WORLD DESIGN CAPITAL CAPE TOWN 2014

Sustainability Software Design

#WDC405 SUSTAINABILITY

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Agenda

- Examples
- Fat tails. What are they?
- Precautionary Principle
  - Applied to GMO's vs Nuclear
- Modelling

* Example - a simple environmental model (that fails). Lucid Fallacy. Wolves in Yellowstone. Trophic cascades.

* Example - Everything one can see is good. Turkey MBA (Just Before Thanksgiving)

* Example - (Not very good) "Expert" opinion. Dr John & Fat Tony

The risk of breakage of the coffee cup is not necessarily in the past time series of the variable; in fact surviving objects have to have had a "rosy" past.

https://www.youtube.com/watch?v=ysa5OBhXz-Q

Effects of Biotechnology on Maize Productivity and Yield Risk

by Guanming Shi[1]

Jean-Paul Chavas[1]

and Joseph Lauer[2]

Abstract: Biotechnology and genetically engineered (GE) crops are parts of the current wave of agricultural technological change. We analyze grain yield data from annual field experiments conducted from 1990 to 2010 in Wisconsin to test hypotheses that GE maize has greater productivity (as measured by the mean harvested yield) and lower production risk (as measured by the variance, skewness and kurtosis of harvested yield). Compared to conventional hybrids, the impact of GE traits (both single and stacked traits) on mean yield ranges from -12.2 to +6.5 bushels per acre. It shows that reducing yield risk is an important source of benefits from GE technology, especially for the stacked traits. These risk benefits are estimated to be equivalent to a yield increase ranging from 0.8 to 4.2 bushels per acre. Evidence was found for gene interactions ("yield drag" and "event lag" effects) that can reduce yield.

Need toolbox to look at tail risk

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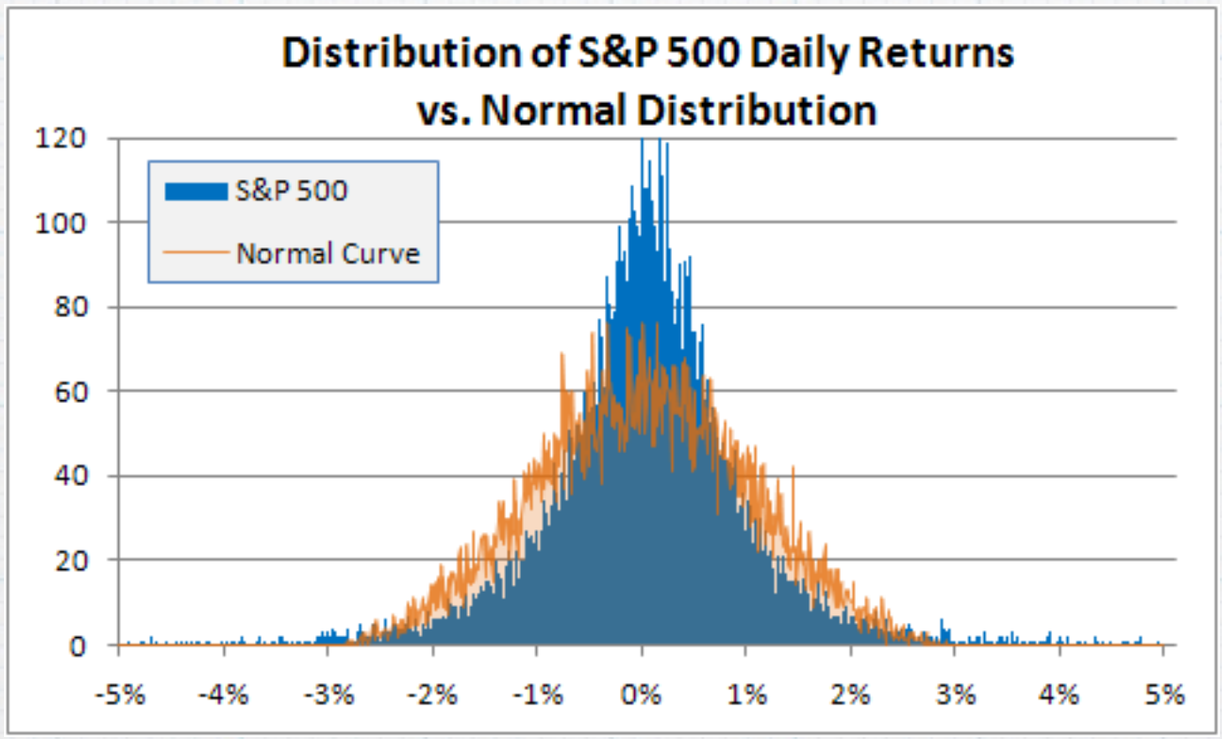
What is a Fat Tail?



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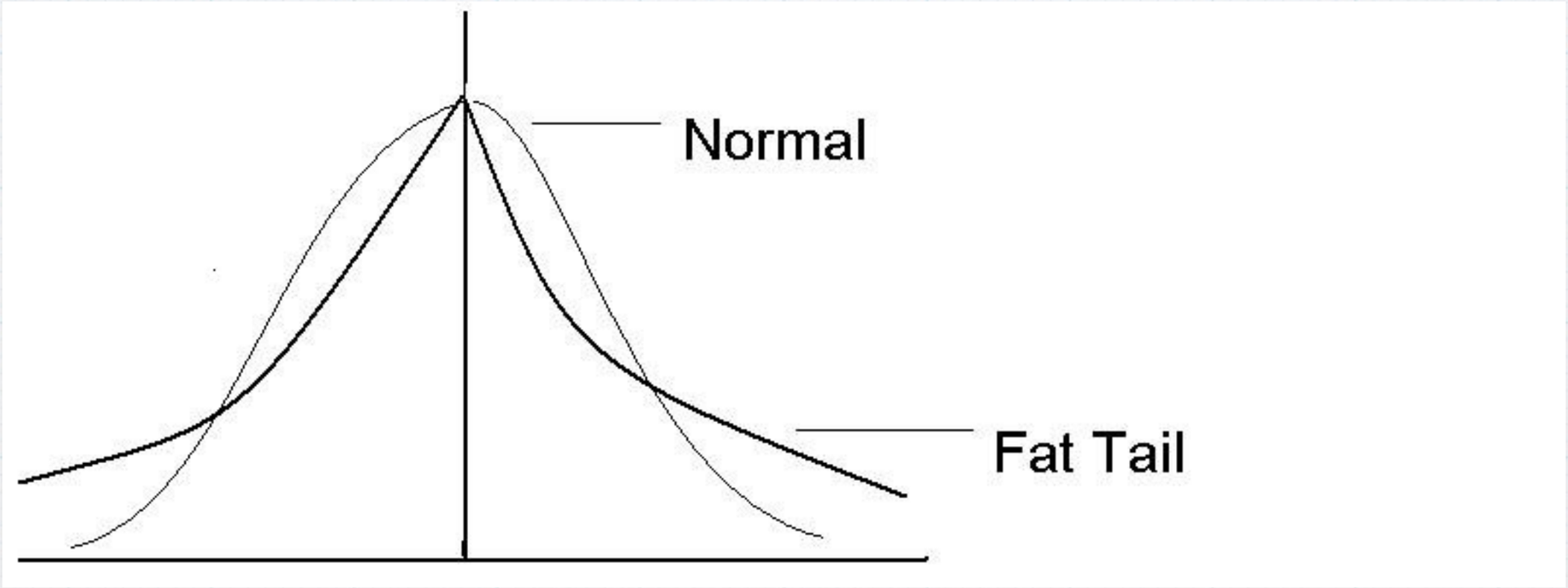
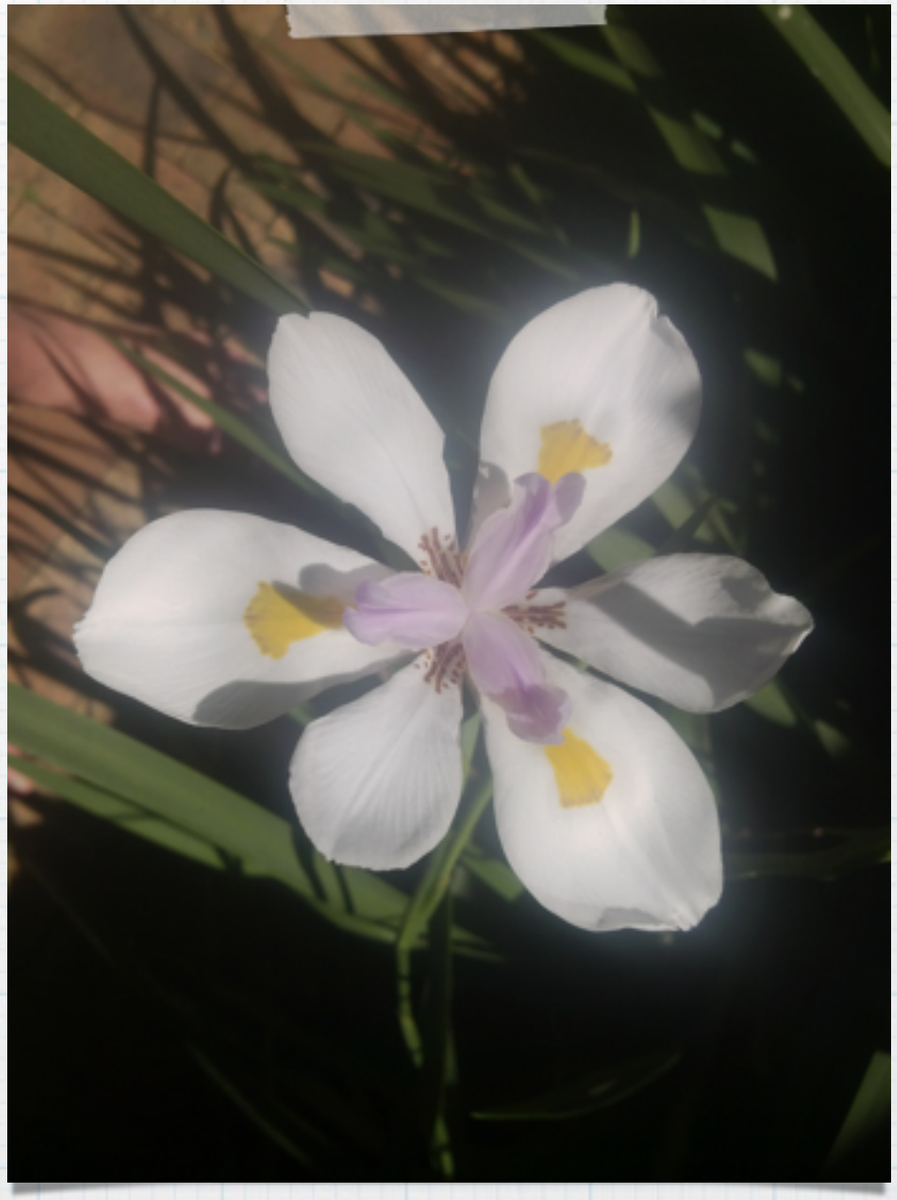


Precautionary Principle

* If an action or policy has a suspected risk of causing severe harm to the public domain, the action should not be taken in the absence of scientific near-certainty about its safety.

* Under these conditions, the burden of proof about absence of harm falls on those proposing an action, not those opposing it.



Daniel Kahneman 2011 book "Thinking, Fast and Slow". Mental models are essential. Some seem to be in-built and some can be damaging

Modelling in Software

* (Data is not sufficient. One needs a Model.)
* A Model (M) without Data is a game. (Lucid)
* In Software Testing is everything - especially *all* the boundary conditions.
* Humans are needed to interpret the outputs of models (and the input data)
* Simulation creates 'fake' data. Beware of $f(x_i, M)$. Numerical techniques are good to obfuscate the facts. (Dr John)
* Remember Models specifically exclude the 'detail'. (Trophic)

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Thank You

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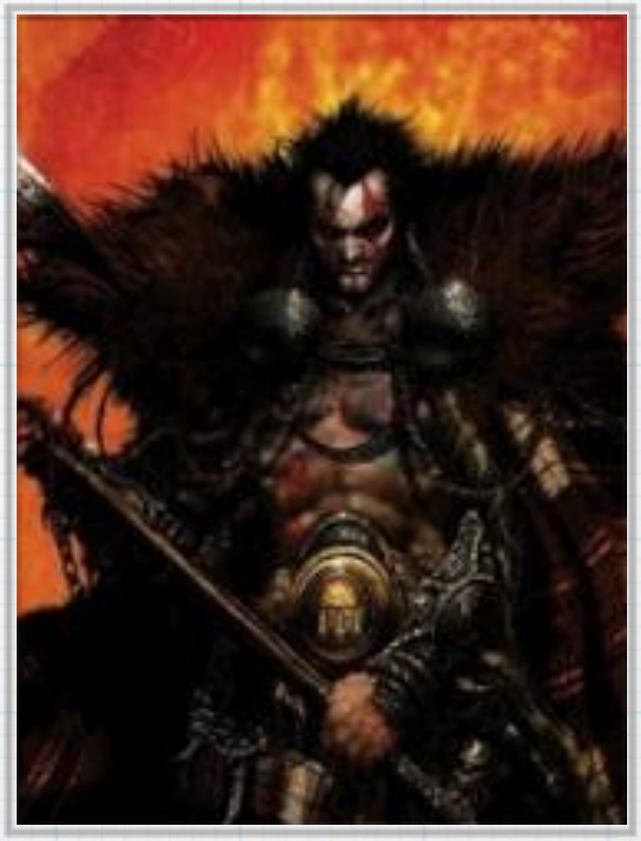

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