

Notes About Diagnostics in R

There is no need to copy the function `snfs.i` mentioned in the text and on the “Data” webpage. Commands for the standard influence diagnostics are included routinely in R.

As an example, consider the fit of the nuclear power data from Chapter 3:

```
nukes<-read.table('nukes.s')
attach(nukes)
lc<-log(c)
ls<-log(s)
ln<-log(n)
nn<-length(lc)
nreg<-lm(lc~d+ls+ne+ct+ln+pt)
```

The following illustrates the use of R commands `dffits`, `dfbetas`, `cooks.distance`, `covratio`, `rstandard` and `rstudent`.

```
> summary(nreg)
```

Call:

```
lm(formula = lc ~ d + ls + ne + ct + ln + pt)
```

Residuals:

Min	1Q	Median	3Q	Max
-0.32721	-0.07620	0.02920	0.08115	0.28946

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	-13.26031	3.13950	-4.224	0.000278	***
d	0.21241	0.04326	4.910	4.70e-05	***
ls	0.72341	0.11882	6.088	2.31e-06	***
ne	0.24902	0.07414	3.359	0.002510	**
ct	0.14039	0.06042	2.323	0.028582	*
ln	-0.08758	0.04147	-2.112	0.044891	*
pt	-0.22610	0.11355	-1.991	0.057490	.

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1592 on 25 degrees of freedom

Multiple R-Squared: 0.8569, Adjusted R-squared: 0.8225

F-statistic: 24.95 on 6 and 25 DF, p-value: 2.058e-09

```
> dffits(nreg)
```

1	2	3	4	5	6
0.30189548	-0.47211287	-0.57003332	0.33049555	0.26714788	-0.60872915

```

      7      8      9      10      11      12
-0.99076567 0.26231848 0.32860793 0.54623567 0.20472398 -0.84921806
      13      14      15      16      17      18
0.43870068 -0.09102756 -0.13227385 0.11952717 0.62287034 -0.76945727
      19      20      21      22      23      24
1.88304902 -0.08839130 0.57583906 -0.87155429 0.62437747 0.10214256
      25      26      27      28      29      30
0.17508306 -1.84810971 -0.21053795 0.25297215 0.09654253 0.04643932
      31      32
-0.06060195 -0.06315160

```

```
> round(dfbetas(nreg),3)
```

```

      (Intercept)      d      ls      ne      ct      ln      pt
1      0.137 -0.119 -0.103 0.123 -0.138 0.134 -0.113
2      -0.033 0.095 -0.245 0.063 -0.152 0.174 0.059
3      -0.040 0.114 -0.295 0.076 -0.183 0.210 0.072
4      0.095 -0.133 0.112 0.126 0.096 0.104 -0.087
5      0.077 -0.108 0.091 0.102 0.078 0.084 -0.070
6      -0.145 0.064 0.335 -0.329 -0.183 0.071 -0.028
7      -0.616 0.638 0.025 0.491 0.552 -0.438 0.730
8      0.028 0.019 -0.165 -0.015 -0.081 -0.092 -0.008
9      0.164 -0.171 -0.001 -0.163 -0.191 0.120 -0.224
10     -0.178 0.172 0.074 0.412 0.214 -0.337 0.209
11     0.075 -0.043 -0.131 -0.064 -0.095 0.017 -0.075
12     0.025 -0.030 -0.007 -0.632 0.380 0.139 0.003
13     0.054 0.016 -0.265 -0.096 0.200 -0.072 -0.010
14     -0.007 0.019 -0.044 0.038 0.043 -0.020 0.043
15     -0.067 0.068 0.010 0.074 0.058 -0.100 0.094
16     0.037 -0.037 -0.004 -0.045 -0.071 0.000 -0.059
17     -0.077 0.076 0.019 0.376 -0.241 0.093 -0.023
18     -0.095 -0.028 0.465 0.168 -0.350 0.126 0.018
19     -1.175 1.002 1.048 0.239 -0.345 -1.490 0.582
20     -0.012 0.023 -0.040 0.039 0.042 -0.028 0.046
21     0.206 -0.232 0.035 -0.324 0.229 0.387 -0.293
22     0.577 -0.600 -0.049 -0.511 0.129 0.200 -0.339
23     -0.017 0.039 -0.095 -0.297 0.319 0.308 -0.126
24     -0.077 0.078 0.018 0.003 -0.020 -0.064 0.037
25     -0.029 0.056 -0.097 -0.052 0.076 0.050 0.007
26     1.310 -1.199 -0.694 0.264 -0.875 0.156 -0.528
27     -0.045 0.037 0.039 0.006 0.038 -0.018 -0.088
28     -0.008 0.007 0.004 0.000 0.149 -0.018 0.145
29     -0.013 0.010 0.011 0.002 -0.011 -0.003 0.058
30     -0.006 0.005 0.006 0.001 -0.005 -0.001 0.028
31     -0.013 0.011 0.011 0.002 0.011 -0.005 -0.025
32     0.008 -0.007 -0.007 -0.001 0.007 0.002 -0.038

```

```

> cooks.distance(nreg)
      1      2      3      4      5      6
0.0133832837 0.0323278929 0.0465883710 0.0160255779 0.0105222148 0.0530583279
      7      8      9     10     11     12
0.1172845609 0.0101687021 0.0155278375 0.0428975691 0.0061779009 0.0931794891
     13     14     15     16     17     18
0.0276860347 0.0012302065 0.0025959290 0.0021144535 0.0537391949 0.0796638182
     19     20     21     22     23     24
0.4184194980 0.0011602784 0.0467306958 0.1068286150 0.0542243324 0.0015501595
     25     26     27     28     29     30
0.0045507793 0.4226319762 0.0065418316 0.0094526588 0.0013844487 0.0003207888
     31     32
0.0005461416 0.0005930082
> covratio(nreg)
      1      2      3      4      5      6      7      8
1.5559217 1.5092236 1.3921718 1.5899271 1.6452263 1.4159547 0.3339720 1.7877455
      9     10     11     12     13     14     15     16
1.1822525 1.4166477 1.4728362 0.5931076 1.2943619 1.5059285 1.6239336 1.4205699
     17     18     19     20     21     22     23     24
0.9809041 0.8106462 0.4108388 1.5206123 1.1339112 1.3842129 1.0222707 1.6883953
     25     26     27     28     29     30     31     32
2.0106014 0.6227270 1.5351845 1.7157955 1.5937343 1.6094291 1.6188784 1.6053998
> rstandard(nreg)
      1      2      3      4      5      6      7
0.5749708 -0.7958617 -0.9554053 0.5928138 0.4803580 -0.9718465 -2.2197269
      8      9     10     11     12     13     14
0.4164271 0.9175082 0.9200005 0.4862689 -1.8147816 0.9123624 -0.2396138
     15     16     17     18     19     20     21
-0.2718659 0.3685376 1.3151162 -1.5476314 2.2750157 -0.2259233 1.1506292
     22     23     24     25     26     27     28
-1.1717646 1.2777608 0.1959972 0.2437334 -2.0522758 -0.4537918 0.4298801
     29     30     31     32
0.2133144 0.1026813 -0.1311172 -0.1396086
> rstudent(nreg)
      1      2      3      4      5      6      7
0.5671162 -0.7898520 -0.9536744 0.5849626 0.4728400 -0.9707245 -2.4271748
      8      9     10     11     12     13     14
0.4094360 0.9144995 0.9170706 0.4787136 -1.9082462 0.9091934 -0.2350426
     15     16     17     18     19     20     21
-0.2667677 0.3620766 1.3355716 -1.5946760 2.5031740 -0.2215851 1.1584742
     22     23     24     25     26     27     28
-1.1809785 1.2949431 0.1921850 0.2390933 -2.2051253 -0.4464659 0.4227601
     29     30     31     32
0.2091951 0.1006279 -0.1285123 -0.1368413

```

In the function `dnsim.i` (in the text and on the webpage): this was written to produce Atkinson's plots. I recommend replacing `studres` (a function I wrote myself) by `rstudent` in the example code. You will then get the same figures as illustrated in the text, modulo slight discrepancies due to the random nature of the simulations and slight formatting differences between S-PLUS and R.