

Sam Savage

Stanford University

A New Notation For Probability Distributions

- Unambiguous
- Additive
- Auditable

Additivity

$$\begin{array}{r} 437 \\ + 588 \\ \hline 1025 \end{array}$$



$$\begin{array}{r} DLXXXVIII \\ + CDXXXVII \\ \hline MXXV \end{array}$$

The Distribution String (DIST) OPEN STANDARD

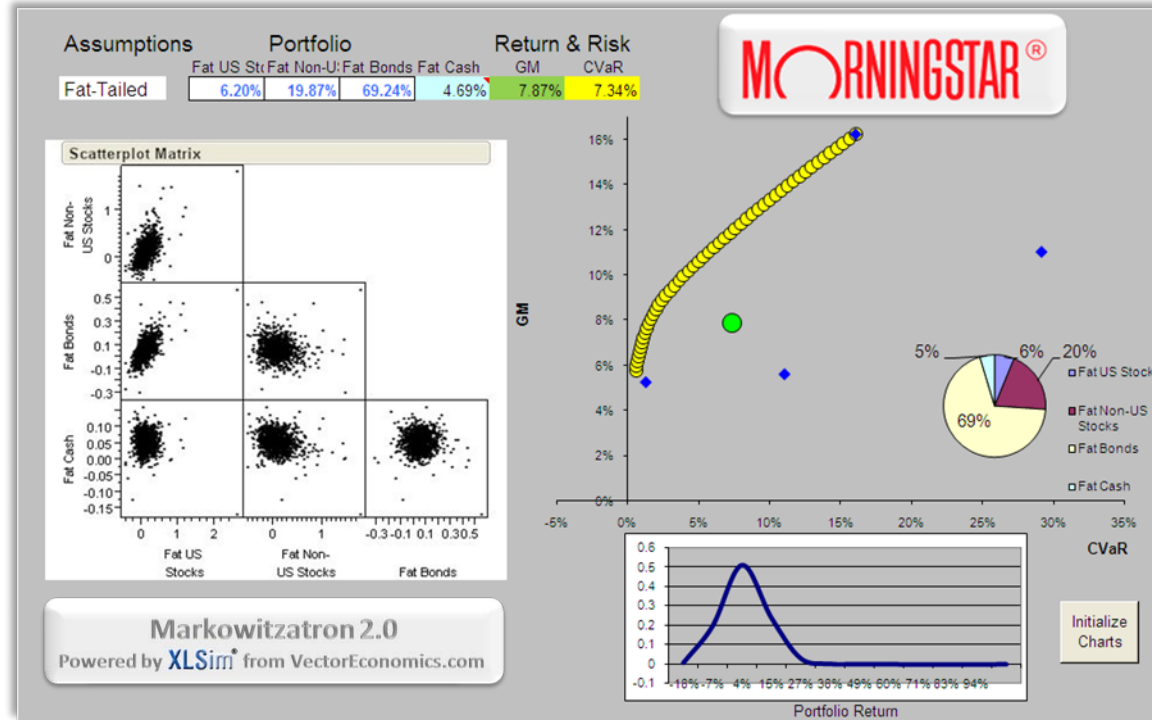
Encapsulates Thousands of Scenarios into a Single Data Element

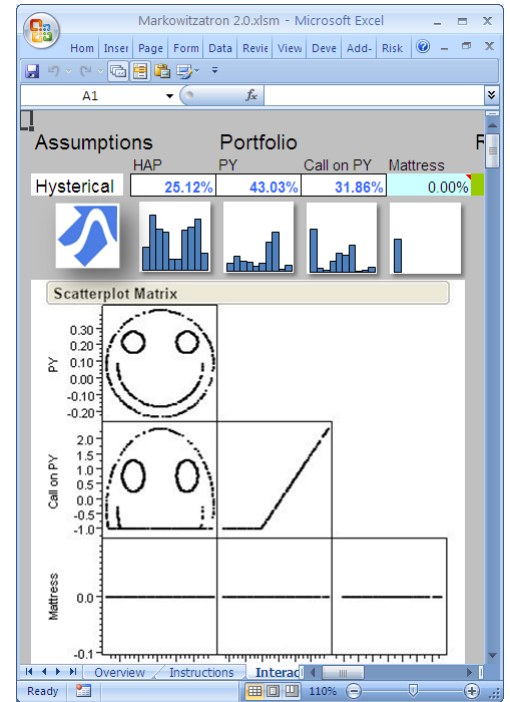
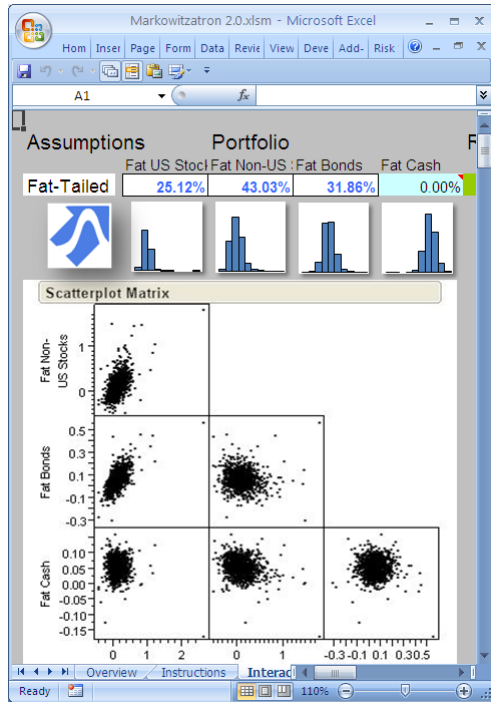
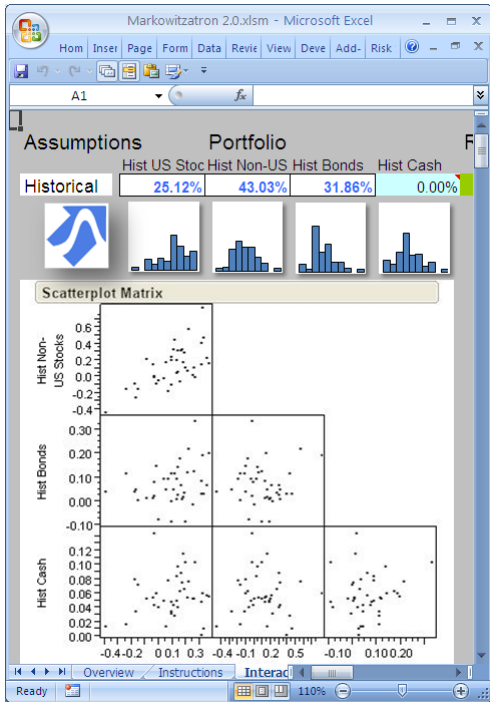
Developed in
Collaboration with
Oracle Corp.
SAS Institute
Frontline Systems

... 0.756, 0.927,
0.873, 0.253, 0.070, 0.705,
0.665, 0.427, 0.375, 0.708, 0.733, 0.769,
0.405... **Thousands of Scenarios** ... 0.094,
0.715, 0.829, 0.012, 0.848, 0.008, 0.024,
0.174, 0.745, 0.253, 0.242, 0.273, 0.517,
0.446, 0.630, 0.564, 0.929, 0.129,
0.285, 0.615, 0.629, 0.188
0.253, 0.745 ...

	A		C	D	E	F
1						
2						
3			<dist name="Large Cap" avg="7.02855199E-002"			
4						
5						

The DIST Enables Interactive Simulations in Which Distributions are Data





```

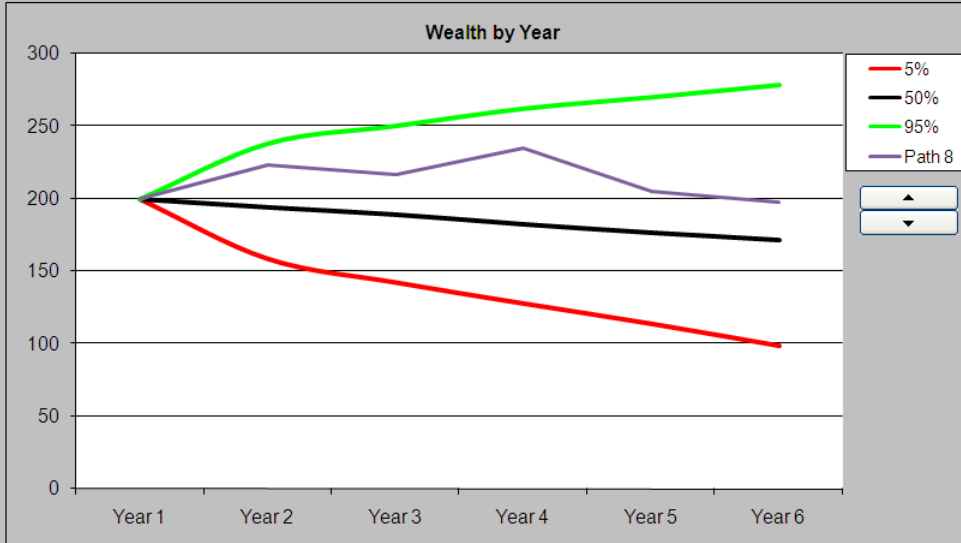
Lognormal 5 <dist name="Lognorm US Stocks" avg="1.22120172E-001" min="-3.27158352E-001" max="9.12581866E-001" count="1000" type="Double"
6 ver="1.1">qCQo/jAYbelit1VdIDNGvmVh/8v7mxscdk6jWYBQW1pMWXcOR6csycYXGU+6oGsaaJuaWqwSHiLW5OR1dZ92QhLM2P3UCLKylhIErUfSKUL0uvhN9Zfc3/TxMp7aVASGk8S1yUZRL7ivHq+vwBQwJ1o
7 q0TyLYockFTcAsYJoT2Ztdf15UkJKMF5QKwRT+CDfJDBgpd0lleKbYyL1Ur2OkeCOqHTQb1LcJ7ZU0+wniveWclC+z98T1PHFmsO5pFFWkAdB53LX7cCtSxi44hb1fAk4gSWdZHP7o1yMwl9sWpdZnWdRz5bkUXhR
8 aZDi3U3cTVSr4N3WKpg5WfSMBBr4QmWCRmHhS4QpDJ1gSX0ub32rSRsBZzTnUF1dGkuQqxbEmheEfr4T2zscQIZbEUZ2d0RY2T4gabJHslpZVZNMV7gHO9IVQls9eb9SF3pCMsOcNWMnU9sqfjDbRccS71ZJNhyG
Fat-Tailed 9 OKMyrFNf8E5VKn5vADfyFlg1UhaS7AAnoGDCSylGtEDmbnOXICNgAVVRf1FjdopYmkZgy5P8VAQsFM+h0pMfyWfRklmMgyAvGdzB1Ho4PgPknPFGPP2SLPXRvjhrzoyBbnBRCC0fzb2d0/nnqMQQskZjXZhbWVCZjh
10 Sli3L1XrJJu0+apVQj3yPiZJ469Uqoe1eF+s/agBze4uCaFaFeZmiuGipcy3fWUONJ3CQScInRrp2YV09TYbToQnpkztzIqFkXUO0cBSYEWWh2Tr48IHMXPsZF102xcEsnx2uEdZdGOThdDcnchZUL0chtLIGAogmNfj2i0UH2W6
11 JCGMP1CsV9yWcrDmXKbPYwitYAAyHx8bElsQsJ4tkdYw+REZ5NMxu1BJF3EM9ZxKXlaZ+BK8bLUYOM8tTetbf5sXsTxr2MiopksD59TF9hbiCwP3vmQ9Uf3Uf8gB4W5Cec5PVfWd4Ddft1mLyiuoNt/Yn2cbwtw9mb7f
12 +NOW3YvmvQr70I3Se4yb0raTqtW4F5ny6aRYFm+TM97VsrnNgVc82oQX05eWefUPp0zBC7NhpauNuYCOqadnJTNUA1HT1F9LflZLY+PQaR7Ca+lhOW32mtQVZ8mGNZt1h71p+Z/w5Cd/YxYfJM1prnneAJ3vNdjx4
Hysterical 13 oqoPrdgsVW1Kow2HWn6dx18l03uhCJMkUYyvpshSBDJpGU5vCIOccYIXckHHVE5+4p04dt69IUWwPpxH0lbnAVag8292LsZD6nW+iyB2gXebXRgjomDPnt5bb3CpP6N6ZGySOYd2b0LGHUpi912CTQFaeYsU0BVA1F
14 UNUZWNHcnTOg/qEmWcZiWlM3JS7JMBVxryYNaAtK9yERtS2zhzEsZjWm41uoFvpV914HJIsU5cCKGudKuBRNUy1PyVU3VqKhQs+5mZ2LRzTVwjqVw/1YnVg9u20iScR5VJ21Udgiu8fj3UeA1+E99cjZHxI86D
15 r4k2mgSjn1CqmV0Fb0mSXLias2pAZztN7VA326pWrV04mdhXfRo1W06d1Y2FuOodu95JRRMAadxr1UIMX61zdGg0Q8+OOC0IOPZS0m+YB8QZaJTXE7JzmQpd13KnfdatitM02iWfZUJi6OaYtZK0dWt1ROzj24UvRI3zi
16 Dj5hb6CACy1pV8GeKdGw0ZKudajwxwUCzUWCDRpDvX+hoJjbTZFgOYF3mjCs0MIUIPZJhs1PJQS8vdUfVHFxNETquO+CRSIQZRIhAHAwvgmWmK2AsQGZ4zV8hVLN+URoLd1IKLHFQk3p7ob8SPIRmZNXyaxY8
2dzWd5QWS0gLygAAIvzV59apzi7TWr3XfnOXf1kWWdLREJgtzxwWmPysISBq18pgZx7173yMIR/UqUclmBcOR72z9eYp3lydYfVnISsQWVz7PBdzUC5h3LcPf9b0FckWIn9nBM0Pq2EL2Gva1V6iFXPFxSuRkZCMh
VDDWBMt6ZhnVzzV6CEDFs8g1dNgUwJWKnrj2QZbY9Hm6Fz980OzRhUfJ6TPRgkjmppd7c/SXichQICHElxSjIsmzXQxvFQJ6rkX2Ruyy6ngbE+R20Kw5L0Do1OFpQQ1oAlIcVdIKWM+IpmXSAvxsVYyaABFU
WkgUjAhhkYtWpJ6Yhhb8tYRgcvQr6juZQrlyf1JdeBzPx0eSfllQmRyFsfmJfzSdi8VJeXCE7leBBdXhtFvxdN2ErdQJrZxJObHJkPeNixHFSQY1BKq1yOVUB1qaXGN9ZbXZ5ZupnW3iHaWY3AypUImA8Eio
WkphlyqshFR2QVFCRTb+Kc3RTWxtJ9wVJZ+AOuArVQJF5c05KnrFXSvZYXFNjC5dGZlo5bthFEwVGAQu4GagPN8WwG9kR/OBmgngRufEXDYmFphdFogZarmk2WYXcod+EgFpsBFMGJJSVWdDSYiIR/kjlttTZot7S
ooU09rJ3pVfKsAZJRsvFNUIwstphGkGcXbRh+X04XWODTvbucIRxoVVAISACESagLp3uTbZhogrVTeRoJwUbuRR96X1umctP1NYhsRXJC7WT+ZHIWbWjrXhd6zfeVG9xGqKtkifyAkQDblOIZecA9C2WzyX
9EVgUJNWRJaoycgydpGQcPrVnGtEIPbhjk1w0V+OAAAAA</dist>

```

PORTFOLIO

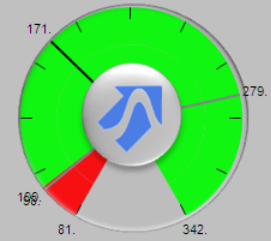
25% **50%** 0% 0% **25%** 0% 0%

Cash Large Cap Non US Equity Mixed Fund Multi-Cap Small Cap Gold



Threshold \$ 100
 Chance of Breach **5%**
 Percentiles

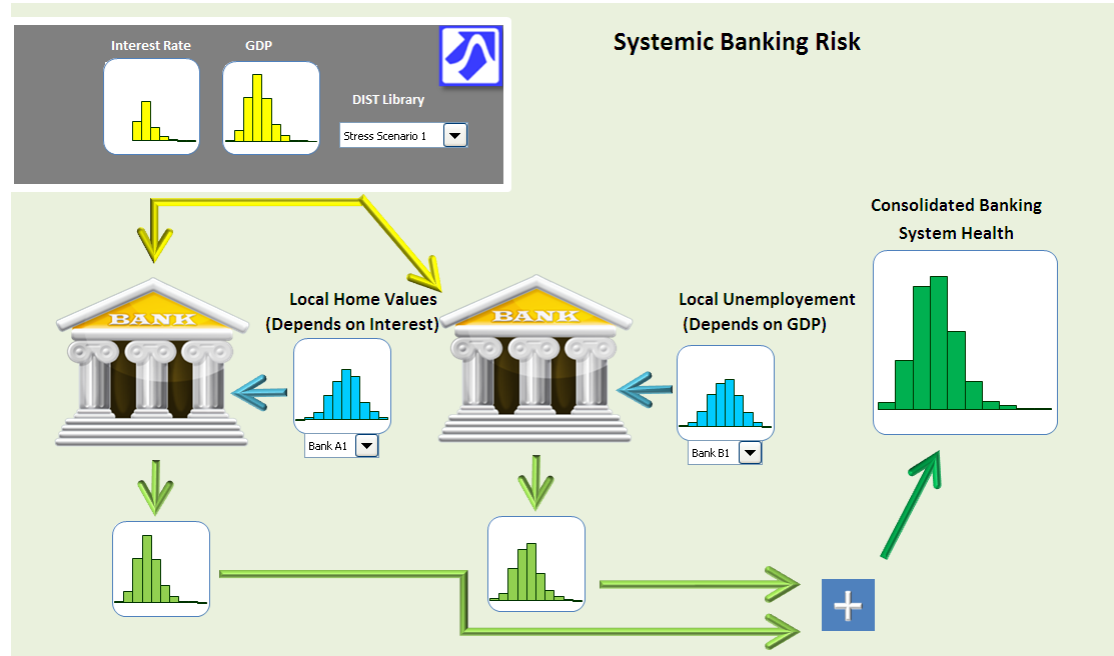
95%
 50%
 5%



Log Normal
 Fat Tail



© Copyright 2011, Vector Economics Inc.



ProbabilityManagement.org

VectorEconomics.com

Savage@Stanford.edu

References:

http://probabilitymanagement.org/Library/IWM11MarApr_MonteCarlo.pdf

<http://www.riskprofessional-digital.com/riskprofessional/200912/?pg=35#pg38>