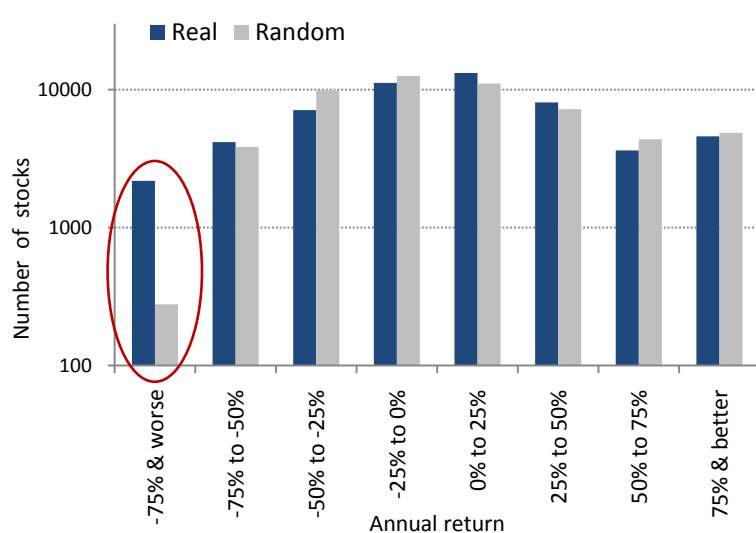


## The non-random behavior of declining stock prices

Negative annual returns of U.S. stocks have not been consistent with randomness. We calculated the annual returns for each of the 3,000 most liquid U.S. stocks from 1991 to 2008. These 54,000 annual returns were compared to an equal number of hypothetical annual returns created with a random number generator.

*\*Annual returns were calculated on a total-return basis (dividends reinvested). Delisted stocks were included to reduce “survivorship-bias”. Liquidity was calculated each year and used as a filter for the following year to avoid “look-ahead bias”.*

Annual returns of the 3000 most liquid stocks, 1991 - 2008



	Real	Random	Deviation
-75% & worse	2179	278	684%*
-75% to -50%	4163	3847	8%
-50% to -25%	7095	9883	-28%
-25% to 0%	11144	12551	-11%
0% to 25%	13151	11033	19%
25% to 50%	8064	7204	12%
50% to 75%	3614	4359	-17%
75% & better	4590	4845	-5%

\*These results were not overly influenced by the market events of 2008. In prior years, real was still significantly higher than random by 554%

Our random number generator was specifically calibrated to reflect generally-held academic beliefs regarding stock returns and distributions. The resulting gray bars in the above chart show the typical lognormal distribution associated with annual stock returns. The dark blue bars represent the actual historical record of annual stock returns. Notice that far more stocks lost more than 75% of their value in a given year than randomness would suggest.

We believe this phenomenon argues strongly that a “stop loss” or “sell discipline” feature can add value to an investing or trading strategy. If you lose 75% on an investment you must earn 300% on the remaining capital just to break even. At a bare minimum investors and investment managers should be aware of the substantial difference between reality and theory before making decisions.

The following table shows the year by year distribution of actual stock returns:

Annual return	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
-75% & worse	20	26	23	77	24	64	77	138	75	614	239	300	17	19	39	12	54	361
-75% to -50%	62	136	130	233	112	183	212	358	230	357	389	483	22	100	100	74	215	767
-50% to -25%	154	342	342	493	243	333	334	519	536	384	482	544	45	318	277	220	520	1009
-25% to 0%	395	661	625	1043	436	602	475	737	731	421	698	771	231	546	739	637	811	585
0% to 25%	689	912	941	756	727	807	661	569	484	396	602	668	767	1131	962	1174	718	187
25% to 50%	657	489	483	237	706	577	621	299	267	338	288	155	861	578	488	595	358	67
50% to 75%	358	205	219	76	374	204	319	153	153	210	138	50	422	177	212	170	156	18
75% & better	665	229	237	85	378	230	301	227	524	280	164	29	635	131	183	118	168	6