2_3

March 28, 2016

```
In [6]: __author__ = 'Security'
        import numpy as np
        import scipy.stats as stats
        %matplotlib inline
        import matplotlib.pyplot as plt
```

Рассмотрим функцию

$$p(x) = \frac{5}{x^6} I_{[1, +\infty)}$$

Это, очевидно, плотность некоторого распределения, поскольку

$$\int_1^{+\infty} p(x)dx = 1.$$

Расмотрим случайную величину ξ имеющую такую плотность.

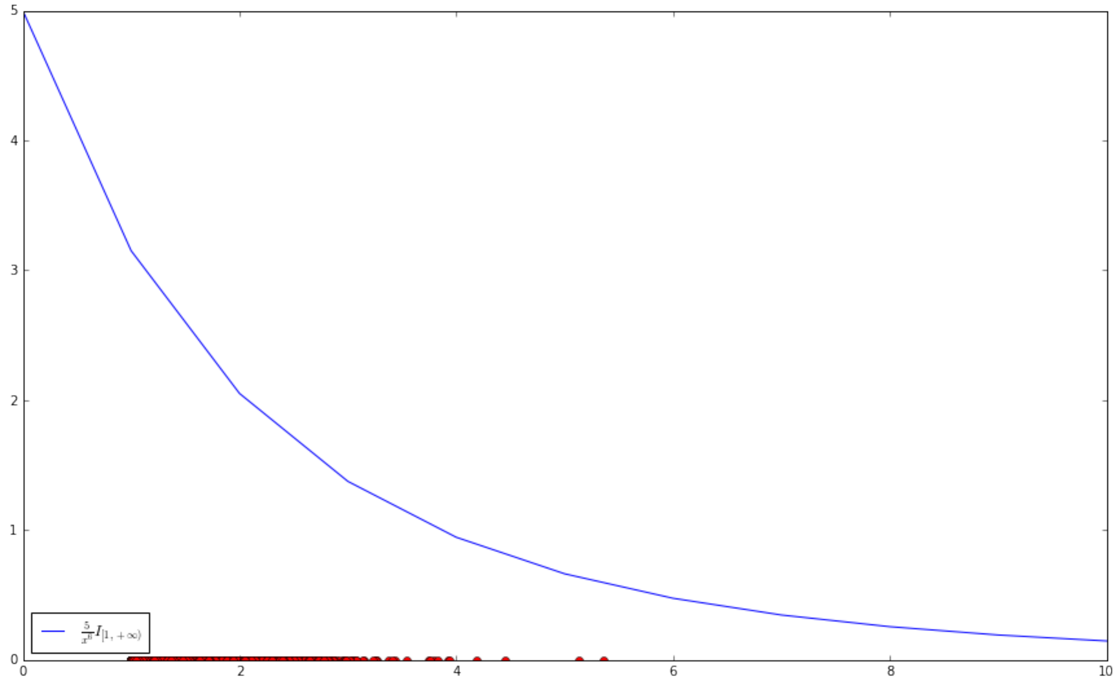
$$\mathbb{E}\xi^4 = \int_1^{+\infty} \frac{5x^4}{x^6} dx = 5$$

$$\mathbb{E}\xi^5 = \int_1^{+\infty} \frac{5x^5}{x^6} dx = \int_1^{+\infty} \frac{5}{x} dx \longrightarrow \infty$$

```
In [3]: class distGen(stats.rv_continuous):
            def _pdf(self, x):
                return 5. / float(x ** 6)
        f5sampleGenerator = distGen(a=1, name='finite 5 moment distribution')
```

```
In [12]: N = 10000
         sample = f5sampleGenerator.rvs(size=N) #генерируем выборку
```

```
In [15]: plt.figure(figsize=(15, 9))
         a = [5 / (float((x/100.0) ** 6)) for x in range(100, 100000, 8)]
         plt.xlim(0, 10)
         plt.plot(np.array(a), label=r'$\frac{5}{x^6}I_{[1, +\infty)}$')
         plt.plot(sample, [0 for _ in range(len(sample.tolist()))], 'ro')
         plt.legend(loc='best')
         plt.show()
```

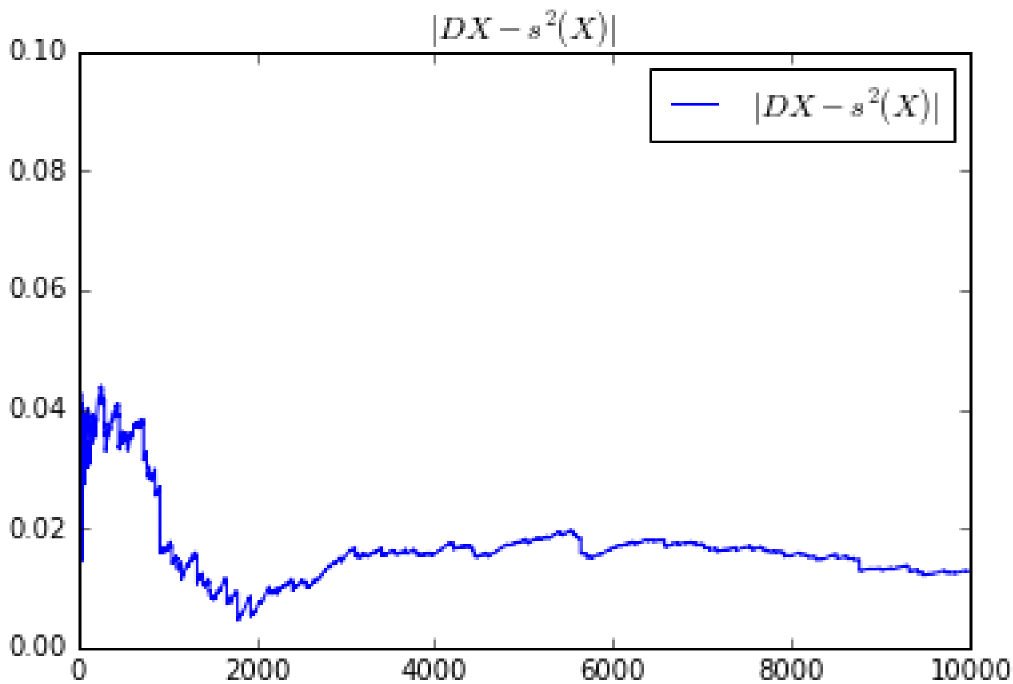


Несложно понять чему равна дисперсия:

```
In [16]: despersion = 5/3. - 25/16.
```

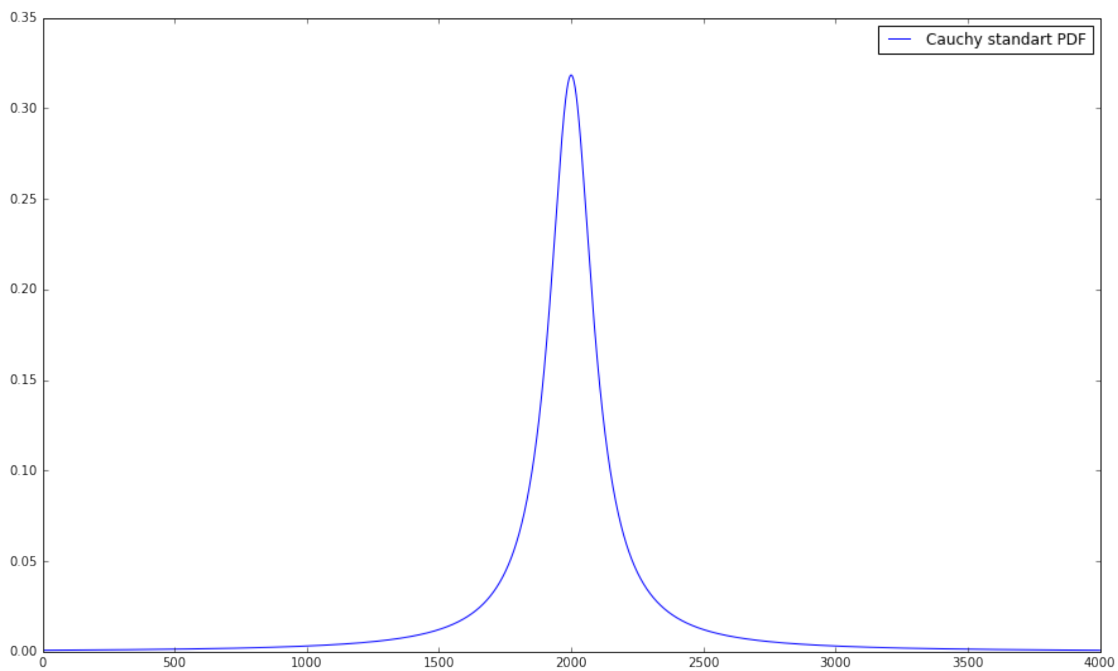
```
In [17]: def meanSrt(s, n):
             return (s[:n+1] ** 2).mean()
         def srtMean(s, n):
             return (s[:n+1].mean() ** 2)
         def getDataForPlot(s):
             return [abs(meanSrt(s, n) - srtMean(s, n) - despersion) for n in range(1, N)]
```

```
In [23]: plt.title(r'$|DX - s^2(X)|$')
         plt.plot(getDataForPlot(sample), label=r'$|DX - s^2(X)|$')
         plt.legend(loc='best')
         plt.ylim(0, 0.1)
         plt.show()
```



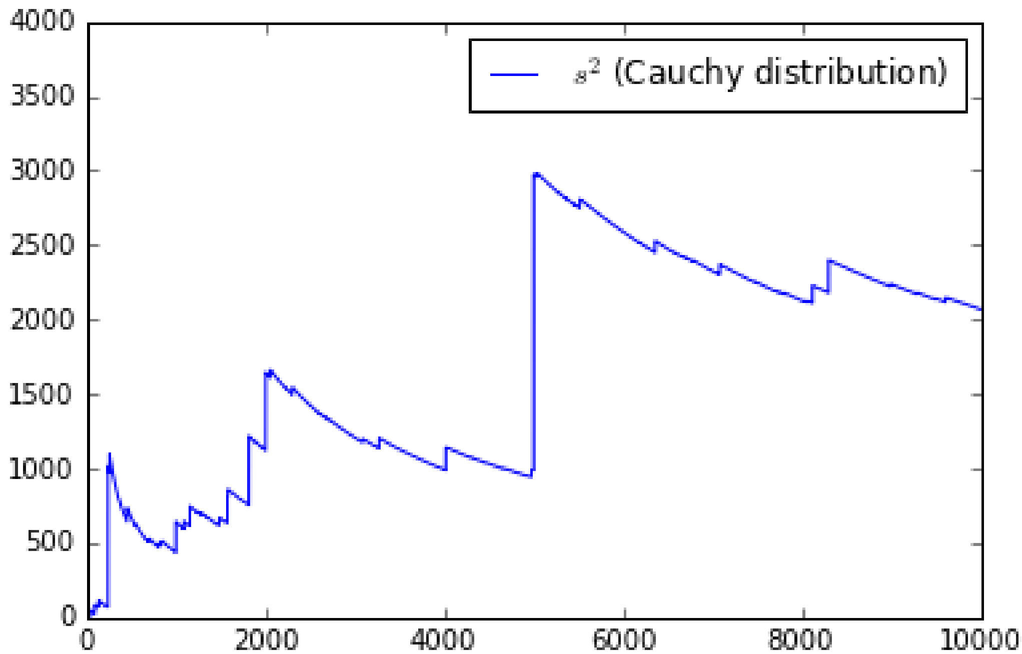

```
In [29]: cauchySample = stats.cauchy.rvs(size=N)
```

```
In [42]: plt.figure(figsize=(15, 9))
         plt.plot([stats.cauchy.pdf(x) for x in np.arange(-20, 20, 0.01)], label=r'Cauchy standart PDF'
         plt.legend(loc='best')
         plt.show()
```



```
In [37]: res = [(cauchySample[:n+1] ** 2).mean() - cauchySample[:n+1].mean() ** 2 for n in range(N)]

         plt.plot(res, label=r'$s^2$ (Cauchy distribution)')
         plt.ylim(0, 4000)
         plt.legend(loc='best')
         plt.show()
```

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In [ ]:
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In [ ]:
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