Re: Why, for Sample Standard Deviation, Divide by N−1, Instead of N?

Source: http://sci.tech−archive.net/Archive/sci.stat.math/2006−08/msg00590.html

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- *From*: "Kevin E. Thorpe" <kevin.thorpe@xxxxxxxxxxx>
- *Date*: 15 Aug 2006 18:36:59 −0700

DarkProtoman wrote:

> Kevin E. Thorpe wrote:
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> > DarkProtoman wrote:
> >
> > > Why, when you calculate the sample standard deviation, you
> > > divide by
> > > n−1, instead of n? I've heard someone said it has "nice
> > > mathematical
> > > properties that make the math work out smoothly". What are
> > > those "nice
> > > mathematical properties"? Thanks!!!!!
> >
> > Supposing you have a random sample of observations from a population.
> > The sample variance \sum[(x_i − \bar{x})^2]/(n−1) is the unbiased
> > estimate
> > of the population variance. The standard deviation is the square root
> > of
> > this. It is actually the variance that has the "nice" properties
> > (unbiasedness,
> > its relation to the chi−squared distribution).
>
> OK, then, what are the nice mathematical properties of the variance,
> then?

I mentioned two.

It's unbiased.

Let s^2 be defined as above and xbar be the sample mean
computed on a sample from a normally distributed population
with mean mu and variance sigma^2. A theorem from

mathematical statistics states that xbar and s^2 are independent
random variables. Furthermore, (n−1)*s^2 / sigma^2 has a
chi−square distribution on n−1 degrees of freedom.

It is also this sample variance that ultimately gives the t−statistic
its distribution (again under normality).

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