quantile_regression_example

February 27, 2023

1 Régression quantile illustrée

La régression quantile est moins sensible aux points aberrants. Elle peut être définie comme une régression avec une norme *L1* (une valeur absolue). Ce notebook explore des régressions avec des quantiles différents.

[1]:
```
from jyquickhelper import add_notebook_menu
add_notebook_menu()
```

[1]:
```
<IPython.core.display.HTML object>
```

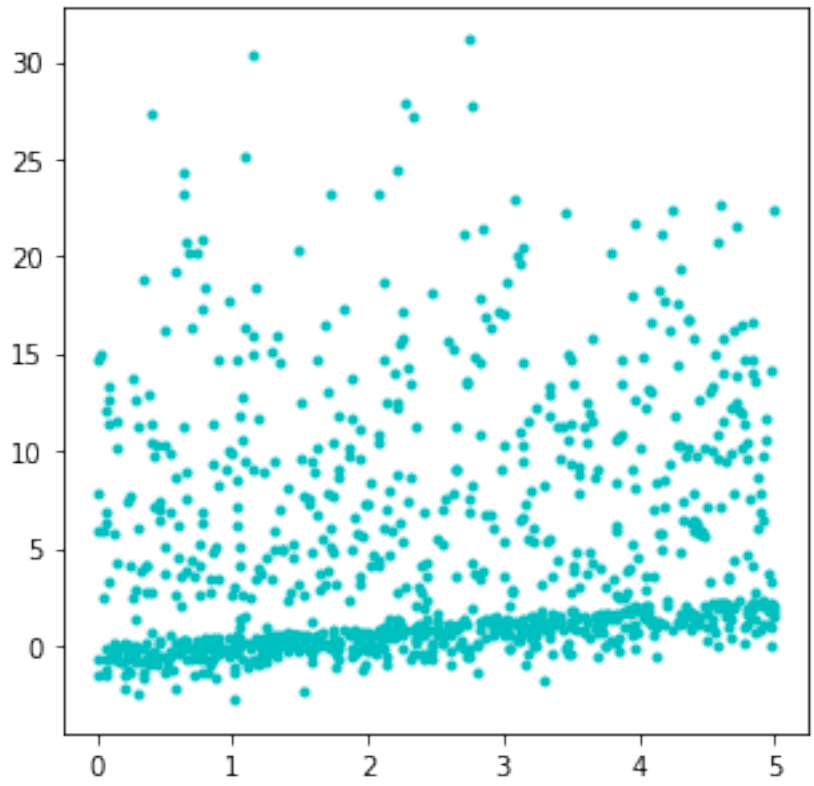
[2]:
```
%matplotlib inline
```

1.1 Un jeu de données non symétrique

[3]:
```
import numpy.random as npr
import numpy
n = 1000
eps = npr.normal(n)
X = npr.rand(n, 1) * 5
X1 = npr.normal(size=(n, 1)) * 1
X2 = npr.normal(size=(n//2, 1)) * 10
X2 = numpy.vstack([X2, numpy.zeros((n//2, 1))])
eps = - numpy.abs(X1) + numpy.abs(X2)
Y = (0.5 * X + eps).ravel()
X.shape, Y.shape
```

[3]:
```
((1000, 1), (1000,))
```

[4]:
```
import matplotlib.pyplot as plt
fig, ax = plt.subplots(1, 1, figsize=(5,5))
ax.plot(X, Y, 'c.');
```



1.2 Régression linéaire et régression quantile

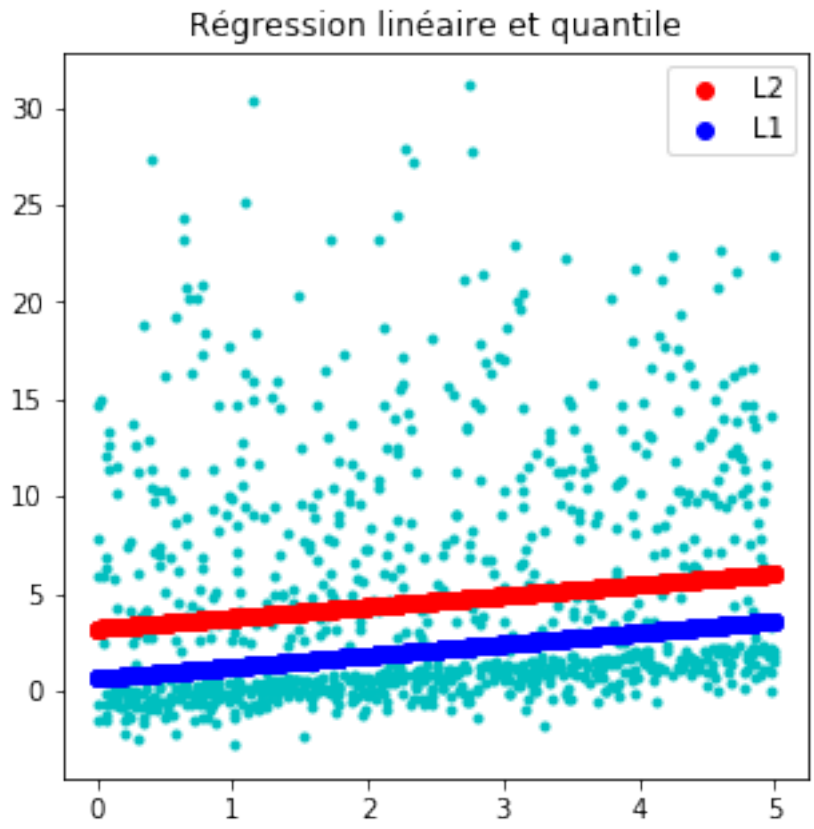
[5]:
```
from sklearn.linear_model import LinearRegression
clr = LinearRegression()
clr.fit(X, Y)
```

[5]:
```
LinearRegression(copy_X=True, fit_intercept=True, n_jobs=1, normalize=False)
```

[6]:
```
from mlinsights.mlmodel import QuantileLinearRegression
clq = QuantileLinearRegression()
clq.fit(X, Y)
```

[6]:
```
QuantileLinearRegression(copy_X=True, delta=0.0001, fit_intercept=True,
             max_iter=10, n_jobs=1, normalize=False, quantile=0.5,
             verbose=False)
```

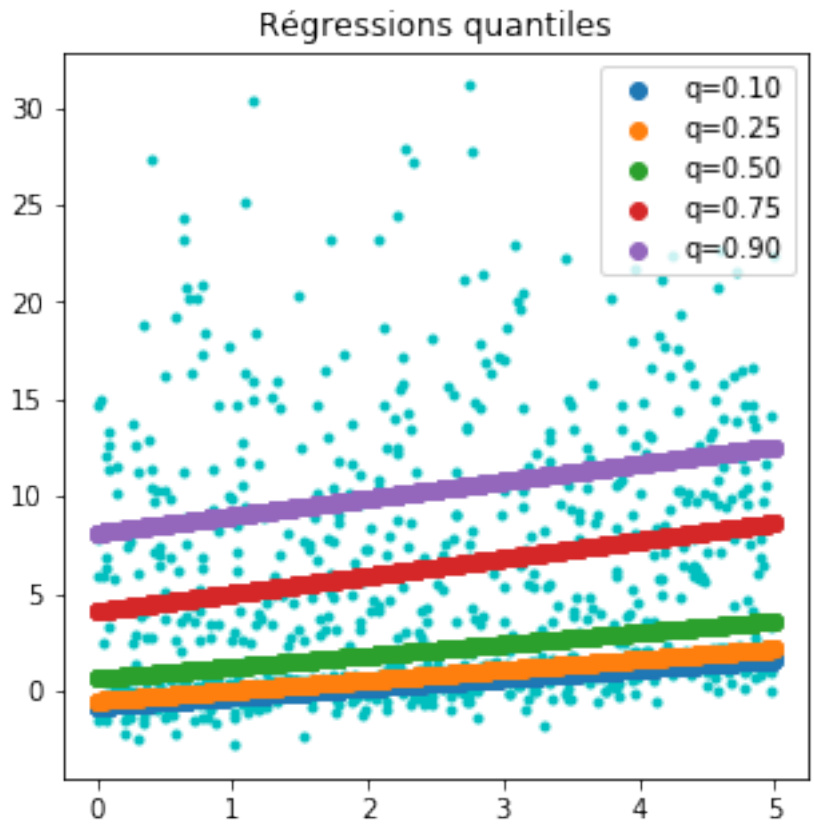
[7]:
```
fig, ax = plt.subplots(1, 1, figsize=(5,5))
ax.plot(X, Y, 'c.')
lin = clr.predict(X)
ax.plot(X, lin, 'ro', label="L2")
qu = clq.predict(X)
ax.plot(X, qu, 'bo', label="L1")
ax.legend()
ax.set_title("Régression linéaire et quantile");
```



1.3 Différents quantiles

[8]:
```
clqs = {}
for qu in [0.1, 0.25, 0.5, 0.75, 0.9]:
    clq = QuantileLinearRegression(quantile=qu)
    clq.fit(X, Y)
    clqs["q=%1.2f" % qu] = clq
```

[9]:
```
fig, ax = plt.subplots(1, 1, figsize=(5,5))
ax.plot(X, Y, 'c.')
for k, v in sorted(clqs.items()):
    p = v.predict(X)
    ax.plot(X, p, 'o', label=k)
ax.legend()
ax.set_title("Régressions quantiles");
```


Régressions quantiles
q=0.10
q=0.25
q=0.50
q=0.75
q=0.90
30
25
20
15
10
5
0
0
1
2
3
4
5

[10]: