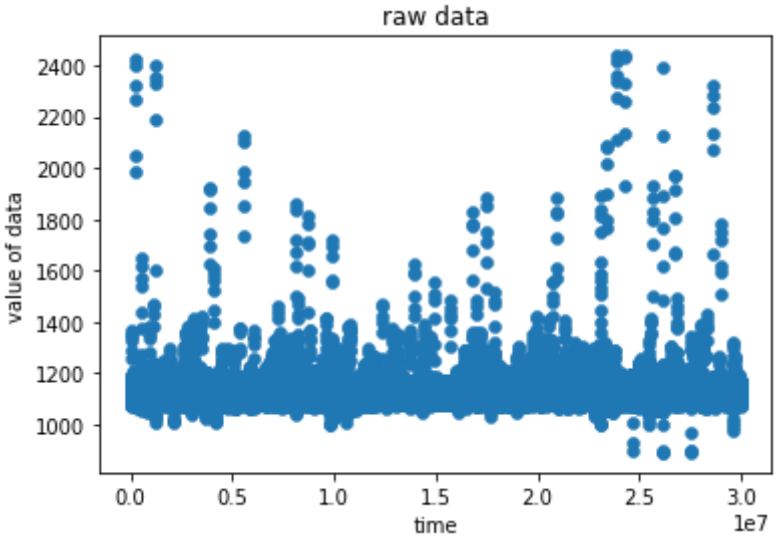
Detect Result for the data set hit_0_bbgem_304

Channal : moduleId 1 stripID 300 axisID 1

The length of the data set is : 30006912

The raw data set has many peaks, however, the background the data has no change.



We add sudden change in the raw data set start at index m_1 and end at index m_2,

$$data[m_1 : m_2] = data[m_1 : m_2] + \sigma * std(data)$$

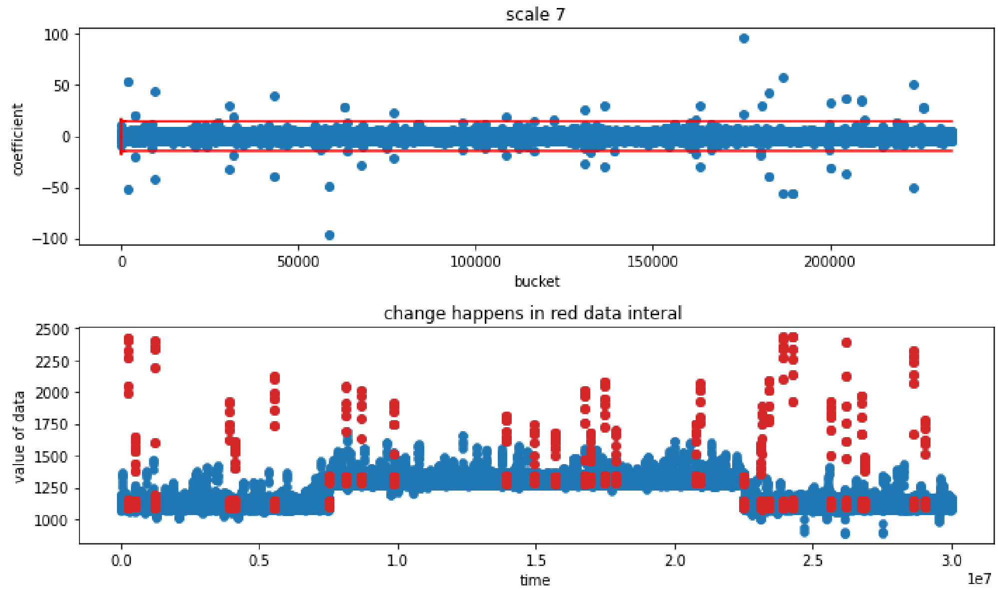
we choose $m_1 = \frac{1}{4} * the\ length\ of\ data$, $m_3 = \frac{3}{4} * the\ length\ of\ data$, $std(data)$ is the standard deviation of the data set, the parameter σ decide the amplitude of the sudden change we add in the raw data set.

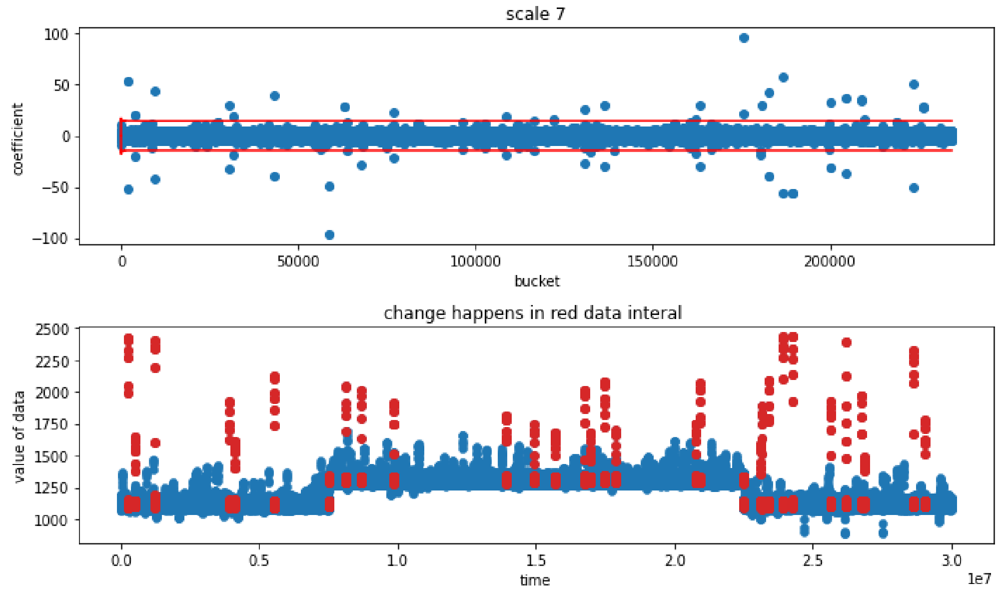
The goal of our detect results :

- Can we detect the sudden change in the data set?
- For a fix scale, is there exists a small amplitude of the sudden change?

To answer these question, I fix the 'level', and then change the parameter σ to find the smallest one. The σ I choose are $18, 12, 6, 3, 1, 0.5, 0.2$. To make the result more intutitive, I use red color to plot the change interval data and use blue color to plot the unchange interval data.

Scale 7


scale 7
coefficient
bucket
0 50000 100000 150000 200000
100 50 0 −50 −100
change happens in red data interal
value of data
time
1e7
0.0 0.5 1.0 1.5 2.0 2.5 3.0
2500 2250 2000 1750 1500 1250 1000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coefficient
bucket
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100 50 0 −50 −100
change happens in red data interal
value of data
time
1e7
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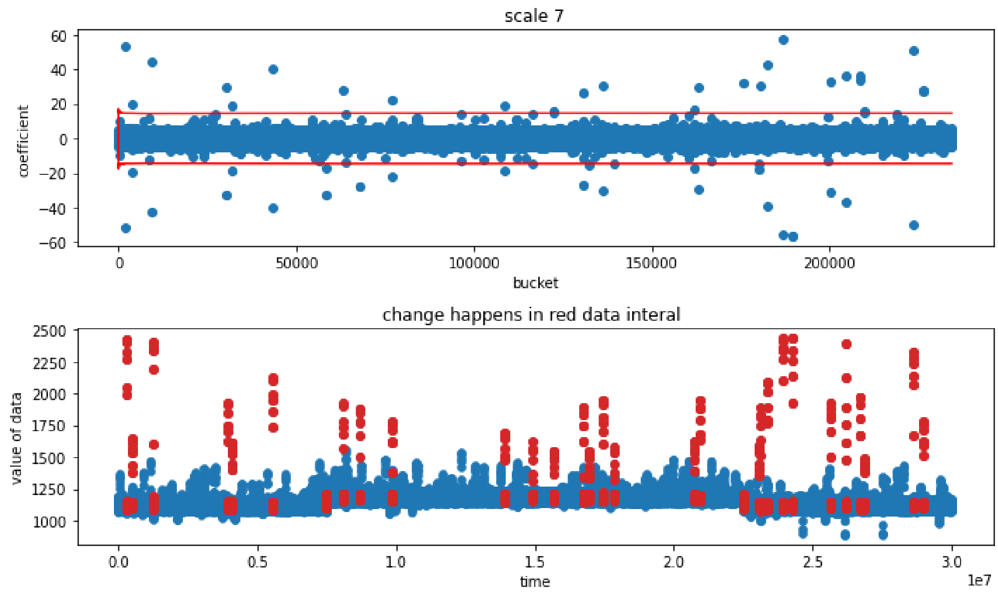
2500 2250 2000 1750 1500 1250 1000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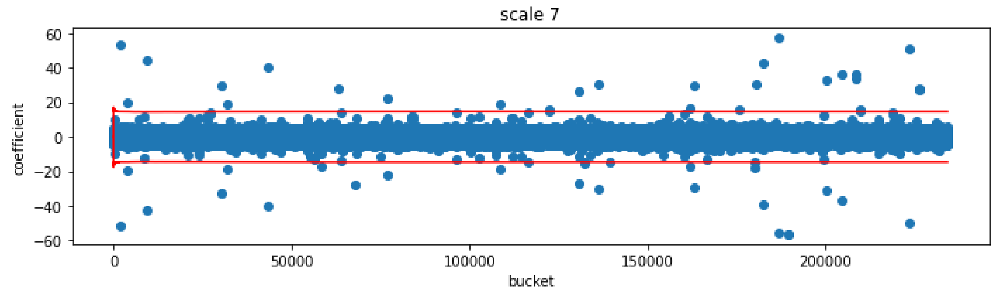
coefficient
bucket
0 50000 100000 150000 200000
60 40 20 0 −20 −40 −60
change happens in red data interal
value of data
time
1e7
0.0 0.5 1.0 1.5 2.0 2.5 3.0
2500 2250 2000 1750 1500 1250 1000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coefficient
bucket
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−40
−60
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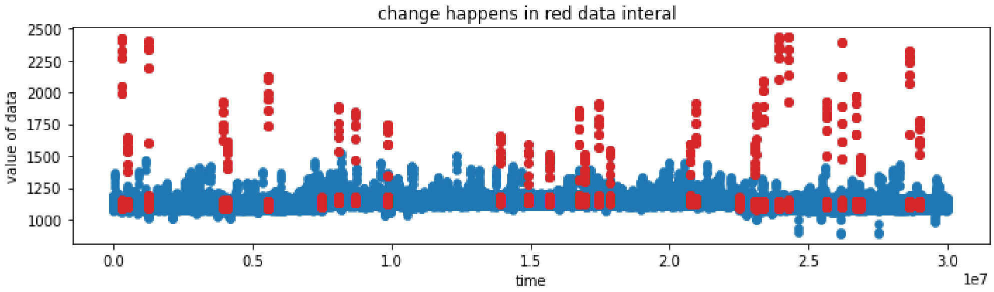
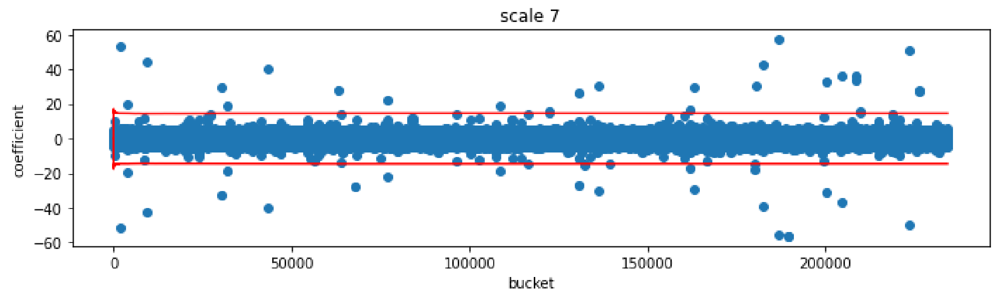
200000


change happens in red data interal
value of data
time
2500
2250
2000
1750
1500
1250
1000
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1e7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coefficient
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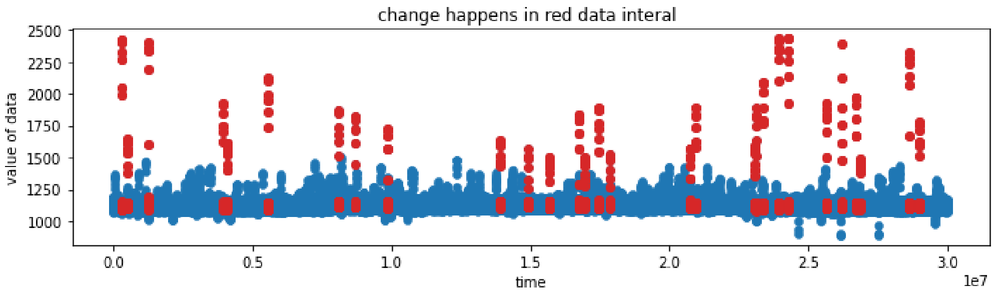
200000


change happens in red data interal
value of data
time
2500
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2.0
2.5
3.0
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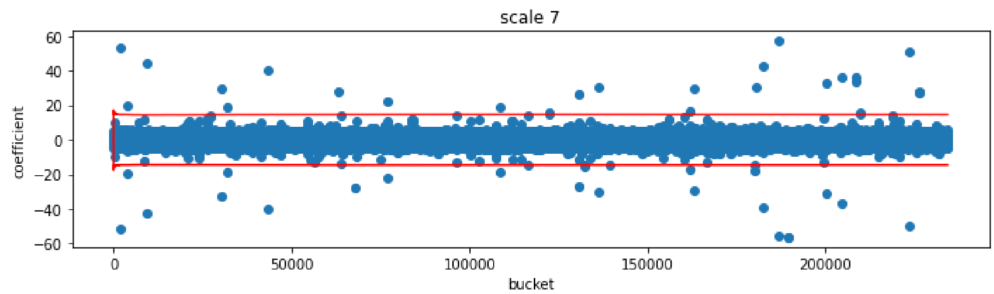
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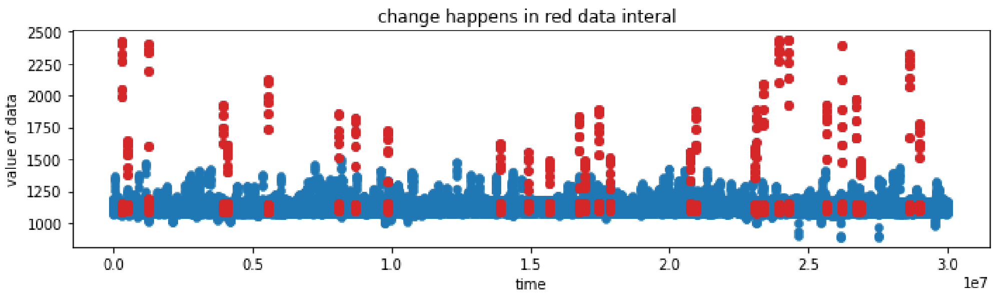
change happens in red data interal
value of data
time
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1000
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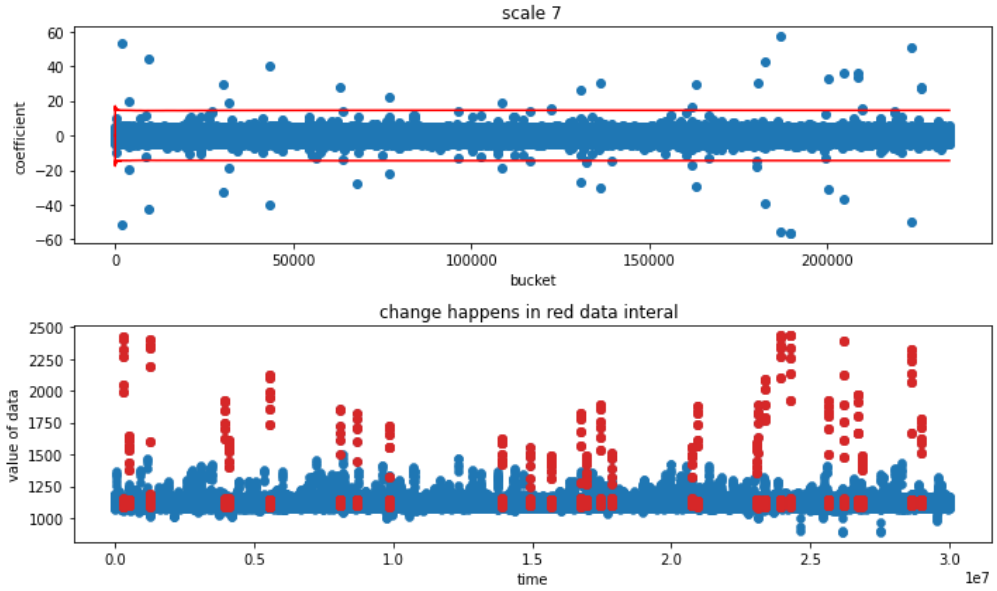
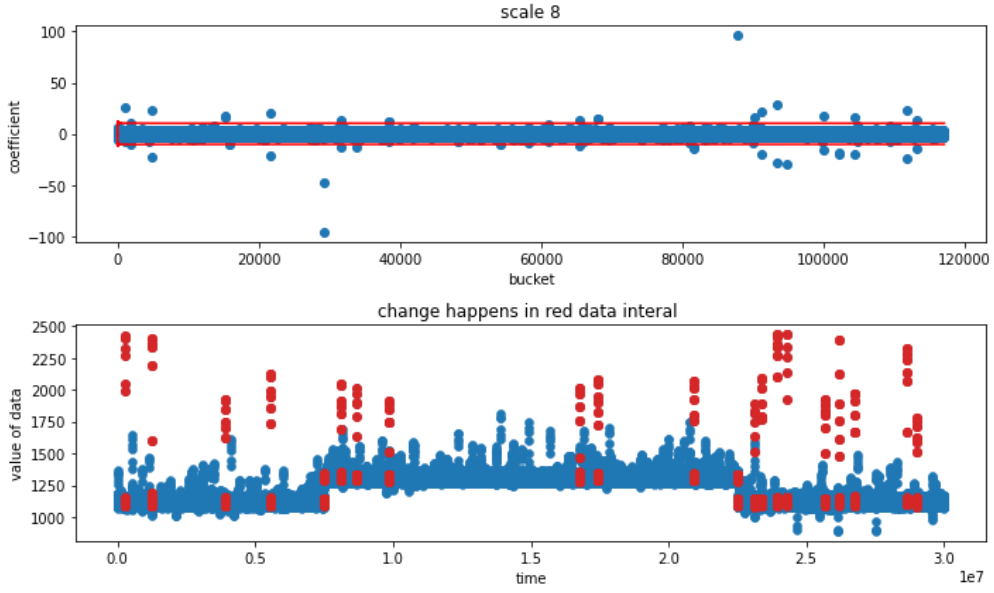
1.0
1.5
2.0
2.5
3.0
1e7

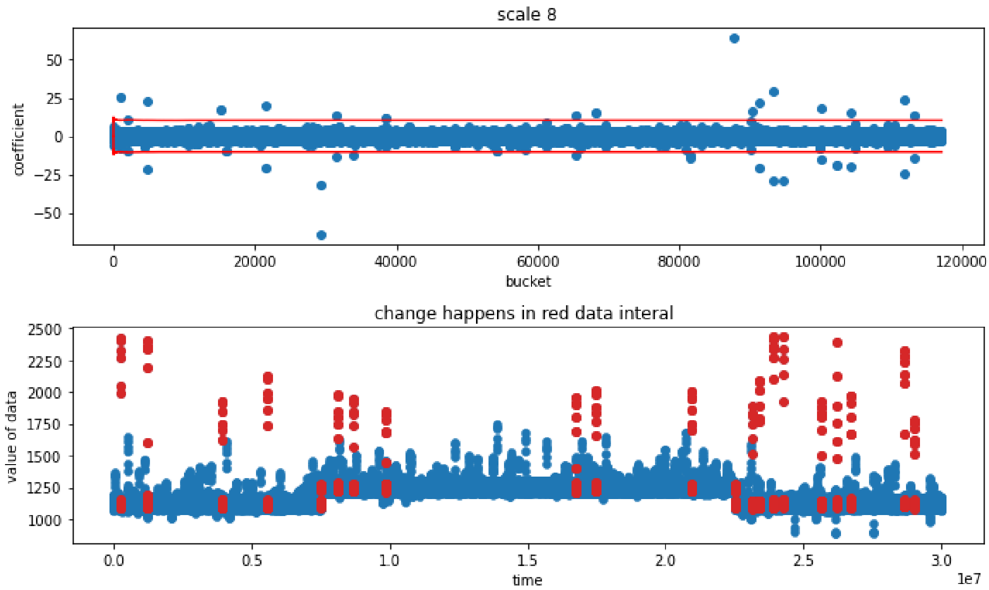


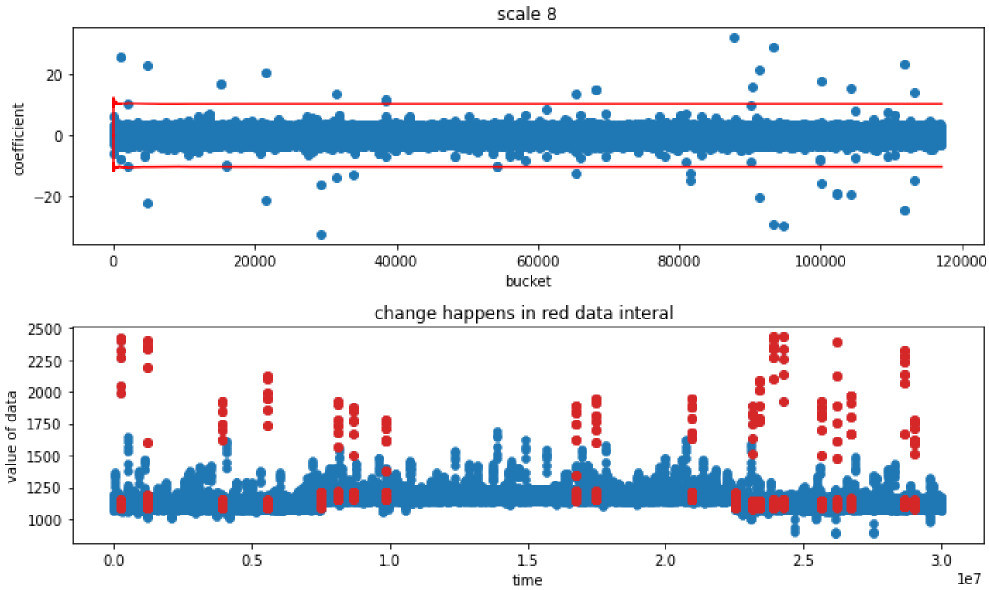
conclusion :

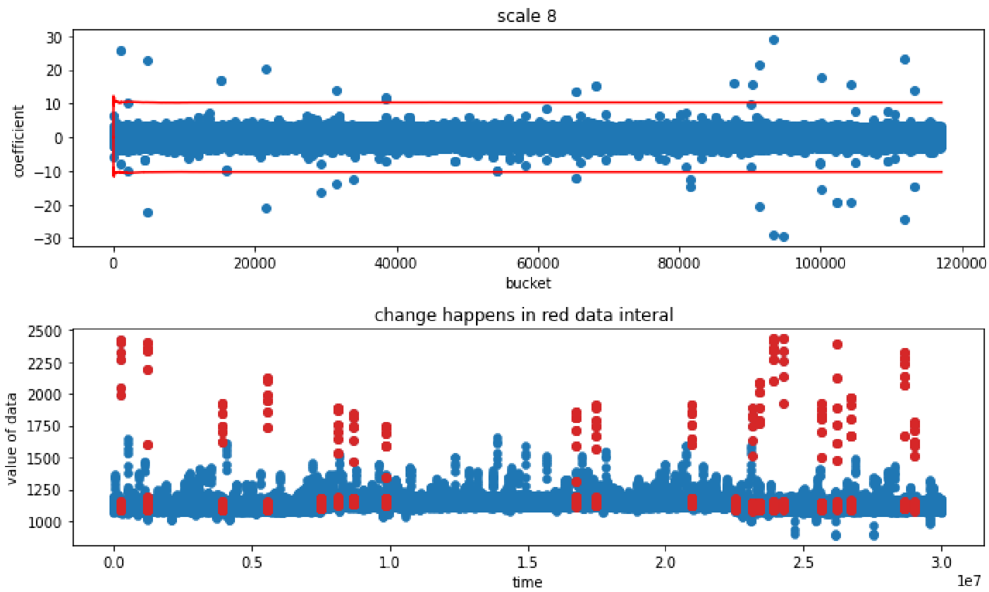
- we can detect all larges peak in the data set.
- the smallest σ is 3

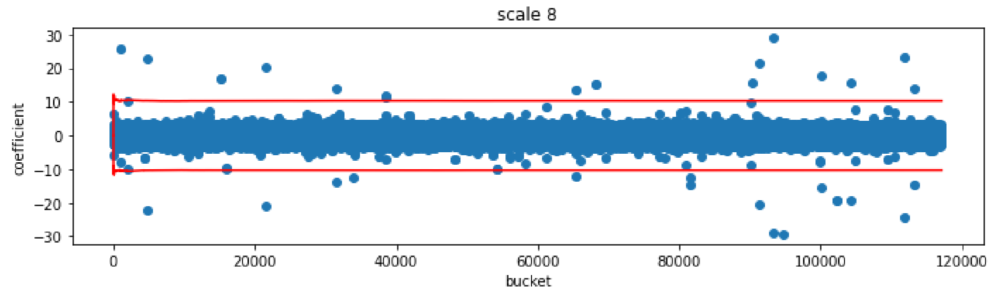
Scale 8

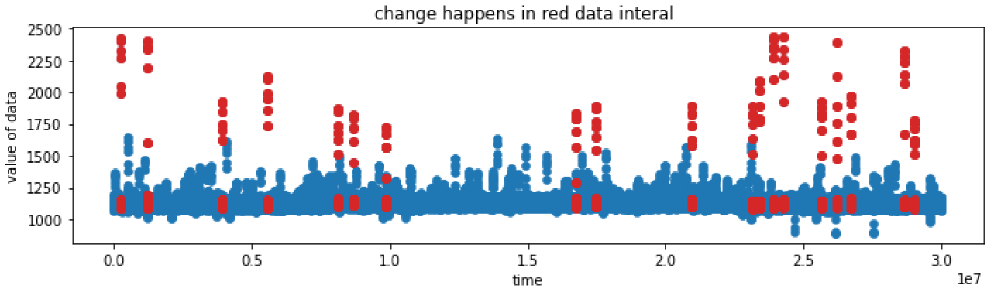


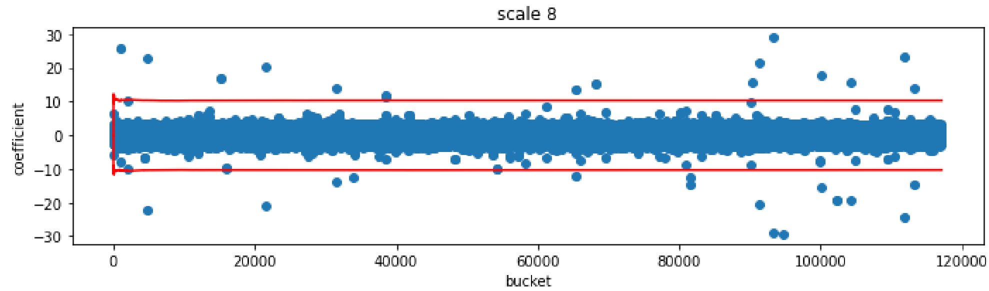

scale 8
coefficient
bucket
change happens in red data interal
value of data
time
1e7

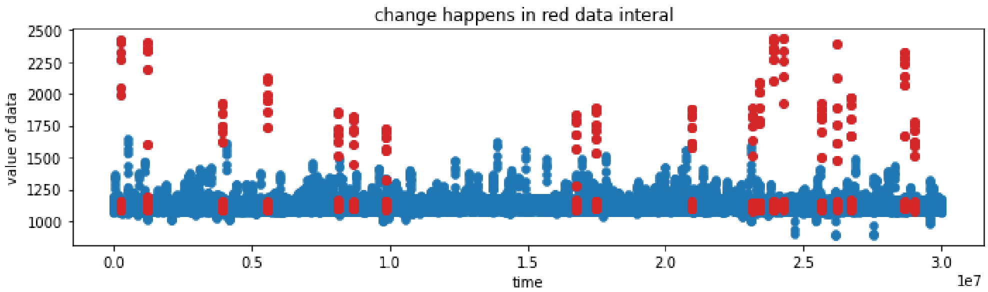

scale 8
coefficient
bucket
change happens in red data interal
value of data
time
1e7

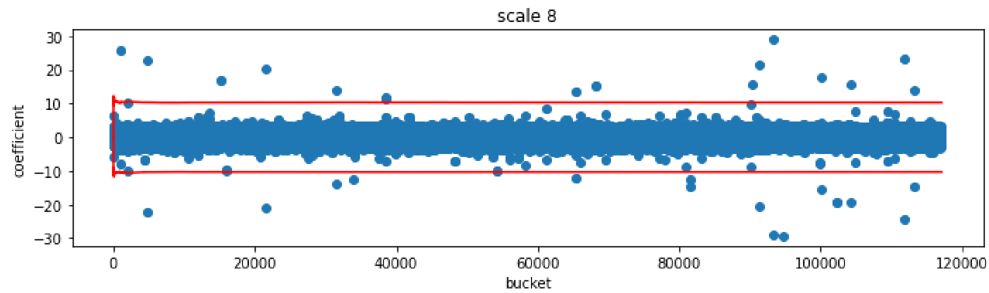

scale 8
coefficient
bucket
change happens in red data interal
value of data
time
1e7

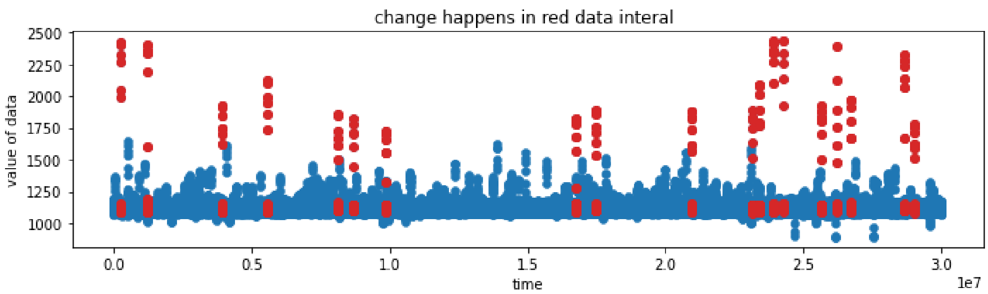








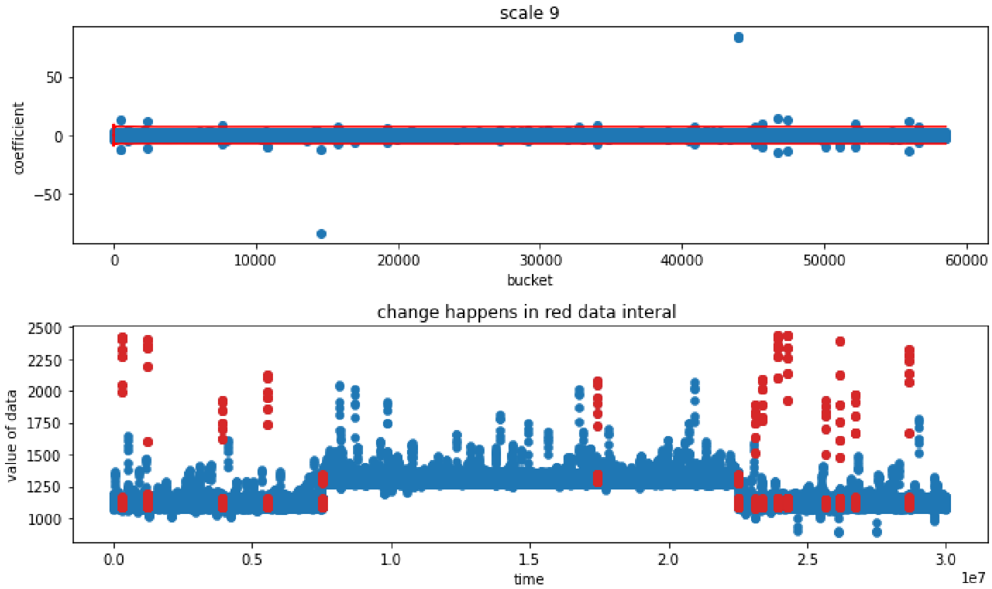


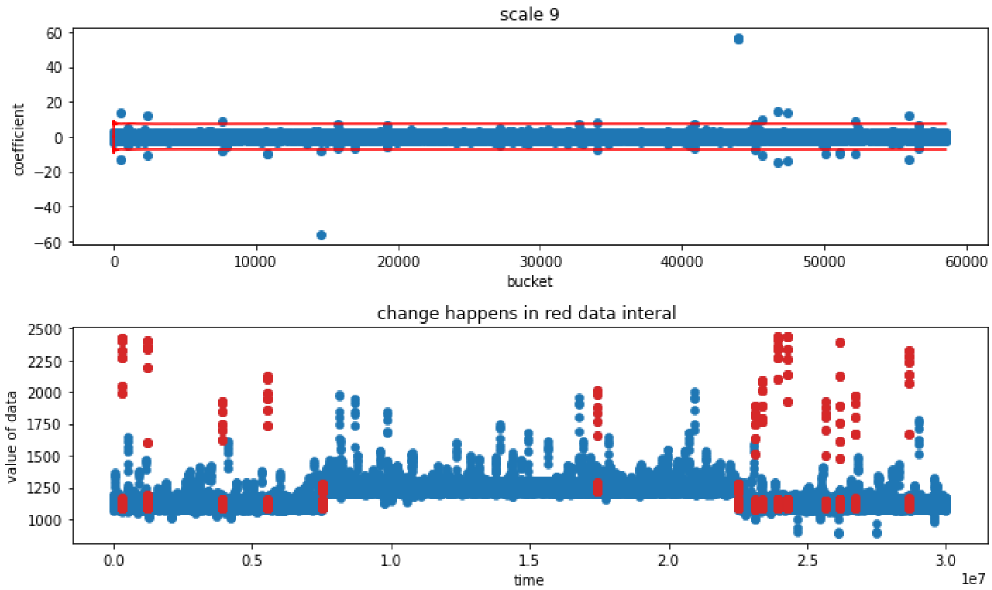


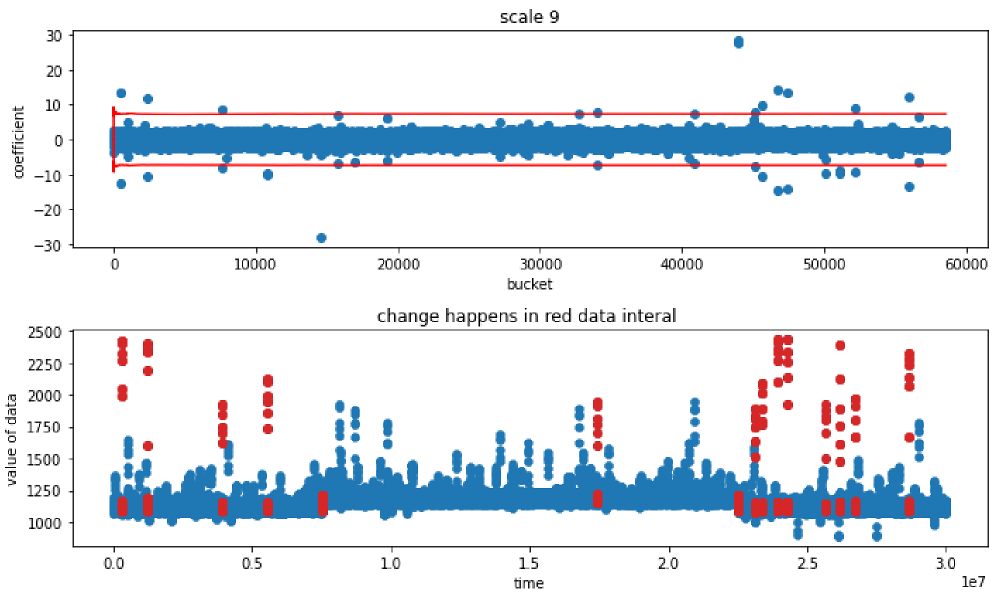
conclusion :

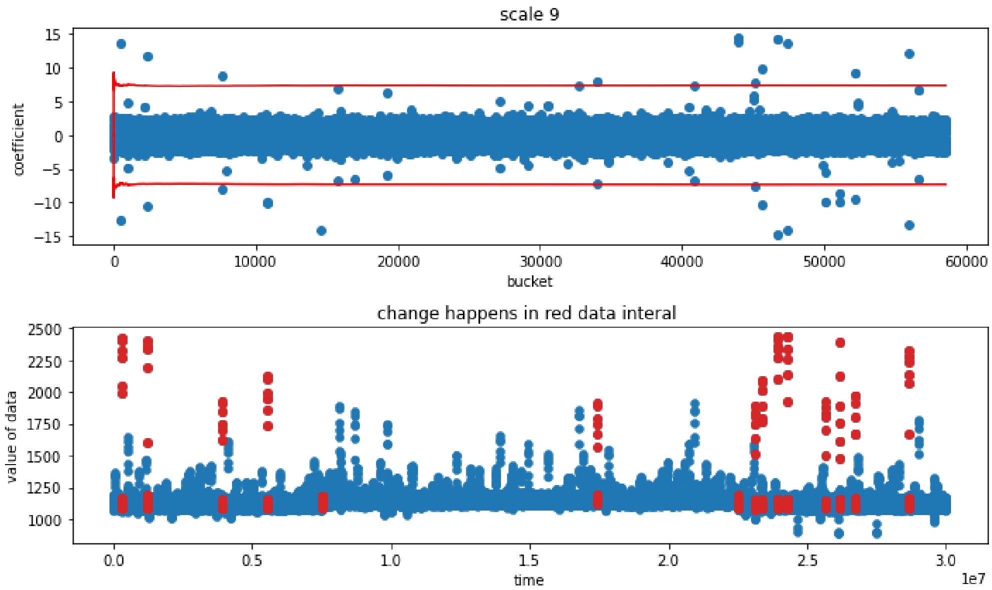
- we can detect most large peaks in the data set.
- the smallest σ is 3

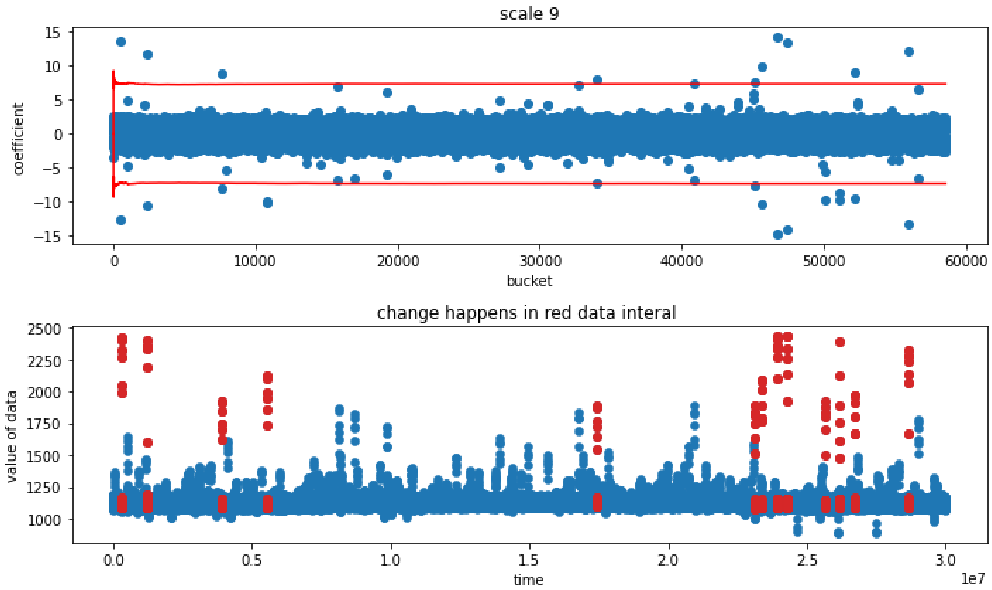
Scale 9

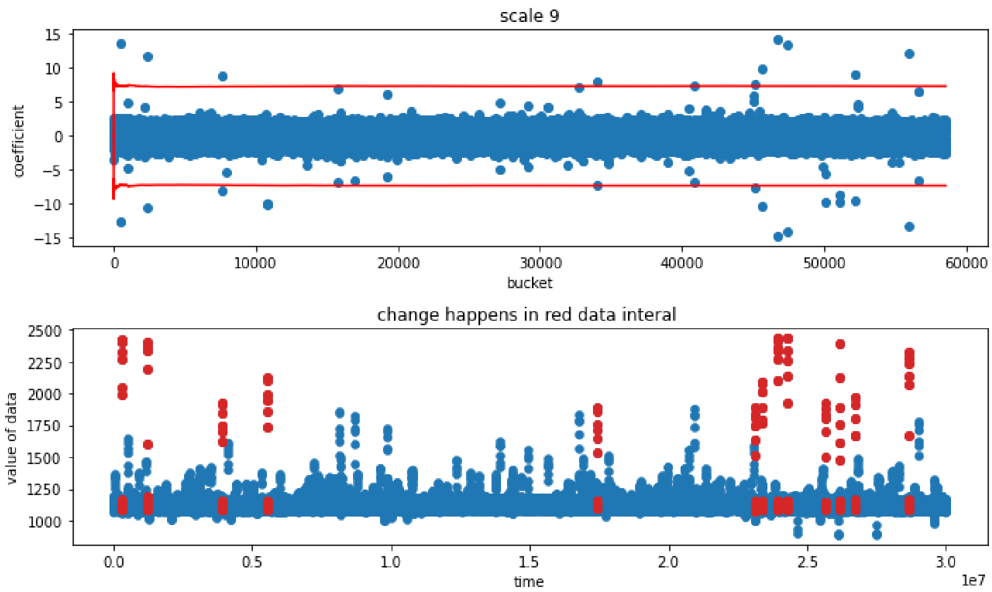

scale 9
coefficient
bucket
change happens in red data interal
value of data
time
1e7

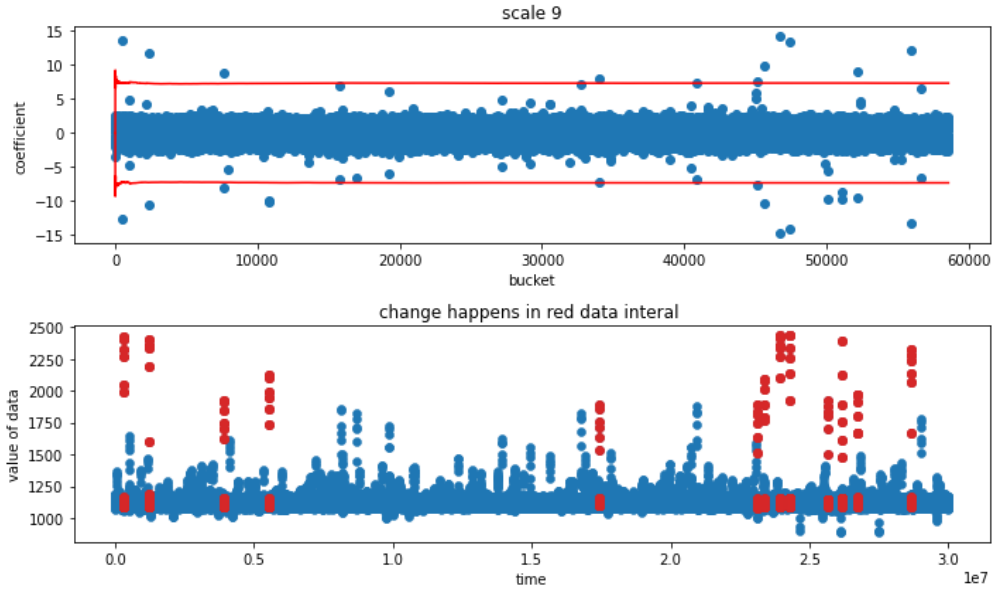

scale 9
coefficient
bucket
change happens in red data interal
value of data
time
1e7


scale 9
coefficient
bucket
change happens in red data interal
value of data
time
1e7


scale 9
coefficient
bucket
change happens in red data interal
value of data
time
1e7


scale 9
coefficient
bucket
change happens in red data interal
value of data
time
1e7

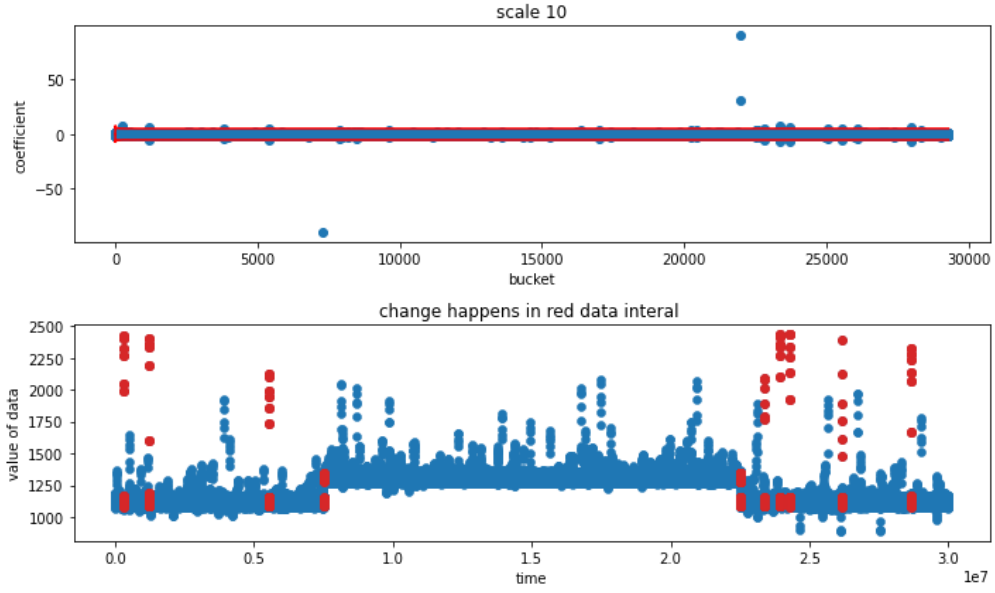

scale 9
coefficient
bucket
change happens in red data interal
value of data
time
1e7

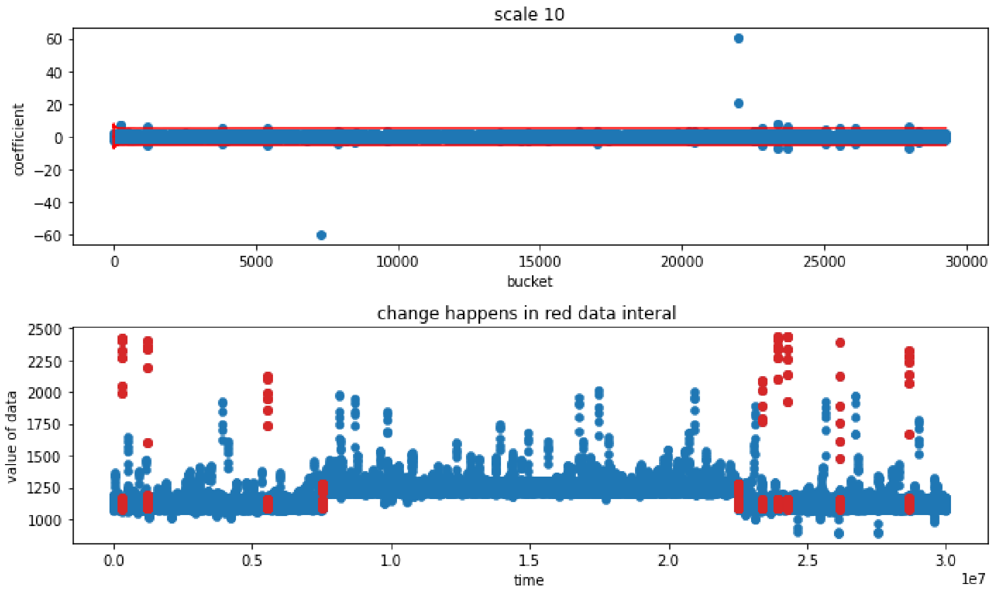


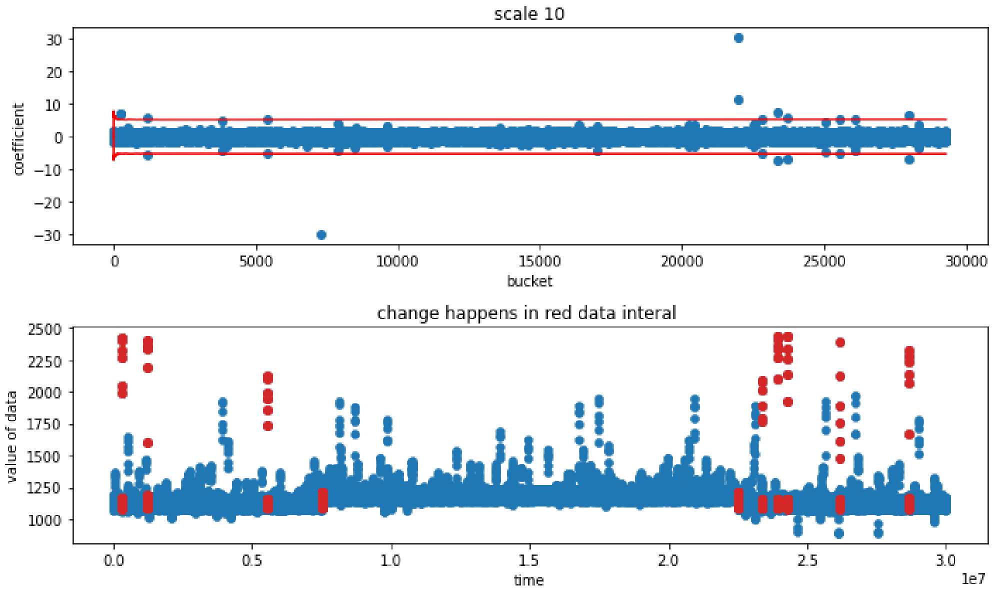
conclusion :

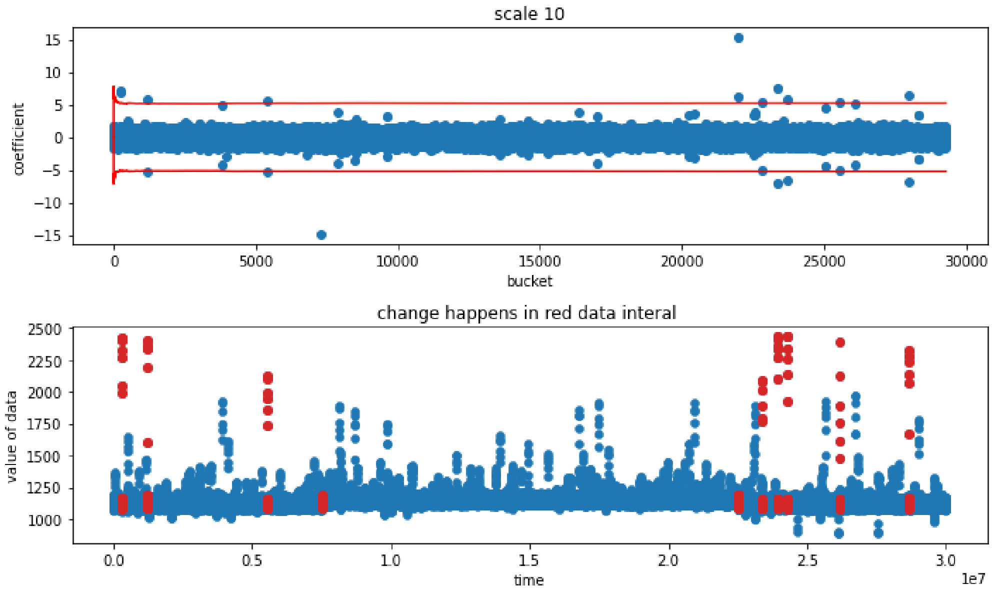
- we can detect most large peaks in the data set.
- the smallest σ is 3

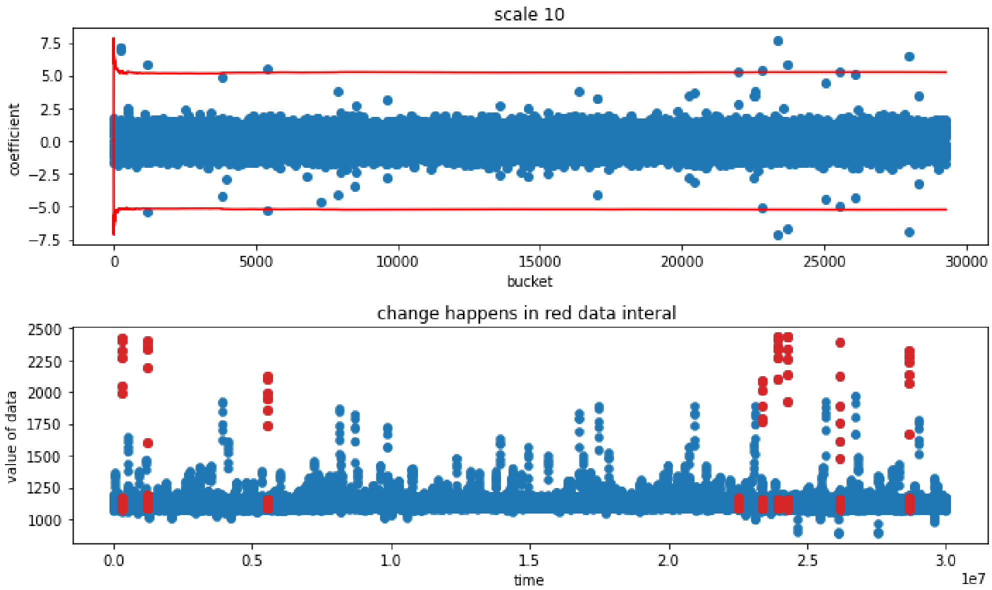
scale 10

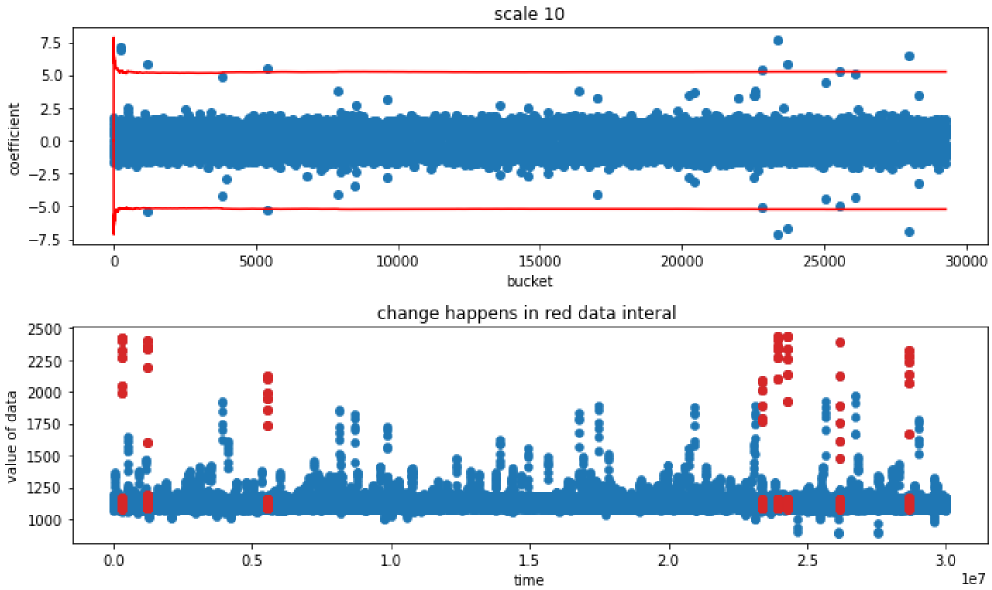


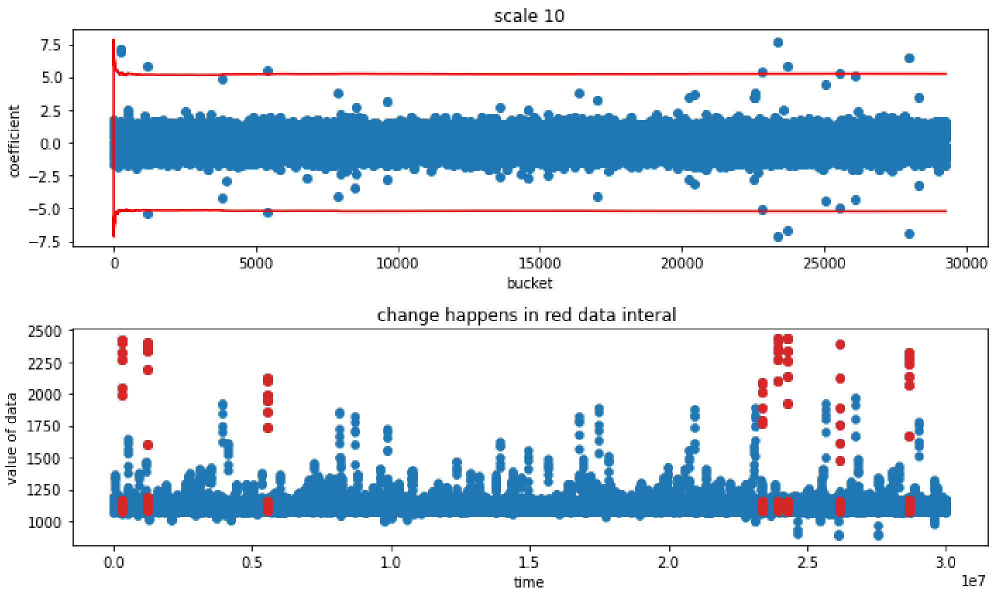

scale 10
coefficient
bucket
change happens in red data interal
value of data
time
1e7


scale 10
coefficient
bucket
change happens in red data interal
value of data
time
1e7


scale 10
coefficient
bucket
change happens in red data interal
value of data
time
1e7



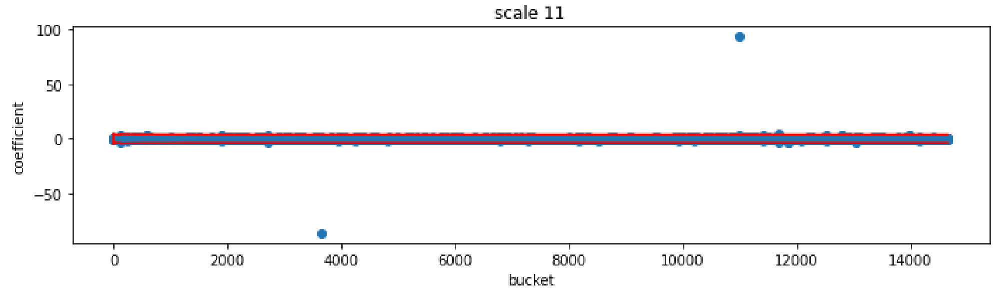




conclusion :

- we can detect most large peaks in the data set.
- the smallest σ is 3

Scale 11


scale 11
coefficient
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0
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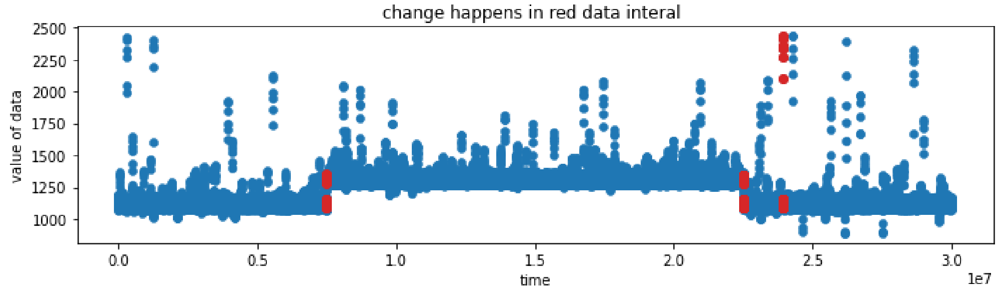
8000
10000
12000
14000


change happens in red data interal
value of data
time
2500
2250
2000
1750
1500
1250
1000
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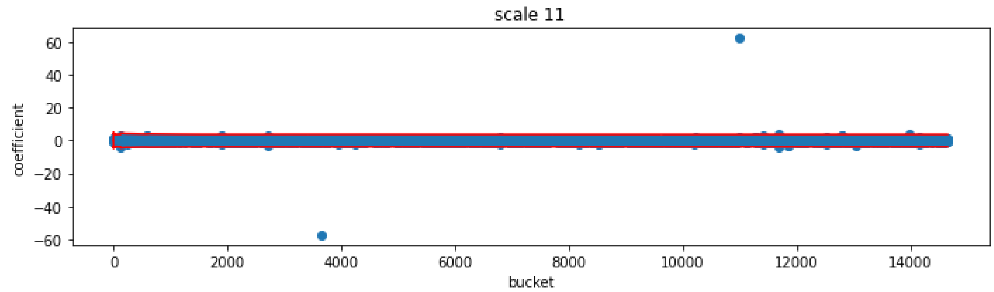
1e7


scale 11
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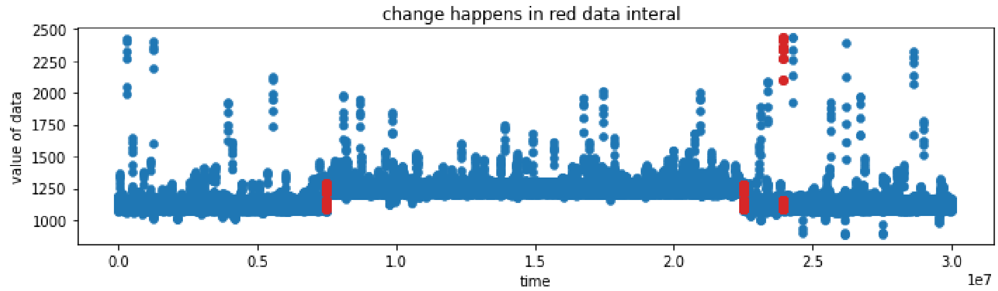
change happens in red data interal
value of data
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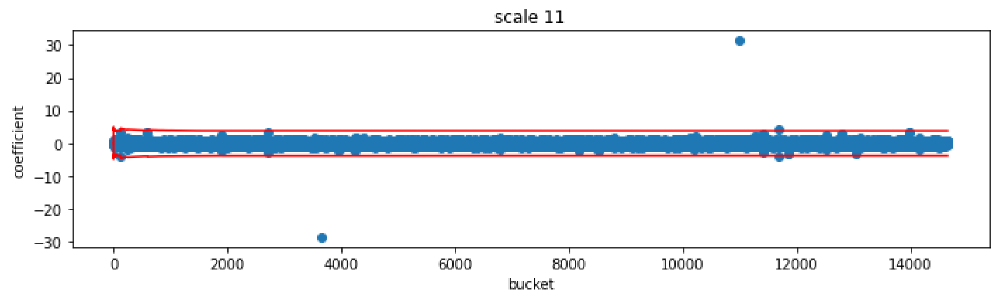
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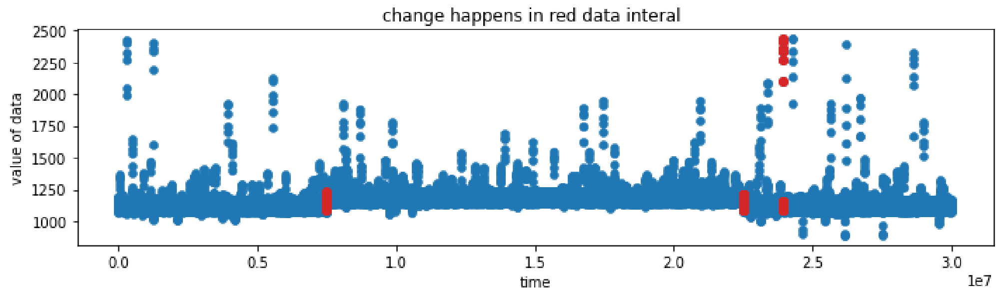
change happens in red data interal
value of data
time
2500
2250
2000
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1500
1250
1000
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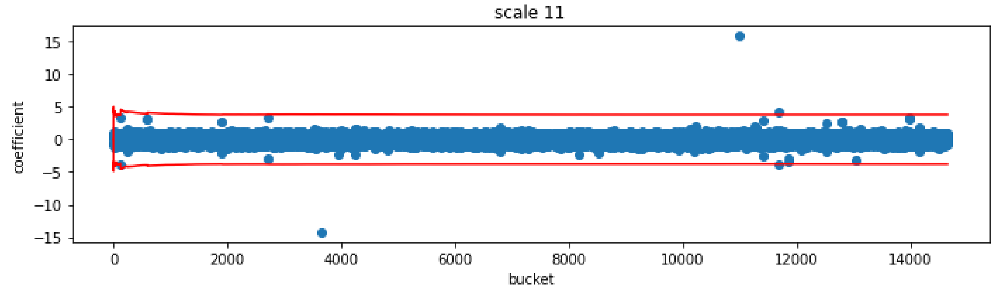
0.5
1.0
1.5
2.0
2.5
3.0
1e7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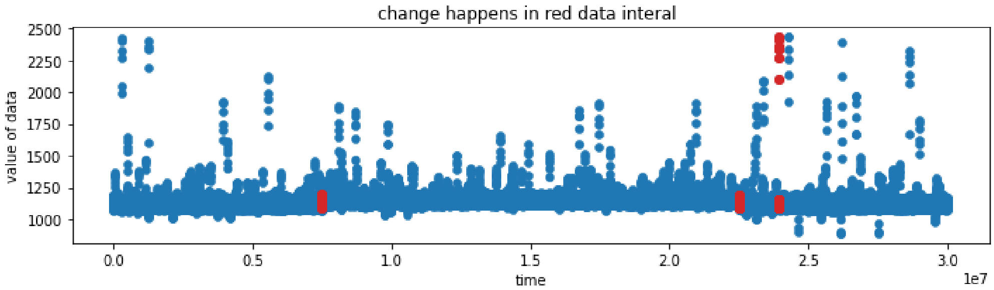
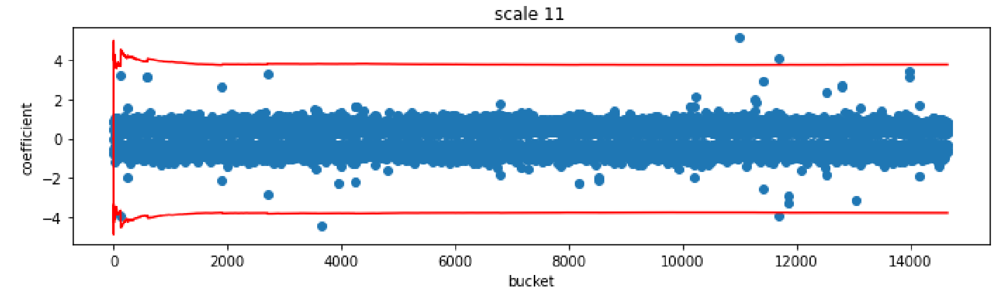
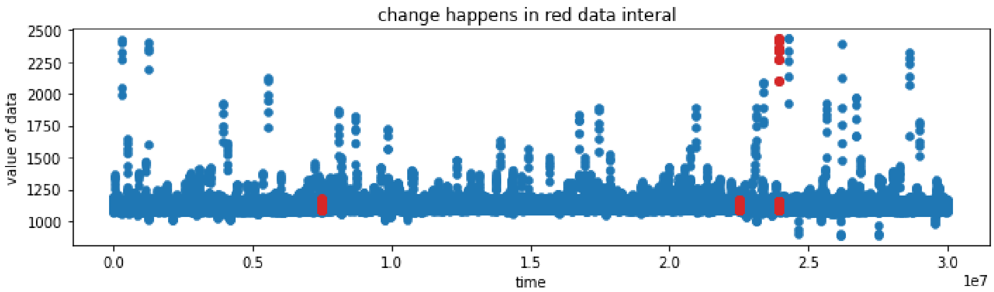
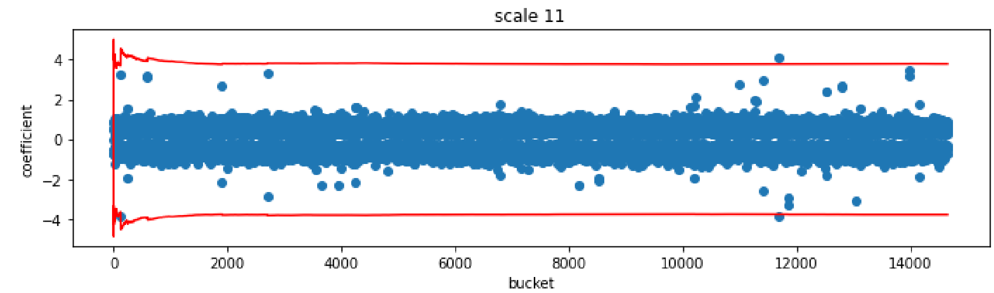
coefficient
bucket


change happens in red data interal
value of data
time
1e7


scale 11
coefficient
bucket


change happens in red data interal
value of data
time
1e7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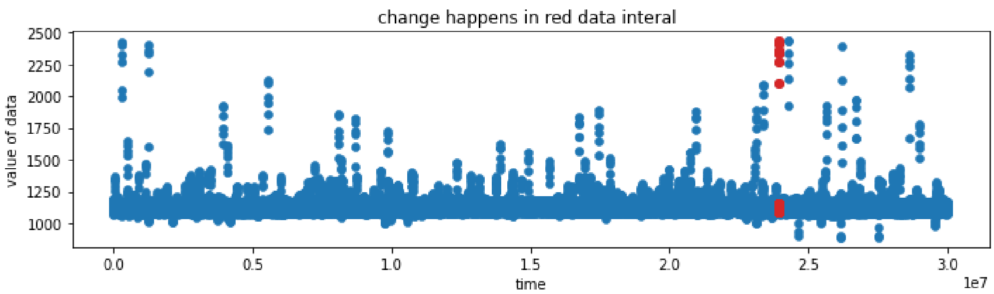
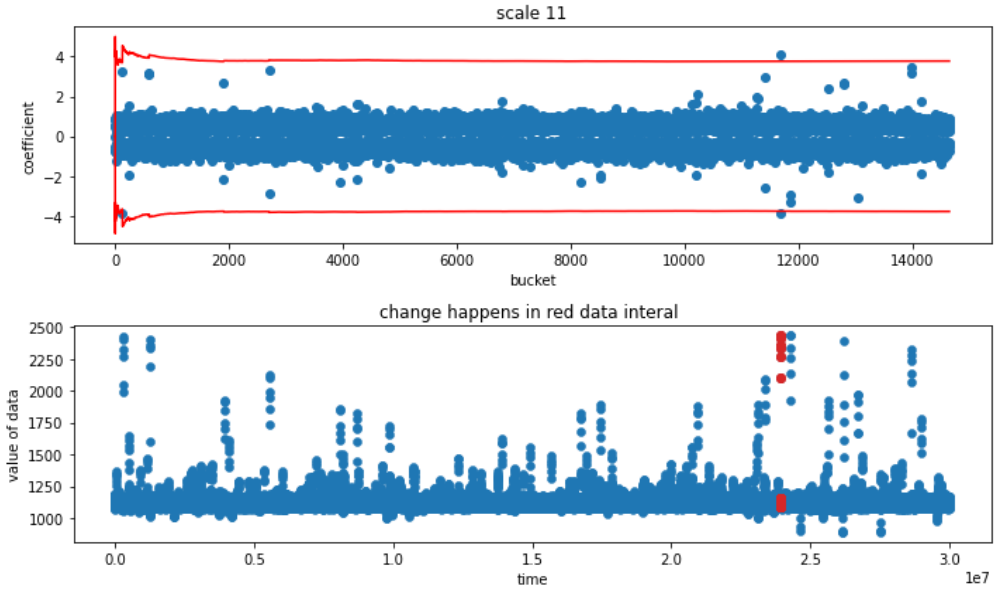
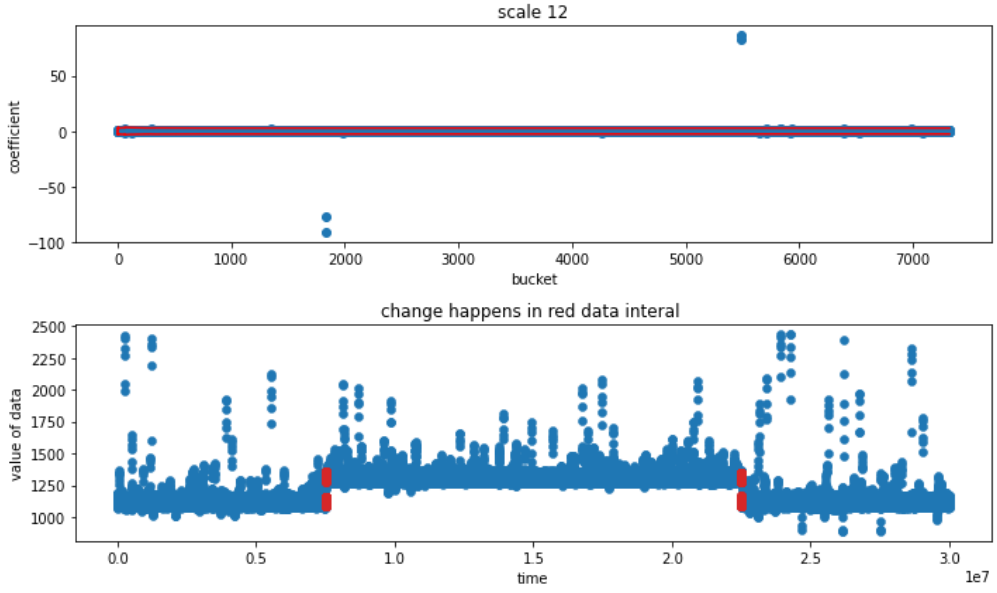

change happens in red data interal
value of data
time
1e7

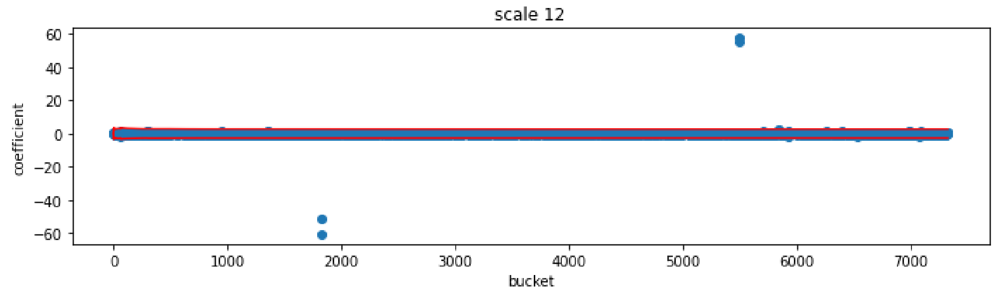


conclusion :

- No peaks has been detected, we only detected the sudden changes.
- the smallest σ is 1

scale 12

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coefficient
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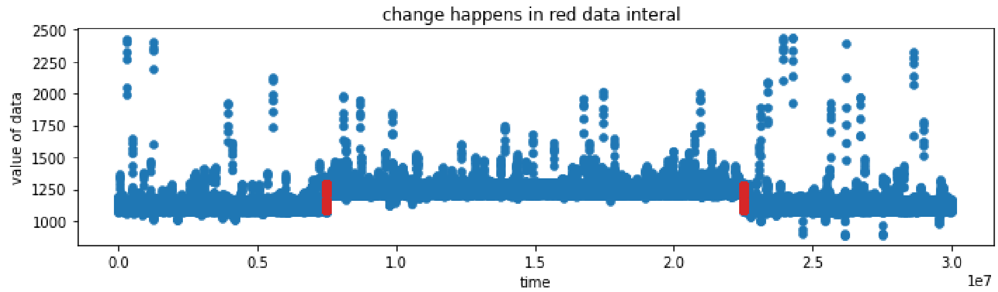
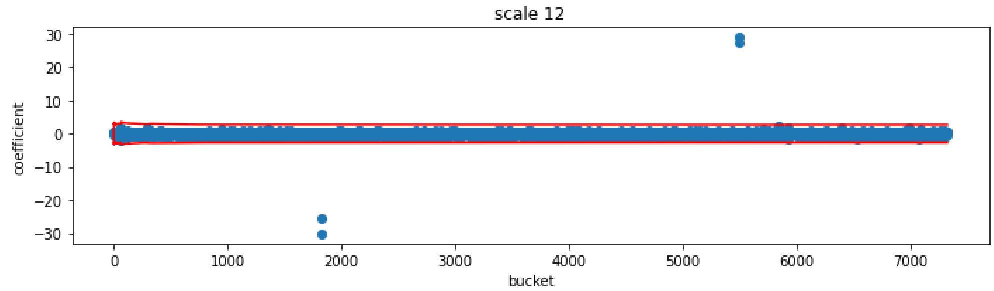
0 1000 2000 3000 4000 5000 6000 7000
bucket


change happens in red data interal
value of data
2500 2250 2000 1750 1500 1250 1000
0.0 0.5 1.0 1.5 2.0 2.5 3.0
time
1e7


scale 12
coefficient
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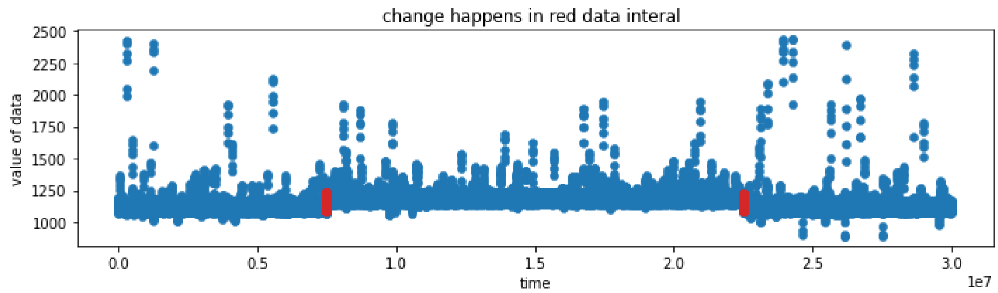
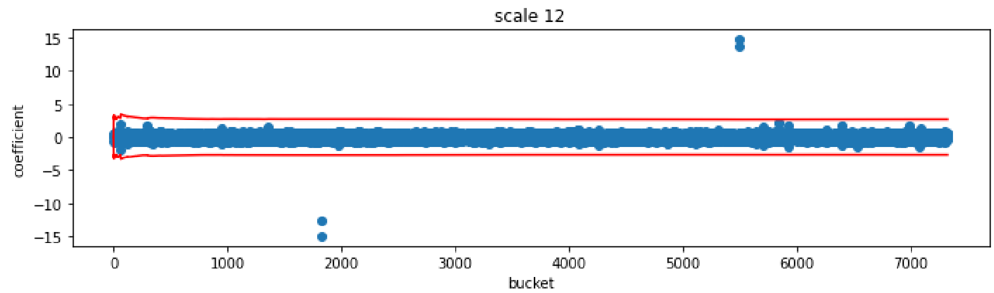
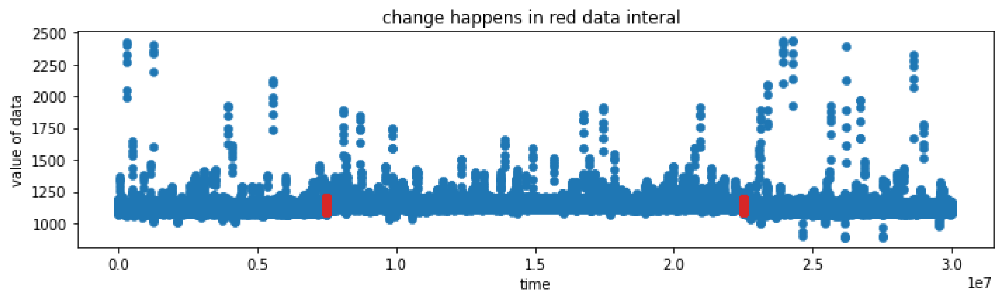
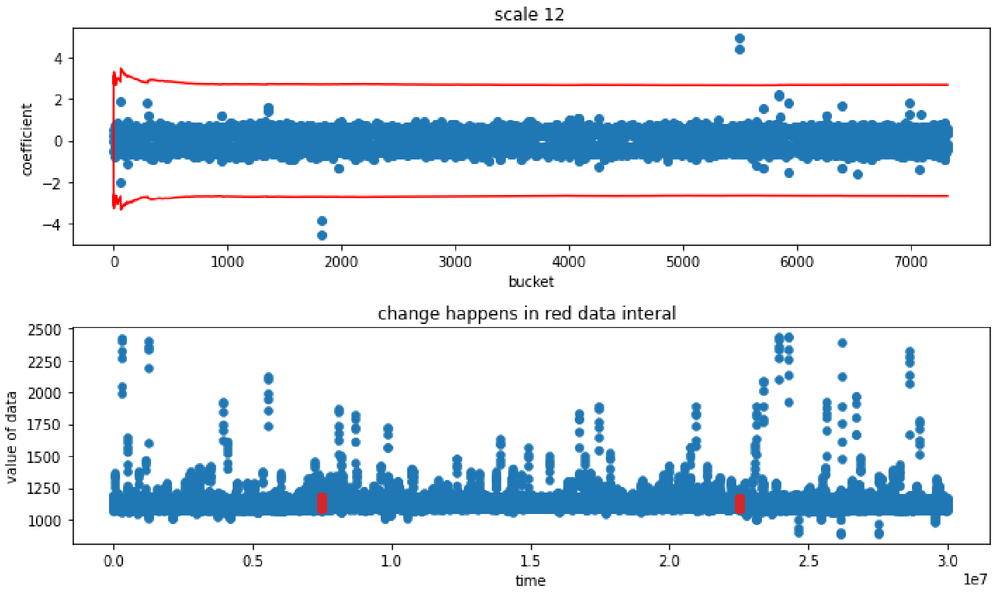
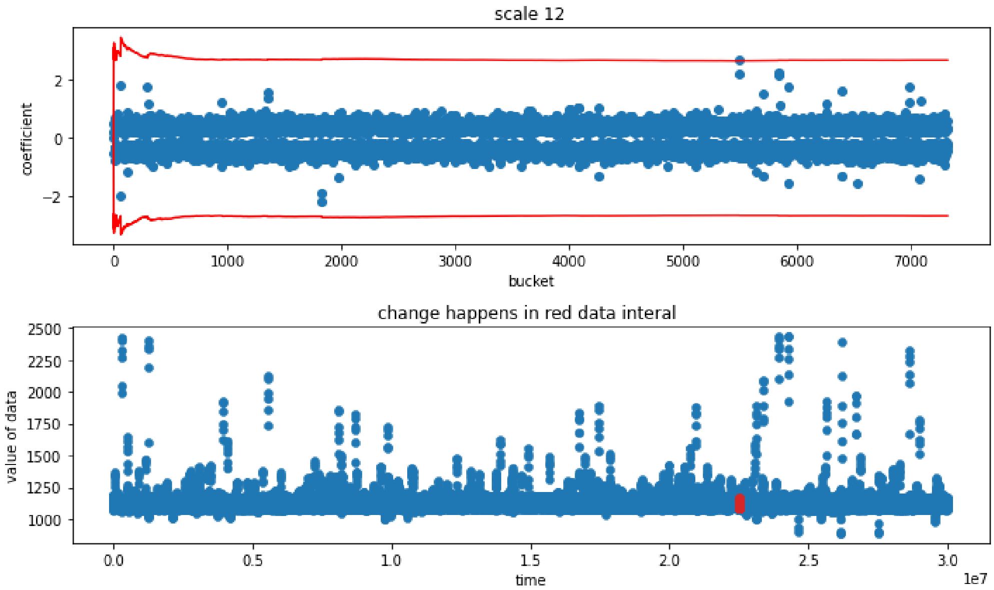
0 1000 2000 3000 4000 5000 6000 7000
bucket

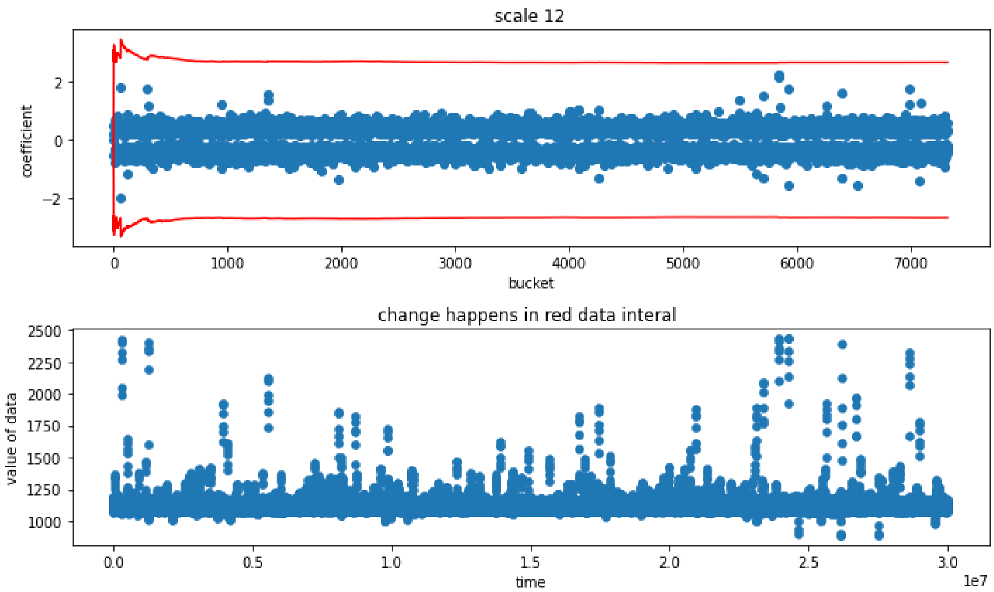

change happens in red data interal
value of data
2500 2250 2000 1750 1500 1250 1000
0.0 0.5 1.0 1.5 2.0 2.5 3.0
time
1e7


scale 12
coefficient
15 10 5 0 −5 −10 −15
0 1000 2000 3000 4000 5000 6000 7000
bucket


change happens in red data interal
value of data
2500 2250 2000 1750 1500 1250 1000
0.0 0.5 1.0 1.5 2.0 2.5 3.0
time
1e7



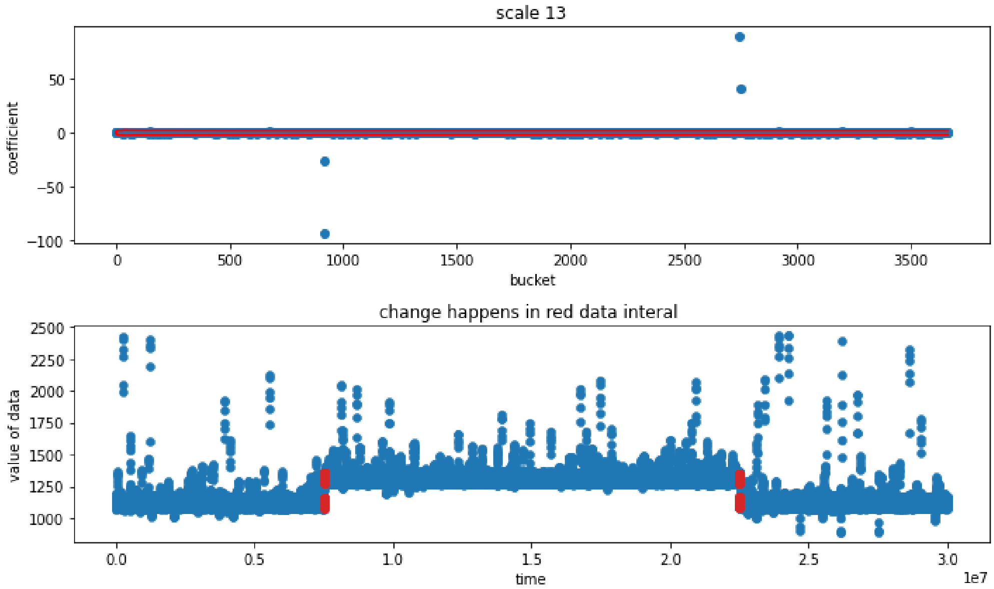


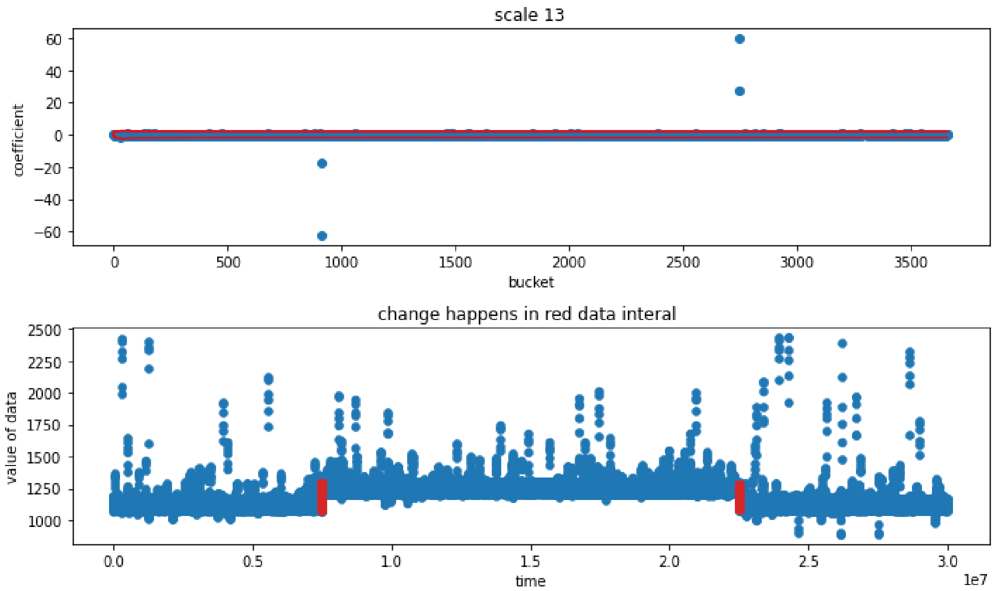


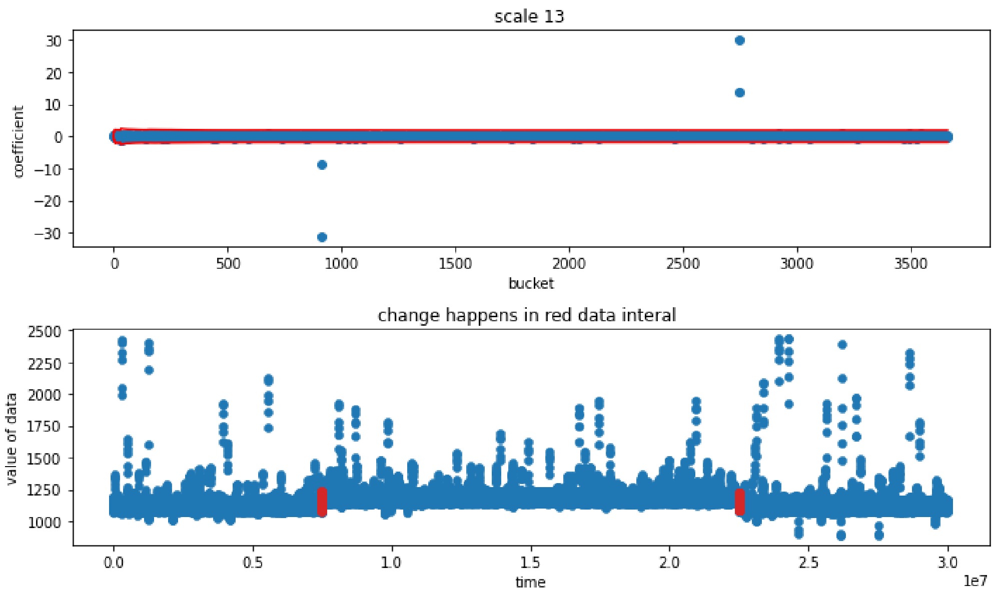
conclusion :

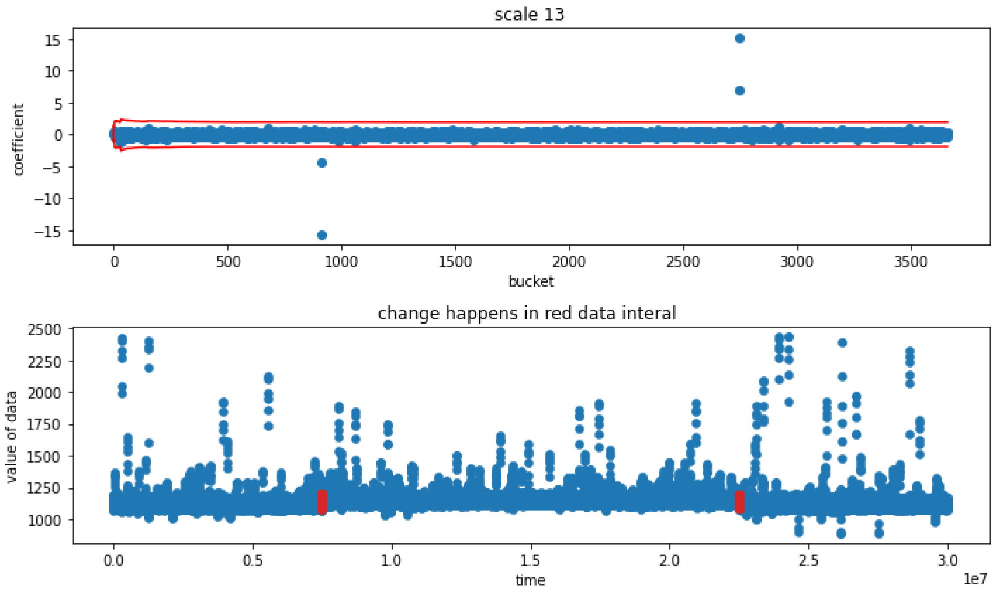
- No peaks has been detected, we only detected the sudden changes.
- the smallest σ is 1

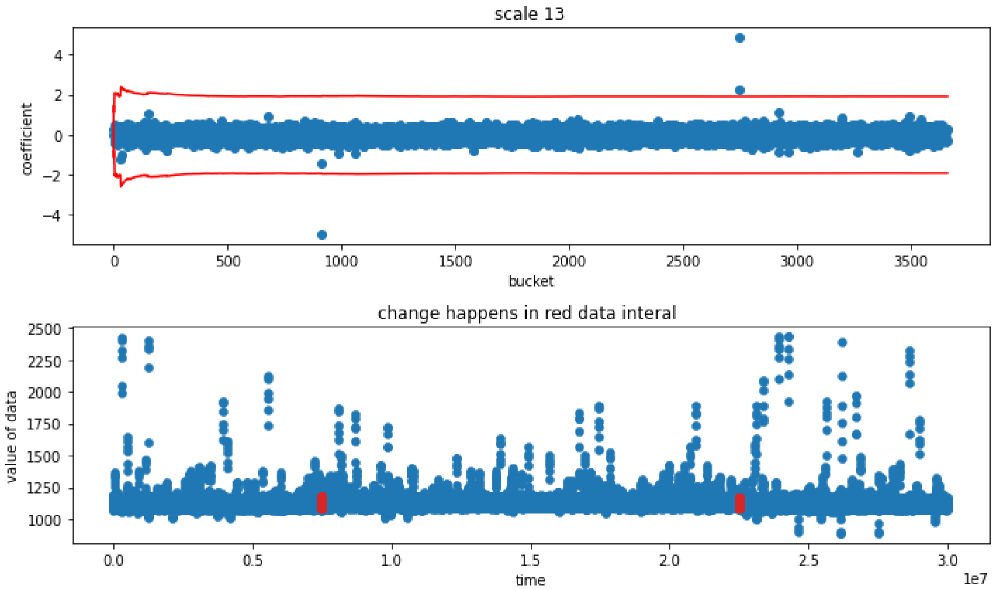
scale 13

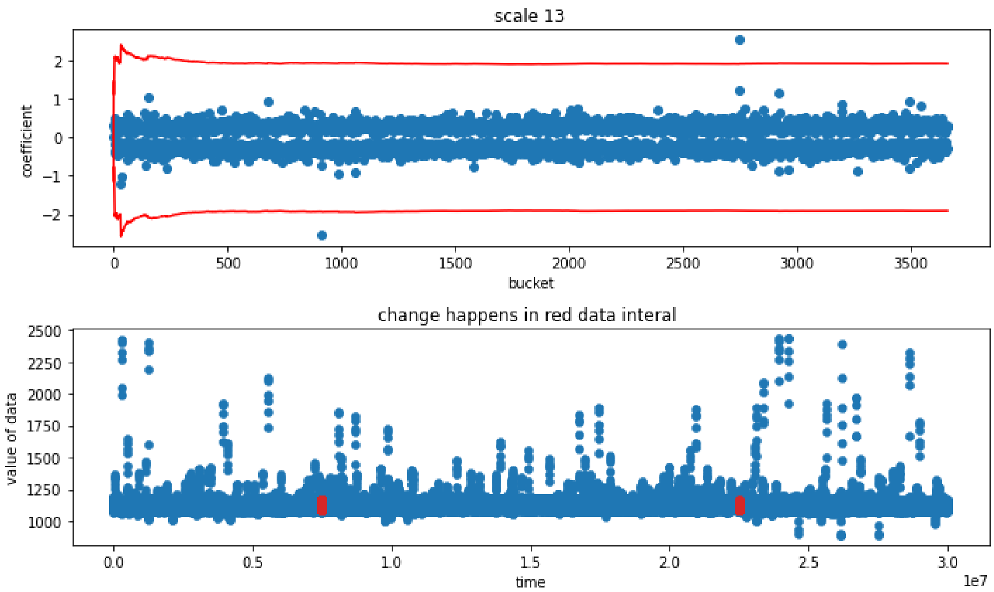

scale 13
coefficient
bucket
50
0
−50
−100
0
500
1000
1500
2000
2500
3000
3500
change happens in red data interal
value of data
time
2500
2250
2000
1750
1500
1250
1000
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1e7

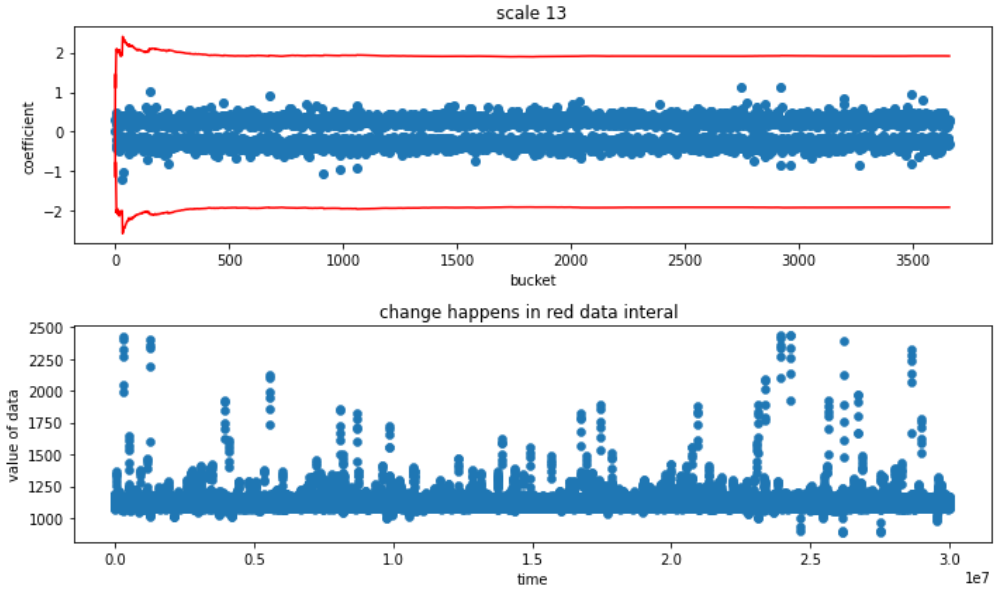

scale 13
coefficient
bucket
60
40
20
0
−20
−40
−60
0
500
1000
1500
2000
2500
3000
3500
change happens in red data interal
value of data
time
2500
2250
2000
1750
1500
1250
1000
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1e7


scale 13
coefficient
bucket
30
20
10
0
−10
−20
−30
0
500
1000
1500
2000
2500
3000
3500
change happens in red data interal
value of data
time
2500
2250
2000
1750
1500
1250
1000
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1e7


scale 13
coefficient
bucket
change happens in red data interal
value of data
time
1e7


scale 13
coefficient
bucket
change happens in red data interal
value of data
time
1e7

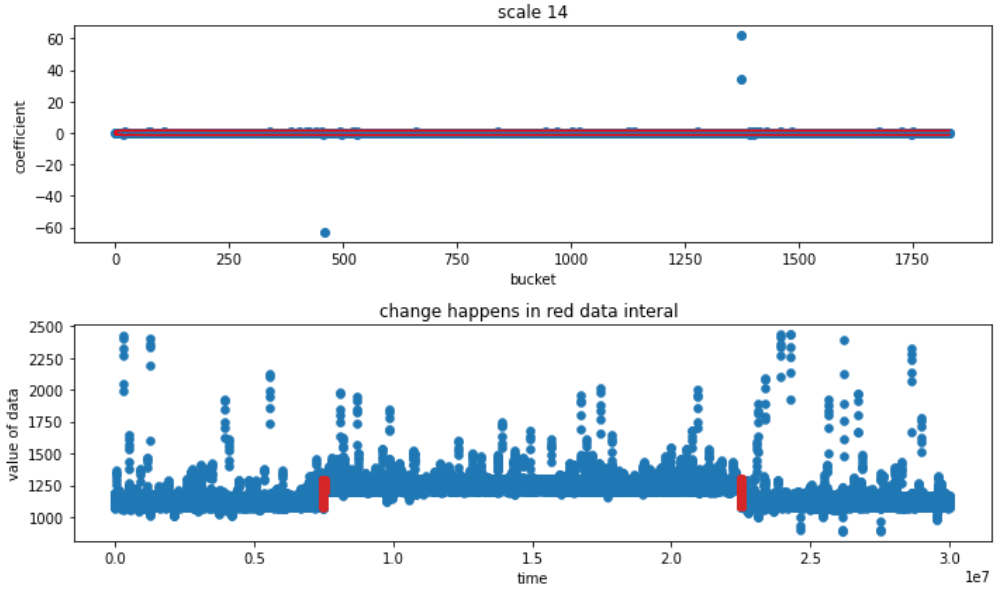

scale 13
coefficient
bucket
change happens in red data interal
value of data
time
1e7

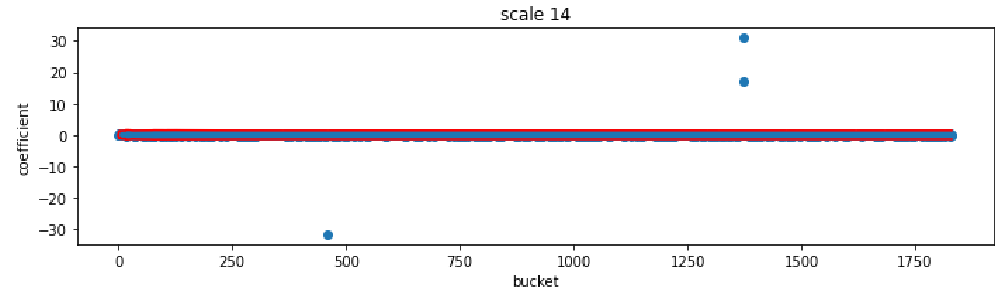


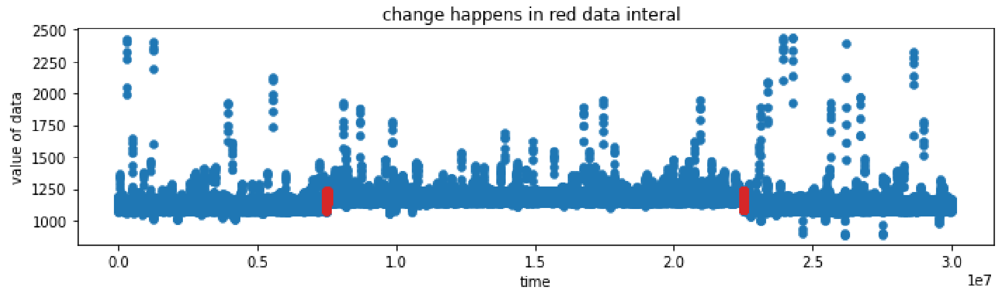
conclusion :

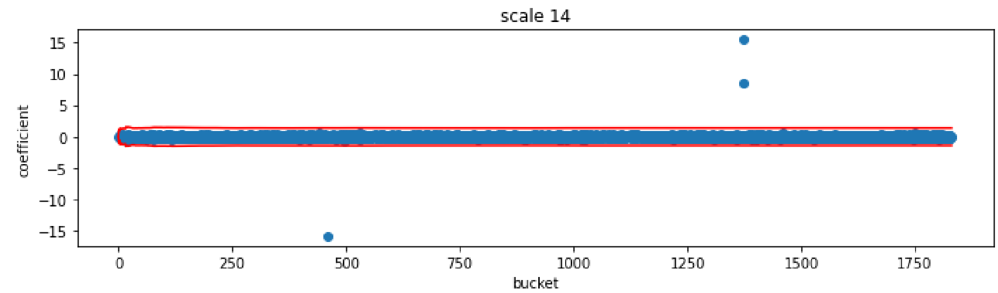
- No peaks has been detected, we only detect the sudden change.
- the smallest σ is 0.5

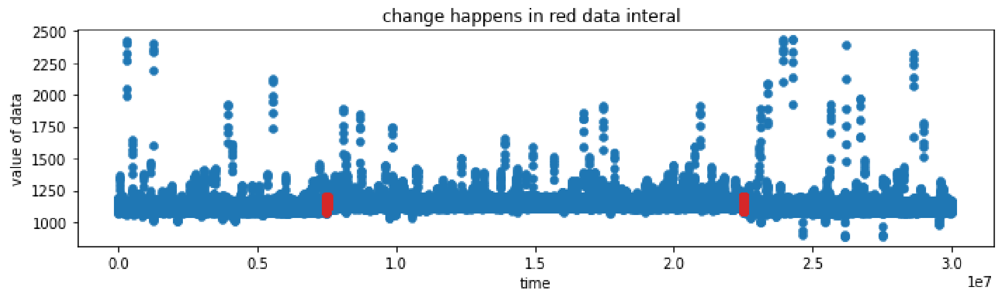
scale 14

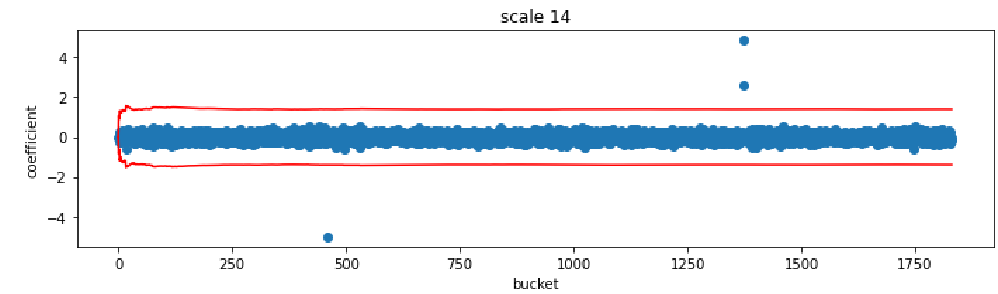


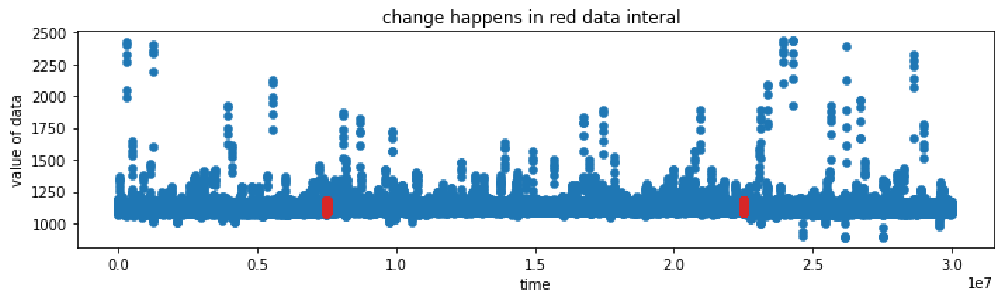

scale 14
coefficient
bucket

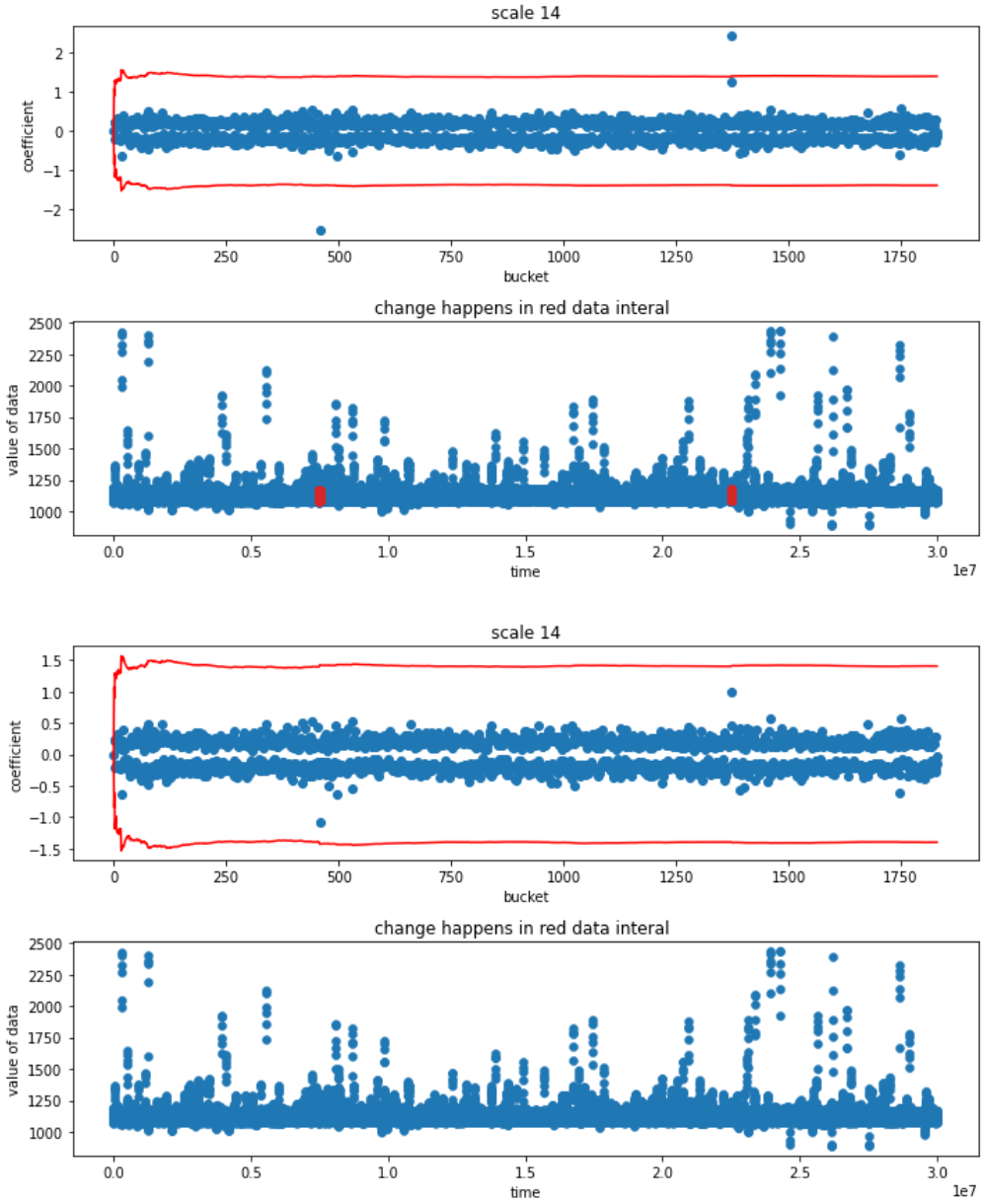

change happens in red data interal
value of data
time
1e7


scale 14
coefficient
bucket


change happens in red data interal
value of data
time
1e7


scale 14
coefficient
bucket


change happens in red data interal
value of data
time
1e7



conclusion :

- No peaks are detected, we only detect the sudden change.
- the smallest σ is 0.5

Summary

- In the small scale, we can detect most peaks in the data set. In the large scale, we can detect sudden change.
- For each fixed scale, we change the $\sigma = 18, 12, 6, 3, 1, 0.5, 0.2$ to find the smallest parameter. We obtain the following relation

scale	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
smallest σ	3	3	3	3	1	1	0.5	0.5

In [ ]:

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