

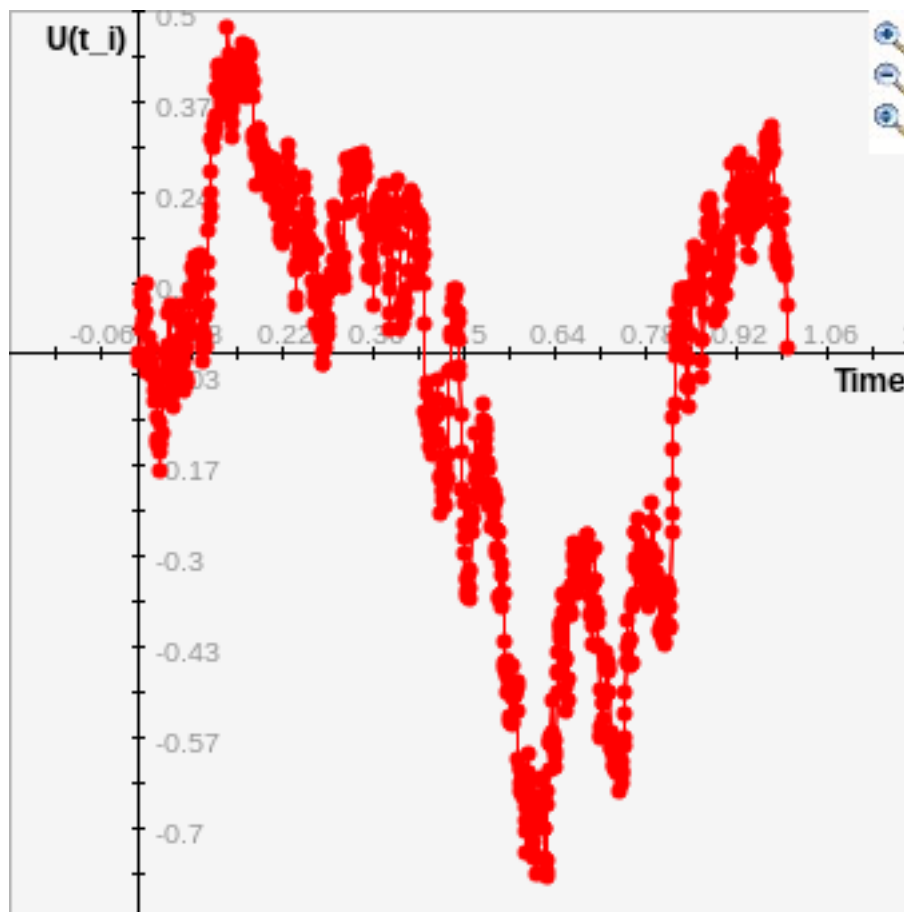
Stochastic Processes 160B, Week 7

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Part A

My code creates a list beginning with 0 and populates the list with 1023 more values of $U(t_i)$ by generating Normal Random variables mean 0 and standard deviation $\frac{1}{\sqrt{N}}$ and storing their cumulative sums in the list. Then it prints the t_i 's and $U(t_i)$'s as ordered points. Below is a scatterplot of the points generated:



Part B

I ran 100 trials for 100 pairs (a, b) with a between -.5 and .4 and b between .5 and 1.4. This range of values seemed to show the behavior of the process at a few extremes. My program prints 100 results in a table built to be displayed in LaTeX, with b along the horizontal and a along the vertical:

	.5	.6	.7	.8	.9	1	1.1	1.2	1.3	1.4
-0.5	0.08	0.06	0.01	0.01	0.0	0.01	0.01	0.0	0.0	0.0
-0.4	0.08	0.07	0.02	0.01	0.03	0.0	0.01	0.0	0.0	0.0
-0.3	0.1	0.07	0.06	0.02	0.0	0.0	0.0	0.0	0.0	0.0
-0.2	0.08	0.07	0.04	0.02	0.03	0.02	0.01	0.0	0.0	0.0
-0.1	0.1	0.1	0.01	0.03	0.01	0.03	0.02	0.0	0.0	0.0
0.0	0.13	0.14	0.14	0.08	0.03	0.01	0.02	0.01	0.0	0.0
0.1	0.12	0.13	0.13	0.06	0.04	0.02	0.03	0.0	0.0	0.0
0.2	0.19	0.14	0.03	0.1	0.06	0.03	0.03	0.01	0.0	0.01
0.3	0.25	0.13	0.15	0.17	0.02	0.06	0.07	0.03	0.03	0.01
0.4	0.21	0.24	0.16	0.11	0.07	0.03	0.05	0.0	0.02	0.01

Part C

In this section, I performed 500 simulations on each of 20 x values between 0 and 2. As before, I have the program print the information using syntax that makes it easy to make a LaTeX table:

x :	$P(B(Tau) \geq x)$
0.0	0.51
0.1	0.428
0.2	0.37
0.3	0.294
0.4	0.226
0.5	0.21
0.6	0.154
0.7	0.162
0.8	0.112
0.9	0.092
1.0	0.078
1.1	0.04
1.2	0.032
1.3	0.04
1.4	0.022
1.5	0.03
1.6	0.012
1.7	0.016
1.8	0.012
1.9	0.014

I note, in particular, that when $x = 0$, the probability that a randomly chosen Tau will have $B(Tau) \geq x$ about half the time. Since this is the expected mean of Brownian motion, this is what we would expect.