#### 10.16.4.1 Get a Correlation Coefficient with Error

One may need to obtain a correlation coefficient with its error because the data set to be examined has errors. We provide a FORTRAN program for such a purpose.

"corr.zip" includes

```
corr.f    dat.corr   plotr     plotxy
```

Taking an example is easy to understand the case.

**Example** Photon indices are given for five pulsars in the X-ray band. Correlation between the age of the pulsars and the photon index is to be examined.

The data are as follows:

```
#name logAge.vs.PI1
J0537-6910    3.6929   2.49   2.44   2.54
J1813-1749    3.7464   2.02   1.92   2.07
J1400-6325    4.1038   2.02   1.94   2.13
J1833-1034    3.6861   1.74   1.72   1.76
B0531+21      3.0993   1.99   2.00   1.98
```

The fist line is just a note for this data. The first column gives the pulsar name; the second column gives photon index; The third and fourth columns indicate error given by range for confidence level of 90%.

To do:

- Save the data in "dat.corr"
- The FORTRAN program "corr.f" is provied so comple it and exute, e.g.,
  > gfortran corr.f
  > a.out
- the result is given in "r.result"

The result may be such as below

```
logAge.vs.PI1              5      0.06141
  the_rage_of_r     -0.03320      0.18269
```

The first line gives the note, the number of data and the obtaied correlation coefficient. The possible range of the coefficient is given in the second line providing 90% confidence level.

**Additional info.**

- gnuplot -persist plotxy gives a scatter plot for the data.

- gnuplot -persist plotr gives a cumulative distibution of the correlation coefficient, by which the error is calculate.

- If the confidence level you use is differennt from 90%, replace the paramter ss=1.64 in corr.f" with a suitable value; eg. with 1.96 for 95%.

```
subroutine crdata()
use random
...
double precision, parameter ::ss=1.64 .
...
```