# Problem 5

1) The AMPL model file (and data file, if any)

File1:Model

**param** n:=2;

**param** k:=20;

**var** a{j **in** 1..n};

**var** b;

**param** x0 {1..k,1..n};

**param** y0 {1..k};

**minimize** inverseQPobj: **sum**{i **in** 1..k}((y0[i]-(a[1]\*x0[i,1]+a[2]\*x0[i,2]+b))\*(y0[i]-(a[1]\*x0[i,1]+a[2]\*x0[i,2]+b)));

File2:data.dat

**param** x0: 1 2 :=

1 46 0

2 74 0

3 89 16

4 77 16

5 84 21

6 89 15

7 68 14

8 70 6

9 60 13

10 55 9

11 35 3

12 51 7

13 87 23

14 83 4

15 68 0

16 84 19

17 74 3

18 73 0

19 84 15

20 91 7;

**param** y0:=

1 1

2 10

3 29

4 25

5 29

6 40

7 21

8 0

9 13

10 4

11 0

12 7

13 21

14 9

15 7

16 22

17 6

18 2

19 29

20 11;

File3:solve.run

**reset**;

**option** solver kestrel;

**option** kestrel\_options 'solver=minos';

**model** model.mod;

**data** data.dat;

**solve**;

**display** a,b;

2) A print-out of the solution from your NEOS solver.

Connecting to: neos-server.org:3333

Connected to NEOS Server.

Job 6382566 submitted to NEOS, password='eVaqYynW'

Check the following URL for progress report :

http://neos-server.org/neos/cgi-bin/nph-neos-solver.cgi?admin=results&jobnumber=6382566&pass=eVaqYynW

Job 6382566 dispatched

password: eVaqYynW

---------- Begin Solver Output -----------

Condor submit: 'neos.submit'

Condor submit: 'watchdog.submit'

Job submitted to NEOS HTCondor pool.

optimal solution found.

7 iterations, objective 694.005674644359

Nonlin evals: obj = 16, grad = 15.

a [\*] :=

1 0.270589

2 0.967714

;

b = -14.4511

3）A table listing the model error yi - (a'xi+b) for all the 20 countries.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | x1 | x2 | y | **a**'**xi**+b | yi- (**a**'**xi**+b) |
| Bolivia | 46 | 0 | 1 | -2.00 | 3.00 |
| Brazil | 74 | 0 | 10 | 5.57 | 4.43 |
| Chile | 89 | 16 | 29 | 25.11 | 3.89 |
| Colombia | 77 | 16 | 25 | 21.87 | 3.13 |
| CostaRica | 84 | 21 | 29 | 28.60 | 0.40 |
| Cuba | 89 | 15 | 40 | 24.15 | 15.85 |
| DominicanRep | 68 | 14 | 21 | 17.50 | 3.50 |
| Ecuador | 70 | 6 | 0 | 10.30 | -10.30 |
| ElSalvador | 60 | 13 | 13 | 14.36 | -1.36 |
| Guatemala | 55 | 9 | 4 | 9.14 | -5.14 |
| Haiti | 35 | 3 | 0 | -2.08 | 2.08 |
| Honduras | 51 | 7 | 7 | 6.12 | 0.88 |
| Jamaica | 87 | 23 | 21 | 31.35 | -10.35 |
| Mexico | 83 | 4 | 9 | 11.88 | -2.88 |
| Nicaragua | 68 | 0 | 7 | 3.95 | 3.05 |
| Panama | 84 | 19 | 22 | 26.66 | -4.66 |
| Paraguay | 74 | 3 | 6 | 8.48 | -2.48 |
| Peru | 73 | 0 | 2 | 5.30 | -3.30 |
| TrinidadTobago | 84 | 15 | 29 | 22.79 | 6.21 |
| Venezuela | 91 | 7 | 11 | 16.95 | -5.95 |

4）Discuss the insights you gained from this analysis, such as: How does each attribute influence the change? Which attribute seems to have stronger correlation with the change? Does the linear regression model seem accurate to you?

1. In this case, both x1 and x2 can help the growth of y. And x2 seems to have stronger correlation with the change because its heavier weight.
2. Linear regression model can capture the pattern somehow, but not very accurate. To improve the model, I believe we should find out more useful features and maybe use stronger regressor.