FOS Examples

# Example 1

Data Generation

x = rand(3000, 1);

N = 1000;

y = 1 + x.^2;

All Possible Candidates

Check Condition:

1. Set

= mean(y)= 1.3377

1. Set

Candidate A

=mean(x)= 0.5033

=mean(x.\*x) - 0.5033\*0.5033= 0.0844

mean(y.\*x)-1.3377\*0.5033= 0.0846

Candidate B

=mean(x.^2)= 0.3377

=mean(x.^2 .\* x.^2)- 0.3377\*0.3377= 0.0903

mean(y.\*x.^2)-1.3377\*0.3377= 0.0903

Candidate has greatest .

1. Set

Candidate A

=mean(x)= 0.5033

mean(x .\* x.^2) - 0.3377\*0.5033 =0.0846

=mean(x.\*x) - 0.5033\*0.5033 -0.09369\*0.0846= 0.0765

mean(y.\*x)-0.05033\*1.3377-0.09369\*0.0903= 0.6821

Check Condition:

8.9163^2 \* 0.0765 > 4/(1000-0+1)\*(mean(y.^2) - 1.3377\*1 - 1^2\*0.0903)

=> TRUE

Stop Here.

Obtain y1[n]

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# Example 2

Data Generation

x = rand(3000, 1);

N = 1000;

y = 1 + 2\*delay(x,1);

All Possible Candidates

Check Condition:

1. Set

= mean(y(2:N))= 2.0130

1. Set

Candidate A

=mean(x(2:N))= 0.5061

=mean(x(2:N).\*x(2:N)) - 0.5061\*0.5061= 0.0834

mean(y(2:N).\*x(2:N))- 0.5061\*2.0130= 0.0046

=0.0046/0.0834=0.0552

0.0552^2\*0.0834= 2.5412e-004

Candidate B

=mean(delay(x(2:N),1))= 0.5056

=mean(delay(x(2:N),1).\*delay(x(2:N),1)) - 0.5056\*0.5056= 0.0837

mean(y(2:N).\*delay(x(2:N),1))- 0.5065\*2.0130= 0.1646

=0.1646/0.0837=1.9665

1.9665^2\*0.0837= 0.3237

Candidate C

=mean(x(2:N).^2)= 0.3395

=mean(x(2:N).^2 .\* x(2:N).^2)- 0.3395\*0.3395= 0.0892

mean(y(2:N).\*x(2:N).^2)-0.3395\*2.0130= 0.0036

=0.0036/0.0892=0.0404

=0.0404^2 \* 0.0892= 1.4559e-004

Candidate D

=mean(x(2:N) .\* delay(x(2:N),1))= 0.2582

=mean(x(2:N).\*delay(x(2:N),1).\*x(2:N).\*delay(x(2:N),1)) - 0.2582\*0.2582= 0.0494

mean(y(2:N).\*x(2:N).\*delay(x(2:N),1))- 0.2582\*2.0130= 0.0842

=0.0842/0.0494=1.7045

1.7045^2\*0.0494= 0.1435

Candidate E

=mean(delay(x(2:N),1).^2)= 0.3393

=mean(delay(x(2:N),1).^2 .\* delay(x(2:N),1).^2)- 0.3393\*0.3393= 0.0893

mean(y(2:N).\*delay(x(2:N),1).^2)-0.3393\*2.0130= 0.1667

=0.1667/0.0893=1.8667

=1.8667^2 \* 0.0893= 0.3112

Candidate has greatest .

1. Set

Assume Done

Obtain y1[n]

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1=

# Example 3

Data Generation

x = rand(3000, 1);

y = zeros(3000, 1);

for n = 2:3000

y(n) = 1 + 0.3\*y(n-1);

end

All Possible Candidates

Check Condition:

1. Set

= mean(y(2:N))= 1.4280

1. Set

Candidate A

=mean(x(2:N))= 0.5056

=mean(x(2:N).\*x(2:N)) - 0.5056\*0.5056= 0.3370

mean(y(2:N).\*x(2:N))- 0.5056\*1.4280= 2.0831e-004

= 2.0831e-004/0.3370=6.1813e-004

6.1813e-004^2\*0.3370= 1.2876e-007

Candidate B

=mean(delay(y(2:N),1))= 1.4265

=mean(delay(y(2:N),1).\*delay(y(2:N),1)) - 1.4265\*1.4265= 0.0023

mean(y(2:N).\*delay(y(2:N),1))- 1.4265\*1.4280= 6.5392e-004

=6.5392e-004/0.0023= 0.2843

0.2843^2\*0.0023= 1.8590e-004

Candidate has greatest .

1. Set

Assume Done

Obtain y1[n]

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=1.4280\*1 + 0.2843\*(-1.4265)= 1.0224

1=

# Example 4

Data Generation

x = rand(3000, 1);

y = 1 + 0.6\*x + 0.3\*delay(x,1);

N = 1000;

All Possible Candidates

Check Condition:

1. Set

= mean(y(2 +1 : N))= 1.4433

=1.4433^2 \* 1 = 2.0831

1. Set

Candidate A

=mean(x(2 +1 : N))= 0.4928

=0.4928/1=0.4928

=mean(x(2 +1 : N).\*x(2 +1 : N)) - 0.4928\*0.4928= 0.0802

mean(y(2 +1 : N).\*x(2 +1 : N))- 0.4928\*0.4928= 0.5171

= 0.5171/0.0802= 6.4476

6.4476^2\*0.0802= 3.3340

Candidate B

=mean(delay(x(2+1:N),1))= 0.4920

= 0.4920/1= 0.4920

=mean(delay(x(2+1:N),1).\*delay(x(2+1:N),1)) - 0.4920\*0.4920= 0.0803

mean(y(2+1:N).\*delay(x(2+1:N),1))- 1.4416\*1.4433= -1.3454

= -1.3454/0.0803=-16.7547

(-16.7547)^2\*0.0803= 22.5418

Candidate C

=mean(delay(x(2+1:N),2))= 0.4914

= 0.4914/1= 0.4914

=mean(delay(x(2+1:N),2).\*delay(x(2+1:N),2)) - 0.4914\*0.4914= 0.0806

mean(y(2+1:N).\*delay(x(2+1:N),2))- 0.4914\*1.4433= -0.0026

= -0.0026/0.0806= -0.0323

(-0.0323)^2\*0.0806= 8.4089e-005

Candidate D

=mean(delay(y(2+1:N),1))= 1.4416

=1.4416/1=1.4416

=mean(delay(y(2+1:N),1).\*delay(y(2+1:N),1)) - 1.4416\*1.4416= 0.0389

mean(y(2+1:N).\*delay(y(2+1:N),1))- 1.4416\*1.4433= 0.0147

= 0.0147/0.0389= 0.3779

0.3779^2\*0.0389= 0.0056

Candidate E

=mean(delay(y(2+1:N),2))= 1.4402

= 1.4402/1= 1.4402

=mean(delay(y(2+1:N),2).\*delay(y(2+1:N),2)) - 1.4402\* 1.4402= 0.0409

mean(y(2+1:N).\*delay(y(2+1:N),2))- 1.4402\*1.4433= -0.0012

= -0.0012/0.0409= -0.0293

(-0.0293)^2\*0.0409= 3.5112e-005

Candidate has greatest .

Check condition:

22.5418 > 4/(1000 – 2 + 1)\*(mean(y(2+1:N).^2) – 1.4433^2\*1)

22.5418 > 1.4729e-004

TRUE -> Continue

1. Set

0.4920

1.4433

-1.3454

0.4920

0.0803

Candidate A

=mean(x(2+1:N))= 0.4928

=0.4928/1=0.4928

mean(x(2+1:N) .\* delay(x(2+1:N),1)) - 0.4920\*0.4928 = 0.0019

= 0.0019/0.0803=0.0237

=mean(x(2+1:N).\*x(2+1:N)) - 0.4928\*0.4928 -0.1220\*0.0098= 0.0790

mean(y(2+1:N).\*x(2+1:N))-0.4928\*1.4433-0.1220\*(-1.3454)= 0.2129

= 0.2129/0.0790=2.6949

=2.6949^2 \* 0.0790 = 0.5737

Candidate C

=mean(delay(x(2+1:N),2))= 0.4914

= 0.4914/1=0.4914

mean(delay(x(2+1:N),2) .\* delay(x(2+1:N),1)) - 0.4920\*0.4914= 0.0021

= 0.0021/0.0803= 0.0262

=mean(delay(x(2+1:N),2).\*delay(x(2+1:N),2)) - 0.4914\*0.4914 -0.0262\*0.0021= 0.0805

mean(y(2+1:N).\*delay(x(2+1:N),2))-0.4914\*1.4433-0.0262\*(-1.3454)= 0.0326

= 0.0326/0.0805= 0.4050

= 0.4050^2 \* 0.0805 = 0.0132

Candidate D

=mean(delay(y(2+1:N),1))= 1.4416

=1.4416/1=1.4416

mean(delay(y(2+1:N),1) .\* delay(x(2+1:N),1)) - 0.4920\* 1.4416= 0.0493

= 0.0493/0.0803=0.6139

=mean(delay(x(2+1:N),2).\*delay(x(2+1:N),2)) - 1.4416\*1.4416 -0.6139\*0.0493= -1.7864

mean(y(2+1:N).\*delay(x(2+1:N),2))-0.4914\*1.4433-0.0324\*(-1.3454)= 0.0410

= 0.0410/0.0805= 0.5093

=0.5093^2 \* 0.0805 = 0.0209

Candidate E

=mean(delay(y(2+1:N),2))= 1.4402

= 1.4402/1= 1.4402

mean(delay(y(2+1:N),2) .\* delay(x(2+1:N),1)) - 0.4920\*1.4402= 4.8668e-004

= 4.8668e-004/0.0803= 0.0061

=mean(delay(y(2+1:N),2).\*delay(y(2+1:N),2)) - 1.4402\*1.4402 -0.0061\*4.8668e-004= 0.0409

mean(y(2+1:N).\*delay(y(2+1:N),2))-1.4402\*1.4433-0.0061\*(-1.3454)= 0.0070

= 0.0070/0.0409= 0.1711

= 0.1711^2 \* 0.0409= 0.0012

Candidate has greatest .

Check condition:

0.5737 > 4/(1000 - 2 + 1)\*(mean(y(2+1:N).^2) - 2.0831 - 22.5418)

0.5737 > -0.0901

TRUE -> Continue

Obtain y1[n]

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=1.4280\*1 + 0.2843\*(-1.4265)= 1.0224

1=