

2_1

March 28, 2016

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

In [68]: N = 10000

In [69]: def getDelta(x, theta):
    return abs(x-theta)

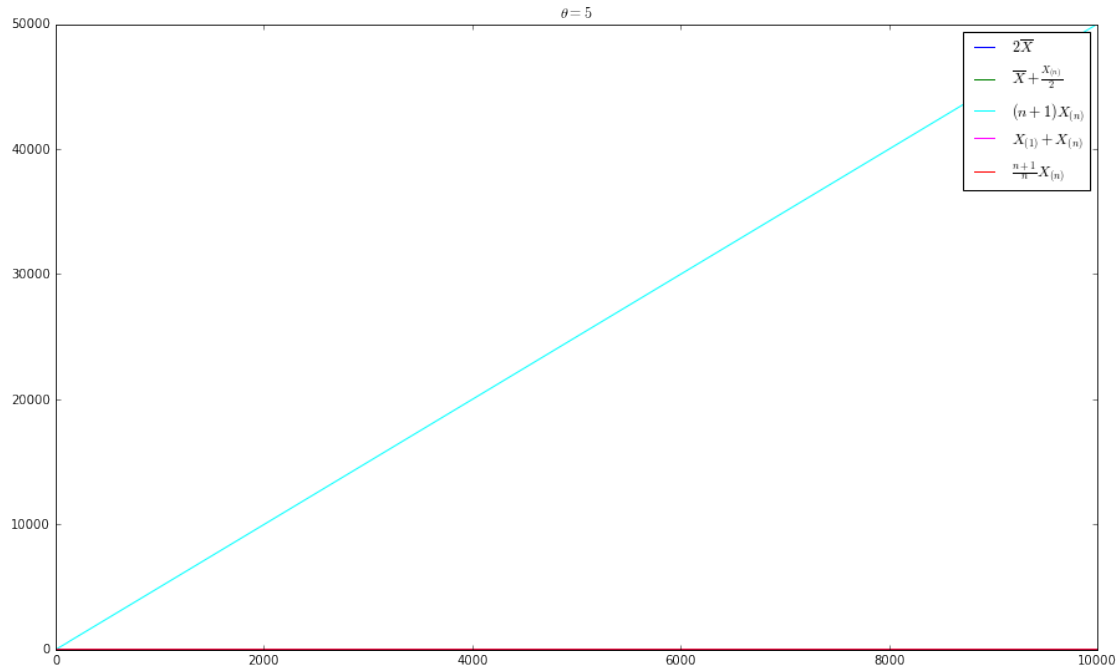
In [70]: def getStat(arr, k):
    return np.partition(arr, k)[k]

In [77]: def getDataForPlot(theta):
    sample = stats.uniform.rvs(size=N, scale = theta)
    data = np.array([[float(0) for i in range(0, N)] for j in range(0, 5)])

    for n in range(1, N):
        sampleSlice = np.array(sample[0:n+1])
        mean = sampleSlice.mean()
        data[0][n] = getDelta(sampleSlice.mean() * 2, theta)
        data[1][n] = getDelta(sampleSlice.mean() + getStat(sampleSlice, n)/2, theta)
        data[2][n] = getDelta(float((n + 1)) * getStat(sampleSlice, n), theta)
        data[3][n] = getDelta(getStat(sampleSlice, 1) + getStat(sampleSlice, n), theta)
        data[4][n] = getDelta((float(n + 1) / float(n)) * getStat(sampleSlice, n), theta)
    return data

In [80]: def drawAllPlots(data, theta):
    plt.figure(figsize=(15, 9))
    plt.title(r"$\theta$ = {0:}$".format(theta))
    plt.plot(data[0], color='blue', label = r"$2\overline{X}$")
    plt.plot(data[1], color='green', label = r"$\overline{X} + \frac{X_{(n)}}{2}$")
    plt.plot(data[2], color='cyan', label = r"$ (n+1)X_{(n)}$")
    plt.plot(data[3], color='magenta', label = r"$X_{(1)} + X_{(n)}$")
    plt.plot(data[4], color='red', label = r"$\frac{n+1}{n}X_{(n)}$")
    plt.legend()
    plt.show()

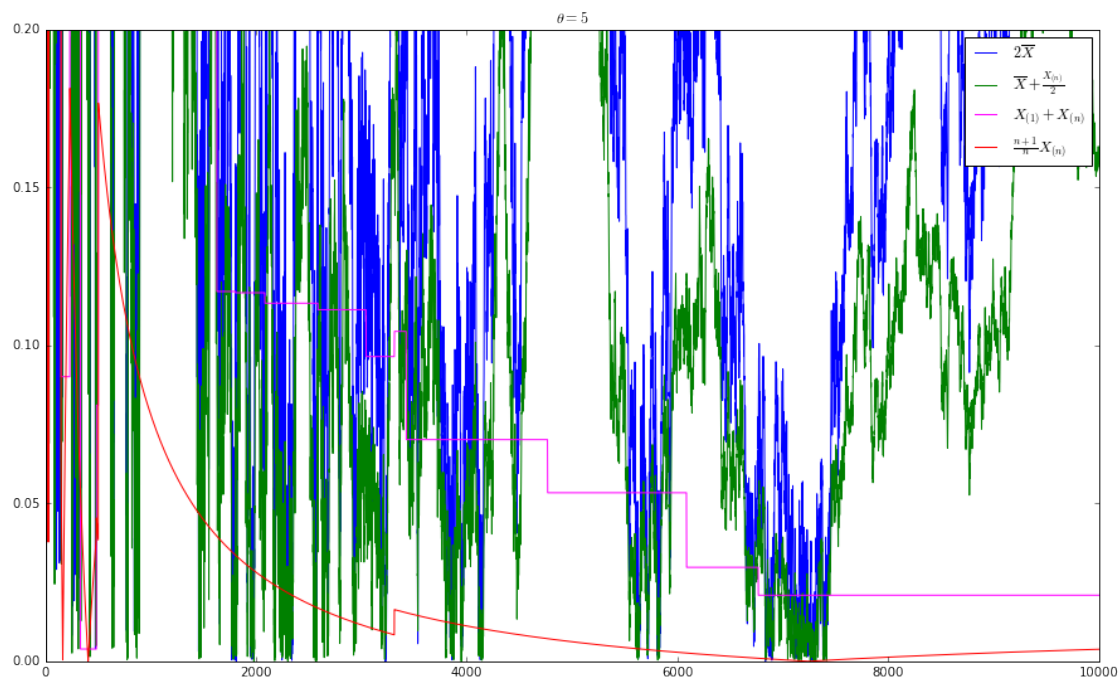
In [81]: theta = 5
    data = getDataForPlot(theta)
    drawAllPlots(data, theta)
```



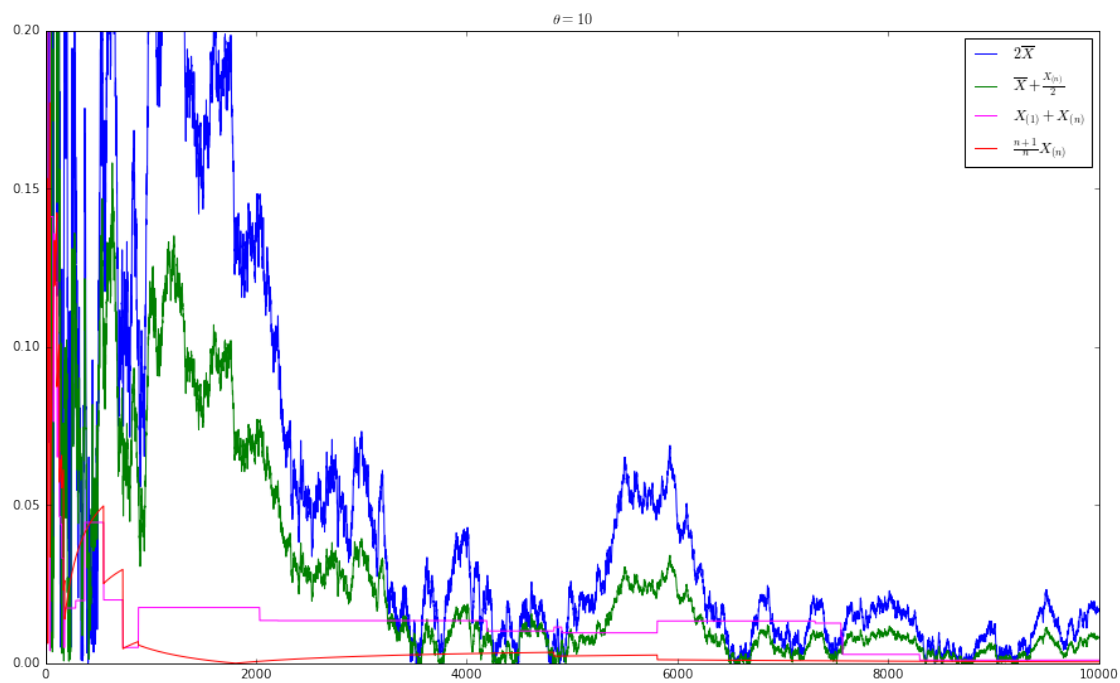
Исключим оценку $(n+1)X_{(n)}$

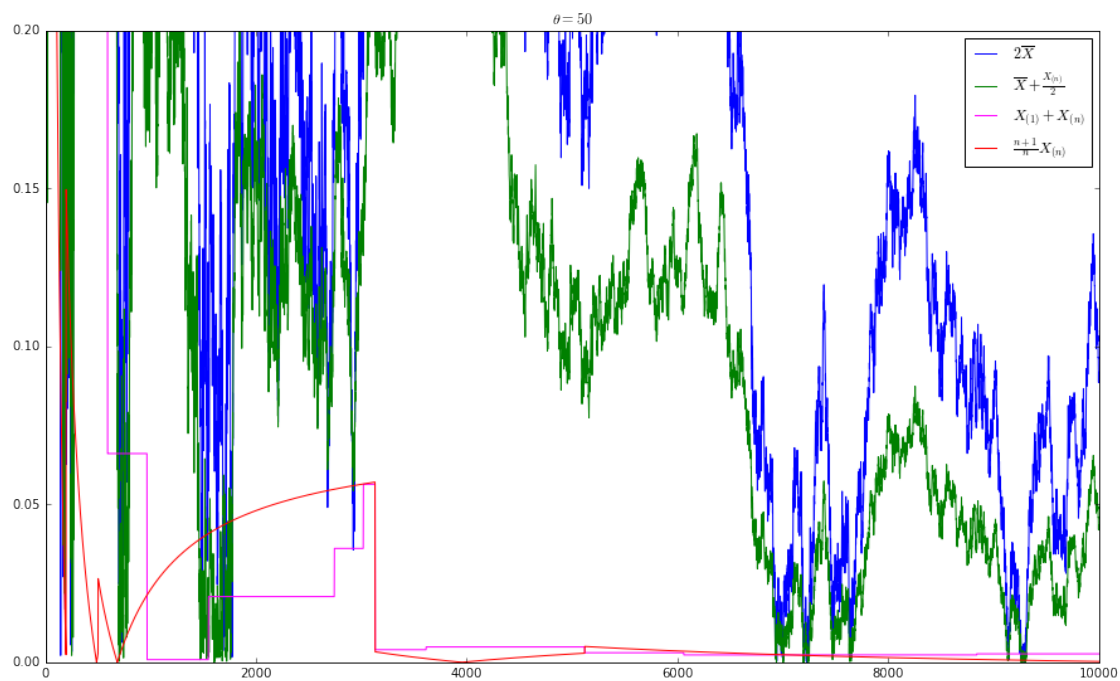
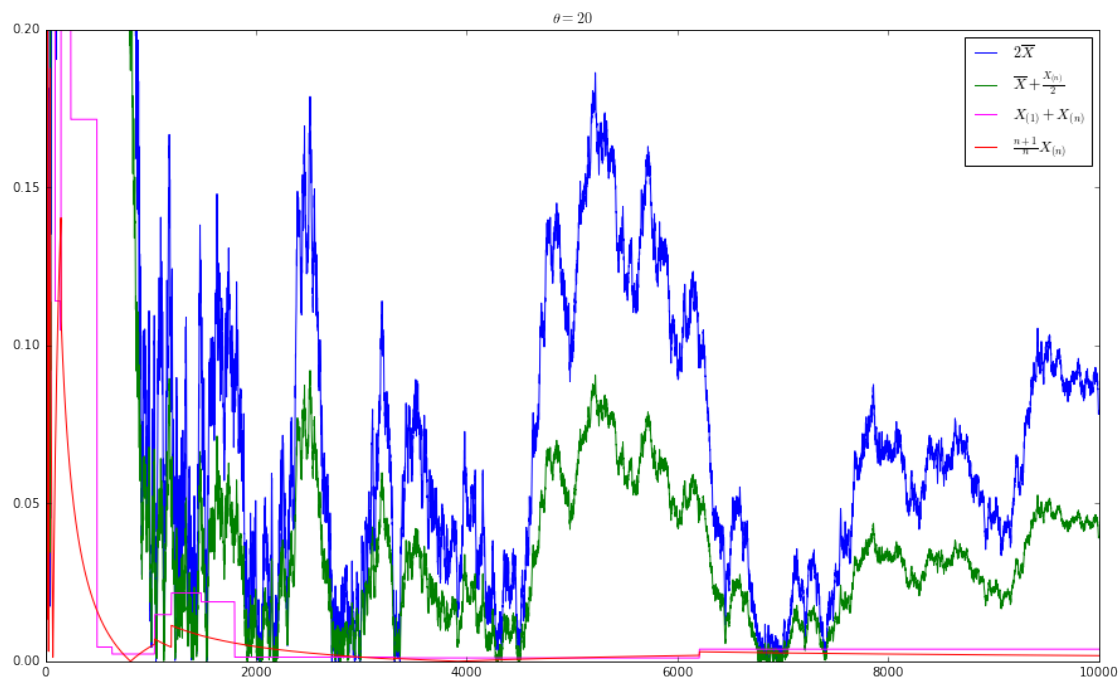
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In [87]: def drawGoodPlots(data, theta):
    plt.figure(figsize=(15, 9))
    plt.title(r"$\theta$ = {0:}".format(theta))
    plt.plot(data[0], color='blue', label = r"$2\overline{X}$")
    plt.plot(data[1], color='green', label = r"$\overline{X} + \frac{X_{(n)}}{2}$")
    plt.plot(data[3], color='magenta', label = r"$X_{(1)} + X_{(n)}$")
    plt.plot(data[4], color='red', label = r"$\frac{n+1}{n}X_{(n)}$")
    plt.ylim(0, 0.2)
    plt.legend()
    plt.show()
```

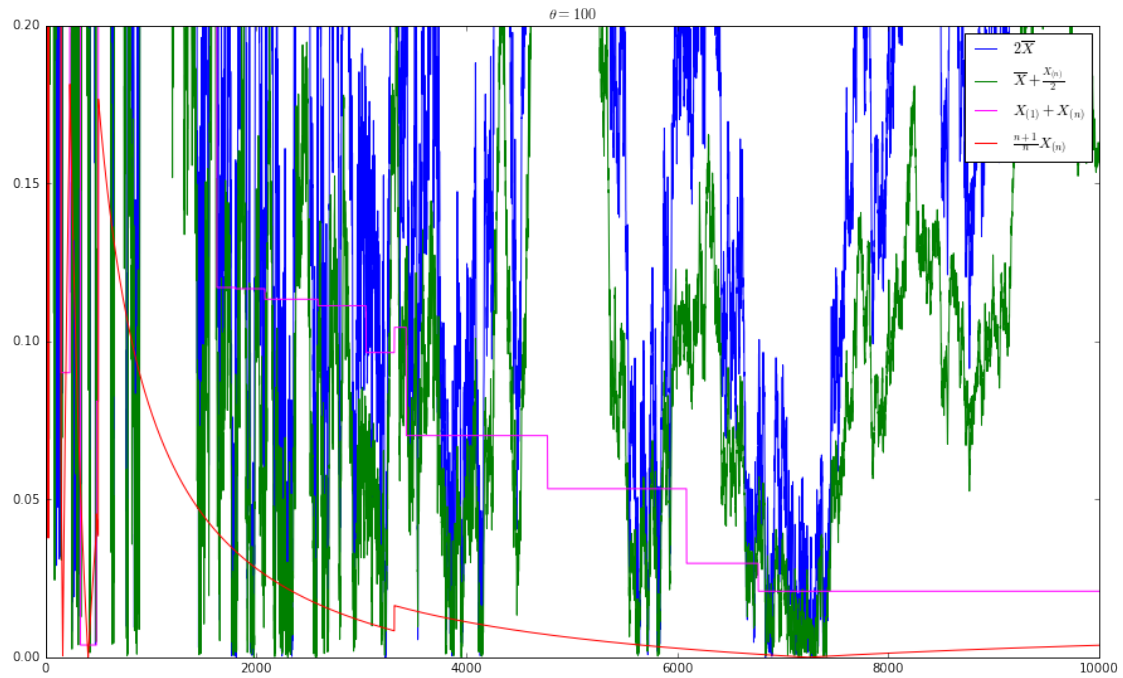
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In [88]: drawGoodPlots(data, 5)
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In [84]: for th in [10, 20, 50, 100]:
          data = getDataForPlot(th)
          drawGoodPlots(data, th)
```







Вывод. Хорошие оценки - $\frac{n+1}{n}X_n$ и $X_{(1)} + X_{(n)}$, наилучшая среди представленных - $\frac{n+1}{n}X_n$.

In []: