Re: define the division of X/Y

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- *From*: "Proginoskes" <CCHeckman@xxxxxxxxx>
- *Date*: 12 Oct 2006 16:22:45 −0700

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schoenfeld.one@xxxxxxxxx wrote:

> Proginoskes wrote:
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> > > > > Proginoskes wrote:
> > > > >
> > > > > > Mike wrote:
> > > > > >
> > > > > > > where X and Y are two random variables...
> > > > > > >
> > > > > > > What is the precise and rigorous condition on Y to avoid the "dividing by

zero"
problem?

Hmm.
Making
sure Y is
nonzero
would do it.

Making the
probability
that
Y is zero
equal to
zero might
also do it.

That's an insufficient
condition.

The probabiltiy of drawing
5 out of the Naturals is 0.

What distribution are you using?

You didn't answer my question: You said the probability of choosing a 5 out of the natural numbers is zero; I asked what your distribution was.

Countably infinite sets cannot be sampled _uniformly_ at random, which I think you want to do here. However, you can set up a distribution by saying the probability of choosing N is 1/2^N. But then the probability of choosing a 5 is 1/32, which is nonzero.

The probability
of drawing a 0.5 out of the
set [0,1] is 0. It does not
mean that they
cannot ever be drawn.

But things such as the expected value (and
moments) can still be
calculated if the probability of dividing by

zero is 0.

And I did NOT mean that "probability of
event E = 0" is the same as "E
cannot happen". The more precise statement
of my intention was: "Y is
nonzero almost everywhere".

If P(Y == 0) = 0 does not imply that X/Y is well defined for
all X in
Reals, Y in Reals,

That's a weird implication.

It sure is, and it's all yours.

It's a weird way of phrasing it.

then how P(Y==0)=0 help with the OP's question?

Because X and Y are random variables, not arbitrary real numbers. This
suggests that the setting is a probability space, not general
arithmetic.

Just because the probability of drawing (y=0) is 0 does not mean that
(y=0) is never drawn. The OP necessarily requires that (y=0) is never
drawn.

The OP (Mike) didn't say exactly what he wanted to do, so all of this
is speculation anyway. But I suspect he might want to calculate the
probability that X/Y is between 2 or 3, or the expected value of X/Y,
or _some_ statistic involving X/Y.

I don't see how you came up with that.

Because I read the original post, which states that X and Y are random
variables.

You're confusing a variable with its value here.

> > For instance, X and Y might be uniformly distributed over [−1,1], and Mike wants to calculate the probability that X/Y is between 2 and 3. The problem is that X/Y is not defined, so you could end up with an improper integral when trying to calculate this probability.
> >
> > One solution might be to change the distribution to one of the form:
> > p(x) = 1/2, if x is not 0;
> > p(x) = 0, if x = 0.
> >
> > Then, if Y has this probability distribution, Y will definitely never be 0. The only concern is that this is a different distribution. However, since the probability distribution has been changed on a set of measure 0, you will get the same answer for problems like "What is the probability that Y > −0.5?" as you would for the old distribution. However, you can now talk about X/Y, since Y will never be 0.
>
> That's not what the OP asked. The OP asked what were the 'precise and rigorous conditions' for avoiding a divide by zero for random x and random y.

No, x and y are _random variables_. In fact, that statement has survived the thread:

Mike wrote:

where
X
and
Y
are
two
random
variables...

This means that you can change the defintion of Y on a set of measure zero without changing the expected value of Y.

Looking over your post, I doubt that you have any experience with measure theory, or probability (beyond probability with finite sets). It's not clear to me that you know what I'm talking about.

−−− Christopher Heckman

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