

Example of Least Squares Quadratic Approximation

With squares of 10 by 10 the following data was generated using the Excel program.

radius	Winners for 500 tosses	Ratio of winners to tosses
1	311	0.622
1.5	259	0.518
2	170	0.340
2.5	109	0.218
3	83	0.166
3.5	47	0.094

The theoretical probability p of a win using squares 10 by 10 and coins of radius r is given by

$$p(r) = \frac{(10 - 2r)^2}{10^2} = 0.04r^2 - 0.4r + 1$$

The least squares quadratic to the data set (r , ratio of winners to tosses) is

$$q(r) = 0.0474r^2 - 0.4316r + 1.0227$$

A comparison of the values at $p(r)$ and $q(r)$ follows:

radius	$q(r)$	$p(r)$
1	0.6386	0.64
1.5	0.4821	0.49
2	0.3493	0.36
2.5	0.2402	0.25
3	0.1548	0.16
3.5	0.931	0.9

Had we used more tosses, the results from the least squares polynomial most likely would have been better.