Obs
-291.252	19	138.711	35
-165.246	20	149.057	7
-153.981	15	162.423	9
-151.699	5	260.775	17
-135.842	36	368.770	6

Stem Leaf	#	Boxplot
3 7	1	0
3		
2 6	1	
2		
1 56	2	
1 00334	5	
0 5555666899	10	+-----+
0 0033	4	+
-0 3210	4	*-----*
-0 997766665	9	+-----+
-1 4321110	7	
-1 755	3	
-2		
-2 9	1	

-----+-----+-----+-----+  
 Multiply Stem.Leaf by 10\*\*\*2

Normal Probability Plot



```

6 font fixed courier new
-----+-----1-----2-----3-----4-----5-----6-----7-----8-----9-----0-----1-----2-----+-----
7 font fixed courier new
-----+-----1-----2-----3-----4-----5-----6-----7-----8-----9-----0-----1-----+-----
8 font fixed courier new
-----+-----1-----2-----3-----4-----5-----6-----7-----8-----9-----+-----
9 font fixed courier new
-----+-----1-----2-----3-----4-----5-----6-----7-----8-----+-----
10 font fixed courier new
-----+-----1-----2-----3-----4-----5-----6-----7-----+-----
11 font fixed courier new
-----+-----1-----2-----3-----4-----5-----6-----+-----
12 font fixed courier new
-----+-----1-----2-----3-----4-----5-----6-----+-----
    
```

```
110      GOPTIONS DEVICE=CGMflwa GSFMODE=REPLACE GSFNAME=OUT NOPROMPT noROTATE
111          ftext='TimesRoman' ftitle='TimesRoman' htext=1 htitle=1 ctitle=black ctext=black;
112
113      GOPTIONS GSFNAME=OUT1;
114      FILENAME OUT1'C:\Geaghan\EXST\EXST7015New\Fall2002\SAS\SLR-Trees1.CGM';
NOTE: There were 47 observations read from the data set WORK.ONE.
NOTE: The PROCEDURE PLOT printed page 14.
NOTE: PROCEDURE PLOT used:
      real time          0.09 seconds
      cpu time           0.04 seconds
115      PROC GPLOT DATA=ONE;
116          TITLE1 font='TimesRoman' H=1 'Simple Linear Regression Example';
117          TITLE2 font='TimesRoman' H=1 'Wood harvest from trees';
118          PLOT weight*Dbh=1 weight*Dbh=2 / overlay HAXIS=AXIS1 VAXIS=AXIS2;
119          AXIS1 LABEL=(font='TimesRoman' H=1 'Diameter at breast height (inches)') WIDTH=1
MINOR=(N=1)
120              VALUE=(font='TimesRoman' H=1) color=black ORDER=3 TO 13 BY 1;
121          AXIS2 LABEL=(ANGLE=90 font='TimesRoman' H=1 'Weight of wood harvested (lbs)') WIDTH=1
122              VALUE=(font='TimesRoman' H=1) MINOR=(N=5) color=black ORDER=0 TO 1800 BY
200;
123          SYMBOL1 color=red V=None I=RLcli99 L=1 MODE=INCLUDE;
124          SYMBOL2 color=blue V=dot I=None L=1 MODE=INCLUDE; RUN;
NOTE: Regression equation : Weight = -729.3963 + 178.5637*Dbh.
NOTE: Foreground color BLACK same as background. Part of your graph may not be visible.
NOTE: 52 RECORDS WRITTEN TO C:\Geaghan\EXST\EXST7015New\Fall2002\SAS\SLR-Trees1.CGM
125      **** V = "dot" would place a dot for each point;
126      **** I = for regression: R requests fitted regression line, L, Q or C requests Linear,
127          Quadraatic or cubic, CLM or CLI requests corresponding confidence interval and
128          95 specifies alpha level for CI (any value from 50 to 99);
129      **** I = for categories" requests STD (std dev) 1 (1 width, 2 or 3) M (of mean=std
err)
130          J (join means of bars) t (add top & bottom hash) p (use pooled variance);
131      **** Other options for categories: omit M=std dev, use B to get bar for min/max;
132      RUN;
NOTE: There were 47 observations read from the data set WORK.ONE.
NOTE: PROCEDURE GPLOT used:
      real time          0.22 seconds
      cpu time           0.10 seconds
```

