Re: a simple(?) probability question...

Source: http://sci.tech−archive.net/Archive/sci.math/2007−01/msg05834.html

- *From*: "Joe" <jconcordia@xxxxxxxxxxx>
- *Date*: 28 Jan 2007 07:54:03 −0800

On Jan 25, 1:35 pm, "Randy Poe" <poespam−t...@xxxxxxxxx> wrote:

> On Jan 24, 9:57 pm, "Joe" <jconcor...@xxxxxxxxxxx> wrote:
>
> > On Jan 21, 4:16 pm, James Waldby <j−wal...@xxxxxxxx> wrote:
> >
> > > Joe wrote:
> > >
> > > > [...] By definition, a 100 Years Storm is a
> > > > storm that will occur at
> > > > least once in 100 years. That means certainty
> > > > within 100 years, i.e.
> > > > probability equals 1 in the elapsed time of
> > > > 100 years....
> > >
> > > That doesn't agree with common terminology as stated, for
> > > example,
> > > inhttp://bcn.boulder.co.us/basin/watershed/flood.htmlandhttp://en.wikip....
> > > From the former:
> > > The terms "10 year", "50 year", "100 year" and "500 year"
> > > floods
> > > are used to describe the estimated probability of a flood
> > > event
> > > happening in any given year. [...] A 10 year flood has
> > > a 10 percent probability of occurring in any given year, a 50
> > > year event a 2% probabaility, a 100 year event a 1%
> > > probability,
> > > and a 500 year event a .2% probability. While unlikely, it is

possible to have two 100 or even 500 year floods within years or
months of each other.

Given the likelihood of 1% for a 100−year event to occur in a
given year, one could figure 1 − (1−0.01)^50 or ~ .395 likelihood
for it to occur at least once in any given 50−year period, or
1 − (1−0.01)^100 or ~ .634 likelihood for any 100−year period.

A Poisson process
(http://en.wikipedia.org/wiki/Poisson_process)
with lambda = 0.01 per year has probability ~ .632 of 1 or more
events occurring in any 100−year period, which is about the same
as for the Bernoulli process mentioned in the preceding paragraph,
just as one would expect for a small probability and many years.

−jiwWhile that calculation provides a numerical result of 0.634, I think

the notion that a
100 year storm has only a 63% chance of happening in 100 years would seem silly
to engineers.A coin has a 50% chance of coming up heads. Nevertheless,

the probability is not 100% that you will see heads in 2 flips.
It is only 75%.

A 6−sided die has probability 1/6 of coming up with a 3. That
does mean that in six throws a 3 is guaranteed. The probability
of seeing a 3 at least once in six throws is 66.5%.

Your intuition is leading you astray.

It would also be rather inconsistent with decisions by
rational people
to spend tremendous amounts of money on facilities to deal with planned 100 year

> > storm situations.Why? What is the inconsistency?
>
> Actually, I think it would be silly to spend that money in your
> model. Suppose the last 100−year storm was in 1965. Why
> bother spending money until 2065, since you are guaranteed
> there will be no 100−year storm till then?
>
> > I think the real weather data would show the calculation as giving a
> > conclusion that
> > is faulty. The threshold rainfall levels for the 100 year storm are set
> > by examining available
> > data, based on real events. The value of the rainfall intensity is
> > selected because
> > such storms have actually occured, not that they "might" occur.
> >
> > Some interesting data is available from the National Climatic Data
> > Center to support the
> > concept that when a given rainfall intensity is stated for the 100 year
> > storm it certainly
> > will occur. After looking at the actual data for a 50 year interval I
> > am quite convinced of this.You're quite convinced from 50 years of data
> > about exact
>
> 100 year cycles? How so?
>
> Could you point to some of this data and what conclusions
> you draw from it?
>
> − Randy− Hide quoted text −− Show quoted text −

This discussion has gotten rather out of hand. My principle point in
my first response
to the question posed was that the Poisson distribution is not an
appropriate one for
the 100 Year Storm. Really nothing more than that. I suggested the
process is more
like one of flipping a coin, where a storm is equally likely to either
occur or not occur
in any given year. From that, others through application of certain
probability formulas
interpret this as meaning a 100 years storm will certainly occur every
100 years, etc. etc.

The numerical solution of a probability function of 1.0 does not
guarantee that the event will
actually occur in nature. It only means the arithmetic was executed

accurately. I am
not surprised or dismayed by the various comments that extrapolate these calculations
to ridiculous solutions. The value of statistical analysis is in applying a proper model to
the natural process being analysed. The Poisson distribution does not properly model
the 100 year storm for the various reasons I have discussed in previous posts.

Since there is limited data to verify this, it cannot be shown with a high degree of reliability,
however looking at real data for a 50 year cycle gives interesting insight. I would be happy
to email the data to anyone that requests it.

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