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

Source: http://sci.tech−archive.net/Archive/sci.math/2007−01/msg06205.html

- *From*: "Joe" <jconcordia@xxxxxxxxxxx>
- *Date*: 29 Jan 2007 10:54:14 −0800

On Jan 29, 1:13 pm, "Randy Poe" <poespam−t...@xxxxxxxxx> wrote:

> On Jan 29, 12:29 pm, "Joe" <jconcor...@xxxxxxxxxxx> wrote:
>
> > On Jan 28, 9:52 pm, matt271829−n...@xxxxxxxxxxx wrote:
> >
> > > [Google is very flaky right now. I apologise if this appears more than
> > > once.]
> > >
> > > On Jan 28, 11:19 pm, "Joe" <jconcor...@xxxxxxxxxxx> wrote:
> > >
> > > [snip]
> > >
> > > > My point is this. Do not assign probability of 1.0 or 0.0 to
> > > > anything, since nothing in nature is absolutely certain nor
> > > > absolutely uncertain.What does "absolutely uncertain" mean? Did you mean to say "absolutely
>
> impossible"?

> These numbers are artifacts in arithmetic formulae. When I said the storm will occur in 100 years, it should not be interpreted that I meant it was impossible to not occur in that time, or that it must occur only once.You've lost me. At one point you claimed that a hundred−year storm

will certainly occur in 100 years. Various people, including me, said that this was wrong. Now you say that a probability of 1 (certainty) should not be assigned to any event in nature, presumably with particular reference to the hundred−year storm allegedly certainly occurring in 100 years. For a moment that seemed like progress, but you then go on to imply that you still think the storm "will occur in 100 years", but that this somehow doesn't mean that it's impossible for the storm not to occur. This makes no sense to me.

> Perhaps my language is too imprecise for the discipline of statistical analysis. I agree your statement that the 100 year storm is "likely" to occur is a more appropriate way to state it.I hope I never said anything that vague.

> However if the probability for an event is very high could you accept the notion that it is "virtually certain" and speak of it as if it actually will occur, and likewise if the probability is very low you can speak of it as "virtually impossible".Yes, if I drop a book then it is "virtually certain" that it will fall

to the floor. It is "virtually impossible" that it will turn into a bird and fly away.

> The line of discussion for many of these posts following my first comments have been a distraction. My comments in this dialogue have been directed at whether the Poisson distribution is or is not appropriate to estimate the liklihood of a 100 year storm in an element of time. My contention is that it is not. That is really the whole point of my posts, not a discourse on calculating probabilites using various probability functions. I note that you may feel that a binomial distribution may be a better fit. It would be interesting to hear more commentary on the applicability of the Poisson distribution to the original 100 year storm question.

> The 100 year storm is a rare and unique event."Unique" means happening only once (ever). A hundred−year storm may be

rare, but it is presumed not to be unique.

> That is what I mean when I say it is a discrete event.The fact that an event is discrete has nothing to do with its rarity

or uniqueness.

> The process is not a continuous one, it is "discontinuous". The process of 100 year storms has no characteristics like those usually analysed by using the Poisson function. There is no flowing stream of events to be enumerated,

> there is one occurance in the time domain of
> concern.Not true. A hundred−year storm
> may occur zero, one or many times

within the time domain (i.e. interval) of concern, *provided* that the
interval is of sufficient length for it to be meaningful to experience
two separate storms. The potential downside of the Poisson model is
that it assumes that in any given time interval, *however short*,
there may be multiple instances of the event. This is not plausible
for storms. If this is the point you have in mind with your talk of
discrete, continuous and "flowing streams" then I agree. Otherwise I
have no idea what you are talking about.

In contrast to the Poisson model, the binomial method discretises time
and says that in each successive fixed−length time interval the event
will either happen (once) or it won't (with some stated probability).
For example, if a time interval of one day is chosen then every day
the storm either happens or it doesn't. The storm may not happen more
than once on any given day, but it may happen on successive days. The
conceptual downside here is that a storm doesn't happen at a particular instant, and if, say, a single storm stretches from one day
into the next it may not make much sense to state that it happens on
one day but not the other.

The Poisson model is equivalent to a binomial model with an "infinitely small" time interval. The difference between the results
obtained from a Poisson model and a binomial model with a granularity
of, say, one day are tiny for the question originally posed.

> > Both the binomial and Poisson models are perfectly capable
> of
> modelling rare events − as rare as you like. In these models
> there is
> *no qualitative difference whatsoever* between extremely
> common events
> and extremely rare events.
>
> My point about virtually certain or virtually impossible when applied
> to the 100 year
> storm is that it is virtually certain that one will occur,I don't know why you
> should think this should be true of the

next 100 years, just because a storm occurred in the last
100 years.

> it is
> virtually impossible that
> the storm would occur "many" times in the 100 years.While that seems
> reasonable, I don't know why you should

assume that the probability is near zero that two storms
can occur less than 100 years apart, based on the fact
that one storm was observed in the previous century.

> We are not just
> talking about
> a big storm when we say 100 years storm. We are talking about a storm
> intensity
> that in the prior 100 years only happened one time. Somehow the
> assignment of a
> 1/100 probability to this leads to the notion that such storms can be
> "frequent" events.No, it leads to the notion that on average over a long period

such storms occur in one year out of 100.

However, perhaps p = 0.01 is too high a probability, and
a lower value of p should be chosen that more closely
corresponds to what the sailors mean by "a 100 year storm"
(i.e. a storm such that probability of occurring at least once
in 100 years is high, and the probability of occurring three
times in 100 years is extremely low). But even the old
sailors would probably say that of course a 100 year
storm can occur 90 years after the last 100 year storm,
whereas you seem to want a model that absolutely
prohibits that from occurring until exactly 100 years
have elapsed.

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No, I am just saying that I expect the storm to occur once in 100 years,
that could be year #1 or year #99. My statement on this has always been
that there is a 50:50 chance for the storm every year of the 100 year term.

I think granularity of 1−year is appropriate since the underlying data set is based
on annual data. I think a time domain of 100 years is appropriate since we are
concerned with a data value that is selected from a set that includes the data for
a 100 year time frame. While some analogies can be made to 10−year, 25−year, etc
storms, I think the storm cycles within these time periods are not good representative
examples for the 100year storm. I believe it is not as simple at 100 year storm = 0.01 probability,
10−year storm = 0.10 probability. There is a unique character to the 100 year storm by
virtue of the long duration being considered, and the singularity of the event within that
time frame.

The reference: http://en.wikipedia.org/wiki/100−year_flood has been cited earlier,
but on revisiting it is interesting to see the opening statement of that article again. If you consider WIKI Encyclopedia
as a credible reference perhaps you would accept that first sentence. It is:

"A one−hundred year flood is calculated to be the maximum level of flood water expected to occur on average once every one hundred years" I think the operative words "expected to occur" and "once every" are the basis for my
previous posts.

While this article discusses flood waters, it is reasonable to assume that the
statement would apply as well to the 100 year storm, since the flood waters most likely occur because of a storm.

It is also interesting to take note of some suggested probability density functions to be applied to this type of
situation as given in the following website: http://www.mathwave.com/applications/flood_frequency.html.
This is of course a site that is promoting their software, however there is a nice description of the application
of certain distribution functions to [100 year] storm data. The best

fit of data does not include the Poisson distribution.

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