

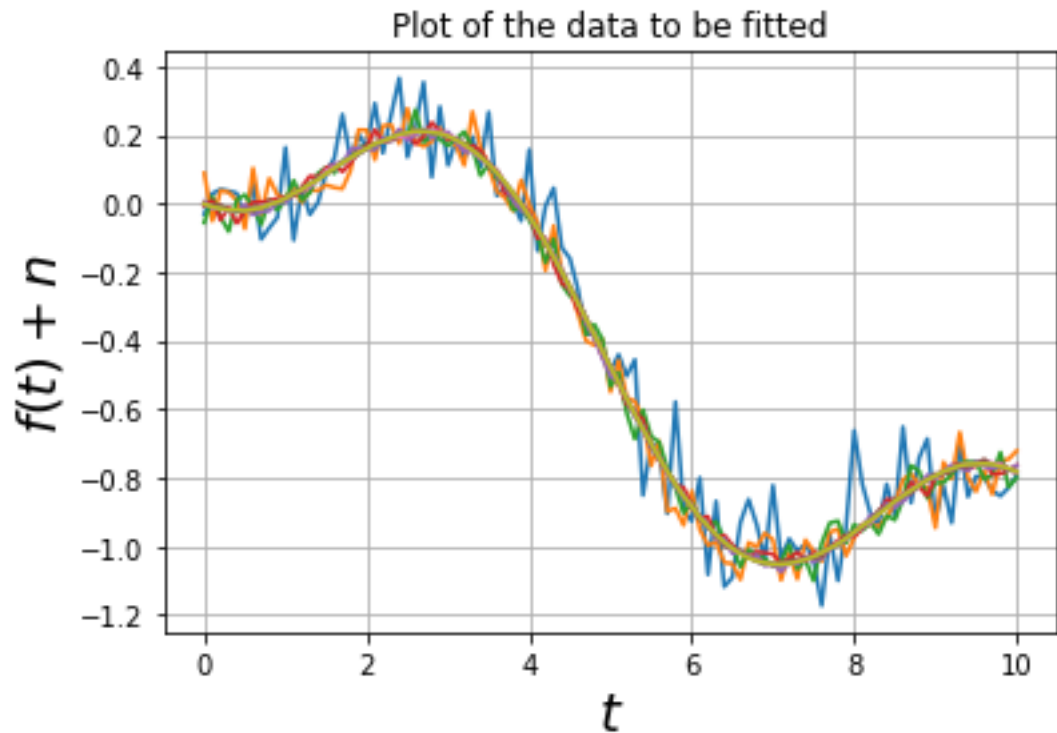
Assingment3

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1 DOWNLOAD THE SCRIPT

On running the script python code gnerate-data.py.This code code creates a file fitting.dat.This gives a plot of a Function with added noise. Fitting.dat file has ten columns with 101 rows of data.The first column is time and the next nine columns are the values of the function with different amount of noise.



Script to generate data files for the least squares assingment from pylab import

2 Extraction of Data

To extract data from the fitting.dat file Python's loadtxt function is used.

```
data = np.loadtxt(fittingfile)
x = data[:,0]
```

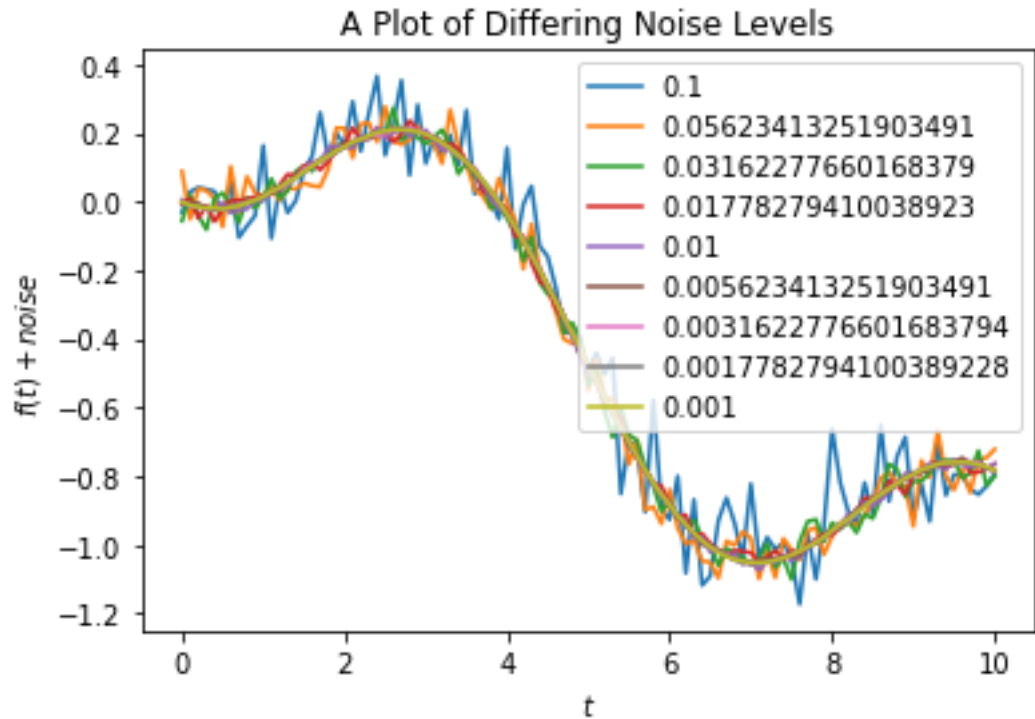
3 Plotting the Function with Noise

Function is given as :

```
g(t,A=1.05,B=-0.105):
return A*sp.jn(2,t)+B*t
```

Q3,Q4 asks to plot the nine data columns along with true value

Plots of graph for nine data column and true value is given below



4 Plots of Error Bar

. Plotting every 5th data we are plot the error bars with red dots using

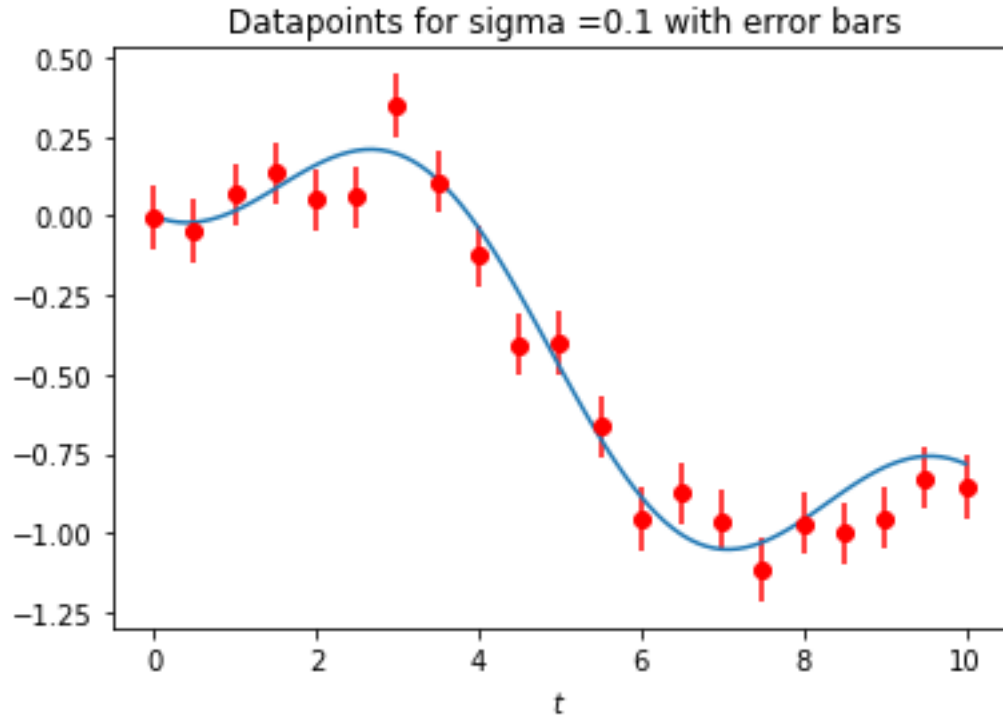
```
errorbar(t,data,stdev,fmt='ro')
```

Here, 't' and 'data' contain the data, while 'stdev' contains n for the noise.

In order to show everyf ifth data point, we can instead use

```
errorbar(t[::5],data[::5],stdev,fmt='ro')
```

The graph obtained by plotting every 5th data point with error bars and the original data is as follows :



5 Creating Matrix

The matrix M created when multiplied with (A,B) matrix will be equal to the value

of the function .This can be recognized by substituting $A=1.05$ and $B=-0.105$.

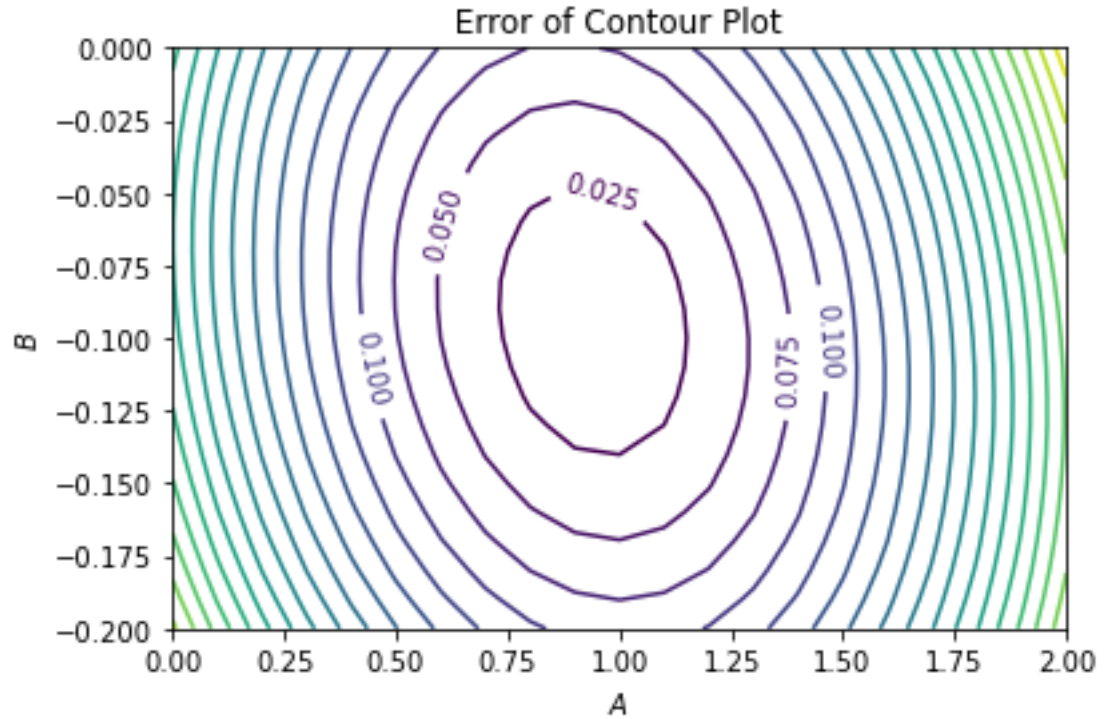
6 Computing mean square error

The mean square error is calculated as follows if function is given so The python code to calculate the mean squared error is as follows

```

xp = np.linspace(0,2,21):
yp = np.linspace(-0.2,0,21):
X, Y = np.meshgrid(xp,yp):
error = Errormatrix(x,y,0) :
```

7 Plotting contour of E_{ij}



Conclusion

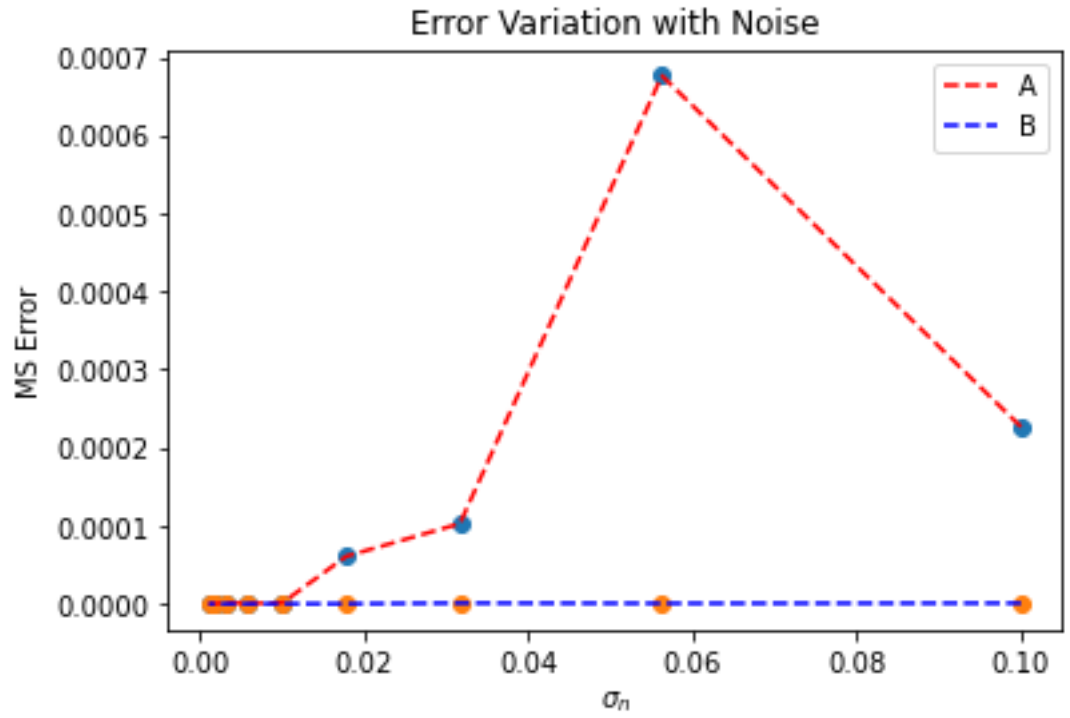
From the above plot ,we can conclude that there exist one and only one minimum for E_{ij} and as we move away from A_0, B_0 value of E_{ij} increases

8 Error in the Estimate of A and B

A and B are calculated by minimising E_{ij} by `lstsq` from `scipy.linalg`. Using Python function `lstsq` from `scipy.linalg` to obtain the best estimate of A and B.

9

The plot of the MS error in A and B vs noise in linear and loglog scale



10 Conclusion

The graph is not linear because our noise variation is on the logarithmic scale and it is expected that the error must vary accordingly in a logarithmic manner.