Re: Weighted sum of squared normals question

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Date: 02/23/05

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Date: 23 Feb 2005 14:00:25 −0500
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In article <1109090264.820492.222960@f14g2000cwb.googlegroups.com>,
Ray Koopman <koopman@sfu.ca> wrote:
>Ray Koopman wrote:
>> Tom Diamond wrote:
>>> Hello,

>>> I know that a sum of squared normals N(0,1) follows the chi−square
>>> distribution with n degrees of freedom. What if the sum is weighted,
*>>> i.e. we have to add a1*x1^2 + a2*x2^2 + ... + aN*xN^2, where x1, x2,*
>>> ..., xN are normals N(0,1)?

>>> Tnx,

>>> Tom.

>> It's approximately chi−square, with

>> (a1 + a2 + ... + aN)^2
>> df = −−−−−−−−−−−−−−−−−−−−−−−−.
>> a1^2 + a2^2 + ... + aN^2

*>That's not quite right. It's approximately *proportional**
>to a chi−square variable. The constant of proportionality is

> a1^2 + a2^2 + ... + aN^2
>c = −−−−−−−−−−−−−−−−−−−−−−−−.
> a1 + a2 + ... + aN

I doubt that this approximation is that good, especially in
the tails. For computational purposes, both the cdf and
density can be computed quite reasonably by using steepest
descent and related methods to invert the mgf.

There are statistics whose limiting distribution is that of
an infinite linear combination of squares of normals. In
that case, the idea of a chi−square approximation is very
much not appropriate. But even for chi−squared tests with
estimated parameters, complex variables for computation is

likely to be best.

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This address is for information only.  I do not claim that these views
are those of the Statistics Department or of Purdue University.
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