A Simple Pseudo Random Number Generator

Hubbard Decision Research
2 South 410 Canterbury Ct
Glen Ellyn, Illinois 60137
www.hubbardresearch.com

HDR PRNG

=(mod((mod(mod(999999999999989,mod(Trial*2499997+Var*1800451+Ent*2000371,7450589)*4658+7450581)*383,99991)*7440893+mod(mod(999999999999989,mod(Trial*2246527+Var*2399993+Ent*2100869,7450987)*7580+7560584)*17669,7440893))*1343,4294967296)+.5)/4294967296

	First Term	2nd Term
Trial	2499997	2246527
Var	1800451	2399993
Ent	2000371	2100869
Time	1796777	1918303
Agent	2299603	1624729

Capacity
100 Million Trials
100 Million Variables
100 Million Entities
10+ Million on each of the optional dimensions

Hubbard Decision Research

How to Use PRNG Dimensions

- The equation is open source
- Entity ID's will be assigned – but anyone can use Entity ID=0 (which simply cancels out the Entity term)
- Variable IDs should follow a structure – perhaps like a table of accounts

Hubbard Decision Research

PRNG Requirements

- It has to fit in one cell in Excel and run (meeting Excel constraints) and produce the same results in other environments.
- It has to be a counter-based, that is it behaves like a hash function in which you enter the seed(s) and iteration counter, and the result appears as an output without recursion.
- It has to have a multiple dimensional seed.
- It has to do at least as well on standard statistical tests for randomness as Excel Rand() – but better is nice.

Hubbard Decision Research

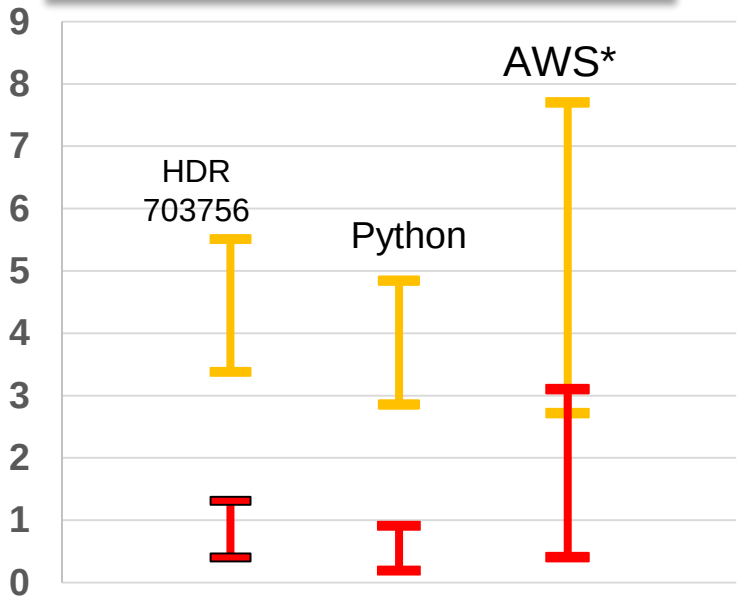
The Dieharder Tests

- The “Dieharder” are a set of 114 statistical tests for Pseudo-Random Number Generators on sets of 65 million numbers.
- We ran full test sets on over 2,000 PRNG formulas and over 10,000 “quick” tests.
- For the best, we rand 10 additional sets of 65 million and compared them to other PRNGs.

Hubbard Decision Research

New PRNG Performance

90% Confidence Intervals for number of non-pass and fails.



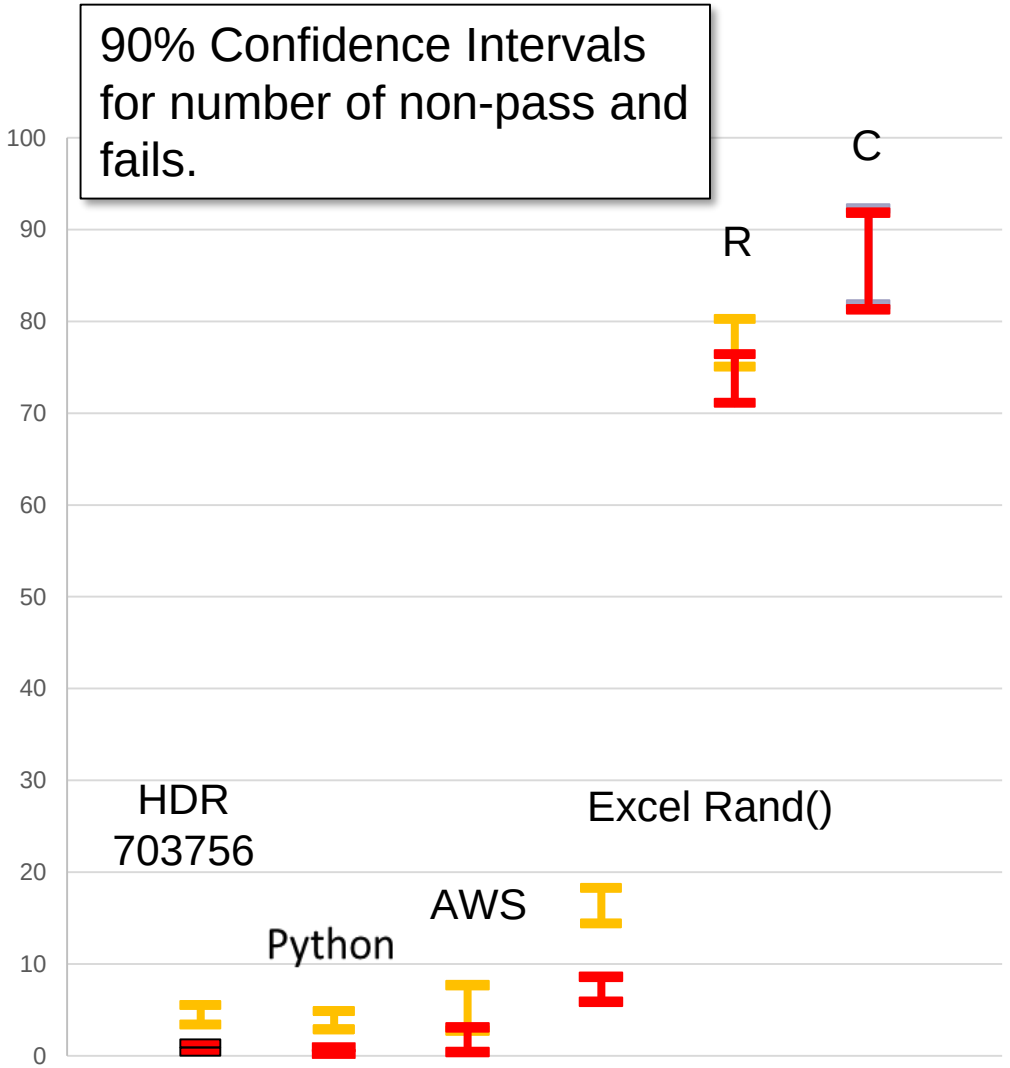
*2 sets of 65M instead of 10

- The best HDR PRNG did about as well as Python and AWS.

Hubbard Decision Research

New PRNG Performance

- All the non-HDR PRNGs we tested are supposedly based on the Mersenne Twister (MT) which is the benchmark for the best PRNG – but MT is *much* more complicated, is serial, and could not fit in an Excel cell.
- Even though Excel, R and C are also based on MT, we are not sure why the differences should be so large. They are well outside what could be a random fluke.



Hubbard Decision Research