

Re: The First Variation of a PDF

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On Sun, 12 Oct 2008, junexpress wrote:

Consider a pdf having compact support on $[-X,+X]$ for some given positive real X , that is a function of a real parameter c .

When $c=0$, the pdf is symmetric about $x=0$ and the pdf takes a very simple form.

When c is non-zero, the form of the pdf is non-symmetric about $x=0$ becomes quite complicated.

I want to understand the effect c has when it is small but non-zero, on the bias of x .

One way I considered was to construct an approximation to the pdf:

$$(1) f(x,c) \approx f(x,0) + c \left(\frac{df}{dc}\right)_{c=0}$$

$$f(x,c) \approx f(x,0) + c \cdot f_c(x,0).$$

Now the RHS of (1) integrates to 1, but it is probably not a pdf (since it is not obvious the first order approx is non-negative). This

$$\int_{-\infty,\infty} f(x,0) dx + \int_{-\infty,\infty} c \cdot f_c(x,c) dx = 1 + c \cdot \int_{-\infty,\infty} f_c(x,0) dx = 1$$

bothers me somewhat, and has me wondering if this is the correct way to approach this problem. Any suggestions?

Why should it bother you? Doesn't it make you happy to have an approximate pdf to work with?

