Copula simulation

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Copula simulation

In general copula simulation is performed with the following relation

$$\frac{\delta C(u_1, u_2)}{\delta u_1} - q$$

with u_1 is the first variate, q is the desidered quantile the variate u_2 should sits on. The calculation is performed simply by computing the value of u_2 for which the function above is zero. Below an application to the Clayton copula.

Clayton copula simulation

Clayton copula in 2-dimension is described by

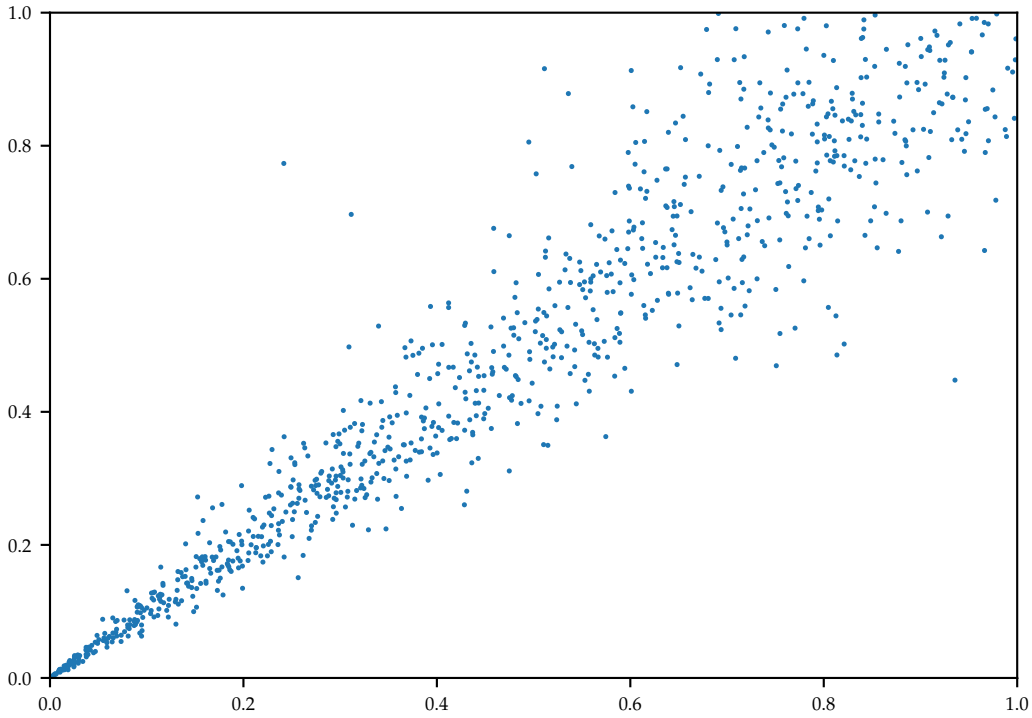
$$C(u_1, u_2) = (u_1^{-\theta} + u_2^{-\theta})^{-\frac{1}{\theta}}$$

We show below the simulation

```
if __name__ == '__main__':

    f = clayton

    np.random.seed(10)

    v1 = np.random.uniform(size = 1000) #v1 ---> v2
    q =  np.random.uniform(size = 1000) #quantile

    pool = pp.ProcessPool(16)

    theta = 10

    pairsvq = list(zip(list(v1), list(q)))
    data = list(map(lambda x: tuple([x, f, theta]), pairsvq))
    copulaList = pool.map(conditionalCopula2, data)

    xy = np.array(list(map(lambda x: x[0], copulaList)))
    q = np.array(list(map(lambda x: x[1], copulaList)))
    q = np.reshape(q, (q.shape[0],1))
```

```
## (0, 1)
```

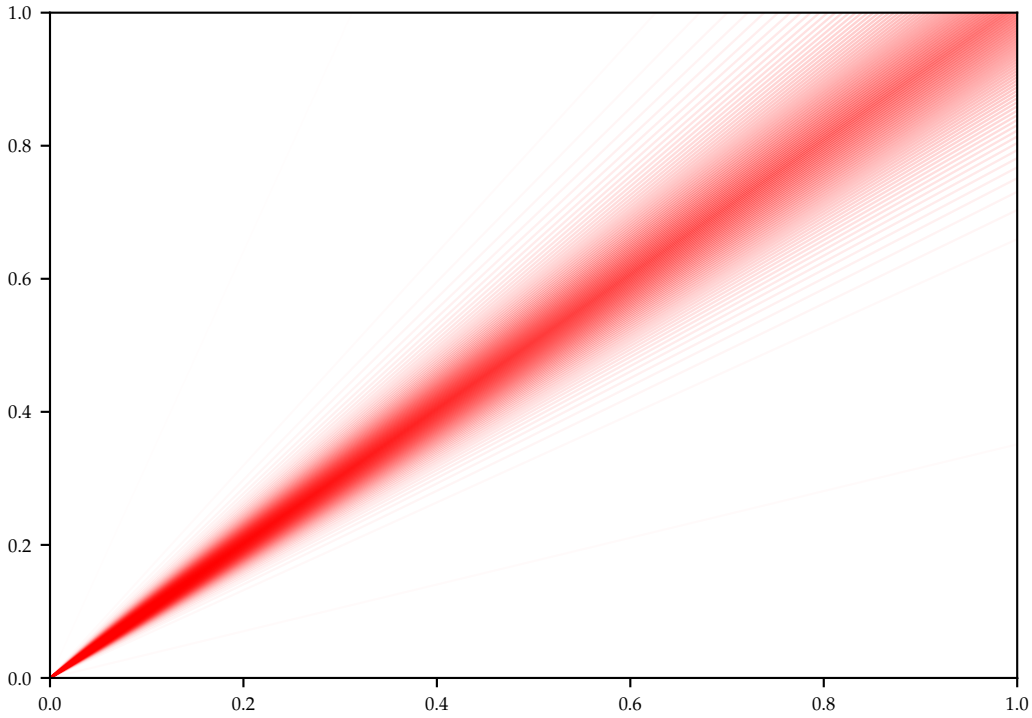
```
## (0, 1)
```



We show below level curves for Clayton copula (not a simulation)

```
## (0, 1)
```

```
## (0, 1)
```


1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0